Circular Business Models: Overcoming Barriers, Unleashing Potentials

Executive Summary and Recommendations

acatech/Circular Economy Initiative Deutschland/SYSTEMIQ (Eds.)

Circular Economy Initiative Deutschland

SYSTEMIQ

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NATIONAL ACADEMY OF SCIENCE AND ENGINEERING

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Circular Economy
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Contents

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Project

Editors

- acatech – National Academy of Science and Engineering
- Circular Economy Initiative Deutschland (CEID) Office
- SYSTEMIQ Ltd.

Lead of working group

- Prof. Dr. Erik G. Hansen, Endowed Institute for Integrated Quality Design (IQD), Johannes Kepler University Linz (JKU)
- Patrick Wiedemann, Reverse Logistics Group

Members of working group

- Ulrich Ahle, Fiware
- Andres Alcayaga, Endowed Institute for Integrated Quality Design, Johannes Kepler University Linz (JKU)
- Prof. Dr. Fenna Blomsma, Universität Hamburg
- Daniel Büchle, AfB Group
- Ann-Kathrin Denker, Interseroh
- Prof. Dr. Klaus Fichter, Borderstep Institut für Innovation und Nachhaltigkeit/Carl von Ossietzky University of Oldenburg
- Karsten Fiolka, SAP
- Prof. Dr. Magnus Fröhling, Technical University of Munich (TUM)
- Alexander Häge, Interseroh
- Prof. Dr. Volker Hoffmann, ETH Zurich
- Prof. Dr. Melanie Jaeger-Erben, Technische Universität Berlin
- Prof. Dr.-Ing. Holger Kohl, Fraunhofer Institute for Production Systems and Design Technology (IPK)/Technische Universität Berlin
- Prof. Dr. Florian Lüdeke-Freund, ESCP Business School Berlin
- Tara Nitz, Covestro
- Christian Schiller, Cirplus
- Prof. Dr. Thomas Schomerus, Leuphana University Lüneburg
- Rebecca Tauer, WWF
- Ursula Tischner, Econcept/FH Joanneum University of Applied Sciences, Graz
- Dr. Dieter Vollkommer, Siemens
- Dieter Wilhelm, Siemens
- Dr.-Ing. Hartmut Zefferer, Trumpf

Content support

- Dr. Reinhard von Wittken, CEID acatech Office
- Seda Akinci, CEID acatech Office
- Manfred Eschenbacher, Telekom
- Florian Hofmann, Technische Universität Berlin
- Dr. Jörn Kobus, SYSTEMIQ
- Pierre Kuhl, Covestro
- Johanna Lettgen, Reverse Logistics Group
- Marcel Rakowski, Reverse Logistics Group
- Dr. Susanne Kadner, Lead CEID acatech Office

Coordination and editing

- Seda Akinci, CEID acatech Office
- Yvonne Turzer, CEID acatech Office
- Dr. Jörn Kobus, SYSTEMIQ
- Dr. Reinhard von Wittken, CEID acatech Office
- Ronja Wolf, SYSTEMIQ
- Dr. Susanne Kadner, Lead CEID acatech Office

Taskforce 'Typology & barriers'

Taskforce lead 'Typology'

- Prof. Dr. Erik G. Hansen, Johannes Kepler University Linz (JKU)
- Prof. Dr. Florian Lüdeke-Freund, ESCP Business School Berlin

Taskforce lead 'Barriers'

- Prof. Dr. Klaus Fichter, Borderstep Institut für Innovation und Nachhaltigkeit/Carl von Ossietzky University of Oldenburg
- Prof. Dr. Melanie Jaeger-Erben, Technische Universität Berlin

Members

- Prof. Dr. Fenna Blomsma, Universität Hamburg
- Karsten Fiolka, SAP
- Florian Hofmann, Technische Universität Berlin
- Prof. Dr.-Ing. Holger Kohl, Fraunhofer Institute for Production Systems and Design Technology (IPK)/ Technische Universität Berlin
- Marcel Rakowski, Reverse Logistics Group
- Rebecca Tauer, WWF
- Patrick Wiedemann, Reverse Logistics Group
- Dr.-Ing. Hartmut Zefferer, Trumpf

Taskforce 'Digital enablers'

Taskforce lead

- Patrick Wiedemann, Reverse Logistics Group

Members

- Ulrich Ahle, Fiware
- Andres Alcayaga, Johannes Kepler University Linz (JKU)
- Prof. Dr. Fenna Blomsma, Universität Hamburg
- Daniel Büchle, AfB Group
- Karsten Fiolka, SAP
- Prof. Dr. Magnus Fröhling, Technical University of Munich (TUM)
- Alexander Häge, Interseroh
- Prof. Dr. Erik G. Hansen, Johannes Kepler University Linz (JKU)
- Prof. Dr.-Ing. Holger Kohl, Fraunhofer Institute for Production Systems and Design Technology (IPK)/ Technische Universität Berlin
- Johanna Lettgen, Reverse Logistics Group
- Marcel Rakowski, Reverse Logistics Group
- Christian Schiller, Cirplus

Taskforce 'Policy enablers'

Taskforce lead

- Prof. Dr. Erik G. Hansen, Johannes Kepler University Linz (JKU)
- Prof. Dr. Thomas Schomerus, Leuphana University Lüneburg

Members

- Ann-Kathrin Denker, Interseroh
- Prof. Dr. Volker Hoffmann, ETH Zurich
- Tara Nitz, Covestro
- Rebecca Tauer, WWF
- Ursula Tischner, Econcept/FH Joanneum University of Applied Sciences, Graz
- Patrick Wiedemann, Reverse Logistics Group
- Dieter Wilhelm, Siemens

External reviewers of selected chapters (taskforces)

- Prof. Fiona Charnley, University of Exeter
- Dr. Colin Fitzpatrick, University of Limerick
- Prof. Dr. Jur. Helmut Maurer, Senior Legal Expert, European Commission DG ENV.B2
- Dr. Max Marwede, Fraunhofer Institute for Reliability and Microintegration (IZM)
- Prof. Andrea Urbinati, LIUC Business School

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1 Executive Summary

The Circular Economy represents a disruption of today's linear 'take-make-waste economic' paradigm. It is not an end-of-pipe approach to tackling 'waste'. Turning the dominant linear structures into value cycles requires a rethinking by all involved actors. It starts with circular product redesign and demands a consistent realignment of all subsequent business processes of value creation, delivery, and return.

Overall objectives, mission of the working group

The aim of this report was to **develop a scientifically based practical manual for the successful implementation of business practices for advancing a Circular Economy (CE)**. Taking a system perspective, the task of the related CEID working group on 'Circular Business Models' was

a. to identify and describe **actor-specific circular business models** (CBMs) and their interactions in business ecosystems
b. to provide an **integrated presentation of existing barriers** to CBMs
c. to identify **digital and regulatory enablers** of CBMs
d. to derive **specific recommendations for action** addressed to decision makers in the areas of politics, business and science in order to accelerate system transition towards a CE.

Key findings and positions of the working group

Circular Business Models

- Business models are a key lever for companies to embrace the CE. Ideally, a business model aligns circular value creation activities with opportunities to capture economic value. A greater adoption of CBMs in business practice by pioneers and followers is **crucial to triggering** the desired transformation process of industries and society **towards a CE and generating a self-reinforcing momentum**.

- The isolated optimisation and profit-maximisation of individual actors' business models no longer satisfies the demands of a CE. Effectively transforming existing value chains into value cycles requires a **holistic view and design of circular ecosystems** consisting of complementary value-generating actors. The CBMs of actors within the value cycle have to be aligned, with one of the actors taking the role of a centralised orchestrator, so that the combined value creation activities can indeed reach circularity at the system level. This requires all actors in the value cycle to not only share a vision of circularity, but also to distribute **profits in a way that ensures the long-term commitment of contributing actors.** Digital technologies will play a crucial role in moving towards and further reinforcing value cycles.

- To reduce the complexity of CBMs and make them applicable in business practice, the working group proposes a **typology of 22 CBM patterns** covering both business-to-business and business-to-consumer markets. They provide practitioners with a comprehensive overview regarding their respective focus, circular potentials, and product design needs (see the 'Business model patterns overview' figure below). The patterns can be combined by a single actor to build a more comprehensive business model and interlinked across actors in the value cycle to build business model ecosystems. The typology is structured **along three dimensions**:

  1. **Actor roles:** Different actors, with their traditional roles in the value chain, are confronted with **actor-specific challenges and opportunities** when implementing CBMs. The transformation towards a CE leads to **considerable dynamic change in industries** and actors may have to go beyond their traditional roles: The positioning in the value cycle changes when actors **take on additional roles** (e.g. producers may cover recycling operations) or when **entirely new actors and roles emerge**. In order to extend their business practices towards other stages of the value cycle, focal actors preferably follow **strategic choices of vertical integration (make) or networking (ally)**, as outsourcing (buy) does not provide sufficient potential for integrating learning and related feedback into product redesign.

  2. **Circular strategies:** Grounded in an understanding which focuses primarily on technical cycles as closed-loop systems, the working group derived the following core circular strategies: **maintain and upgrade, repair, reuse, remanufacture and recycle**. While actors' business models are rooted in a core circular strategy, they are usually complemented with further supporting strategies

Actor's main role	Circular strategy	Id	Business model pattern	Service Level (sub-pattern)		
				Product-oriented	Use-oriented	Result-oriented
Supplier (molecules/ materials)		A1	Circular raw materials supplier	Molecule & material recycling	Materials bank	–
		A2	Process molecule service provider	–	Molecule & material leasing	Molecule & material performance
Supplier (mechanical engineering)		B1	Machines/components 'as new'	Machines/components 'as new'	Rental machines/ components 'as new'	Pay per reman machine performance
		B2	Machine/component remarketing	Used machines/ component sales	Rental machines/ components	→ see **B1** Pay per reman machine performance
Producer		C1	Proprietary material cycles	Waste cherry picking	Materials bank partnership	–
		C2	Product 'as new'	Selling products 'as new'	Product leasing 'as new'	→ see **C6** Total care producer
		C3	Used product remarketing	Used product sale	–	–
		C4	Out-of-warranty repair service	On-demand repair	→ see **C6** 'Leasing producer'	→ see **C6** Total care producer
		C5	Upgrades, spares & accessories	Modules & accessories shop	Upgrade subscription	–
		C6	Maximising product uptime	Fee-based maintenance	Leasing producer	Total care producer
Retailer & service points		D1	Retailer as cycle manager	Retailer as cycle manager	→ see **C1** Materials bank partnership	–
		D2	Retail remarketing & reman	Used goods on sale	Rent-a-wreck fleet manager	–
		D3	One-stop shop (retail)	Integrated service point	Rental retail	Total care retail
Repair provider		E1	Repair gap exploiter	Repair transaction	Repair-based rental	–
Prosumer		F1	Prosumer support system	Do-it-yourself repair	Peer-to-peer sharing	–
Logistics provider		G1	Material reverse logistics	–	–	Pay per recycling logistics performance
		G2	Refurb logistics services	–	–	Pay per refurb performance
		G3	Spare parts management	–	–	Pay per spare part performance
Recovery manager		H1	Revitalised products	Used goods bargain	–	–
		H2	Coordinator of informal collection	Fair-trade recyclates	–	–
Intermediary		I1	Recycling platform	Recycling platform	–	–
		I2	Used goods & sharing platform	Used goods platform	Sharing platform	–
Emerging actors	All	J1...x	?	?	?	?

Business model patterns overview (Source: own presentation based on Hansen et al. 2020). The table provides an overview of the 22 main CBMs plus the emerging actor class. The ID number (third column) provides easy referencing to specific business model patterns.

which, combined, constitute a **circular strategy configuration**. By ensuring better circulation of products and incorporated materials, a CE aims to **avoid waste in the first place** and achieve an absolute reduction of resource use at the level of the circular system and economy as a whole, not necessarily at the level of the individual product.

3. **Product service system type:** The service level of CBMs is represented by a continuum covering **product-, use- and result-oriented services**. It is assumed that the **maturity of CBMs generally increases as one moves from product- towards result-oriented service levels**. This is because higher service levels usually emphasise material productivity over mere product turnover. They also provide a conducive contractual infrastructure for capitalising on digital enablers of circularity (e.g. preventive maintenance) as well as for preventing discarded goods from becoming waste (e.g. a contract requiring the return of leased products to the lessor).

Barriers

- Barriers to the implementation of CBMs are usually divided into categories such as **regulatory, financial, technical, organisational, value chain and consumer barriers**. However, in the 'real world', it is **the mutual relationships between providers** (supplier, producer, retailer, repair provider, logistics provider, etc.), **users** (professional users such as businesses as well as consumers) **and the product** (i.e. technology, design) **and related services** which lead to **sets of nested barriers**. On the basis of this framework, an integrated solutions approach is introduced for each circular strategy.

Digital enablers

- While the **application of digital technologies** to business practice has thus far mainly focused on improving production processes in terms of efficiency (often referred to as 'Industry 4.0'), digital technologies can also play an important role in overcoming barriers to CBMs and **enabling the operationalisation of circular material, component, and product flows**. Simply put, they are the 'glue' connecting CBMs of value cycle partners and related stakeholders through data sharing and increased transparency. Thus, digital service elements become the basis for **smart maintenance/repair, smart reuse, smart remanufacturing, and smart recycling strategies.** For instance, component monitoring enables a producer to collect a product at the exact point in time when it is worn out, but not yet broken so that remanufacturing is technically and economically feasible. In this way, **digitalisation addresses the 'information gap'** that currently often prevents circular strategies from being effective.

- Depending on the level of an organisation's digital maturity, data and **digital technologies can be used to provide either hindsight, oversight or foresight value** for an organisation. While hindsight and oversight value are obtained by revealing trends and understanding events and behaviours, foresight value is obtained by generating predictions about how to best optimise the use of products and resources. Digitally enabled CBMs therefore move away from descriptive to more prescriptive approaches to analysing CE-relevant data.

Policy enablers

- While Germany and the European Union have a long tradition of waste legislation, there is no consistent CE regulatory framework in place. Instead, **CE-related aspects are scattered across different, sometimes conflicting, legal areas such as waste legislation and the EU Ecodesign** legislation (currently applicable to only a small range of electrical devices). It is therefore important to develop a **more holistic policy framework** emphasising prevention through the extension of product lifetimes, reuse, and remanufacturing **based on circular product design requirements and standards**.

- The report sets out a **CE policy toolbox plotting the wide variety of instruments identified in prior studies and those developed within the working group along two dimensions: instrument type and coverage of CE strategies**. Types of instruments include economic (dis)incentives, regulation, voluntary standards (i.e. self-regulation), information, and government procurement. These instruments can either address CBMs more broadly, or individual CE strategies of maintenance/repair, reuse, remanufacturing, and recycling in a more focused way.

- While CBMs aim to avoid waste in the first place, this is often hindered because the legal concept of waste carries significant and often detrimental consequences for the application of circular strategies and, thereby, impedes economically successful CBMs. **Policy enablers should prevent products from becoming waste** by facilitating a longer service life of products (e.g. extended warranties), mandatory take-backs by producers, or higher-level service

business models in which **customers use products (e.g. rental) instead of owning them**. As a consequence, CBMs focused on **value-sustaining circular strategies such as repair, reuse, and remanufacturing are incentivised** and can gain momentum.

Use case: circular televisions

While each aspect presented above is an important piece of the puzzle, it is their **interrelationships and combined effect** which provides the full picture. By referring to the **example of television sets**, the report explores the **three levels of service business models introduced in the CBM typology: i) product-oriented TV after-sales services, ii) use-oriented TV leasing and iii) result-oriented pay-per-view.** For each service level, the role of digital and policy enablers in overcoming barriers to the development of CBMs and related ecosystems is demonstrated.

Recommendations

The transition to a CE requires **a paradigm shift in business, politics, science and society in general**. The working group commonly agreed on **seven core actions** for further implementation. The first one highlights the **leadership role of industry**, the subsequent five recommendations describe the **government's role in establishing a policy mix** consisting of economic, regulatory, self-regulatory (i.e. standardisation), information and public procurement instruments, and the last recommendation addresses the **long-term governance** of the transition (a detailed list of specific measures can be found in the 'Recommendations' chapter of this report):

1. **Business model experimentation:** Industry needs to lead and invest in business experimentation with radically more circular service business models and related advances in circular product designs, circular service processes, and partnerships across the value cycle.

2. **True-cost pricing and further economic incentives:** Governments should develop an economic market framework with true-cost pricing based on established Ex'Tax reform principles: a zero-sum game where costs of labour are decreased and costs of natural resources and related emissions are increased proportionally. This allows manpower to be used in labour-intensive circular strategies (e.g. remanufacturing) instead of primary resources and energy. Additionally, there is a need for targeted support for product-, use-, and result-oriented service business models which combine circular product design with related circular (service) strategies (e.g. maintenance, repair) in order to accelerate the transition.

3. **Advanced regulation based on a circular product policy framework:** Isolated reforms of current waste management and Ecodesign policies do not appear to be enough to overcome the current dominant focus on waste and to ensure circularity is truly embraced. In contrast, a coherent circular product policy framework is needed which ensures a level playing field for global competition. This requires i) all products to comply with minimum circular design characteristics (e.g. reparability) as part of product registration for the European market, ii) straightforward digital accessibility to product characteristics through a common product ID, iii) greater responsibility of producers/retailers along the product life cycle through approaches such as extended warranties and obligatory take-back, and iv) preventing waste status of products where circular strategies remain reasonable. In addition, high-quality recycling should be promoted by Safe-by-Design policies and by linking qualitative criteria to the existing quantitative quotas.

4. **Standardisation:** Government and industry need to support the development and/or harmonisation of standards for i) the condition of used, refurbished, and remanufactured products and components, ii) high-quality post-consumer recyclates, and iii) open data formats for exchanging relevant circular characteristics between actors (e.g. product or material passports).

5. **Information, awareness and user skills:** Strengthening the decision-making capability of customers and users requires increased literacy in circularity, to be established through training courses and educational programmes in schools, vocational training centres, and universities. Increased information needs regarding the circular characteristics of products and services must be addressed through better product labelling and declarations at the points of sale (e.g. average product lifetime).

6. **Government procurement:** Public institutions should lead by example by establishing strategic targets and quotas for used, remanufactured, and recycled products. Moreover, vendors with service business models offering services such

as advanced maintenance, repair, and take-back should be prioritised over those vendors limiting their services to compliance (i.e. repairs based on legal warranty). This also includes removing barriers to procurement regarding use- (e.g. leasing) and result-oriented (e.g. pay-per-performance) service business models.

7. **Long-term institutionalisation:** Provide science-based guidance for the transition to a CE through the establishment of a national and European central body that aligns the outlooks of politics, industry and society across legislative (and financial) periods in the long term.

2 Recommendations

A successful transition to a Circular Economy requires **a paradigm shift in and close collaboration between business, governments, science and society**. This requires an understanding of comprehensive system transformations, or the 'great transformation'[1, 2]. In line with such **a systemic point of view**, the recommendations developed in this chapter should not be understood as singular measures, but as bundles of integrated actions which together represent **a carefully drafted 'policy mix'**, ensuring coherence and complementarity. In this way, possible synergies in the implementation process can be exploited and conflicts between individual measures avoided. Ensuring a transdisciplinary dialogue among politics, business, science and civil society can ensure a coordinated approach during the implementation period and make sure that goals and achievements are continuously monitored and reassessed.

2.1 Overarching policy recommendations

Successful transformation toward a CE, as with sustainability more broadly, requires policy makers to specify and adhere to long-term goals, create new markets and niches, align innovation with Exnovation[3], and provide necessary complementary public infrastructure (e.g. collection schemes).[4] Against this background, the working group commonly agreed on **seven core actions for further implementation**. The first one highlights industry's leadership role, the next five recommendations set out the government's role in establishing a policy mix consisting of economic, regulatory, self-regulatory (i.e. standardisation), information and public procurement instruments, and the last recommendation addresses the long-term governance of the transition:

1. Industry needs to lead and invest in experimentation with new CE-oriented (service) business models and related radical innovations in products, processes, and organisational forms

In order to drive innovation and accelerate the transition to a CE, companies need to proactively embrace the transition, realign their strategies and R&D goals, and generally invest more time and resources. Innovation spaces – within or independent of core business units – for questioning traditional linear business models, products designs, and related value chains and for engaging in radical innovation of service business models are fundamental to transforming organisations. This involves developing and strengthening cross-sector partnerships and expanding business model ecosystems towards full circles.

2. Governments should develop an economic market framework with true-cost pricing and provide targeted support for advanced CE practices (policy type: economic incentives)

True-cost pricing is key to the further development of appropriate economic and market frameworks for CBMs (and sustainability more broadly). CBMs cannot come into widespread use if key economic conditions and incentives remain hostile to their development. We are therefore following other reputable reports in concluding that 'one of the preconditions for a Circular Economy is a fundamental shift in taxes from labour to the use of natural resources'.[5] A very well established and tested agenda for reform is the Ex'Tax principle, at the core of which is the aim to shift rather than increase the tax burden (i.e. a zero sum game).[6, 7] It describes a tax-related policy mix which combines instruments that increase the costs of the exploitation of natural resources (e.g. higher CO_2 prices) – including the removal of harmful subsidies (e.g. all kinds of tax exemptions/reductions linked to the exploitation of fossil fuels) – with instruments that lower tax burdens for labour (e.g. the reduction of employer-paid contributions to employed persons' insurance and health) and labour-intensive services contributing to circularity (e.g. zero VAT for repair and maintenance services).

Beyond true-cost pricing, targeted funding should accelerate the transition to the CE. Most importantly, it is necessary to support the adoption and diffusion of service business models linked to circularity (e.g. chemical leasing), introduce or expand repair service operations, promote standardised reusable systems (e.g. a standard bottle), and establish and demonstrate remanufacturing operations. This can all be cross-facilitated by the implementation of digital technologies for better tracking-and-tracing of materials, components, and products along value cycles, including digitally enhanced collection and sorting infrastructures.

1 | See Schneidewind/Singer-Brodowski 2014.
2 | See Schneidewind 2018.
3 | E.g. increased use of secondary raw materials also needs to be linked to reduced production of primary raw materials.
4 | See Clausen/Fichter 2020.
5 | See Groothuis/Ex'Tax Project 2014, p.5.
6 | See Groothuis/Ex'Tax Project 2014.
7 | See Groothuis/Ex'Tax Project 2016.

3. Further develop regulatory framework and remove related barriers (policy type: regulation)

Isolated reforms of current waste management and Ecodesign policies do not appear to be sufficient to overcome the current dominant focus on waste and to ensure circularity is truly embraced. In contrast, a coherent circular product policy framework is needed which ensures a level playing field for global competition (a more detailed elaboration is given in section 2.3). This requires i) all products to comply with minimum circular design characteristics (design for longevity, reparability, recyclability) as part of the product registry for the European market, ii) straightforward digital accessibility of product (product type) characteristics through a common product ID, iii) greater responsibility of producers/retailers along the life cycle with extended warranties and obligatory take-back to provide incentives for better product design and circular service operations and iv) preventing end-of-product status where circular strategies of repair, reuse or remanufacturing remain reasonable and preventing waste status as long as recycling is feasible. The prohibition of the destruction of returned products from online and offline shopping is a precondition for circulation.

In order to promote high-quality recycling, governments should establish quality criteria in addition to quantitative recycling quotas (this includes the definition and differentiation of the recycling term regarding quality, the consideration of potential output qualities from sorting/recycling facilities and related treatment requirements, and more material-specific quotas)[8], establish binding minimum quality standards for recyclates, and define sector-specific requirements for minimum recycled content from post-consumer materials. It is not possible to move towards quality recycling without tightening the regulation of toxins in materials and products: the shift to 'Safe-by-Design Chemicals' through the progressive substitution of hazardous and other substances of concern is to be addressed in the product policy framework and the EU's chemical strategy[9] and has implications for the interface of REACH, Ecodesign, and waste legislation.

4. Support the development and harmonisation of product and material-level standards (policy type: standardisation)

The absence of standardisation hinders the more widespread diffusion of CBMs. The German government should support and, where they do not exist, initiate standardisation initiatives on national and international levels. The most important needs are i) to establish a standard for classifying the condition of used, refurbished, and remanufactured goods and components, ii) to develop quality standards and labels for the reliability of remanufactured products and their incorporated components, iii) to harmonise and diffuse quality standards and labels for high-quality post-consumer recycled materials (recycled content in products) with transparency and quality assurance regarding physical, chemical, biological, and toxicological properties, and iv) to establish standards for open data formats (e.g. product passports) and related standardised exchanges of circularity-related data. Standards should preferably be open rather than proprietary.

5. Strengthen user competency and information availability regarding circular products and services in the market (policy type: informational instruments)

The uptake of CBM is often slow due to a lack of awareness of circular characteristics and existing offerings. Governments should help in diffusing awareness, knowledge and skills relating to circularity and CBMs. This involves better information availability through product labelling and declarations (based on standards) at the point of sale regarding average product lifetimes, product reparability (i.e. reparability score), and advanced eco-labelling based on the circular requirements of the EU product registry and/or the Ecodesign Directive. Awareness raising campaigns should also increase the literacy of users and consumers in do-it-yourself or assisted repairs (e.g. repair café), contributing to a shift from consumers to circular prosumers. The basis for translating better information into better decisions is training and educational programmes in schools, vocational training centres (e.g. consumer electronics repair), and universities (e.g. master's programmes in CE). Education has the dual effect of increasing the user literacy and building the skills of the future specialised workforce required by companies in the transition to a CE.

6. Make public institutions lead by example through government procurement (policy type: government procurement)

Governments and public authorities have a responsibility to lead the transition into the CE. We recommend strategic targets and quotas for used, remanufactured, and recycled (and simultaneously recyclable) products differentiated by goods category. Moreover, vendors with service business models offering services such as advanced maintenance, repair, and take-back should be prioritised over those vendors limiting their services to compliance (i.e. repair based on legal warranty). This also includes removing barriers to procurement regarding use- (e.g. leasing) and result-oriented (e.g. pay-per-performance) service business models which have considerable potential to advance circularity, but which vendors often have difficulty in diffusing on the market. Central procurement guidelines and competence centres should support these practices.

8 | See Sachverständigenrat für Umweltfragen 2020, pp. 163-167.

9 | The EU is currently working on the initiative 'Chemicals – strategy for sustainability (toxic-free EU environment)', in which these aspects are discussed.

7. Institutionalise a long-term CE transition by a national and European central body

Provide science-based guidance for the transition to a CE through the establishment of a national and European central body that aligns the perspectives of politics, industry and society across legislative (and financial) periods in the long term.

2.2 Detailed policy recommendations per Circular Economy strategy

The following table gives an overview of the recommended actions developed in the working group on the basis of existing policy studies and joint discussions. Each of the recommendations is further specified by indicating which policy type the measure can be subsumed under, which CE strategy it promotes, by when the measure should be implemented and which political/societal actors bear decisive responsibility for implementing it.

Policy instrument	Policy type					Responsibility	Possibly effective in* ...		
	Economic	Regulatory	Standards	Informational	Government procurement		2021-23	2024-26	2027-29
Meta level									
Foundation and funding of a national and European central body that aligns perspectives of politics, industry and society across legislative periods.	×		×	×		National government, multiple ministries incl. Research, Environment, Economy, Finance	×		
Support the creation of university, vocational and school educational programmes for the CE (and related positions as professors/teachers) including digitalisation as a lever for smart maintenance, repair, reuse, reman, and recycling. This covers all levels including apprenticeships [dual training] and higher education (e.g. integration of CE-modules in established business, engineering, social science, and political science programmes).	×			×		F.M. of Education and Research	×		
Advance the framework conditions for Circular Business Models across all CE strategies (maintain/repair, reuse, reman, recycle)									
Ex'Tax reform: compensating for higher resource taxes with lower labour taxes (e.g. higher CO_2 and consumption taxes, removal of harmful subsidies, lower VAT for repair/maintenance services, reduction of employer-paid contributions to social security, lower income taxes).	×					Broad participation of F.M. (e.g. Economy, Environment, Finance, Labour)	×	×	×
Invest in new corporate and interorganisational innovation spaces for developing, experimenting with, and evaluating radical new service business models linked to circular value creation (e.g. maintenance, upgrading, repair).						Industry	×		
Ecodesign Directive: Support the ongoing progressive reform of the EU Ecodesign directive with additional criteria of longevity, reparability/ disassembly, upgradability, reusability, recyclability, and non-toxicity.		×		(×)		National government	×	×	

Policy instrument	Policy type					Responsibility	Possibly effective in* ...		
	Economic	Regulatory	Standards	Informational	Government procurement		2021-23	2024-26	2027-29
Advance the framework conditions for Circular Business Models across all CE strategies (maintain/repair, reuse, reman, recycle) *continued*									
Assessment of circular criteria (e.g. reparability, recyclability) in EU product registry for market access (i.e. ‚Conformité Européenne'/CE marking), establishing a level playing field.		×				National lobbying with EU government		×	×
General obligation for producers to take back products (combined with EPR) to prevent waste status.		×				National lobbying with EU government		×	×
Revision of Waste Legislation (KrWG) to prevent used but reusable, repairable, or remanufacturable products from being assigned waste status in the first place.		×				National government, with optional links into EU legislation		×	
Stimulate industry adoption of distributed ledger technologies (e.g. blockchain) through standards and software packages, enabling the traceability of products, components, and materials along the value cycle.	×		×			Companies/Industrial Associations; F.M. Economic Aff.		×	
Support the development of secure standards for open data formats (e.g. product passports) and related exchange of circularity-related data (e.g. product exchanges/condition, maintenance, repair).			×			e.g. F.M. of Economy, Transport/Digital Infrastructure, Environment; Standardisation Bodies	×		
Targets/quotas for government procurement regarding used, remanufactured, and recycled products and related preferences for product-as-a-service business model contracts over traditional goods purchases.					×	National/state governments, public-sector institutions	×	×	
Support, remove barriers to, and stimulate demand for a shift to CE-related product-as-a-service business models (e.g. circular leasing) which are linked to maintenance, repair, and product take-back for remanufacturing and recycling.	×	×		×	(×)	F.M. of Economy, Education/Research, Environment, Finance	×		
Advance the product-life extension through repair/maintenance, and upgrading									
Providing funding to producers or third-party actors in support of the operation of repair networks with nation-wide accessibility.	×					National government	×		
Extend legal and/or commercial warranties to planned technical lifetime, to three years for all goods, or five years for selected goods as a driver for service business models.		×				National government		×	
To prevent breaches of data privacy, producers should only collect and share data that are relevant for carrying out the specific function (e.g. maintenance). For this purpose, data should be categorised and layered in a way that such bounded access can be operationalised.			×			Companies; Industrial Associations; Standard-setting bodies	×		
Create a product repair score including physical and digital components (i.e. upgradability) and related (mandatory) product labelling.				×		National governments with links to EU Ecodesign Directive	×	×	
Increase user autonomy by engaging in repair practices & increasing repair skills (e.g. visiting repair cafés).				×		User/Civil society	×		

Policy instrument	Policy type					Responsibility	Possibly effective in* ...		
	Economic	Regulatory	Standards	Informational	Government procurement		2021-23	2024-26	2027-29
Advance the reuse of products (and components)									
Promote reusable systems (e.g. packaging, parcels) and evaluate extensions (more product categories) of Single-Use Plastics Directive to additional product categories and materials.	×					National governments, partly EC	×		
Prohibition of destruction of returned products from online and offline shopping.		×				National government	×		
Declaration of average product life at point of sale.				×		National government		×	
Standardise and improve statements on the condition of reused, refurbished, and remanufactured products/components based on traceable data (e.g. product history tracking, product passport) and their quality assurance in order to improve transactions on online platforms and increase the confidence of market participants.			×	×		Industry; Consumer protection agencies	×	×	
Advance the remanufacturing of products (and components)									
Strategic funding of reman institutions (e.g. National Institute), programmes, pilots, and training.	×					National government (e.g. F.M. of Education/ Research; Economy)	×		
Support demonstration projects by companies using track-and-trace and life cycle information about products-in-use to improve take-back services, planning of remanufacturing processes, and replacement of virgin production with remanufacturing.	×					e.g. F.M. of Economy; Transport and Digital Infrastructure	×		
Explicit integration of reman definitions/standards in waste legislation and regulation of international trade to prevent waste status of returned used products/components (‚cores') and harmonisation at an international level to remove trade barriers.		×				National government (e.g. F.M. of Economy; Environment)		×	
Support the development of quality standards and labels for the reliability of remanufactured products and their incorporated components.			×			National government; Standardisation bodies		×	
Advance the high-quality recycling									
Advanced and circularity-modulated recycling fees for producers of end products across sectors to be paid when goods are introduced to the market.	×					National government		×	
Support the demonstration and diffusion of digital technologies (e.g. artificial intelligence) in the recovery sector to improve material recognition and sorting as a basis for high-quality recycling and, where necessary, cover necessary adaptations of product designs (e.g. markers as a basis).	×					Sorting infrastructure companies; Industrial Associations; F.M. of Economic Aff.		×	
Shift to ‚safe-by-design chemicals' with the progressive substitution of hazardous substances – to be addressed at the interface of REACH, Ecodesign/ product, and waste legislation.		×				National government and EC		×	×
Regulate the amount of recycled content in products (e.g. packaging) using approaches such as quotas.		×				Government		×	×

Policy instrument	Policy type					Responsibility	Possibly effective in* ...		
	Economic	Regulatory	Standards	Informational	Government procurement		2021-23	2024-26	2027-29
Advance the high-quality recycling *continued*									
Introduce qualitative recycling criteria and link them to existing quantitative quotas to prevent downcycling on a national or European level.		×				National government or EC		×	
Establish binding quality standards for secondary materials and recycled content in end products.		×	×			Government; Industry	×	×	
Support the development of new and/or the harmonisation of existing standards/certification systems (e.g. RAL % Recycling Kunststoff, Cradle to Cradle) for high-quality recyclates with transparency and quality assurance regarding physical, chemical, biological, and toxicological properties - as a basis for product declaration.			×	×		National government; Standardisation bodies	×	×	

Overview of recommended actions (Source: own presentation)

* Timeframe shows the earliest date possible when a policy could become effective, if policy makers start working on their planning/ implementation today.

2.3 A change in perspective: advancing regulation towards a circular product policy framework

To date, neither waste nor Ecodesign legislation has fulfilled the goal of reaching a Circular Economy. Despite covering not only the product's waste phase but also its whole life cycle, waste management legislation still focuses on the end of product life, primarily recycling and further waste treatment, and does not take waste prevention entirely seriously. On the other hand, Ecodesign legislation is still narrow in scope, only addressing energy-related products. A significant share of the above regulatory recommendations can therefore be considered to go beyond waste and Ecodesign legislation.

In order to achieve more significant progress towards a CE, and to better accommodate the various isolated policy instruments recommended above, the regulatory framework must be far more product and producer oriented. There would appear to be a need for **independent product legislation**, a sustainable and circular product policy framework which goes beyond the traditional areas of Ecodesign and waste legislation. Such a policy framework is rooted in **a change of perspective along seven lines** (all of which have already been addressed as part of the policy recommendations above or elsewhere in this report)[10, 11]:

1. **From waste to product hierarchy:** Complementing the waste hierarchy, a 'product hierarchy' following the priorities of CE strategies could be established containing longevity (maintainability), reparability, remanufacturability, non-toxic composition (substances of very high concern), and recyclability (rule exception relation). This hierarchy would then also be the basis for defining financial incentives, as in the Ex'Tax reform.

2. **From end-of-waste to end-of-product status:** While the waste status of products is precisely defined in waste legislation, and often presents a barrier to higher level circularity, an end-of-product status may better serve a CE. A product should only lose its status under certain conditions, namely when no repair, remanufacturing or re-use is possible, when it cannot be transformed into a material, substance or other product without endangering human health or the environment, and as long as illegal waste exports can be prevented in a reasonable manner. The application of end-of-product status could prevent products from falling automatically under overly complex waste management regulations at the end of their use. Hence, other than current practice, products falling under the definition of waste should be made the exception, not the rule.

10 | See Maurer 2020a.
11 | See Maurer 2020b, p. 3.

3. **From extended producer responsibility to producer responsibility for sustainability:** A further element which is to some extent being considered in the current draft of an amendment to KrWG (Section 23 No. 11 KrWG-draft)[12] is the concept of 'producer responsibility for sustainability'.[13] Generally speaking, producers should keep control over their products and have a duty of care over their full life cycle. This includes obligatory take-back and encouraging product longevity, etc. Possible supporting policies already proposed are minimum guarantee periods on products, long-term availability of spare parts, and establishing product repair and refurbishment networks.

4. **From limited product groups (Ecodesign) to general design requirements:** All products, not only those falling under the Ecodesign Directive, should be designed based on circular criteria.

5. **From design only to design-based aftersales services:** Product design alone does not reap the potential of circularity. Only in combination with after-sales services (e.g. repair) does circularity become a reality. This includes earlier policy recommendations such as a producers' own operation of, or financial contribution to, repair networks.

6. **From limited ex-post to general ex-ante registration schemes for market access:** In order to establish a level playing field for more demanding circular requirements, a key recommendation above includes the verification of minimum design characteristics as part of the general registration in the EU product registry for market access.

7. **From anonymous to digitally identifiable products:** As a basis for leveraging the various digital enablers for circularity, products marketable in the EU have to bear a visible product ID (e.g. barcode), allowing access to authorised data contained in a product passport with important circular characteristics (e.g. average life-span, access to repair service, recyclability profile).

2.4 Leading the change in individual business organisations

The recommendations for industries and policy makers outlined above will certainly accelerate the transition to a Circular Economy. Over time, framework conditions will be ever more conducive to CE-oriented business practices and business models. Still, the strategic choices, designs and mode of implementation of CBMS in the individual organisation remain a strategic responsibility of each individual company. Companies can respond more quickly and proactively to anticipated changes in regulatory and market frameworks, or they can respond more defensively to current regulatory requirements.[14]

Proactively adopting CBMs can be an important driver of success for individual organisations if a '**Business Case for Circularity**' is developed. Six business drivers service this end:

- costs and cost reduction
- risks and risk reduction
- sales and profit margin
- reputation and brand value
- attractiveness as an employer, and
- innovation and innovativeness.

The table below provides examples of issues which corporate decision makers can raise in order to develop viable business cases for circularity and outline exemplary measures/KPIs by which their implementation rate can be monitored. In this way, the table provides some initial practical guidance for business managers seeking to strategically implement more circular business practices at an organisational level.

12 | See BMU 2019, p. 65.
13 | See Stahel (2019), p. 53. Proposes a similar 'Extended Producer Liability' scheme.
14 | See Schaltegger et al. 2012.

Business case driver	CE aspect	Exemplary measures	Exemplary KPIs
Costs and cost reduction	How can CE measures reduce costs?	– Increasing the use of secondary raw materials may reduce costs (if market framework reflects true costs). – Introduction of repair service packages reduces product complaints/returns.	% Share of secondary raw materials in individual product group/entire portfolio # Reduction of number of complaints/product returns.
Risks and risk reduction	How can CE measures reduce risks for the company?	– Installing take-back systems and increasing reuse of secondary materials makes companies less dependent on primary raw materials and related supply chain issues and increases resilience. – With service business models companies are able to contain the technical risks of new product designs through monitoring, (preventive) maintenance, and repair. – Reducing content made of Substances of Very High Concern (SVHC) in products will reduce risks related to customer health.	% Share of secondary raw materials in individual product group/entire portfolio # Reduction of customer complaints directed at the company or on online platforms (i.e. user ratings).
Sales and profit margin	How can CE measures increase sales margins and/or increase profits?	– New quality-as-new (i.e. remanufactured) product line can be offered at lower costs, reaching new customer groups. – Total care service contracts allow for additional (service) sales turnover over the entire use phase.	# New customers attracted by quality-as-new product line € Sales of new maintenance/repair service packages. # Total care contracts.
Reputation and brand value	How can CE strategy and measures increase reputation and brand value?	– Communication of a new Circular Business Model (e.g. 'material bank') in industry forums, stakeholder events, corporate reporting, and customer brochures. – Marketing campaign on extended warranties and related repair offerings will contribute to perceptions of the brand as a quality leader.	# Number of media articles per month mentioning the company's new circular business model and related products/services.
Attractiveness as employer	How do the company's CE strategy and measures contribute to employer branding and talent acquisition?	– Employer branding campaign highlights take-back, repair, and remanufacturing programmes as contributions to sustainable development.	% Awareness of potential employees (talent) of the company's CE strategy, programmes, or measures.
Innovation and innovativeness	How does circularity drive the company's innovativeness?	– Include circularity goals in R&D strategy (e.g. take-back systems, reusability, disassembly, recycled content)	% Share of CE-related innovation projects in the overall innovation portfolio. # Employee ideas related to the CE # 'Material Circularity Indicator (MCI) at product or company level'[15]

Business case drivers for implementing Circular Business Models (based on Schaltegger et al. 2012)

15 | Footnote for content in the table below right: See Linder et al. 2017.

List of Abbreviations

B2B	Business to Business
B2C	Business to Consumer
CE	Circular Economy
CBM	Circular Business Model(s)
EC	European Commission
ECJ	European Court of Justice
EU	European Union
F.M.	Federal Ministry
KrWG	German Circular Economy Act
KPI	Key Performance Indicator
REACH	Regulation (EC) No. 1907/2006 of the European Parliament and of the Council of 18th December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

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Circular Economy Initiative Deutschland

Editors:

acatech – National Academy of Science and Engineering
Karolinenplatz 4
80333 Munich | Germany

Circular Economy Initiative Deutschland Office
Karolinenplatz 4
80333 Munich | Germany

SYSTEMIQ Ltd.
69 Carter Lane
London EC4V | United Kingdom

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Munich Office
Karolinenplatz 4
80333 Munich | Germany
T +49 (0)89/52 03 09-0
F +49 (0)89/52 03 09-900

Berlin Office
Pariser Platz 4a
10117 Berlin | Germany
T +49 (0)30/2 06 30 96-0
F +49 (0)30/2 06 30 96-11

Brussels Office
Rue d'Egmont/Egmontstraat 13
1000 Brussels | Belgium
T +32 (0)2/2 13 81-80
F +32 (0)2/2 13 81-89

info@acatech.de
www.acatech.de

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