EUROPEAN INVESTMENT BANK

The EIB Circular Economy Guide

Supporting the circular transition

European Investment Bank

60 years

The EU bank

The EIB Circular Economy Guide

Supporting the circular transition

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Abbreviations

3D	three-dimensional
CDP	Cassa Depositi e Prestiti
CE	Circular Economy
CO_2eq	Carbon dioxide equivalent
DSCR	Debt-Service Coverage Ratio
EBIT	Earnings Before Interest and Taxes
EC	European Commission
EFSI	European Fund for Strategic Investments
EIB	European Investment Bank
EU	European Union
EUR	Euro
GDP	Gross Domestic Product
GHG	Greenhouse Gas
Gt	Giga-tonne
ICT	Information and Communication Technology
Mt	Mega-tonne
RDI	Research, Development and Innovation
SME	Small and Medium-Sized Enterprise
UNEP	United Nations Environment Program

1. Introduction

The circular economy (CE) concept is gaining attention in light of increasing consumption and resource use by a fast-growing population with rising standards of living. Circularity refers to the circular flow and efficient (re)use of resources, materials and products. This is a new economic model that represents sustainable progress towards efficient green growth, moving from a consumption and disposal-based linear model to extending the life and use of products and materials and minimising wastage. Due to its expected environmental, climate, social and economic benefits, the circular economy is not only being strongly promoted by the European Commission (EC) and other EU institutions, as well as a growing number of EU Member States and cities, it is also attracting increasing attention from the business community and from public and private financiers. The circular economy clearly goes beyond resource efficiency and recycling and provides the framework to develop new business models aimed at increasing the value, use and life of materials, products and assets and designing out waste from production and consumption.

In light of the EC Circular Economy Package, the EIB, as the EU bank, aims to support the transition to a circular economy, in particular in the EU, but also in other parts of the world. While the EIB has a long track record of lending to projects focusing on recycling and the recovery of waste and by-products in various sectors, there is room for expanding the lending volume to innovative CE projects aimed at systematically designing out waste, extending the life of assets and closing material loops. The EIB also offers circular economy advisory services, and is active in CE networking, sharing of best practices, connecting different CE stakeholders and facilitating access to CE finance. In light of this, the EIB CE Guide aims to:

a. promote a common understanding of the CE concept and related challenges and opportunities among our financial and project partners;
b. raise awareness about and promote circular solutions among project promoters and other stakeholders;
c. facilitate and harmonise due diligence of and reporting on CE projects by our financial and project partners;
d. communicate our vision of how the EIB can further support the transition to a circular economy.

The EIB CE Guide is a living document that will be updated in response to our evolving understanding of CE needs, opportunities and risks, and growing experience with the appraisal and financing of CE projects. Any suggestions for a future edition of the Guide can be communicated to CircularEconomy@eib.org.

2. The circular economy

The background and needs

Our current linear take-make-use-dispose economy originates in the second industrial revolution, which generated considerable growth in prosperity in the years following the Second World War, but also increased resource use and propagated a consumption and throw-away society.

The turn of the millennium saw the reversal of a 100-year trend with natural resource prices decreasing steadily in parallel to economic growth. Since then, real commodity prices have risen in tandem with economic growth[1] and have thereby increased the focus on resource efficiency and security of supply. While recessions in recent years have temporarily reversed these trends, price volatility and uncertainty remain.

With expected future global population growth of about 500-750 million per decade, accompanied by rapid growth in living standards and purchasing capacity in less developed areas, the UNEP's International Resource Panel predicts that material resource use may double between 2015 and 2050[2]. This raises concerns that the earth's finite resources may not be sufficient to sustain the expected increases in consumption and wasteful resource use. The increasing raw materials consumption also

[1] Accenture, "Circular Advantage" (2014), p. 7, analysis based on World Bank data – Pink sheets
[2] UNEP/UNEP/International Resource Panel, "Assessing Global Resource Use" (2017), p. 8

increases the costs and related externalities of extraction and transport of resources from more remote and less accessible deposits.

Furthermore, it has been estimated that 20% of global material extraction ends up as waste[3]. Considering that the import dependency for some raw material categories used in the EU, such as metal ores, is over 90%, and that the EU has listed 27 raw materials[4] as critical in terms of supply, this presents resource supply constraints and related price volatility risks that may negatively influence the competitiveness of EU companies.

The concept

In a fully circular economy, the concept of waste is minimised to the extent possible by carefully rethinking and designing products and industrial processes so that resources are kept in use in a perpetual flow, and by ensuring that any unavoidable waste or residues are recycled or recovered. The Ellen MacArthur Foundation has described the circular economy in a system diagram, shown in Figure 1, which comprises two material cycles: a *biological cycle*, in which residues are returned to nature after use, and a *technical c*ycle, where products, components or materials are designed and marketed to minimise wastage. Such a circular system aims at maximising the use of pure, non-toxic materials and products designed to be easily maintained, reused, repaired or refurbished to extend their useful life, and later to be easily disassembled and recycled into new products, with minimisation of wastage at all stages of the extraction-production-consumption cycle.

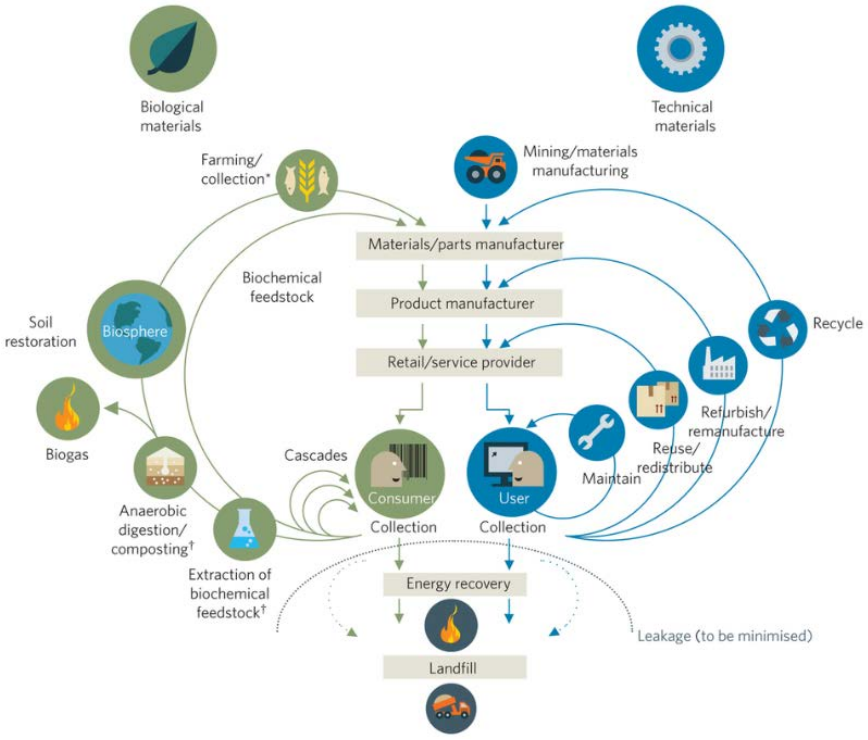

Figure 1 The Ellen MacArthur Circular Economy System Diagram[5]

This circular way of producing and consuming enables a decoupling of economic growth from extraction and consumption of materials. As such, a circular economy offers a way to hedge future resource and material supply risks for companies and increase their resilience to decreasing supplies and increasing price uncertainty and volatility. This will reduce resource dependency and – particularly by spurring innovation – also support competitiveness. It is also argued that the circular economy presents an opportunity for economic and industrial renewal with associated investment needs.

[3] OECD "Material Resources, Productivity and the Environment - Key Findings" (2015), p. 10
[4] COM(2017) 490 - Communication on the list of critical raw materials 2017
[5] Ellen MacArthur Foundation, "Towards the Circular Economy" (2013), p. 24

In summary, the circular economy can be defined as follows:

> *In a circular economy, new products and assets are designed and produced in a way that reduces virgin material consumption and waste generation; new business models and strategies are applied that optimise capacity utilisation and extend useful life of products and assets; and resource and material loops are closed through recycling of end-of-life products and materials.*

Links to further information on the CE concept and case studies are provided in Annex 1. The 8R[6] circular economy strategies are further defined in Annex 2.

The drivers and business opportunities

There are three fundamental ***drivers*** of the circular economy[7]:

- ***Resource constraints***: With global resource demand growing quickly, there is increasing concern about looming shortages of critical raw materials and water. The same holds true for arable land, as demand for cotton, crops, etc. is growing. It is thus becoming imperative to rethink our resource use.
- ***Technological development***: The introduction of new technologies, notably the internet of things and big data tools, is enabling the development and introduction of new CE business models, often based on sharing and leasing but also reuse and remanufacturing. New technical systems and tools enable the tracking of products or materials during their life to enable extended use/life and maintaining the highest possible value. Meanwhile, design and manufacturing capabilities are evolving with advances in production, material science and manufacturing, e.g. 3D printing and artificial intelligence.
- ***Socio-economic development***: Currently, about half the world's population lives in cities, and this will rise to six in ten by 2030, according to World Health Organization estimates. Increasing urbanisation supports the development of circular models since urban areas can easily host cost-effective collection and return systems for goods, materials and other resources and thus promote the closing of circular loops, as well as asset-sharing schemes and systems for product reuse.

The circular economy offers the following ***opportunities*** for companies in the EU to reduce their exposure to so-called "linear risks"[8], reduce costs and exploit new market and business opportunities:

- ***De-risk/hedge future commodity supply uncertainty and price volatility***: The circular economy offers the means to increase resilience and hedge risks related to uncertain future commodity supply and price volatility. As an example, the shift from selling products to services enables manufacturers to control and reuse or recycle components and raw materials used to produce goods as corporate assets.
- ***Reducing manufacturing costs***: Design for reuse, disassembly and recycling with a view to facilitating remanufacturing and reintroducing the products is often less expensive than producing new parts from virgin materials. As an example, the remanufacturing of car parts is 30-50% less expensive than producing new parts and generates 70% less waste.
- ***Avoided costs and new revenue streams****:* Companies realise the rationale of evaluating their production chains to identify by-product and waste streams that could be avoided, reused or recycled. As a consequence, companies turn to resource management or reverse logistics partners rather than waste management companies to identify potential uses for their by-products and waste, an approach that cuts costs and increases efficiency while reducing resource consumption and environmental impact. Companies not able to reuse/recycle their own goods, by-products or waste can offer these to other companies and thus create symbiotic circular relationships. Such approaches create resilient circular business models, generate new revenue streams and avoid waste management costs.
- ***New business opportunities and new markets***: The ability to increase the life and revenues from a given asset through repair and refurbishment schemes enables new service-based business models and strengthen the customer relationship. In such models companies design

[6] 8Rs: Reduce, Reuse, Repair, Refurbish, Remanufacture, Repurpose, Recycle, Recover
[7] Accenture, "Waste-to-Wealth" (2015)
[8] Circle Economy, PGGM, KPMG, EBRD, WBCSD, "Linear Risks" (2018)

products to make the repair and component reuse easier, and may also provide consumers with information, tools and replacement parts to repair their products.

The business models

The shift to a circular economy requires companies to rethink not only their use of resources but also to redesign and adopt new business models based on dematerialisation, longevity, refurbishment, remanufacturing, capacity sharing, and increased reuse and recycling.

Reference is often made to three circular business model categories, each of which focuses on a different phase of the value chain: (a) the design and manufacturing phase; (b) the use phase; and (c) the value recovery phase. These different CE business models can be illustrated in what is called a Value Hill, shown in Figure 2.

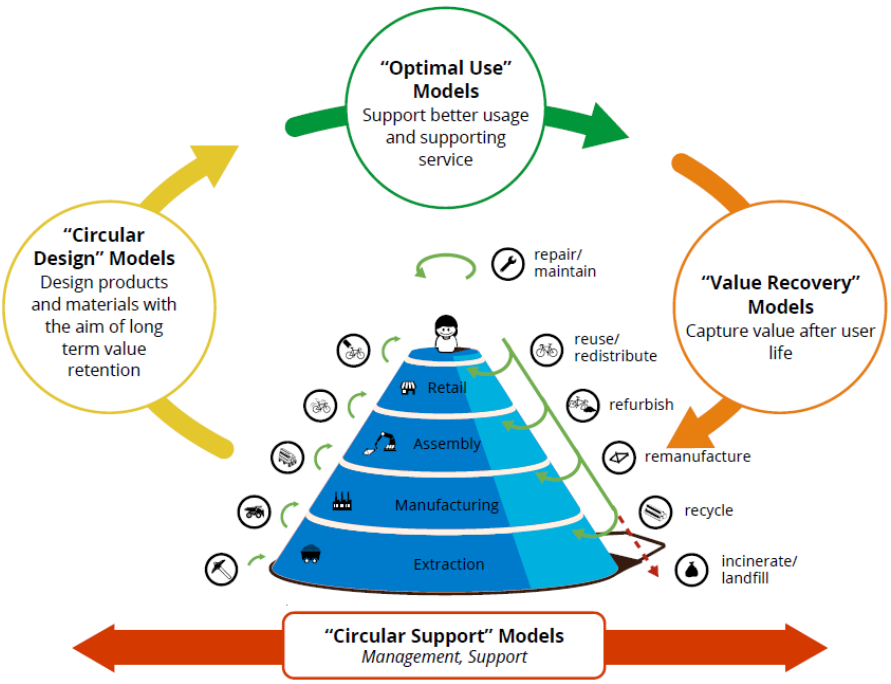

Figure 2 Different CE business models in the Value Hill[9]

Circular Design Models focus on the development of existing or new products and processes that seek to optimise circularity. Products are designed to last longer and/or be easy to maintain, repair, upgrade, refurbish, remanufacture or recycle. Additionally, new materials are developed and/or sourced, e.g. bio-based, less resource intensive, or fully recyclable. The risks related to financing such innovations do not differ much from financing other innovation or Research, Development and Innovation (RDI) projects.

Optimal Use Models aim to increase the value and use of a product during an extended life. These business models often build on retained ownership of a product, e.g. by providing a service rather than selling a product, and/or take responsibility for the product throughout its useful life, e.g. through maintenance services, or add-ons to extend the life of a product. Such product-to-service models have financial implications coming from, for instance, the changing nature of cash flows, with increasing working capital to pre-finance clients, balance sheet extension, and re-evaluation of residual value. Related challenges lie in product tracking and legal issues surrounding ownership of collateral and its value. Such risks may be difficult to assess or value, and could lead to difficulties in financing this type of project.

Value Recovery Models focus on maximising recovery and recycling of products and materials after use into new products or useful resources in order to reduce wastage and conserve resources. The development of *reverse logistics*, i.e. the return from point of consumption to point of production, is

[9] Elisa Achterberg, Jeroen Hinfelaar, Nancy Bocken, "The Value Hill Business Model Tool: identifying gaps and opportunities in a circular network" (2016)

essential for this model. It should be considered that for some materials, recycling involves a loss of quality and for products also loss of design, and technical and energy inputs. Acknowledging this, difference can be made between *downcycling*, which results in lesser quality and reduced functionality, and *upcycling*, which involves transforming by-products and waste into new materials or products of higher quality or better environmental value.

Circular Support Models focus on the management and coordination of circular value networks and resource flows, and optimising incentives and other supporting activities in a circular network. Circular support models also include the development or deployment of key enabling technologies supporting, enabling and facilitating the other business models

The challenges

Making the shift to a circular economy can be challenging, especially for companies whose structures, strategies, operations and supply chains are deeply rooted in the linear approach. Even if the transition to a circular economy often makes economic sense, production processes first need to transform from linear to circular, which may require initial investments, modification of processes, feedstock, equipment and output, re-training of staff, and coordination within the wider value chain.

The EIB study on access-to-finance for projects supporting the circular economy[10] made the case that the private sector as a whole is by nature geared towards short-term gains (and also generally risk-averse). As commodity prices increase, so will the demand for innovations that increase resource efficiency. Therefore, many businesses are likely to wait until high commodity prices create the business case for CE transitions.

This has not prevented many established companies and start-ups from seeking competitive advantages with innovative circular business models that capture value in new market segments, and succeeding in doing so. Besides the economic advantage brought by being perceived as an innovator on the market, the consideration of environmental costs/externalities and societal value creation makes the CE case even more compelling. This however still remains the exception rather than the rule, which is mostly explained by the fact that there is no level playing field for circular businesses to compete with linear businesses on the market. Increased customer awareness about the need and rationale for a more circular economy will likely change this situation with time, as will companies' increasing understanding of the need to hedge material supply risks and price volatility.

The above-mentioned EIB study concluded that market forces alone could create a circular economy but with the risk of a slow transition and high opportunity costs. Public sector intervention and support is therefore essential in order to (i) pre-empt potential supply crises; (ii) reduce the EU's dependence on strategic imported resources (as discussed above); and (iii) realise the societal and environmental benefits from a transition to a circular economy. The transition to a circular economy will need a systemic approach involving various stakeholders. It challenges not only (a) businesses to develop circular business models and enabling technologies; but also (b) policy makers and legislators at EU and national level to put in place effective regulation and incentives (see Annex 3); (c) the financial sector to work towards improving the availability of financing and to revisit its approach to appraising linear and circular risks (see Chapter 6); and (d) public authorities and civil society as a whole to contribute to increasing public awareness and improving consumer education.

The relation to climate change and environmental protection

The current linear resource-wasting model is depleting the earth's natural capital, and the associated pressure on the earth's ecosystems and their absorption capacity, essential for human survival, will bring irreversible and dangerous changes to our environment and climate.

The exploitation of natural resources is often linked with biodiversity loss, as well as water and soil pollution. Ozone depletion and chemical pollution affect ecosystems' ability to support life in its different forms. Environmental protection is an EIB global policy priority that will undoubtedly benefit from the shift towards circularity. Reduced intensity of extraction of materials, sustainable land use and rehabilitation, ecosystem protection, resource efficiency and renewable energy sources – all linked to the concept of circular economy – will help preserve natural capital.

Climate change is only one of the many serious environmental challenges propelled by the current path of human development. Curbing greenhouse gas (GHG) emissions to fight climate change is one of the

[10] EIB, "Access-to-finance conditions for Projects supporting the Circular Economy" (2015), p. 49

public policy objectives of the EU, and is strongly supported by the Bank. The EU has committed to achieving transformation to low carbon pathways to contain global warming well below 2 °C.

The potential effects of shifting to a circular economy on GHG emissions are substantial, achieved mainly through improving resource efficiency, extending the useful life of buildings and assets, greater recycling and reuse, and an absolute reduction in the use of primary raw materials. Circular economy activities can thus be seen as an effective strategy to enhance climate change mitigation[11].

The positive impact of a circular economy on reduction of GHG emissions is demonstrated by many recent studies and publications, some of which are listed in Annex 4.

3. EU Policy framework

The key EU policy initiative on the circular economy is the Circular Economy Package, which was presented by the Commission in December 2015. The goal of the initiative is to support the transition to a stronger and more circular economy where resources are used in a sustainable way, bringing benefits for both the environment and the economy.

The CE Package goes beyond waste management and fully explores synergies with other policies such as product legislation and the development of well-functioning markets for secondary raw materials and by-products.

The CE package comprises:

- an umbrella Communication, Closing the Loop - An EU action plan for the Circular Economy[12];
- a broad action plan with 54 concrete actions with timetable and a monitoring section;
- a legislative proposal on waste management and recycling updating key waste sector Directives that was adopted in July 2018[13].

The action plan focuses on the whole life cycle of products and comprises actions targeting product design, production and processes, consumption, waste management, and secondary raw materials. The plan also comprises horizontal actions on innovation, investments and monitoring as well as sectoral actions on plastics, critical raw materials, construction, biomass and bio-based materials.

Further information about the Circular Economy Package is provided in Annex 3 and on the EC website[14].

4. EIB lending to the circular economy

In the past, EIB has financed circular economy investments in a large number of projects, as shown in Table 2, which summarises past EIB CE lending history in the period 2013 – 2017.

Table 2 EIB CE lending in the period 2013 - 2017 (signed operations)

Sector	CE lending 2013-2017 (EUR m)	Share
Industry and services sector	706	33%
Water management sector	554	26%
Agriculture and bioeconomy sector	366	17%
Waste management sector	331	16%
Mobility	95	5%
Urban development sector	50	2%
Energy sector	14	1%
Total CE lending	**2 116**	**100%**

[11] Material Economics "The Circular Economy – A Powerful Source for Climate Mitigation" (2018)
[12] COM 2015/614 - Closing the Loop - An EU action plan for the Circular Economy
[13] OJEU, L150, Vol 61 (June 2018), p. 93 - 154
[14] European Commission - DG Environment, Circular Economy Package

EIB-financed CE operations range from more traditional recycling projects to innovative sharing and leasing business models. Some recent CE project examples are presented in Table 3 below. Other examples are presented in the EIB CE brochure[15].

Table 3 Examples of approved EIB projects contributing to the circular economy

Project
Ecotitanium: This project comprises the first EU industrial plant to recycle and re-melt aviation-grade scrap titanium metal and titanium alloys, which today has to be exported outside Europe. The project will thereby enable the recycling of valuable metal scraps from European manufacturing sources and reduce dependence on imported titanium. Link
Novamont renewable chemistry: This project concerns the development of innovative bioplastics and biochemicals based on renewable resources and which are biodegradable and compostable. Novamont's holistic approach and vision for the bioeconomy, where the business model includes local agriculture as well as the reuse of by-products, is producing positive results for material innovation, and is opening up opportunities in the market and larger economy. Link
Recycled paper circular economy Spain: This project enables a containerboard production plant to use more recycled fibre as raw material, improving the management of natural resources, following the principle of the circular economy. Link
CDP climate change Investment Platform: This is a risk-sharing investment platform under development together with the Italian National Promotional Bank (CDP) that, among other things, focuses on CE projects sourced by intermediary commercial banks. The investment platform is supported with a guarantee under the European Fund for Strategic Investments (EFSI).
Omnicane carbon burn-out: This project comprises the construction of two sugar refineries with related sugar handling and storage facilities, and the expansion of a sugar mill. The project will enable the reuse and recycling of all by-products in the process. Link. Intranet article.
Rabobank Impact Loans I - III: A series of intermediated loans to finance small and medium-sized investments with a high degree of positive social impact and high sustainability, including CE investments, primarily in the Netherlands. The investments are promoted by SMEs and mid-caps that are frontrunners in sustainability/social impact performance. Link
Belfius Smart Cities, Climate and Circular Economy: This bank-intermediated framework loan targets areas including CE projects for public promoters in Belgium. The defined eligibility criteria assist the intermediary bank in sourcing and screening project eligibility. Link
Green Metropole Fund: The project consists of a loan to a regional investment platform sponsored by the Port of Amsterdam and managed by e3 Partners, a Dutch private fund manager. The EIB loan will leverage the other investors' investment capacity for SMEs and small projects, mainly in the important sectors of the circular economy, renewable energy and energy efficiency, and to a lesser extent also in advanced materials and smart technology. Link
Romania Recycling and Circular Economy Project: The project comprises investments to increase the promoter's capacity for: (i) the collection of recyclable materials; (ii) the production of Polyester Staple Fiber from PET flakes; and (iii) the recycling of waste electric and electronic equipment in Romania in support of the transition to a circular economy and the attainment of national recycling targets.
Ultimaker: Ultimaker is recognised as a highly innovative manufacturer that develops 3D printers and associated materials in the consumer-oriented desktop printer segment, as well as open-source software to operate the printers. 3D Printing, the additive manufacturing process that "prints" objects, is transforming the way we make things. While not all products can currently be produced by the technology, it is easy to imagine a large percentage of our goods being 3D printed, absorbing a big chunk of production into the circular economy. Link
De Lage Landen (DLL) Circularity L4SMEs-Midcaps: This project comprises the first intermediated loan to co-finance the expansion of DLL's circular economy finance solution: i.e. DLL's second and third life equipment financing. This circular leasing facility provides customers access to equipment finance along multiple stages in the life cycle of the asset and facilitates the remanufacturing or refurbishment of used assets through DLL's Life Cycle Asset Management (LCAM) programme. By offering these financing solutions, DLL encourages SMEs and mid-caps to use (lease) rather than own (purchase) their assets and helps its partners to transition from selling an asset to selling a service, leading to more sustainable circular-focused business models. Link

[15] EIB Circular Economy Brochure

5. EIB circular economy financing products, instruments and services

EIB circular economy financing products and instruments

The EIB has a range of financing products and instruments that are well adapted to support the transition to a circular economy. Financing can be tailored to the specific needs of the borrower and the project reflecting that investment needs vary widely depending on a project's scale, maturity, type of promoter, position in the value chain, etc.

For more traditional and larger scale CE projects, we offer medium and long-term direct loans with fixed or variable interest rates. For smaller operations, we offer financing indirectly through credit lines to local banks and other intermediaries, particularly targeting SMEs and mid-caps. More information about our standard lending products can be found on the EIB website[16].

More novel CE projects types with medium to high risk profiles may be accommodated under the European Fund for Strategic Investments (***EFSI***)[17], ***InnovFin***[18] and other special financial instruments with higher risk-taking potential.

Considering the characteristics and risk profiles of many CE project types, the Bank is adapting its standard products and launching CE thematic operations. Such adaptation and development of new lending products will continue in parallel with our increased understanding of market needs and opportunities, and of the limitations of existing instruments.

One recent example is the ***Circular Bioeconomy Thematic Investment Platform***[19], initiated and coordinated by the EIB Innovation Finance Advisory. The fund will be entrusted to a third party manager, to be selected through a call for expressions of interest managed by the EIB and endorsed by the European Commission. The objective of the fund will be to provide access to finance to innovative bioeconomy projects, with a priority on (but not exclusivity for) innovative circular bioeconomy projects.

For innovative CE projects with a demonstration value that are not fully financially viable, the EIB may advise the promoter on applicable investment grant sources.

EIB circular economy advisory

To assist circular project promoters, the EIB provides advisory services on structuring and improving the bankability of CE projects. Such advisory services cover technical and financial aspects in an integrated manner, and are primarily provided by the European Investment Advisory Hub[20] (with a focus on technical aspects) and by InnovFin Advisory[21] (with a focus on financial aspects). Further information on the advisory services can be found on the EIB webpage on the circular economy[22].

6. Project eligibility, screening and assessment

Eligibility of circular economy projects

The circular economy is in line with the EIB's public policy goal to promote environmental protection and resource efficiency, and it generally supports climate action. Some CE projects may include innovative features and thus be considered eligible under the innovation goal. Depending on the size of the promoter, CE projects may also be eligible under SME and mid-cap finance.

Nevertheless, the risk features derived from the new financing models discussed above may result in a sub-investment grade risk profile. This also holds true for projects carried out by small and poorly capitalised promoters of projects that may also be technically unproven and commercially uncertain. Furthermore, new sharing/leasing business models in which customers no longer purchase goods directly would require new or adapted risk assessment and financing approaches.

[16] EIB lending activities and products
[17] EFSI - European Fund for Strategic Investments
[18] InnovFin – EU Finance for innovators
[19] Financing the Circular Bioeconomy: Structuring an Investment Platform to Improve Access to Finance in Europe
[20] EIAH - European Investment Advisory Hub
[21] InnovFin Advisory
[22] EIB CE webpage: The EIB in the Circular Economy

Project screening and assessment

A project is deemed to contribute to the circular economy if it falls under any of the following ***Circularity Categories***:

1. **Circular design and production**

   Application of reduce/recycle strategies in design/production phases

   a. Design for modularity, easy repair, disassembly and recycling, and longer product life
   b. Substituting virgin materials with secondary/recycled materials
   c. Reducing input of hazardous substances to facilitate reuse and recycling
   d. Development/deployment of innovative materials and process technology that increase circular resource efficiency

2. ***Circular use and life extension***

   Application of reuse/repair/repurpose/refurbish/remanufacture strategies in use phase

   a. Reuse, repair and remanufacturing of products and components up to generally accepted industry standards
   b. Repurposing and refurbishment of abandoned buildings and redundant assets up to generally accepted industry standards
   c. Decontamination and redevelopment of abandoned brownfield sites
   d. Extension of use/life of assets/products through product-as-service, sharing, leasing/ subscription business models incorporating circular economy principles

3. ***Circular value recovery***

   Application of recycle/recover strategies in after-use phase

   a. Recovery of materials and chemicals from waste, residues and by-products
   b. Recovery of bioresources, chemicals and nutrients from bio-waste, bioresidues and wastewater sludge
   c. Recovery of energy from residual biomass, bio-waste, bioresidues and organic sludge
   d. Recovery of waste heat
   e. Reuse of treated wastewater

4. ***Circular support***

   Support and facilitation of all circular strategies in all lifecycle phases

   a. Development/deployment of key enabling ICT technologies and services supporting/ facilitating circular business models and value chains

Further to falling under one of these categories, CE projects or project components should be "intentional" in the sense of having a clearly communicated intention, goal or design brief to contribute to the CE goals and objectives, and generate a positive impact on society and the environment, similar to impact investing. The due diligence must consider the long-term thinking and broader conception of value common in many CE projects where upfront investments generate: (i) returns (or reduce risks further in the future than conventional projects); and (ii) multiple values (ecological, social and financial).

As a complement to the Circularity Categories above, Annex 5 contains a list of ***CE project types*** that falls under one of the Circularity Categories. This list and the Circularity Categories provide guidance on CE project types recognised by the EIB as contributing to the circular economy. These lists are complementary to sector specific eligibility criteria that guide the screening of CE projects, and will be updated regularly to reflect developments in the different sectors.

Specific circularity criteria

The sections below provide further clarifications on some of the Circularity Categories listed above.

Leasing** (category 2d):* Under leasing, the owner of an asset (the lessor***) conveys the right to use of the asset to another party (***the lessee***) for an agreed period of time in return for a fee. There are two types of leasing models, as summarised below:

- ***Financial lease:*** Risks and rewards of asset ownership are transferred to the lessee. Ownership may be transferred to the lessee, usually at the end of the lease period, which is long, often equal to the economic life of the asset. Assets are usually accounted for on the lessee's balance sheet, which makes financial lease similar to a loan.
- ***Operating lease***: Few if any of the risks of asset ownership are transferred to the lessee, and ownership of the asset remains with the lessor. The lease period is usually short, assets are accounted for on the lessor's balance sheet, and the lessee treats the leasing fee as an operating cost. Together these features make operating lease similar to rental.

The following ***leasing models*** are ***eligible for EIB financing***:

- The lessor's purchase of assets for lease;
- The lessee's financial lease of assets in cases where the assets are accounted for on the lessee's balance sheet.

Leasing models are considered to ***contribute to a circular economy*** only if at least one of the following conditions are met:

- The contractual set-up demonstrates that the business model is ***service-based*** (pay-per-use, performance-based models);
- The business model pursues ***product/asset life extension*** through at least one of the following features:
  - circular design (e.g. increasing durability, modularity, easy disassembly and repair);
  - predictive maintenance systems (e.g. involving intelligent data management and ICT systems for maintenance aimed at extending the life of the asset).
- provisions are made for ***product/asset return*** at the end of the first lease lifecycle with subsequent refurbishment/repair to enable re-lease for additional lease lifecycles in "as new" quality condition, and recovery/recycling of end-of life materials at the end of the asset's life.

***Financing of second hand assets, rehabilitation and other means of life extension** (category 2a and b)*: Financing of second hand assets, in line with the CE ambition to extend the life of products, can be eligible for EIB financing under certain conditions. Further details on this topic can be provided on request.

Resource efficiency** (category 1 d)*: Resource efficiency is a central principle in a circular economy. However, there are resource efficiency improvements that are linear in nature and do not contribute to a circular economy. ***Linear resource efficiency measures are those that increase yields from virgin raw materials/resource inputs and possibly also reduce waste generation, without closing material/resource cycles and loops. ***Circular resource efficiency*** measures, on the other hand, substitute/reduce the use of virgin materials by replacing them with secondary raw materials, i.e. recycled resources such as copper scrap replacing copper produced from mined copper ore, or recovered paper replacing virgin bio-mass for paper and carton board production. This closure of material loops is a characteristic feature of circular resource efficiency, which may also include measures to reduce waste generation, e.g. by avoiding the use of toxic/hazardous substances or materials to facilitate recycling.

***Recycling** (category 3a)*: As outlined in Chapter 2, recycling is a form of value recovery that contributes to the circular economy since it closes loops for materials and products that enter the waste stream and can no longer be reused, repaired or remanufactured. However, it is important to note that recycling is a measure of last resort in a circular economy. With increased focus both on designing out waste in processes and products and on the introduction of new circular business models, recycling will with time become less and less relevant for the circular economy as fewer materials and products will be discarded as waste. However, with waste generation still on the rise in some EU countries and recycling

levels still at low levels in others, there is still a need to *do more* with regard to the quantity of recycled material and *do better* with regard to the quality of recycling. This is also the ambition set out by the EU Circular Economy Package, as outlined in Chapter 3. In summary, it can be stated that the *circular economy is not just about increasing recycling, which, however, is still important for the transition to a fully circular economy*.

Energy recovery (categories 3 c and f): While communication from the EC acknowledges that energy recovery from non-recyclable residual waste contributes to the circular economy, it is in practice difficult to judge whether a waste stream is non-recyclable or not. Therefore, the EIB does not include energy recovery through incineration and other forms of thermal treatment of: (1) mixed residual waste and fuel generated therefrom; and (2) plastics, as a category that contributes to the circular economy.

Risk assessments

Supply chain risks: An important aspect of the due diligence will be to assess companies' supply chains and related risk management and mitigation. Credit pricing is currently based on creditworthiness of the individual company rather than the supply chain. For CE projects, the creditworthiness of partners within the value chain and/or customers within a lease/pay-per-use scheme will become more important, and analysing creditworthiness of the client's portfolio and/or partners will be essential to defining the overall risk of the CE model.

Market and commercial risks: Market and commercial risks for CE projects can be related to the following aspects of a business plan:

- Material/feedstock input security related to, for example:
  - no/limited guarantees/contracts for the supply of feedstock;
  - uncertainty on gate fees that can be charged or prices that have to be paid for material/feedstock input.
- Prices/revenues for outputs produced at the facility, in particular when competing with virgin materials that may display price volatility.
- Changes to the cash flow that increase the payback period of the investment.
- Contracts in case of product-as-a-service or leasing: good circular business model contracts incorporate incentives for all parties involved to continue business activities and dissuade contract termination.

In light of the above, due diligence needs to assess the following aspects and issues:

- availability/certainty of materials/feedstock input and the competition for such materials in a reasonably delineated catchment area;
- credibility of assumptions regarding gate fees to be charged or prices to be paid for input materials/feedstock;
- robustness of the business plan with regard to variations in feedstock costs and output offtake revenues/costs, as well as maturity of the reuse/second-hand market;
- soundness and credibility of the commercial strategy of the promoter and how their market position and management capacities rate in comparison to competitors;
- soundness of the contracts and cash flow optimisation, i.e. inclusion of 'customer-binding' incentives, deposits or other risk premium to mitigate risks related to early contract termination/loss of customers and secure future cash flow.

In addition to carrying out thorough due diligence of the key aspects outlined above, market risks can be mitigated by requesting that:

- a certain share of the facility input is backed by supply agreements for at least part of the facility life;
- the loan is backed by a corporate or external guarantee;
- the sponsor and feedstock suppliers have a reasonable equity share in the overall financing;
- the business case reaches minimum credit metric levels, e.g. regarding DSCR, interest coverage by EBIT, and cash flow from operations to debt.

Annex 1 Circular economy reference documents

Source/Author	Title/Description	Year	Link
General documents, studies and other information on the circular economy			
ABN Amro et al	Circular Economy Finance Guidelines	2018	https://www.abnamro.com/nl/images/Documents/040_Duurzaamheid/Publications/ABN_AMRO_Circular_Economy_Finance_Guidelines_2018.pdf
Arup	The Circular Economy in the Built Environment.	2016	http://publications.arup.com/publications/c/circular_economy_in_the_built_environment
CEPS	The Circular Economy: Barriers and Opportunities for SMEs	2015	https://www.ceps.eu/system/files/WD412%20GreenEconet%20SMEs%20Circular%20Economy.pdf
Deloitte	Circular Economy. From theory to practise.		https://www2.deloitte.com/content/dam/Deloitte/fi/Documents/risk/Circular%20economy%20FINAL%20web.pdf
Ellen MacArthur Foundation	Various CE publications	2012-2018	https://www.ellenmacarthurfoundation.org/publications
FinanCE Working Group	Money makes the world go round (and will it help to make the economy circular as well?) (2016)	2016	http://sustainablefinancelab.nl/wp-content/uploads/sites/232/2016/04/FinanCE-Digital.pdf
High-level expert group on Sustainable financing	Financing a sustainable European Economy (2018)	2017	https://ec.europa.eu/info/sites/info/files/170713-sustainable-finance-report_en.pdf
JWT Intelligence	The circular Economy	2014	http://adsoftheworld.com/sites/default/files/jwt_the_circular_economy.pdf
Various NGOs	WALKING THE CIRCLE – the 4 guiding pillars for a Circular Economy	2015	http://www.rreuse.org/wp-content/uploads/WALKING-THE-CIRCLE-–-the-4-guiding-pillars-for-a-Circular-Economy.pdf
World Economic Forum.	Towards the Circular Economy: Accelerating the scale-up across global supply chains	2014	http://www3.weforum.org/docs/WEF_ENV_TowardsCircularEconomy_Report_2014.pdf
CE case studies			
Circle Economy	Various CE case studies		http://www.circle-economy.com/reports-insights/
Ellen MacArthur Foundation	Various CE case studies		https://www.ellenmacarthurfoundation.org/case-studies
Encore	Encore regions and circular economy. Best case studies 2016.	2016	https://www.irekia.euskadi.eus/uploads/attachments/8492/ENCORE_Regions_and_Circular_Economy_WEB_.pdf?1474877920
London Waste & Recycling Board.	London: the circular economy capital. Towards a circular economy – context and opportunities	2015	http://www.lwarb.gov.uk/wp-content/uploads/2015/12/LWARB-circular-economy-report_web_09.12.15.pdf
Luxembourg Centre for Circular Economy	Various CE case studies		http://www.lcce.lu/circular-economy-in-practice/
Plan C, OVAM	Various Belgian case studies		http://www.plan-c.eu/en/belgian-cases
European Institutions: websites and documents			
DG Environment	Website dedicated to the Implementation of the Circular Economy Package and Action Plan		http://ec.europa.eu/environment/circular-economy/index_en.htm
DG REGIO	Information on CE Funding from European Structural and Investment Funds (ESIF)		http://ec.europa.eu/regional_policy/en/policy/themes/environment/circular_economy/
DG RTD - EASME	Information on CE Funding from Horizon 2020 Programme		https://ec.europa.eu/easme/en/horizon-2020-societal-challenge-climate-action-environment-resource-efficiency-raw-materials
European Commission	European Circular Economy Stakeholder Platform		http://circulareconomy.europa.eu/platform/en
European Commission	A European strategy for plastic in a circular economy	2018	http://ec.europa.eu/environment/circular-economy/pdf/plastics-strategy-brochure.pdf

European Commission	Report on Critical Raw Materials and the Circular Economy, Commission staff working document	2018	https://ec.europa.eu/commission/publications/report-critical-raw-materials-and-circular-economy_en
European Commission	Public Procurement for a Circular Economy - Good practice and guidance	2017	http://ec.europa.eu/environment/gpp/pdf/Public_procurement_circular_economy_brochure.pdf
European Environment Agency (EEA)	Circular economy in Europe — Developing the knowledge base (2016) More from less — material resource efficiency in Europe – overview of policies, instruments and targets (2015)	2016 2015	https://www.eea.europa.eu/publications/circular-economy-in-europe https://www.eea.europa.eu/themes/waste/resource-efficiency
EUROSTAT	Overview of available statistics on the CE		http://ec.europa.eu/eurostat/web/circular-economy/overview
Country/regional CE documents			
City of Amsterdam	Circular Amsterdam. A vision and action agenda for the city and the metropolitan area	2016	https://www.circle-economy.com/wp-content/uploads/2016/04/Circular-Amsterdam-EN-small-210316.pdf
City of Glasgow	Circular Glasgow - A vision and action plan for the city of Glasgow	2016	https://www.circle-economy.com/wp-content/uploads/2016/06/circular-glasgow-report-web-low-res.pdf
City of London	London's circular economy route map	2015	http://www.lwarb.gov.uk/what-we-do/circular-london/circular-economy-route-map/
City of Paris	White paper on the circular economy for greater Paris	2017	https://api-site.paris.fr/images/77050
City of Rotterdam	Roadmap Circular Economy Rotterdam	2016	http://www.rotterdamclimateinitiative.nl/documents/2016/roadmap-circular-economy.pdf
Club of Rome	The Circular Economy and Benefits for Society. Swedish Case Study Shows Jobs and Climate as a Clear Winners	2015	http://wijkman.se/wp-content/uploads/2015/05/The-Circular-Economy-and-Benefits-for-Society.pdf
EY	EY study on the Circular Economy in Greece	2016	http://www.ey.com/Publication/vwLUAssets/EY-study-on-the-circular-economy-in-greece/$FILE/EY-study-on-the-circular-economy-in-greece.pdf
Government of the Netherlands	A circular economy in Netherlands by 2050		https://www.government.nl/topics/circular-economy/documents
Nordic Council of Ministers	Moving towards a circular economy – successful Nordic business models	2015	http://norden.diva-portal.org/smash/get/diva2:852029/FULLTEXT01.pdf
SITRA	Leading the cycle – Finnish road map to a circular economy 2016 - 2025	2016	https://www.sitra.fi/en/projects/leading-the-cycle-finnish-road-map-to-a-circular-economy-2016-2025/
Switch – Asia Network Facility	Advancing the circular economy in Asia	2016	http://www.switch-asia.eu/fileadmin/user_upload/SCREEN_final_singlepages02.pdf
Circular economy and climate change mitigation			
CE Delft	The circular economy as a key instrument for reducing climate change	2016	https://www.cedelft.eu/en/publications/1803/the-circular-economy-as-a-key-instrument-for-reducing-climate-change
CEPS	Time to connect the dots: What is the link between climate change policy and the circular economy?	2016	https://www.ceps.eu/system/files/PB%20No%20337%20AB%20on%20CC%20and%20Circular%20Economy.pdf
Circle Economy, Ecofys	Implementing Circular Economy globally makes Paris targets achievable	2016	https://www.ecofys.com/en/publications/circular-economy-white-paper-ecofys-circle-economy/
Club of Rome	The Circular Economy and Benefits for Society	2015	https://www.clubofrome.org/2016/03/07/a-new-club-of-rome-study-on-the-circular-economy-and-benefits-for-society/
Deloitte	Circular economy potential for climate change mitigation	2016	https://www2.deloitte.com/content/dam/Deloitte/fi/Documents/risk/Deloitte%20-%20Circular%20economy%20and%20Global%20Warming.pdf
Material economics	The circular economy – a powerful force for climate mitigation	2018	https://www.sitra.fi/en/publications/circular-economy-powerful-force-climate-mitigation/

Annex 2 Circular economy strategies

Process	Objective	Disassembly	Quality	Result
Reduce/ Eliminate	To design out waste by developing new materials, processes, equipment and products	No (but built-in option)	New product	New processes/equipment with less waste generation, new products with longer useful life
Reuse	The reuse of the product	No	Remains unchanged, but cleaning and damage control	Cleaned used product
Repair	To recover the product to a usable state	Product level	Restore the product to an usable state	Some parts repaired or replaced
Refurbish	To recover the used product to a specified quality level	Module level	Inspection of all modules and recovery to specified quality level	Some modules repaired or replaced, upgrading possible
Remanufacture	To recover the used product to the quality level of a new product	Part level	Inspection of all modules and parts, recover to the quality level of a new product	Used and new modules combined into a new product, upgrading possible
Repurpose	To adapt a used product or part for reuse in a different function than designed for	Product, module, part or raw material level	Same as for refurbishment, remanufacturing or recycling	Products, modules, parts or materials reused, but for a different purpose/function
Recycle	To recover the material of components and modules for reuse, excluding energy recovery. To recover organic matter and biological nutrients from residual bio-waste by composting	Raw material level	Depends on where the material or compost is applied	Material reused for manufacturing new parts High quality compost used as a fertilizer and soil-conditioner in agriculture/horticulture
Recover (Other recovery processes e.g. bio-resources, wastewater, carbon, energy)	To recover bio-resources or energy from residual biomass and bio-waste[23] through biochemical conversion processes, anaerobic digestion and/or thermal treatment To recover treated wastewater, waste heat or carbon emissions[24] for beneficial use	No	Depends on where the recovered resources will be used	Bio-resources or clean CO_2 used in industry to produce high-value chemical products Energy used in the form of transport fuel heat or electricity Treated wastewaters reused for technical applications, irrigation, groundwater recharge)

Source: Nederland Circulair, "The potential for high-value reuse in a circular economy" (2015), p. 15, adapted and further developed by EIB

[23] Only for feedstock that is technically and economically non-recyclable
[24] Wastewater, thermal energy or carbon emissions from industrial facilities, energy facilities, buildings or other sources that would otherwise be transferred to the environment

Annex 3 EU circular economy policy

The key EU policy initiative on the circular economy is the ***Circular Economy Package*** that was presented by the Commission on 2 December 2015. The package comprises:

- an umbrella Communication, Closing the Loop - An EU action plan for the Circular Economy[25];
- a broad action plan with 54 concrete actions with timetable and a monitoring section;
- a legislative proposal on waste management and recycling updating key waste sector Directives that was adopted in July 2018.

The CE package is expected to help European businesses and consumers to make the transition to a stronger and more circular economy where resources are used in a more sustainable way. The proposed actions will contribute to "closing the loop" of product lifecycles through greater recycling and reuse, and bring benefits for both the environment and the economy.

The associated plans and measures will extract the maximum value and use from all raw materials, products and waste, fostering energy savings and reducing greenhouse gas emissions. The proposals cover the full lifecycle: from production and consumption to waste management and the market for secondary raw materials. This transition will be supported financially by EFSI funding, EUR 650m from Horizon 2020 (the EU funding programme for research and innovation), EUR 5.5bn from structural funds for waste management, and investments in the circular economy at national level.

The Circular Economy Package gives a clear signal to economic operators that the EU is using all the tools available to transform its economy, opening the way to new business opportunities and boosting competitiveness. The broad measures for changing the full product lifecycle go beyond a narrow focus on the end-of-life stage and underline the Commission's clear ambition to transform the EU economy and deliver results. Innovative and more efficient ways of producing and consuming should increasingly emerge as a result of the incentives we are putting in place. The circular economy has the potential to create many jobs in Europe, while preserving precious and increasingly scarce resources, reducing the environmental impacts of resource use and injecting new value into waste products. Sectoral measures are also set out, as well as quality standards for secondary raw materials.

Key actions adopted or to be carried out under the current Commission's mandate (2014-2019) include:

- Funding of over EUR 650m under Horizon 2020 and EUR 5.5bn under the structural funds;
- Actions to reduce food waste including a common measurement methodology, improved date marking, and tools to meet the global Sustainable Development Goal to halve food waste by 2030;
- Development of quality standards for secondary raw materials to increase the confidence of operators in the single market;
- Measures in the Eco-design working plan for 2015-2017 to promote the reparability, durability and recyclability of products, in addition to energy efficiency;
- A revised Regulation on fertilisers, to facilitate the recognition of organic and waste-based fertilisers in the single market and support the role of bio-nutrients;
- A strategy on plastics in the circular economy, addressing issues of recyclability, biodegradability, the presence of hazardous substances in plastics, and the Sustainable Development Goals target for significantly reducing marine litter;
- A series of actions on water reuse including a legislative proposal on minimum requirements for the reuse of wastewater.

The revised legislative proposal on waste sets new and in many cases more ambitious targets for the reduction and recycling of waste. To ensure effective implementation, the waste reduction targets are accompanied by concrete measures to address obstacles on the ground and the different situations across Member States. Four legislative acts on waste setting out new rules for waste management and establishing legally binding targets for recycling were published in the Official Journal of the EU on 14 June 2018[26], and came into force 20 days thereafter.

[25] COM 2015/614 - Closing the Loop - An EU action plan for the Circular Economy

[26] OJEU, L150, Vol 61 (June 2018), p. 93 - 154

Meanwhile, a majority of the initiatives included in the Plan have been delivered[27].

With regards to the latest developments in the implementation of the EU Circular Economy Action Plan, in January 2018 the European Commission adopted a Europe-wide ***EU Strategy for Plastics in the Circular Economy*** and annex to transform the way plastics and plastic products are designed, produced, used and recycled. By 2030, all plastic packaging should be recyclable. The Strategy also highlights the need for specific measures, possibly a legislative instrument, to reduce the impact of single-use plastics, particularly in our seas and oceans.

At the same time, the EC published a ***Report on Critical Raw Materials and the circular economy*** that highlights the potential to make the use of the 27 critical materials in our economy more circular.

The EC has also acknowledged the important role that public procurement can have in promoting the transition to a circular economy, considering that public procumbent amounts to about 15% of EU GDP. In 2017, the EC published the ***Public Procurement for a Circular Economy - Good practice and guidance*** *report.*

[27] European Commission - DG Environment, Circular Economy Action Plan

Annex 4 Circular economy impacts on climate change mitigation

(for sources see Annex 1)

Title, author and year of publication	Sector/circular economy strategies	Geographical scope	Main messages/ GHG emission reduction
The circular economy – a powerful force for climate mitigation, Material Economics, 2018	Four largest materials in terms of emissions (steel, plastics, aluminium, and cement) and two large use segments for these materials (passenger cars and buildings)	EU/World	In an ambitious scenario, as much as 296 million tons CO_2 of emissions, out of 530 Mt in total (-56%) can be cut per year in the EU by 2050 – and some 3.6 billion tons per year globally.
Circular economy potential for climate change mitigation, Deloitte, 2016	Food sector: reduction of food waste, recirculation of key nutrients (nitrogen, phosphorous) through their recovery from food waste or waste water Construction sector: recycling, product reuse Automotive sector, electrical and electronic equipment (EEE): large scale, systematic recycling, product reuse and lifetime extension	EU	Across all three sectors studied, the potential for GHG emission reduction is 22%-33% compared to 2007 levels, depending on circular economy scenarios considered (savings between 230-335 MtCO2eq annually). By sector: - Food: between 12%-14% reduction (55-64 $MtCO_2$eq annually) - Construction: between 17%-34% reduction (26-75 $MtCO_2$eq annually) - Vehicle production: between 45%-66% reduction (84-123 $MtCO_2$eq annually) - EEE production: between 43%-50% reduction (65-75 $MtCO_2$eq annually) Altogether, the circular economy may lead to a reduction of 550 $MtCO_2$eq annually, a 33% reduction of the emissions related to the production of goods consumed in the EU.
The circular economy as a key instrument for reducing climate change, CE Delft, 2016	Municipal solid waste recycling	EU/World	Increased recycling of 2/3 of municipal solid waste (from current levels) can reduce global greenhouse gas emissions by 6% (2.3 $GtCO_2$eq annually). The EU's greenhouse gas emissions could be reduced by 4% (180 $MtCO_2$eq annually).
Implementing Circular Economy globally makes Paris targets achievable, Circle economy, Ecorys, 2016	Recovery and reuse, lifetime extension, sharing and service model, circular design, digital platforms	World	The circular economy has the potential to close approximately 50% of the emissions gap between current policies and the 1.5 °C target (15 $GtCO_2$ eq).
Growth Within, A Circular Economy Vision for a More Competitive Europe, Ellen MacArthur Foundation, McKinsey Center for Business and Environment, Stiftungsfonds für Umweltökonomie und Nachhaltigkeit (SUN), 2015	Mobility sector: electric, shared, and autonomous vehicles Food sector: food waste reduction, regenerative and healthy food chains, Built environment: passive houses, urban planning, and renewable energy	EU	Across the 3 sectors, potential CO_2 emission reductions are 48% by 2030 (31 % on the current development path) and 83% by 2050 (61 % on the current development path), compared to 2012 levels.
The Circular Economy and Benefits for Society, Club of Rome, 2015	Material efficiency in manufacturing in general ("+25% overall increase in material efficiency + 50% of all virgin materials being replaced by secondary materials + doubling the product life of long-lived consumer products compared to today")	Finland, France, the Netherlands, Spain and Sweden	The material efficiency scenario is likely to cut carbon emissions in all the countries by between 3 and 10% (~75 $MtCO_2$eq) by 2030. By country: Finland: -4%, France: -5%, Netherlands: -3%, Spain: - 10%, Sweden: -5%.

Annex 5 Circular economy project types (indicative and non-exhaustive list)

1. Design/production phase – circular design/input business model

a) Design (incl. RDI) and manufacturing of:
   - new products and assets for long life and/or modularity for easy maintenance, refurbishment, disassembly, repair, re-manufacturing or recycling
   - new materials with higher recyclability or biodegradability

b) RDI, scale-up and deployment of key enabling process technology (including machinery, equipment) supporting circular economy projects and business models in production, use and value recovery phases (e.g. 3D printing and other advanced manufacturing technology, advanced mechanical or chemical plastic recycling technology, etc.)

c) Use of secondary raw materials and chemicals recovered from waste, residues and by-products as input for new products

d) Replacement of toxic, hazardous and other substances and materials that reduce the reusability or recyclability of products and assets.

2. Use phase – optimal use and life-extension business model

a) Repair, refurbishing or remanufacturing of products and components up to generally accepted/ required industry standards

b) Repurposing and refurbishment of redundant assets and abandoned buildings up to generally accepted industry standards

c) Decontamination/rehabilitation and redevelopment of brownfield sites

d) Product-as-service business models incorporating circular economy principles (e.g. design for longer life, easy repair/remanufacturing, value recovery at end-of-life)

e) Product/asset sharing business models incorporating circular economy principles

f) Leasing/subscription business models incorporating circular economy principles

3. After use phase – value recovery business model

a) Take-back services for end-of-life products, components and packaging for subsequent reuse, refurbishment and recycling

b) Separate collection of recyclable waste materials and bio-waste

c) Processing of waste, residues and by-products into secondary raw materials through mechanical and/or chemical transformation processes

d) Collection and subsequent recovery of inorganic and organic substances through chemical and physico-chemical processes

e) Production of compost from source segregated bio-waste

f) Extraction of chemicals, nutrients or other bioresources from bio-waste, organic sludge or other organic by-products and residues

g) Production of standardised solid fuel (pellets or briquettes) from agricultural and forestry residues or by-products

h) Production of biofuels from non-recyclable bio-waste, biomass by-products and residues (e.g. biochars from waste wood, bio-diesel from used cooking oil and animal fat, biogas and bioethanol from food and other organic waste)

i) Energy recovery from non-recyclable biomass, by-products and residues (as electricity and/or heat)

j) Energy recovery from biogas/landfill gas (as electricity, heat or biomethane for injection into the grid or use as vehicle fuel)

k) Recovery of waste heat, e.g. from industrial processes, buildings, wastewater, etc.

l) Capture, cleaning, storage and transport of carbon emissions from industrial sources in preparation for use in industrial or agricultural applications (greenhouses)

m) Reuse of treated wastewater

4. Circular support – for all business models

a) Development and deployment of services (incl. ICT tools) for predictive maintenance, repair and refurbishment to extend the life of products and assets

b) Development and deployment of material passports and other digital tools and applications to facilitate the tracing, marketing and trade of secondary raw materials and products for reuse, repair or recycling

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