The EIB Circular Economy Guide

Supporting the circular transition

May 2023

European Investment Bank

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For further information on the EIB's activities, please consult our website, www.eib.org.
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For more information on EIB's support to the circular economy, visit our website on www.eib.org/circular-economy, or contact us at CircularEconomy@eib.org.

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1. Introduction

Global population growth and improving living standards have increased consumption beyond the means of Earth's finite resources. This has prompted a shift from our current linear take-make-use-dispose society towards a more circular economy, where the value and utility of products and materials are maintained for as long as possible, and resources are used in the most effective and economical way, while waste generation is minimised.

The circular economy is strongly supported by the European Commission and other EU institutions, and by a growing number of cities and countries across the European Union. It is also attracting increasing attention from the business community and public and private investors, given the potential to develop new circular business models and hedge the risks associated with linear supply chains.

In line with the European Commission's Circular Economy Action Plan, the European Investment Bank (EIB), as the EU bank, supports the transition to a circular economy. Our main focus is to increase lending to innovative and transformative circular economy projects and to offer circular economy advisory services to project promoters to facilitate access to finance.

This guide aims to:

a. promote a common understanding of and the case for change to a more circular economy;
b. raise awareness about circular opportunities and solutions;
c. outline the EIB's support for the circular economy and approach to the screening of and due diligence on circular economy projects.

The EIB Circular Economy Guide will be updated as our understanding of the needs, opportunities and risks evolves. Any comments or suggestions for future editions can be sent to CircularEconomy@eib.org.

2. The circular economy

The background and needs

Our current wasteful linear economy originated in the second industrial revolution, which led to increased prosperity in the years after World War II. However, it also led to increased resource use and the development of a consume 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 with economic growth. Since then, real commodity prices have risen in tandem with economic growth and this has increased focus on resource efficiency and security of supply. While recessions in recent years have temporarily reversed these trends for some materials, price volatility and uncertainty remain.

With an expected global population growth of about 500-750 million per decade, accompanied by a rapid rise in living standards and purchasing power in less developed areas, the United Nations Environment Programme's International Resource Panel predicts that material resource use may double from 2015 to 2050. This raises concerns that Earth's finite resources may not be sufficient to sustain the expected increases in consumption and wasteful use of resources. Moreover, the growing consumption of raw materials will increase the need to extract and transport them from remote and less accessible locations, raising costs and worsening the environmental impact.

Furthermore, it has been estimated that 20% of materials extracted globally end up as waste. The European Union's dependency on imports is over 90% for some raw materials, such as metal ores. Moreover, the European Union has listed 16 raw materials as strategic and 34 as critical in terms of supply. The resulting resource supply constraints and price volatility risks may reduce the competitiveness of EU companies. In addition, extraordinary events, such as the coronavirus pandemic, can seriously affect the functioning of supply chains and reduce production in EU factories. This highlights the importance of resource sovereignty that is supported by closed-loop production.

The concept

In a fully circular economy, waste is minimised by designing products and industrial processes in such a way that resources are kept in use in a perpetual flow, and by ensuring that unavoidable waste or residues are recycled or recovered. The Ellen MacArthur Foundation describes the circular economy in a diagram, as shown in Figure 1. It comprises two cycles: a biological cycle, in which residues are returned to nature after use, and a technical cycle, where products, components or materials are designed and marketed to minimise wastage. Such a circular system aims to maximise the use of pure, non-toxic materials and products that are 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, minimising wastage at all stages of the extraction-production-consumption cycle.

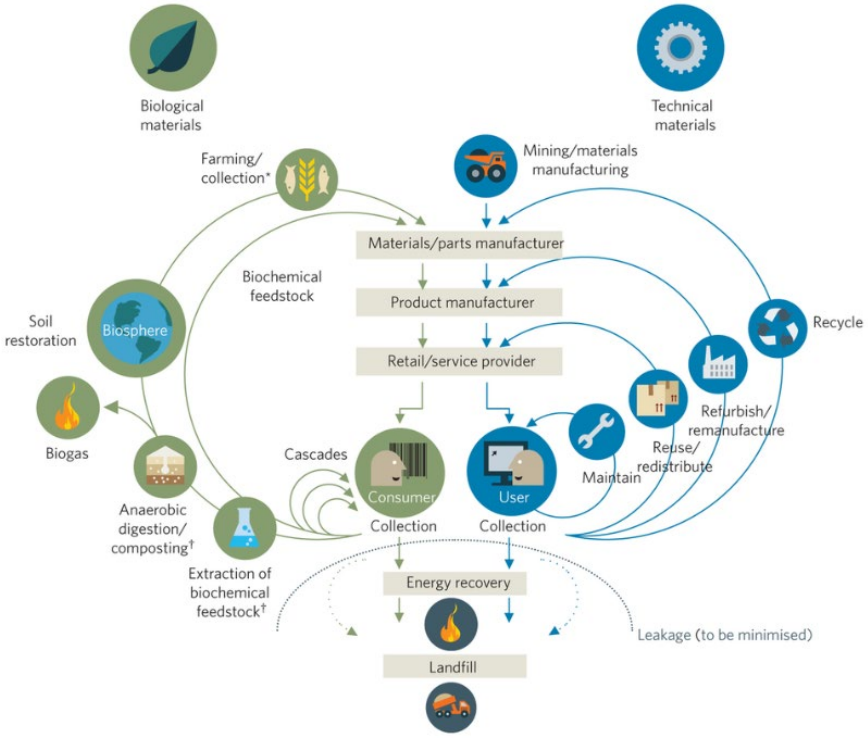

Figure 1: The Ellen MacArthur Foundation circular economy diagram

This circular way of producing and consuming disconnects economic growth from the extraction and consumption of materials. In this way, a circular economy offers companies a way to hedge future resource and material supply chain risks and increase their resilience to diminishing supplies and growing price uncertainty and volatility. This will reduce resource dependency, spur innovation and improve competitiveness. A circular economy also provides an opportunity for economic and industrial renewal with a related increase in investments.

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

- 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 to increase the use and extend the life of underused or idle products, equipment, buildings and other assets.
- Resource and material loops are closed by recycling end-of-life products and materials.

Links to further information on the circular economy and case studies are provided in Annex 1. The circular economy strategies known as the 9Rs[1] are defined in Annex 2.

[1] 9Rs: refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, repurpose, recycle.

The drivers and enablers

There are four fundamental drivers and enablers of the circular economy:

1. **Resource constraints**: With global resource demand growing quickly, concerns about looming shortages of critical raw materials and water are increasing. The same is true for arable land, as demand for cotton and other crops is growing. Rethinking our resource use is therefore imperative.
2. **Environmental and climate impacts of resource extraction and use**: A circular economy will reduce resource extraction and waste generation and the related adverse impacts on the environment and the climate.
3. **Technological development**: The introduction of new technologies, notably the internet of things and big data tools, is enabling the development and introduction of new circular economy business models. These are often based on sharing and leasing, but can also be based on repair, reuse and remanufacturing. New technical systems and tools make it possible to track products or materials during their life to enable extended use and maintain the highest possible value. Meanwhile, design and manufacturing capabilities, for example 3-D printing and artificial intelligence, are evolving with progress in production, material science and advanced manufacturing.
4. **Socioeconomic development**: Currently, about half of the world's population lives in cities, and this will rise to 60% 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. This supports the adoption of asset-sharing schemes and systems for product reuse and the closing of circular loops.

The business opportunities

The circular economy offers companies in the European Union the following **opportunities** to reduce their exposure to risks associated with traditional linear business models, reduce costs and exploit new market and business opportunities:

- **Reducing risks from and limiting uncertainty and price volatility in future commodity supplies**: The circular economy offers the means to increase resilience and hedge risks related to uncertain future commodity supply and price volatility. For example, the shift from selling products to services enables manufacturers to control and reuse or recycle the components and raw materials used to produce goods as corporate assets.
- **Reducing manufacturing costs**: Designing products for reuse, disassembly and recycling, with a view to facilitating remanufacturing and the reintroduction of products onto the market, is often less expensive than producing new parts from virgin materials. For example, the remanufacturing of car parts is 30-50% less expensive than producing new parts and generates 70% less waste.
- **Avoiding costs and creating new revenue streams**: Some companies appreciate the benefits of evaluating their production chains to identify how by-products and waste materials could be avoided, reused or recycled. These companies turn to resource management or reverse logistics partners rather than waste management companies. This approach cuts costs and increases efficiency while reducing resource consumption and environmental impact. Companies not able to reuse or recycle their own goods, by-products or waste can offer them to other companies and create symbiotic circular relationships. Such approaches create new and resilient circular business models, generate new revenue streams and avoid waste management costs.
- **New business opportunities and new markets**: The ability to extend the life of an asset and the revenue it generates through appropriate design, repair, remanufacturing and refurbishment schemes enables the creation of new service-based business models and strengthens and lengthens the customer relationship. In such models, companies design products to make their repair and component reuse easier, and may also provide consumers and end users with information, tools and spare parts to repair their products.

The business models

The shift to a circular economy is compelling companies to rethink their use of resources and to redesign and adopt new business models based on dematerialisation, longevity, refurbishment, remanufacturing, capacity sharing and increased reuse and recycling.

There are three generally accepted categories of circular business models, each focusing on a different phase of the value chain: (i) the design and manufacturing phase; (ii) the use phase; and (iii) the value recovery phase. These different types of business model can be illustrated using what is called a value hill, as shown in Figure 2.

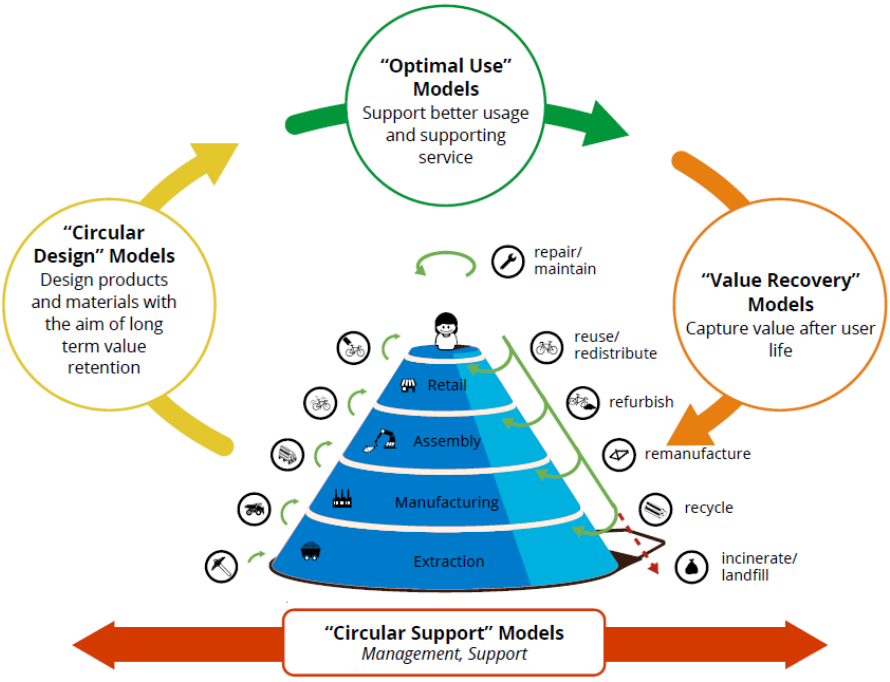

Figure 2: Circular economy business models in the value hill

Source: "The Value Hill Business Model Tool: Identifying gaps and opportunities in a circular network" (2016).

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. In addition, new materials that are, for example, bio-based, less resource-intensive or fully recyclable are developed and/or sourced. The risks related to financing such innovations do not differ much from those related to financing other research, development and innovation 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, for example by providing a service rather than selling a product, and/or take responsibility for the product throughout its useful life, for example by providing maintenance services or new design elements intended to extend the life of a product. Such product-to-service models have financial implications related to, 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. The development of reverse logistics, in other words returning a product or its components from the point of use back to the point of production, is essential for this model. Challenges relate to 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 the recovery of used products and materials, so they can be recycled and reused in new products or as useful resources. The aim is to reduce wastage and

conserve resources. It should be acknowledged that, for some materials and products, recycling involves a loss of quality and, for products, also a loss of the design, technical and energy inputs. It is therefore important to differentiate 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 environmental value.

Circular support models focus on the management and coordination of circular value networks and resource flows, and on optimising incentives and other supporting activities in a circular network. Such 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, business models, strategies, operations and supply chains are rooted in the linear approach. Even if the transition to a circular economy makes economic sense, production processes first need to be transformed from linear to circular, which may require initial investments; modifications of processes, feedstock, equipment and output; the re-training of staff; and coordination within the wider value chain.

The EIB study on access to finance for projects supporting the circular economy made the case that the private sector is by nature focused on short-term gains and generally afraid of taking risks. 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 the transition to a circular economy, particularly in sectors relying on critical raw materials.

Increasingly, established companies and startups are successfully pursuing innovative circular business models in new markets. In addition to the economic advantage of being an innovator or first mover in the market, the lower environmental costs and the benefits to society make the case for this transition even more compelling. Increasing customer awareness and concerns about raw material supplies make companies more aware of the need to design and manufacture circular products and hedge material supply risks and price volatility through a circular economy approach.

The EIB study on access to finance for projects supporting the circular economy concluded that market forces alone could create a circular economy, but that the transition could be slow and opportunity costs could be high. Public sector support is essential for pre-empting potential supply crises, reducing EU dependence on strategic imported resources (as discussed above) and realising the societal and environmental benefits of a transition to a circular economy. The transition will need a systemic approach involving various groups:

- **Companies** must develop circular business models and enabling technologies.
- **Policymakers and legislators** at the EU and national levels must put in place effective regulations and incentives.
- **The financial sector** must improve the availability of financing and revisit its approach to appraising linear and circular risks.
- **Public authorities** and civil society as a whole must increase public awareness and help to educate consumers.

The relationship to climate change and environmental sustainability

The current linear resource-wasting model is depleting Earth's natural capital. The associated pressure on Earth's ecosystems, which are essential for human survival, exceeds their absorption capacity and will cause irreversible and dangerous changes to our environment and climate.
The exploitation of natural resources is often linked with biodiversity loss and water and soil pollution. Ozone depletion and chemical pollution affect the ability of ecosystems to support life in its different forms. For the EIB, environmental protection is a global policy priority that will benefit from the shift to a circular economy. Reducing the extraction of materials, sustainable land use and rehabilitation, ecosystem protection, resource efficiency and renewable energy sources — all linked to the circular economy — will help to preserve natural capital.

Climate change is only one of the many serious environmental challenges caused by the current path of over-consumption and reliance on fossil fuels. Curbing greenhouse gas emissions to fight climate change is an EU public policy objective. The European Union has committed to transforming to low-carbon pathways and reaching carbon neutrality by 2050, which is critical for the future of our planet.

The potential to reduce greenhouse gas emissions by shifting to a circular economy is substantial, as demonstrated by many recent studies and publications, some of which are listed in Annex 3. This can be achieved mainly through improving resource efficiency, extending the useful life of buildings and assets, increasing recycling and reuse, and significantly reducing the use of primary raw materials.

In late 2020, the EIB approved its Climate Bank Roadmap 2021-2025, a plan for climate action and environmental sustainability that has three key aims:

1. mobilising €1 trillion in investment for climate action and environmental sustainability from 2021 to 2030;
2. increasing the share of financing for climate action and environmental sustainability to 50% by 2025;
3. aligning all financing with the Paris Agreement by the end of 2020.

The EIB's support for the circular economy is expected to contribute significantly to achieving the aims of this climate action and environmental sustainability strategy.

3. The EU policy framework

The European Green Deal sets out the European Union's commitment to becoming climate neutral by 2050, and the European Climate Law introduces an intermediate target of reducing the European Union's net emissions by at least 55% by 2030. At the core of these is the European Commission's Circular Economy Action Plan, which aims to make the economy fit for a green future and to strengthen the European Union's competitiveness while protecting the environment and consumers' rights.

The action plan includes 35 legislative and non-legislative initiatives to:

- make sustainable products the norm in the European Union;
- empower consumers;
- focus on the sectors that use the most resources and in which the potential for circularity is high, such as:
  - electronics and information and communication technologies
  - batteries and vehicles
  - packaging and packaging waste
  - plastics
  - textiles
  - construction and buildings
  - food;
- ensure less waste, with a focus on avoiding waste altogether or transforming it into high-quality secondary resources that benefit from a well-functioning market for secondary raw materials.

Some Commission initiatives are dedicated to specific sectors and areas. These include the bioeconomy strategy of 2018 and the Circular Cities and Regions Initiative, which aims to increase synergies among projects and initiatives focused on creating circular cities, disseminate relevant knowledge and promote best practices.

4. EIB support for the circular economy

Advisory services and knowledge sharing

The EIB offers advisory services through several initiatives aimed at supporting circular project promoters in structuring and improving the viability of their projects.

The InvestEU Advisory Hub is the main provider of advisory services and was designed to cover the technical and financial aspects of circular economy projects in an integrated manner.

Public authorities and promoters can benefit from assistance provided by JASPERS, which supports key stakeholders in Member States in developing regional circular economy plans and in identifying and preparing projects.

The Circular City Centre (C3), a joint initiative of the EIB, the InvestEU Advisory Hub and the European Commission's Directorate-General for Research and Innovation, offers awareness-raising and technical advisory services to accelerate the circular transition in cities. With their concentration of people, companies, investment capital and knowledge, cities can be cradles and catalysts for circular development. As outlined in the C3 guide "The 15 circular steps for cities," a circular transition can address many of the problems associated with a linear economy that cities suffer from today, making them more regenerative, resilient, clean and liveable. The C3 initiative is being implemented as part of the Circular Cities and Regions Initiative, in which the EIB is an associated partner.

Knowledge sharing and awareness building are also key EIB activities that aim to promote a common understanding of the circular economy principles and the correct application of sustainable finance taxonomy criteria for a circular economy objective.

More information about circular advisory services, and circular economy awareness-building materials and tools, can be found on the EIB circular economy web page. The C3 initiative has published several guidance documents focused on circular cities, available on the C3 website.

EIB financing products and instruments

The EIB has a range of financing products and instruments that match the requirements of various circular economy projects and promoters, with products targeting public and/or private sector promoters, innovative companies and financial institutions:

- **Investment loans** are intended for more traditional and larger scale projects or investment programmes. The EIB offers medium- and long-term direct loans with fixed or variable interest rates to public or private promoters.
- **Framework loans** are intended for investment programmes for which components have not yet been identified or prepared at the time of signature. They can have a thematic focus, such as the circular economy, and may either come directly from the EIB or be mediated through banks or public institutions.
- **Intermediated lending** is meant for smaller operations. The EIB partners with local banks and other financial intermediaries with a view to channeling its advantageous financing to small and medium-sized enterprises (SMEs) and mid-cap firms. These lines of credit can have a thematic focus, such as climate action.
- **Venture debt** is for fast-growing, innovative companies with medium to high levels of risk. Such companies can benefit from thematic venture debt products backed by the InvestEU guarantee.

The EIB finances projects eligible under EIB rules, that is, projects that are technically and economically sound and conform with EU priorities and policies. Under the Climate Bank Roadmap, projects are expected to contribute to achieving the goals of the Paris Agreement. EIB financing can be tailored to a borrower's specific needs, which will depend on, for instance, a project's size and maturity, and the type of borrower and its position in the value chain.

The EIB is promoting its circular economy thematic framework loans and intermediated lending dedicated to circular economy projects and promoters. These thematic instruments include clearly defined circular economy eligibility criteria. Where needed and justified, the EIB can provide training or technical assistance on the use of these criteria and related reporting.

The EIB is stepping up its support for circular cities by offering circular economy thematic framework loans to municipalities. These loans are designed to finance the circular components of long-term municipal investment programmes and strategies. Such investments can cover projects in the built environment, waste and water management, and mobility sectors, for example.

More detailed information about the EIB standard lending products and instruments can be found online.

EIB financing for the circular economy

From 2018 to 2022, the EIB provided financing for 118 circular economy projects in various sectors, as outlined in Table 1.[2]

Table 1: EIB financing for the circular economy, 2018-2022

Sector	Circular economy financing (€ millions)	Share
Industry and services	1 191	35%
Agri-forestry and bioeconomy	806	23%
Solid waste	741	22%
Water	196	6%
Urban development and buildings	93	3%
Mobility	39	1%
Multisector/small and medium-sized enterprises	357	10%
Total	**3 423**	**100%**

EIB-financed circular economy projects range from those based on innovative sharing-and-leasing business models to more traditional recycling projects. In recent years, the EIB has significantly increased its financing for circular economy projects. The EIB circular economy financing of €3.4 billion in the period 2018–2022 was 36% higher than the €2.5 billion in the period 2015–2019. Despite this growth, circular economy financing still represents a relatively modest share of overall EIB lending. Given this and the strategic importance of the circular transition, the EIB aims to continue increasing its financial and advisory support to the circular economy sector.

Some recent circular economy projects financed by the EIB are presented in Table 2.

[2] The circular economy lending figures for earlier years were determined according to a special categorisation valid for the reporting period 2015-2019, which featured in a previous version of this guide. As of 2020, circular economy lending figures will be calculated based on the circular categorisation system presented in Chapter 5.

Table 2: Approved EIB projects contributing to the circular economy

Circular design and production	Type
Covestro circular economy (Germany): This project will finance Covestro's research, development and innovation programme for the period 2020-2022. Investments will support the transition towards using circular, low-fossil carbon polymers to produce high-performance durable plastics and elastomers. The promoter intends to develop new technologies using raw materials from renewable and/or secondary sources, such as plastics waste, biomass and CO_2. More information online	Corporate
Orbital shower system (Sweden): This project will support Orbital Systems, which has developed a water-saving shower solution for use in homes, vehicles and hotels that can save up to 90% of the water and 80% of the energy used by conventional showers. Water that would normally be discharged is cleaned and reused in the same shower cycle. More information online	Innovation
Matrix Pack (Greece): The project will consist of financing (i) new machines to produce paper straws instead of plastic, non-renewable ones, (ii) ancillary equipment and (iii) related research, development and innovation activities. More information online	Corporate
Circular use	
De Lage Landen (DLL) circularity loans for SMEs and mid-cap firms (Netherlands): This project will consist of two intermediated loans for DLL's circular economy finance solution with a focus on leasing. The facilities provide customers with access to equipment finance at various stages of an asset's life cycle and facilitate the remanufacturing or refurbishment of used assets through DLL's Life Cycle Asset Management programme. This encourages small firms and mid-cap firms to lease, rather than purchase, assets and helps suppliers to transition from selling assets to selling services in more sustainable circular business models. More information online	Finance
Circular value recovery	
Carbios PET bio-recycling demo plant (France): This project consists of the construction and operation of an enzymatic recycling demonstration plant for polyethylene terephthalate (PET) plastics and polyester fibres, and a production unit of enzymatic solutions for compostable plastics. The company aims to demonstrate the technical and economic viability of its technology under real industrial conditions and optimise its bioprocesses. More information online	Innovation
Pescara climate action and circular economy (Italy): A framework loan that finances the city of Pescara's circular investments in the anaerobic digestion of biowaste and the sorting of recyclable materials, among other activities. More information online	Public
Renewcell (Sweden): This project involves a textile recycling demo plant that is the first full-scale commercial plant for the recycling of waste textiles (cotton and viscose fibres) into high-quality biodegradable pulp from which new textiles can be produced. More information online	Innovation
Circular support	
Ultimaker (Netherlands): This project involves a company that develops 3-D printers and associated materials. It also makes open-source software to operate the printers. 3-D printing is transforming the way we make things. A large percentage of our goods could be 3-D printed in the future, making production more circular. More information online	Innovation
Winnow (Romania): This project involves a food waste management company that is helping staff in professional kitchens track the amount and type of food wasted with the aim of better managing and preventing food waste. More information online	Innovation
Multiple circular strategies	
European Circular Bioeconomy Fund (EU members): This involves EIB equity participation in a fund investing in innovative bioeconomy and circular bioeconomy companies and projects in the EU Member States and Horizon 2020 countries. The fund plans to invest in companies and/or projects that promote innovative technology and products in the bioeconomy and circular bioeconomy. More information online	Finance
Belfius Smart Cities, Climate and Circular Economy (Belgium): This involves bank-intermediated framework loans that target public sector projects in Belgium. The defined eligibility criteria help the intermediary bank to source and screen projects based on eligibility. More information online	Finance, public sector

5. The typology of circular economy projects

Project screening and assessment

A sector-neutral circular economy categorisation system, comprising the circular economy categories listed in the following section, was developed by an independent group of experts advising the European Commission on circular economy financing and adopted by the EIB in 2020. The Bank used this categorisation system as the basis for developing its interim circular economy criteria and to identify and prioritise circular economy projects and investments.

To complement this, and pending the adoption of the delegated act for the four environmental sustainability objectives under the EU taxonomy for sustainable activities, the EIB also developed interim technical criteria. These criteria are used to identify projects with the potential to make a substantial contribution to achieving these sustainability objectives, including the objective "Transition to a circular economy."

Circular economy categories

Group 1: Circular design and production models

- 1.a Design and production of products and assets that enable circular economy strategies through, for example, (i) increased resource efficiency, durability, functionality, modularity, upgradability, easy disassembly and repair; and (ii) use of materials that are recyclable or compostable.
- 1.b Development and deployment of process technologies that enable circular economy strategies.
- 1.c Development and sustainable production of new materials (including bio-based materials) that are reusable, recyclable or compostable.
- 1.d Substitution or substantial reduction of substances of concern in materials, products and assets to enable circular economy strategies.
- 1.e Substitution of virgin materials with secondary raw materials and by-products.

Group 2: Circular use models

- 2.a Reuse, repair, refurbishing and remanufacturing of end-of-life or redundant products, movable assets and their components that would otherwise be discarded.
- 2.b Refurbishment and repurposing of products at the end of their design life or redundant immovable assets (such as buildings, infrastructure and facilities).
- 2.c Product-as-a-service, reuse and sharing models based on, for example, leasing, pay-per-use, subscription or deposit return schemes that enable circular economy strategies, including reverse logistics.
- 2.d Rehabilitation of degraded land to return to useful state and remediation of abandoned or underutilised brownfield sites in preparation for redevelopment.

Group 3: Circular value recovery models

- 3.a Separate collection and reverse logistics of waste and redundant products, parts and materials, enabling circular value retention and recovery strategies.
- 3.b Recovery of materials from separately collected waste in preparation for circular value retention and recovery strategies (excluding feedstock, covered under 3.c).
- 3.c Recovery and valorisation of separately collected biomass waste and residues as food, feed, nutrients, fertilisers, bio-based materials or chemical feedstock.
- 3.d Reuse or recycling of wastewater.

Group 4: Circular support

- 4.a Development and/or deployment of tools, applications and services enabling circular economy strategies.

Activities in all 14 of the circular economy categories listed above contribute to increasing resource efficiency and reducing environmental impacts throughout value chains. It is important to note, however, that not all resource efficiency gains contribute to a circular economy. The Commission Expert Group on Circular Economy Financing and the EIB recognise resource efficiency in activities that substantially

contribute to the circular economy as a result of actions that (i) reduce consumption of resources; and (ii) enable value retention and/or value recovery strategies throughout value chains.[3]

Activities aimed at recovering energy from waste and residues are excluded from the circular economy categorisation system. This is because the resource efficiency gains from waste-to-energy and waste-to-fuel activities are limited in comparison with those from activities in the above circular economy categories, particularly when considering the loss of value of potentially recyclable materials.

Activities for the production and use of renewable energy and activities supporting the efficient use of energy are also excluded from the circular economy categorisation system. Nevertheless, the Commission Expert Group on Circular Economy Financing and the EIB consider the production of renewable energy (including biomass, solar, wind and hydro) and the efficient use of energy to be sustainable activities with a key role in supporting the transition to a more circular economy.

In addition to falling under one of these categories, circular economy projects or project components should have a clearly communicated intention, goal or design brief to contribute to circular economy goals and objectives, and be positive for society and the environment, similar to impact investing. Due diligence must consider the long-term thinking and broader conception of value common to many circular economy projects, where upfront investments generate long-term returns or reduce future risks and have multiple impacts (ecological, social and financial).

[3] Value retention and value recovery strategies are those numbered R4-R9 in Annex 2. Reduce (R3) strategies that increase resource efficiency and value retention along food value chains by preventing the generation of food waste in agricultural production, processing, manufacturing, distribution and consumption can also substantially contribute to the circular economy.

Annex 1 Circular economy resources

Source/author	Title/description	Year
General documents, studies and other information on the circular economy		
ABN Amro, ING, Rabobank	Circular economy finance guidelines	2018
Arup	The circular economy in the built environment	2016
Circle Economy, PGGM, KPMG, EBRD, WBCSD	Linear risks	2018
CEPS	The circular economy: Barriers and opportunities for SMEs	2015
Ellen MacArthur Foundation	Various publications on the circular economy	—
FinanCE Working Group	Money makes the world go round (and will it help to make the economy circular as well?)	2016
Various non-governmental organisations	Walking the circle – The 4 guiding pillars for a circular economy	2015
OECD	RE-CIRCLE: resource efficiency and circular economy	—
World Economic Forum	Platform for accelerating the circular economy	—
European institutions: Reference websites and documents		
European Commission	Circular Economy Action Plan and related strategies	—
European Commission	Critical Raw Materials Act	2023
European Commission	Public procurement for a circular economy – good practice and guidance	2017
European Commission — Expert Group on CE Financing	Accelerating the transition to a circular economy	2019
National, regional and local circular economy initiatives		
City of Amsterdam	Circular Amsterdam	—
City of Glasgow	Circular Glasgow	—
City of London	ReLondon	—
City of Paris	Paris Circular Economy Plan	—
City of Rotterdam	Circular Rotterdam	—
Catalunya Region	Catalunya Circular	—
Flanders Region	Circular Flanders	—
Finland — SITRA	Finland's road map to the circular economy 2.0	—
Slovenia	Roadmap towards the circular economy in Slovenia	—
Netherlands	Circular Netherlands	—
Switch — Asia Network Facility	Advancing sustainable consumption and production (SCP) and the circular economy in Asia	—
Circular economy case studies		
Circle Economy	Various case studies	—
Ellen MacArthur Foundation	Various case studies	—
Encore	Encore regions and circular economy. Best case studies	2016
Circular Flanders	Various case studies	—

Source/author	Title/description	Year
European Circular Economy Stakeholder Platform	Selection of good practices	—
Circular economy and climate change mitigation		
CE Delft	The circular economy as a key instrument for reducing climate change	2016
CEPS	Time to connect the dots: What is the link between climate change policy and the circular economy?	2016
Circle Economy, Ecofys	Implementing circular economy globally makes Paris targets achievable	2016
Deloitte	Circular economy potential for climate change mitigation	2016
Ellen MacArthur Foundation, Material Economics	How the circular economy tackles climate change	2019
Material Economics	The circular economy – a powerful force for climate mitigation	2018
Circular economy in cities and regions		
The Circular Cities and Regions Initiative	Methodology for the implementation of a circular economy at the local and regional scale	2022
EIB	The Circular City Funding Guide website	2020
The Circular City Centre (C3)	The following four documents can be downloaded on the C3 website: The 15 circular steps for cities A catalogue of circular city actions and solutions A guide for developing a circular city strategy A guide for circularity in the urban built environment For more circular cities resources, please consult: The C3 circular cities resources inventory	2022/23
OECD	The circular economy in cities and regions	—
Circular economy taxonomy, measurement and monitoring frameworks		
CEPS	The circular economy: A review of definitions, processes and impacts	2017
Deloitte (commissioned by the Dutch Government)	Quick scan – taxonomy circular economy – Analysis based on inputs from Dutch financial institutions	2019
European Environment Agency (EEA)	Resource efficiency and the circular economy in Europe 2019 – even more from less	2019
European Commission	EU Taxonomy for sustainable activities – Regulation (EU) 2020/852	2020
European Commission	EU Taxonomy Compass	2021
European Commission — Expert Group on CE Financing	Categorisation system for the circular economy: A sector-agnostic approach for activities contributing to the circular economy	2020
Eurostat	Circular economy monitoring framework	—
Ellen MacArthur Foundation	Circulytics – measuring circularity	2020
SUMMA (commissioned by Circular Flanders)	Indicators for a circular economy	2018
WBCSD	Circular transition indicators	2019

Annex 2 Circular economy strategies

R	Strategy	Description
R1	Refuse	Make a product redundant by abandoning its function or by offering the same function by a radically different (e.g. digital) product or service
R2	Rethink	Make product use more intensive (e.g. through product-as-a-service, reuse and sharing models or by putting multi-functional products on the market)
R3	Reduce	Increase efficiency in product manufacture or use by consuming fewer natural resources and materials. This includes the prevention of food waste along food value chains including in agricultural production, processing, manufacturing, distribution and consumption
R4	Reuse	Reuse of a product that is still in good condition and fulfils its original function (and is not waste) for the same purpose for which it was conceived
R5	Repair	Repair and maintenance of a defective product so it can be used with its original function
R6	Refurbish	Restore an old product and bring it up to date (to specified quality level)
R7	Remanufacture	Use parts of a discarded product in a new product with the same function (and as-new condition)
R8	Repurpose	Use a redundant product or its parts in a new product with a different function
R9	Recycle	Recover materials from waste to be reprocessed into new products, materials or substances, whether for the original or other purposes. This includes the reprocessing of organic material but does not include energy recovery and reprocessing into materials that are to be used as fuels or for backfilling operations

Source: categorisation_system_for_the_ce.pdf (europa.eu)

A further "R" strategy often mentioned in combination with the above 9Rs, sometimes even as part of a circular economy definition, is the recovery of (embodied) energy from waste and residues. The EIB acknowledges that, from a waste management angle, energy recovery is an environmentally preferable option to landfill disposal, in accordance with the waste hierarchy principle. However, the resource efficiency gains from waste-to-energy and waste-to-fuel strategies are limited in comparison with the other Rs, particularly when considering the loss of value of potentially recyclable materials through combustion. Hence, the EIB does not consider activities primarily aimed at energy recovery from wastes and residues to be activities substantially contributing to the circular economy.

Annex 3 The circular economy and climate change mitigation

(For sources see Annex 1)

Title, author and year of publication	Sector/circular economy strategies	Geographical scope	Main messages/reduction in greenhouse gas emissions
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 tonnes (Mt) of CO_2 emissions, out of 530 Mt in total (–56%) can be cut per year in the European Union by 2050 — and some 3.6 billion tonnes 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 wastewater **Construction sector:** recycling, product reuse **Automotive sector, electrical and electronic equipment:** large-scale, systematic recycling, product reuse and lifetime extension	EU	Across all three sectors studied, the potential for a reduction in greenhouse gas emissions is 22-33%, compared with 2007 levels, depending on circular economy scenarios considered (savings between 230-335 Mt CO_2 equivalent (CO_2eq) annually). By sector: – food: 12-14% reduction (55-64 MtCO_2eq annually) – construction: 17-34% reduction (26-75 MtCO_2eq annually) – vehicle production: 45-66% reduction (84-123 MtCO_2eq annually) – electrical and electronic equipment production: 43-50% reduction (65-75 MtCO_2eq annually) Altogether, the circular economy may lead to a reduction of 550 MtCO_2eq 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 two-thirds of municipal solid waste (from current levels) can reduce global greenhouse gas emissions by 6% (2.3 GtCO_2eq annually). The European Union's greenhouse gas emissions could be reduced by 4% (180 MtCO_2eq annually).
Implementing circular economy globally makes Paris targets achievable, Circle Economy and Ecofys, 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_2eq).

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 three 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 with 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-life consumer products compared to today")	Finland, France, the Netherlands, Spain and Sweden	The material efficiency scenario is likely to cut carbon emissions in each country by between 3% and 10% (~75 $MtCO_2eq$) by 2030. By country: Finland: –4%, France: –5%, Netherlands: –3%, Spain: –10%, Sweden: –5%.

The EIB Circular Economy Guide

Supporting the circular transition

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