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# Financing an inclusive circular economy

## De-risking investments for circular business models and the SDGs

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# Summary


- The question of how best to fund the circular economy is receiving increasing attention not only from circular economy proponents, but from policymakers and the finance sector. Circular economy finance is becoming more sophisticated due to the growing demand for sustainable finance from investors and company shareholders.
- Despite recent growth, circular economy finance and spending remains small-scale in comparison both with other green finance and with spending in the linear economy. Current investment levels are too low to drive a global circular economy transition at scale.
- The current roll out of recovery and economic stimulus packages in response to the COVID-19 pandemic provides an opportunity to accelerate a 'just transition' to an inclusive circular economy. So far, economic stimulus packages have predominantly been allocated to support the existing linear economic system, rather than to investing in transformation towards a sustainable economy.
- The circular economy can contribute to achieving several of the Sustainable Development Goals (SDGs) – including SDG 12 (responsible consumption and production), SDG 14 (life below water) and SDG 15 (life on land), among others. However, the SDGs most directly associated with the circular economy are severely underfunded, with financial support mainly limited to waste management and recycling projects. Furthermore, most instruments aimed at financing the circular economy currently only target high-income countries and companies.
- For the circular economy to make more substantial contributions in the SDG context, there must be a significant increase in financing for higher-value circular economy opportunities across value chains and in support of the scaling of circular business models. Support for low- and middle-income countries in the transition from a linear to a circular economic model is crucial, particularly in the context of the COVID-19 recovery.
- Policy instruments are key to de-risking and incentivizing financial investments that target circular economic development. Instruments – such as blended finance and investment guarantees – that support public–private collaboration and financing of the circular economy offer a wider range of possibilities to scale circular economy finance and investments. Official overseas development assistance, public funds, impact investments and philanthropic giving can leverage private investments and de-risk early-stage investments.

- Strong policy frameworks, such as national action plans and roadmaps for the circular economy; recycling and resource efficiency targets; blended finance; and investment guarantees, form a precondition to attract sustainable funding through foreign direct investment. Public sector support will require continuous monitoring and improvements as part of de-risking investments to ensure sustainable and equitable outcomes.
- For circular economy finance to become sustainable and socially inclusive, it will be necessary to adopt and internalize new ideas, such as the concept of a 'just transition'. While it is not a one-size-fits-all approach, a just transition keeps track of impacts on stakeholders in relation to corporate accountability: who are the winners and losers of these system changes, and how circular economy finance can better support social inclusion and equality of access to the opportunities created by the circular economy.

# 01 Introduction

**The circular economy aims to reduce overconsumption, design-out waste and restore and regenerate ecosystems and natural capital. New financial instruments and investments are needed to finance circular business models and innovations at scale.**

Financial institutions and investors are facing mounting pressure from the public, shareholders and new legislation to act on climate change and address pressing sustainability concerns in their portfolios. The circular economy presents an opportunity to improve the sustainability of the finance sector and investments. Increasingly, governments, international organizations, businesses and the finance industry see the circular economy as a key strategy for sustainable development and climate change mitigation. This research paper provides a high-level overview and analysis of the current investment landscape and developments in finance for the circular economy transition.

This introduction presents a broad overview of the circular economy concept and of how the finance sector is gradually adopting circular economy principles and approaches through different private financial mechanisms. These include circular economy themed green bonds and other financial instruments, as well as the use by investment fund managers of the circular economy as an approach to thematic investing. It also provides an estimate of the current value of corporate spending on circular economy initiatives in selected sectors and in value chains with high material intensity. Furthermore, it outlines emerging circular economy business models, and how these relate to developments in financial products and services.

The second chapter examines international development finance, with particular emphasis on overseas development assistance (ODA) spending in the SDG context. The analysis aims to demonstrate how the circular economy is financed and to estimate the current scale and priority areas of spending.

The third chapter provides an overview of how finance and investment for the circular economy can be de-risked through supportive policy tools and dedicated finance mechanisms. A wide range of policy tools to de-risk investment in circular economy solutions is available, including national circular economy roadmaps

and strategies, extended producer responsibility (EPR) policies, target-setting for resource efficiency and recycling, product eco-design and fiscal policies. In terms of financial instruments that can de-risk investments, this paper proposes a number of approaches, including blended finance, loan guarantees, political risk insurance (PRI) and public equity co-investments.

Chapter 4 provides an overview of current public spending on circular economy initiatives under 'green recovery' packages that have been announced by different governments in response to the COVID-19 pandemic. This paper will make the case for integrating the circular economy more directly into green recovery and just transitions to ensure socially equitable outcomes of investment and public stimulus packages.

The final chapter provides conclusions and recommendations for policymakers, as well as stakeholders in the finance sector and international development finance, to increase the scope and volume of finance and investments for the circular economy.

The appendix offers a brief overview of the research methodology used in the preparation of this paper. The detailed methods used for the quantification of circular spending, and the data sources used for the estimation of the volumes of such spending, are based on a working paper written by Just Economics, which was commissioned by Chatham House to inform this research project and this paper.

## What is the circular economy and how can the transition be financed?

The circular economy concept is rooted in various fields, including industrial ecology, systems thinking, ecological economics and biomimicry, all of which have contributed conceptual, technical and policy aspects to the development of this potential new paradigm of sustainability.[1] The concept entails a 'system overhaul' that aims to reduce overconsumption of resources of traditional 'linear' economies, design out waste from production and consumption systems, and restore and regenerate ecosystems and natural capital. This economic, environmental and societal transition from linear to circular is referred to as circularity – a strategy for sustainable business development to keep resources and products at the highest possible value during their lifetime.[2]

'Linear' refers to the conventional way that the economy treats resources (also referred to as a 'take–make–use–waste' model). 'Circular' refers to an economy where resources and materials are used as long and efficiently as possible within planetary boundaries. In practice, this means that by using already harvested

**1** Saavedra, Y., Iritani, D., Pavan, A. and Ometto, A. (2018), 'Theoretical contribution of industrial ecology to circular economy', *Journal of Cleaner Production*, 170, pp. 1514–22.
**2** Kirchherr, J., Reike, D. and Hekkert, M. (2017), 'Conceptualizing the circular economy: An analysis of 114 definitions', *Resources, Conservation and Recycling*, 127, pp. 221–32.

resources for as long as possible resource stocks can be replenished before they are exhausted. It also implies a diminution in the use of abiotic (non-biological) resources (such as fossil fuels) for combustion and other single-use purposes.

Furthermore, the transition to a circular economy is part of the latest frontier of socio-technological change, linked to digitalization and other Industry 4.0 technology solutions. The financing of socio-technical transitions requires the adoption of a long-term perspective and the building of new and innovative links between technology and finance.[3] For example, one such socio-technological trend relates to mobility. Environmental, climate, safety and spatial concerns, especially in cities, have given rise to 'mobility-as-a-service' business models such as car sharing, facilitated by digital technologies and changes in mobility behaviour. Finance, leasing and insurance models need to fundamentally adapt and reinvent themselves in light of these socio-economic trends.

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Circularity provides principles and strategies that can limit or optimize resource usage. It does this by emphasizing the reduction of waste streams in favour of regenerating wastes to useful resources, coupled with restoration as an alternative to the extraction of virgin resources. The concept of the circular economy, as well as the practice of circularity in general, address economic concerns related to the scarcity of resources, distribution and access; the impacts of production, consumption and price volatility;[4] environmental issues related to designing out harmful wastes and pollution;[5] and societal concerns around preventing the disruption of value chains.[6] In practice, circularity aims to redesign the linear take–make–use–waste economy[7] into a more circular production and consumption cycle. In the linear economy, circularity is present in the form of the recycling of resources: however, recycling alone is largely insufficient to meet environmental, societal and economic needs.[8]

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**3** Perez, C. (2003), *Technological Revolutions and Financial Capital: The Dynamics of Bubbles and Golden Ages*, Cheltenham, UK: Edward Elgar.
**4** Eurostat (n.d.), 'Circular economy – Overview', https://ec.europa.eu/eurostat/web/circular-economy.
**5** Ellen MacArthur Foundation (n.d.), 'What is the circular economy?', https://www.ellenmacarthurfoundation.org/circular-economy/what-is-the-circular-economy.
**6** Pavel, S. (2018), 'Circular Economy: The Beauty of Circularity in Value Chain', Asian Institute of Research, 11 December 2018, https://www.asianinstituteofresearch.org/JEBarchives/Circular-Economy%3A-The-Beauty-of-Circularity-in-Value-Chain-.
**7** Collot d'Escury, A. (2013), 'From 'take, make and waste' to the circular economy', World Economic Forum, https://www.weforum.org/agenda/2013/09/from-take-make-and-waste-to-the-circular-economy.
**8** Cho, R. (2020), 'Recycling in the U.S. Is Broken. How Do We Fix It?', Columbia Climate School, 13 March 2020, https://blogs.ei.columbia.edu/2020/03/13/fix-recycling-america.

### **Box 1.** Circularity and the 9R framework[9]

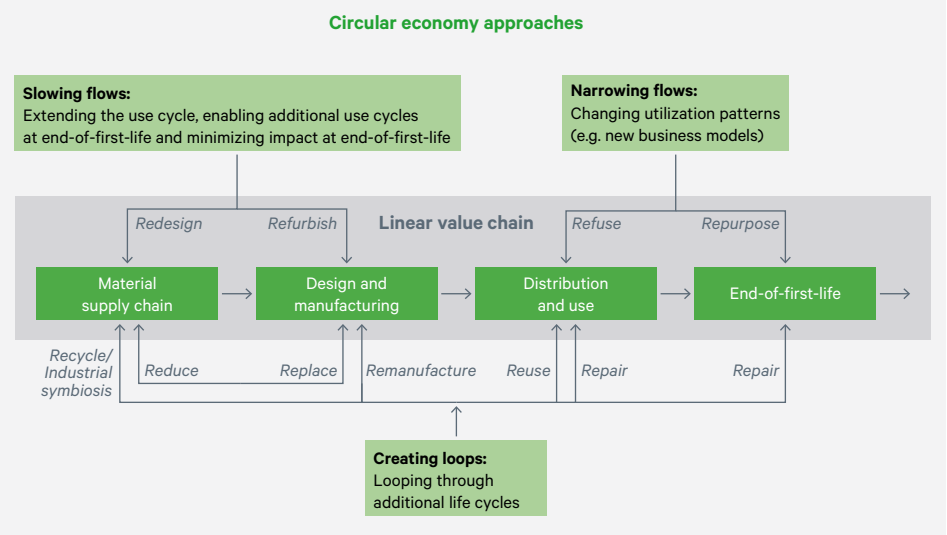
The circular economy encompasses a wide range of circular practices and related socio-economic activities, one iteration of which can be referred to as the '9R' framework: Reduce, Refuse, Redesign, Reuse, Repair, Refurbish, Remanufacture, Repurpose and Recycle. The increased adoption of these and other 9R circularity behaviours in economies is the key to the circular transition.

1. **Reduce** focuses on reducing the overall use of natural resources for production and consumption. The reduction in the resource-intensity of products is linked to dematerialization and the decrease in absolute quantities of resources needed to support economic functions in society.
2. **Refuse** involves the abandonment of the use of a resource or product through elimination, without losing economic function. This can be policy driven, as a consequence of environmental cost or human health risks, as is the case with the disuse of hazardous materials and some chemical compounds. It often results in the substitution of a resource by another resource that is less harmful, or not harmful at all.
3. **Redesign** emphasizes a complete rethink of a product to reduce resource consumption or to eliminate certain resource usage through the adoption of 'product-as-a-service' or 'sharing economy' business models. From a circularity perspective, redesign focuses on needs fulfilment and the availability and use of services, rather than the possession of goods.
4. **Reuse** of a product or resource focuses on assuring that a good is of high enough quality to continue to function for its original purpose. For garments and textiles, this is referred to as a 'second life' (as opposed to recycling, which often implies shredding into textile fibres).
5. **Repair** aims to fix products in disrepair so they can be reused for their original purpose.
6. **Refurbish** emphasizes restoration with the aim of increasing the quality of an otherwise obsolete product to a current quality standard.
7. **Remanufacture** creates products that are as good as new – or sometimes better, upgraded products – through a recombination of parts.
8. **Repurpose** uses a redundant product considered as waste and reprocesses it to give it a different function. In cosmetics, this trend is visible in the recovery of waste streams of food (e.g. orange peels and coffee grounds) into hand soaps.
9. **Recycle** focuses on the recovery of materials from waste to be reprocessed as industry-grade inputs for production. The recovery of energy from waste materials is not included.

**9** Kirchherr, Reike and Hekkert (2017), 'Conceptualizing the circular economy: An analysis of 114 definitions'.

Figure 1 depicts how the 9R framework of circular economy approaches can achieve the objective of slowing and narrowing resource flows and create material loops.

**Figure 1.** Circular economy approaches and the 9R framework




Source: Based on Preston, F., Lehne, J. and Wellesley, L. (2019), *An Inclusive Circular Economy: Priorities for Developing Countries*, Research Paper, London: Royal Institute of International Affairs, https://www.chathamhouse.org/2019/05/inclusive-circular-economy.

What is still missing in these conceptual diagrams is a designed technical concept related to resource flows in the economy. This requires the creation of markets and business models. The main financial challenge for circular economy finance is precisely this economic problem: how to translate the need for slowing and narrowing resource flows, circular strategies and the 9R framework into viable business models that can be financed at scale.

## What is circular economy finance?

There is no single definition of circular economy finance, rather definitions are currently being elaborated as new service offerings evolve. According to the United Nations Environment Programme (UNEP) Finance Initiative, 'financing for circularity covers any type of financial service where money is exclusively used to finance, re-finance, invest in or insure in part or in full, new and/or existing companies or projects that advance the circularity of our economies.'[10]

As pointed out by the OECD, the lack of available finance and persistent funding gaps have been identified as major constraints in the transition towards a circular economy. Many cities and regions in the OECD face restrictions in their ability to transition to a circular economy, whether it be due to insufficient financial

**10** United Nations Environment Programme – Finance Initiative (2020), *Financing Circularity: Demystifying Finance for Circular Economies*, UNEP FI.

resources (73 per cent), financial risks (69 per cent), lack of critical scale for business and investments (59 per cent), and lack of private sector engagement (43 per cent).[11]

Recent publications have noted the growth and opportunities of circular economy finance, but have also highlighted the need to overcome numerous existing barriers, enhance transparency by mandating disclosure and standardizing, and sharpen definitions and metrics for circular activities.[12] Furthermore, it has been noted that the procedures, mechanisms, and tools for social sustainability efforts need to be included in emergent frameworks, analytic conceptions and standards of circular economy finance instruments.[13]

In view of these concerns, an important categorization and framework for investing in the circular economy is offered by the European Commission in preparation for the EU's sustainable finance taxonomy.[14] The Commission's categorization system contains four main categories of circular economy activities and 14 subcategories. In addition to these criteria for measuring the contribution to the circular economy transition, the system also includes a set of 'do no significant harm' (DNSH) criteria and requirements for meeting minimum safeguards with regard to social and human rights.[15]

The first broad category consists of activities related to circular design and production that aim to make resource recovery more effective and efficient. The second category includes the optimal-use systems – such as sharing and product-as-a-service offerings – in which ownership of the asset and the responsibility for maintenance and disposal remain with the service provider. The third category involves material recovery, and the fourth constitutes the circular economy enablers, such as marketplaces for secondary materials, platforms or services that connect the value-chain participants based on circular principles.

The 9R circular economy framework detailed above and this categorization of circular economy activities is increasingly being adopted by public financial institutions such as the European Investment Bank (EIB),[16] as well as the Polish, French, Italian, Spanish and German national promotional banks that act as the EIB's financial intermediaries. Private financial institutions and asset managers – such as ABN AMRO, BlackRock, BNP Paribas, Circularity Capital, ING, Intesa San Paolo, PGGM, Rabobank and RobecoSAM – have issued their own circular economy finance products and services based on guidelines developed by the FinanCE working group, driven by FinanCE members ABN AMRO, ING and Rabobank.[17]

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**11** OECD (2020), *OECD Survey on Circular Economy in Cities and Regions*, Paris: OECD, https://www.oecd.org/regional/the-circular-economy-in-cities-and-regions-10ac6ae4-en.htm.
**12** Ellen MacArthur Foundation (2020), *Financing the circular economy: Capturing the opportunity*, Cowes, UK: Ellen MacArthur Foundation.
**13** Dewick, P., Bengtsson, M., Cohen, M. J., Sarkis, J. and Schröder, P. (2020), 'Circular economy finance: Clear winner or risky proposition?', *Journal of Industrial Ecology*, 24(6): pp. 1–9, https://doi.org/10.1111/jiec.13025.
**14** European Commission (2020), 'Categorisation system for the circular economy', https://ec.europa.eu/info/publications/categorisation-system-circular-economy_en.
**15** Bär, H. and Schrems, I. (2021), *Introduction to the EU Taxonomy for a Circular Economy*, Berlin: Forum Ökologisch-Soziale Marktwirtschaft and NABU.
**16** European Investment Bank (2020), *The EIB Circular Economy Guide: Supporting the circular transition*, Luxembourg: EIB.
**17** ABN AMRO, ING and Rabobank (2018), *Circular Economy Finance Guidelines*, Amsterdam: FinanCE Working Group.

## Financing circular economy business models

Circular business models are often based on new, innovative ideas, and both the research community and policymakers have caught up quite quickly and have engaged in categorizing this new wave of circular economic activity and entrepreneurship. Generally speaking, circular business models and strategies are those supporting the transition to a circular economy, based on the taxonomy of slowing, closing and narrowing resource loops.[18] More specific frameworks and categories are being developed: for example, Geissdoerfer et al.[19] have identified four circular business model strategies – cycling, extending, intensifying and dematerializing – and combine these with three value logic categories – value proposition, value creation and delivery, and value capture.

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According to the EU's categorization of circular economy business models, circular economy finance can flow to at least four categories. With the intended purpose of providing a better and more reliable framework to the finance sector, in early 2020 the EU published a generic, sector-agnostic circular economy categorization system. This work of classification offers technical screening criteria, methodology and guidance that create a regulatory push for financial institutions to align their balance sheets with the environmental objectives and targets of the EU. The regulatory aspect will push the capital allocation process for loans and investments. While it is often seen as part of the cost base of regulatory compliance, the categorization of business models also holds promise as a framework to build a commercial pipeline with companies that have a business model aligned with the environmental objectives of the EU taxonomy. The circular economy categorization defines distinct categories of activities. To qualify, these need to substantially contribute to a circular economy, based on a set of minimum criteria that need to be met by activities under each defined category.[20]

Furthermore, the EU taxonomy provides practical guidance through the provision of an indicative list of typical investments for circularity.[21] Financial institutions will need to adopt this categorization framework for the analysis of their existing portfolios and for future circular economy finance offerings. An important segment

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**18** Bocken, N. M. P., de Pauw, I., Bakker, C. and van der Grinten, B. (2016), 'Product design and business model strategies for a circular economy', *Journal of Industrial and Production Engineering*, 33 (5): pp. 308–20.
**19** Geissdoerfer, M., Pieroni, M., Pigosso, D. and Soufani, K. (2020), 'Circular business models: A review', *Journal of Cleaner Production*, 277: 123741.
**20** UNEP – Finance Initiative (2020), *Financing Circularity: Demystifying Finance for Circular Economies*.
**21** Hirsch, P. and Schempp, C. (2020), *Categorisation System for the Circular Economy: A sector-agnostic approach for activities contributing to the circular economy*, European Commission, https://ec.europa.eu/info/publications/categorisation-system-circular-economy_en.

of the framework is still under development: the types of standard data, metrics and benchmarks that can support the financing of these categories of the circular economy constitute an area of ongoing work in the finance sector.

Below are some examples for each of the four broad categories of circular economy activities identified in the European Commission's taxonomy.

1. **Circular design and production business models** focus on increasing material efficiency using durability, modularity, upgradability, ease of disassembly and repairability as design principles without compromising functionality. Typical investments in this category include research and development (R&D) programmes and infrastructure, including pilot and demonstration facilities; scaling-up and deployment of new technologies at commercial scale; and design and construction of new buildings and infrastructure incorporating circular products, recycled materials, and new construction processes.

2. **Optimal-use business models** emphasize the reuse, repair, refurbishment, retrofitting, repurposing and remanufacturing of end-of-life or redundant products, movable assets and their components, which would otherwise be discarded. The category extends to the refurbishment and repurposing of end-of-life or redundant buildings, infrastructure and facilities. It covers the construction, expansion or retrofitting of manufacturing facilities, ancillary equipment and technology for refurbishing and remanufacturing purposes. Investment can be used for the establishment of small-scale businesses or not-for-profit organizations for the reuse and repair of consumer products such as clothing, furniture, bicycles and household appliances.[22]

   Optimal-use models also include product-as-a-service, reuse and sharing models based on leasing, pay-per-use, subscription or deposit return schemes. Many product-as-a-service businesses continue to struggle to secure financing at the present time. Financial institutions will focus on the earnings model, the robustness of the cash flow and the ability to track products.[23] Product-as-a-service tips the balance from traditional product sales (buying a product) towards a service offering (consumer rents and uses of product). The cash flows of these services or subscriptions become the driver of transactions and the basis for finance. Finance will look at the installed base, the ability to scale activities and the associated marketing cost to grow business, the number of subscriptions, increase and attrition rates, the competitive landscape, digital ability of the company, cross-selling potential and customer loyalty. Product-as-a-service finance is typically expensive, because it involves an extra due diligence effort compared to traditional collateral-based finance for a clearly defined asset. Here, the cash flows form the basis of discussions with the financial service provider.

**22** Ibid.
**23** Circle Economy (2019), *Product-as-a-Service Question Kit*, https://www.circle-economy.com/resources/product-as-a-service-question-kit.

3. **Value and resources recovery business models** highlight the separate and effective collection of different types of waste products. This enables circular value retention and material recovery strategies for biotic materials and biomass, encompassing product categories including food, animal feed, fertilizers and chemical feedstock, and wastewater.

   Financial risk analysis has historically been risk-averse towards biomass projects. The risks associated with potential interruptions of the supply chain, quality, amount and price level of the biomass feedstock need to be tackled to smooth the financial due diligence process. Multiple sources of feedstock – for example, a co-fermentation plant that processes biomass in the form of residual brewing waste from multiple breweries, situated within 100 miles of the facility – has a better negotiating position as regards quality, amount and price than a plant processing the residual waste of just one brewery. The recovery of waste heat, based on industrial symbiosis networks, and its reuse for heating for houses, greenhouses or industrial production sites is another proven approach. With the expansion of data centres close to urban areas, there are increasing instances of companies capturing the waste heat generated by servers and using it to heat nearby homes, offices and greenhouses. Stockholm's Data Parks, for example, aims to cover 10 per cent of the city's heating needs by 2035 using such methods.[24]

   The reverse logistics of redundant products is a focus on the collection – and the logistics of retrieving – parts and materials to reintroduce in other parts of the value chain, either to close the loop or to slow down virgin resource usage. Until recently, the finance sector has objected to reverse logistics, because such activities would add to the cost of production while rarely adding to the profit made. However, with the sharp increase in e-commerce activity during 2020 as a consequence of the coronavirus pandemic, reverse logistics is now gaining momentum. According to Deloitte, in the late 2010s e-commerce revenues were growing by 15 per cent annually, with a product return rate approaching 30 per cent of sales. By 2022, online retailers can expect about 13 billion units, worth $573 billion, to be returned every year.[25] Under current practices, every year millions of returned products and items of unsold stock are simply destroyed, products that are often new and unused.[26] Financiers have begun to consider reverse logistics as forming part of four positive trends for companies: cost reduction, waste avoidance, product improvement and customer retention – since the return of goods and materials is an opportunity for customer intimacy (developing detailed customer knowledge).

   This category of business model also encompasses the restoration of natural systems and the rehabilitation of degraded agricultural land to return to a fertile and productive state. In particular, the restoration of degraded land that has a positive climate impact is being vetted by the finance sector. The biomass

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**24** Holla, K. (2020), 'Waste Heat Utilization is the Data Center Industry's Next Step Toward Net-Zero Energy', Data Center Frontier, https://datacenterfrontier.com/waste-heat-utilization-data-center-industry.
**25** Deloitte (2019), *Bringing it back: Retailers need a synchronized reverse logistics strategy*, https://www2.deloitte.com/content/dam/Deloitte/us/Documents/process-and-operations/us-bringing-it-back.pdf.
**26** Pallot, R. (2021), 'Amazon destroying millions of items of unsold stock in one of its UK warehouses every year, ITV News investigation finds', 21 June 2021, ITV News, https://www.itv.com/news/2021-06-21/amazon-destroying-millions-of-items-of-unsold-stock-in-one-of-its-uk-warehouses-every-year-itv-news-investigation-finds.

that grows on restored land is a carbon store, and land restoration projects are looked upon with increasing interest within the context of climate finance. Thus, a number of projects that have attracted grant funding have also been able to attract private financing, often with guarantees from the public sector.

4. **Circular support models and enablers of marketplaces** aim to facilitate other circular activities and projects, and thus contribute indirectly to increasing resource efficiency. This includes the development and deployment of tools, applications and services to support circular economy strategies – for example, digital tools for predictive maintenance and repair to extend the lifetime of products, and digital applications to facilitate reverse logistics.[27] The emphasis is on the dissemination of circularity knowledge, price information, advice (through the use of software applications), and digital or physical marketplaces, and on enabling platforms for all other circular economy business models. Depending on the maturity of their business, many of the companies in this category will be financed in the traditional manner for IT service companies. Early innovations and R&D by start-ups and scale-ups are mostly the terrain of venture capitalists in the financial world. This is early-stage capital, where large returns are expected due to high perceived risks.

### **Box 2.** Financing circular business models: examples from Europe and the US

**Circular real estate finance:** The first experiments in circular finance in the property sector have been in cases where the façade of a building is financed separately from the rest of the building's structure. The façade has a separate technical lifespan, and can be replaced after disassembly. When, for example, façade upgrades – such as vertical installation of solar panels, or other energy efficiency improvements – are required, then the replacement of the outer shell of the building is part of a separate financial construction. In the Netherlands, façade-as-a-service or façade-leasing concepts have been tested, where the supplier of the improvement can remain the owner of the outer shell of the building. This product-service-system (PSS) model for integrated building envelopes will require a different design philosophy and alternative financing models compared to traditional buildings.[28] As part of the contracting model, it requires the distribution of financial resources to bridge the gap between initial investment cost and long-term service and maintenance fees.

Circular design can also involve the replacement of non-recyclable or non-compostable materials by materials that are recyclable or compostable. In the building and construction sector, an example is provided by mycelium composites – upcycled by-products of fungal biorefineries. These can be used as cheap and sustainable composite materials to replace foams, timber and plastics for many building applications, such as insulation, door cores, panelling, flooring, cabinetry and other furnishings.[29]

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**27** Hirsch and Schempp (2020), *Categorisation System for the Circular Economy*.
**28** Azcarate-Aguerre, J. F., Klein, T., den Heijer, A. C., Vrijhoef, R., Ploeger, H. D. and Prins, M. (2018), 'Façade Leasing: Drivers and barriers to the delivery of integrated Façades-as-a-Service', *Real Estate Research Quarterly*, 17(3): pp. 11–22.
**29** Jones, M., Mautner, A., Luenco, S., Bismarck, A. and John, S. (2020), 'Engineered mycelium composite construction materials from fungal biorefineries: a critical review', *Materials & Design*, 187: 108397, https://doi.org/10.1016/j.matdes.2019.108397.

Mostly, financial institutions will look to invest in the providers of these biodegradable materials and companies offering industrial composting services. Depending on the degree of innovation involved, these activities can often be financed by traditional methods, such as loans, bonds or shares. The use of biomaterials does raise additional issues of quality, and of health and safety compliance standards, which can be complicating factors as regards risk approvals of loans and investments.

**Financing life cycle asset management:** In 2018 the EIB provided funding of €100 million for small and medium-sized enterprises (SMEs) through the Life Cycle Asset Management programme operated by DLL, a Dutch asset finance partner.[30] The EIB credit facility enabled some 200 Dutch and Belgian SMEs and companies with a medium-sized market capitalization – 'mid-caps' – employing less than 3,000 workers, to transition to the circular economy, providing them with financing at favourable rates of interest. Based on information on the incoming financing requests from SMEs, the total was split in a 2:1 ratio between Dutch companies (which submitted funding requests of €66 million) and their Belgian counterparts (€34 million). The programme defined specific criteria with which a circular transaction must comply, with a focus on the financing of remanufactured second-life assets and on delivering solutions for the complete asset life cycle.

**'Deep tech' start-up investment for dematerialization:** Deep tech includes disruptive innovations in material science, blockchain, quantum computing, biotechnology and other fields. Deep tech finance provides capital to start-ups that use computing firepower to drive innovation in frontier areas of science and technology. It is highly relevant for manufacturing sustainable materials in a circular economy, but also for dematerialization – reducing the overall amount of resources used. One major challenge for such deep tech-enabled disruptive innovations is the rigidity and unresponsiveness of existing linear supply and value chains. Despite the challenges, aggregate annual global private investment in seven deep tech categories identified in a Boston Consulting Group report increased by more than 20 per cent annually between 2015 and 2018, to reach almost $18 billion.[31] The US has been leading the field in deep tech investment: in an effort to catch up, the European Innovation Council (EIC) Fund announced investment of €10 billion in the EU's framework programme for research and innovation, Horizon Europe (2021–27) and a new lending instrument, the EIC Accelerator, to support high-risk, high-potential innovative SMEs that are willing to develop and commercialize new products, services and business models.[32]

**30** European Investment Bank (2018), 'Belgium/Netherlands: DLL stimulates circular business for SME companies through EIB-funding', https://www.eib.org/en/press/all/2018-226-dll-et-la-bei-soutiennent-des-modeles-economiques-circulaires-au-sein-des-pme.
**31** Boston Consulting Group and Hello Tomorrow (2019), *The Dawn of the Deep Tech Ecosystem*, BCG, https://media-publications.bcg.com/BCG-The-Dawn-of-the-Deep-Tech-Ecosystem-Mar-2019.pdf.
**32** European Commission (2020), *Deep Tech Europe: European Innovation Council Pilot Impact Report 2020*, Brussels: European Commission.

# Integrating circularity into sustainable finance

How can the circular economy business models and categorizations listed above be integrated into existing financial instruments? For instance, green bonds have already been used as tools to finance low-carbon solutions. All bonds share common principles and mechanisms, as do all listings requirements and exchange traded funds. Environmental, social and governance (ESG) investing considers the environmental and societal impact of a company or business. These existing instruments can become relevant for financing the circular economy, but will need to be tweaked to deliver the intended impact – reductions in resource use and waste generation.

## Green bonds and transition bonds

Green bonds were created to fund projects and assets that have a positive environmental and climate impact. The majority of existing green bonds do not integrate circularity principles. Still, the requirement that green bonds have a clearly defined 'use of proceeds' is valuable to circular economy finance, precisely because green bonds have entered the mainstream in the finance sector and because they can integrate circularity in the set-up. The inception of the green bond market was in 2007, when the first sovereign green bonds were issued by the EIB and the World Bank. In 2013, private companies followed suit, and started to raise capital by issuing corporate green bonds. In 2015/16, China endorsed green finance and green bond development during its presidency of the G20. Following these developments, in 2019 the Italian bank Intesa Sanpaolo became the first private bank to issue a sustainability bond in line with the green bond mechanism, focused on the circular economy and specifically aimed at projects with circularity at their core.[33] Although volumes were down due to the COVID-19 pandemic, issuance nevertheless reached more than €81 billion of green bonds equal to or larger than €100 million globally across all currencies in the first quarter of 2021.[34] With new issuances by Germany being announced in the second half of 2020, some observers projected that the overall green bond market size could grow to $1 trillion by the end of 2021.[35]

In the context of green bonds, waste management and resource efficiency are obviously closely connected with the circular economy and constitute the fourth largest category for green bond 'use of proceeds' globally. Some green bond guidelines for use of proceeds explicitly include categories linked to the circular economy, such as eco-efficient and/or circular economy-adapted products, production technologies and processes, or pollution prevention and control, including reduction of air emissions, waste prevention, reduction and recycling.[36]

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**33** Intesa Sanpaolo (2021), 'Intesa Sanpaolo's new Green Bond is big success', 10 March 2021, https://group.intesasanpaolo.com/en/newsroom/news/all-news/2021/green-bond-for-green-mortgages.
**34** Tillier, N. and Garvey, P. (2021), 'Robust green bond market to expand still further', ING Think, 20 April 2021, https://think.ing.com/articles/green-bonds-no-reason-to-slow-down.
**35** Barbiroglio, E. (2020), 'Green Bond Market Will Reach $1 Trillion With German New Issuance', Forbes, 2 September 2020, https://www.forbes.com/sites/emanuelabarbiroglio/2020/09/02/green-bond-market-will-reach-1-trillion-with-german-new-issuance.
**36** ICMA Group (2018), *Green Bond Principles: Voluntary Process Guidelines for Issuing Green Bonds*, Paris: ICMA, https://www.icmagroup.org/assets/documents/Regulatory/Green-Bonds/Green-Bonds-Principles-June-2018-270520.pdf.

Waste management companies in five countries (China, France, Sweden, Switzerland and the UK) raised $2.3 billion from bond issuances between 2015 and 2018.[37] However, the inclusion of incineration and waste-to-energy plants as circular economy activity in the context of circular economy finance is controversial. The EU's CE Finance Expert Group has advised that 'the resource efficiency gains from waste-to-energy and waste-to-fuel strategies are fairly modest in comparison with the other 9Rs, particularly when considering the loss in economic value of potentially recyclable materials through incineration. Hence, the activities primarily aimed at the energetic use of wastes and residues are excluded from the circular economy categorisation system'.[38] The exclusion of waste incineration from eligible activities would raise the quality and recognition of green bonds by the market and investors as a financial instrument contributing to the circular economy transition.

**The exclusion of waste incineration from eligible activities would raise the quality and recognition of green bonds by the market and investors as a financial instrument contributing to the circular economy transition.**

Many projects that are financed through green bonds are in fact transition outcomes. There is a heavy overlap – and a sometimes artificial distinction – between green bonds and so-called transition bonds. This distinction is driven by the wider Paris Agreement alignment process, aiming for financial flows to become consistent with a pathway towards climate-resilient development.[39] Since concerns have been raised around 'greenwashing' and the additionality of green bonds for climate mitigation, transition bonds have come into play. Transition bonds touch upon what is referred to as a greenhouse gas emissions-intensive taxonomy of economic activities – activities that have a significant negative impact on the environment and climate. Like most green bonds, transition bonds aim at reducing the negative impact of greenhouse gas emissions-intensive technologies and businesses, and enable a low-carbon transition.[40] Projects financing upstream emissions reductions and the decommissioning of fossil-fuel assets are eligible for climate finance, and are sometimes packaged as green bonds. In the circular economy context, transition bonds are used for investments to increase energy and resource efficiency in cement,

**37** Tukiainen, K. (2020), *Financing waste management and resource efficiency in the green bond market*, Climate Bonds Initiative, March 2020, https://www.climatebonds.net/files/reports/markets_waste_resource_efficiency_briefing_2020.pdf.
**38** Hirsch and Schempp (2020), *Categorisation System for the Circular Economy.*
**39** Rydge, J. (2020), *Aligning finance with the Paris Agreement: An overview of concepts, approaches, progress and necessary action*, London School of Economics, Policy Publication, 11 December 2020, https://www.lse.ac.uk/granthaminstitute/publication/aligning-finance-with-the-paris-agreement-an-overview-of-concepts-approaches-progress-and-necessary-action.
**40** Gross, A. and Stubbington, T. (2020), 'The 'transition' bonds bridging the gap between green and brown', *Financial Times*, https://www.ft.com/content/ff2b3e88-21b0-11ea-92da-f0c92e957a96.

metals or glass – for example, by reducing the clinker-to-cement ratio or the use of smelting, using recycled raw materials, and achieving improved recycling rates.[41]

Greenhouse gas emissions-intensive industries are dependent on fossil fuels, and their production and consumption have negative side-effects on the environment, public health and economics – examples might include single-use plastics, unprocessed food wastes or fast-fashion items. When progress is measured and periodically monitored by metrics according to SMART (specific, measurable, achievable, realistic and time-bound) objectives, these transition bonds could mobilize capital to accelerate the circular economy transition of incumbent industries. Furthermore, the concept of just transition sovereign bonds[42] could be used to finance a blend of green and social projects that include education and vocational training, access to skills development and new job opportunities, if these are aligned with climate objectives and the wider circular economy transition.

## Sustainability-linked loans and bonds

These loans and bonds originated in the intention of companies to improve their environmental and social performance. In contrast to green and transition bonds, where the proceeds are identifiably linked to projects and assets, sustainability-linked loans (SLLs) and bonds (SLBs) give flexibility to the borrower or bond issuer to spend the capital for organizational purposes. SLLs and SLBs cover a whole range of key performance indicators (KPIs) that refer to the policy and risk appetite of the issuer. Transparency pressures among responsible investors push for clear KPIs. In setting up the financial instrument, these KPIs can be aligned with circular economy principles (e.g. number of tonnes of material recovered, percentage usage of secondary materials). Since September 2020, SLBs have been issued across a variety of sectors including energy and utilities, fashion and textiles, pulp and paper products, and pharmaceuticals.[43] There is a voluntary mechanism for reporting progress to stakeholders and investors, mostly via the regulatory, integrated or sustainability reporting cycle and not specifically attached to the financial instrument (as is the case with green bonds). Some regulators and policymakers (together with stock exchanges) have imposed mandatory environmental and sustainability reporting obligations for listed companies that raise capital via their stock exchange. In this way, growth in the quantity and quality of sustainability reporting supports the growth of SLLs and SLBs.

## Environmental, social and governance investing with added circular economy metrics

ESG investing is both an evolution and a stricter implementation of the International Finance Corporation's social and environmental performance standards: for many asset managers, it was the next step after exploring investment strategies known

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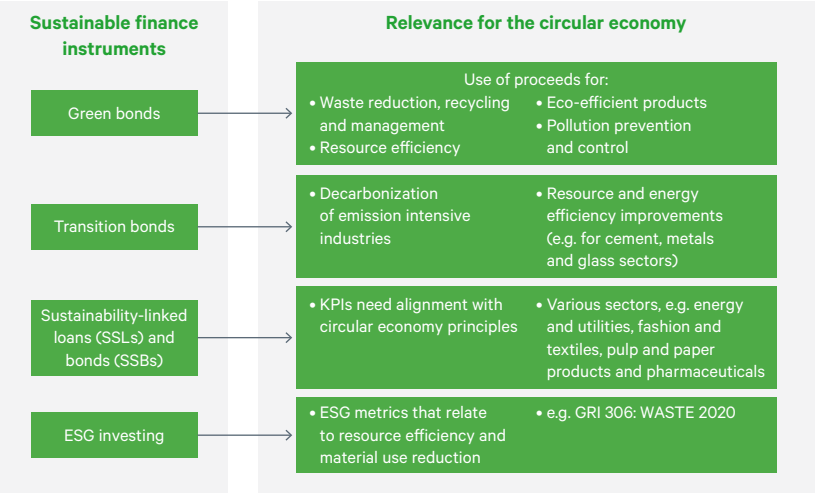
**41** Takatsuki, Y. and Foll, J. (2019), 'Financing brown to green: Guidelines for Transition Bonds', Axa Investment Managers, 10 June 2019, https://www.axa-im.com/content/-/asset_publisher/alpeXKk1gk2N/content/financing-brown-to-green-guidelines-for-transition-bonds/23818.
**42** Robins, N. (2020), 'Why governments need to issue just transition sovereign bonds and how they could do it', London School of Economics, Commentary, 20 January 2020, https://www.lse.ac.uk/granthaminstitute/news/why-governments-need-to-issue-just-transition-sovereign-bonds-and-how-they-could-do-it.
**43** Latham & Watkins (2020), 'Sustainability-Linked Finance Takes Off in 2020', Client Alert Commentary No. 2824, 1 December 2020, https://www.lw.com/thoughtLeadership/sustainability-linked-finance-takes-off-in-2020.

as socially responsible investing (SRI). The key difference with ESG investing in its current form is that these earlier SRI investment models relied on the judgment of individual investors or investment committees. ESG investing and analysis is backed, more numerically, by concrete non-financial metrics in the field of environmental, social and governance performance. Still, the scoring of the ESG criteria remains subjective, and can differ substantially among ESG ratings agencies. The Global Reporting Initiative's (GRI) standards are the most widely used for reporting on ESG impacts.[44] GRI provides disclosure standards for companies and investors to report on critical sustainability issues including climate change, human rights, governance and social well-being. The GRI 306: Waste 2020 standard, published in May 2020, is among the first of its kind, highlighting the relationship between materials and waste. It assists companies in identifying and managing their waste-related practices and impacts throughout their value chain of products and services.[45]

The addition of ESG metrics that relate to resource efficiency and material use within the context of the 9R behaviours is a field that is still being developed by several investors that have introduced circular economy-related investment funds and mandates: these include BlackRock and RobecoSAM. Furthermore, the work being carried out around circularity metrics by the UNEP Finance Initiative, the World Business Council for Sustainable Development and the Ellen MacArthur Foundation will influence the ESG scoring process in time to better integrate metrics of circular economy approaches into ESG frameworks.

**Figure 2.** Overview of sustainable finance instruments to support circularity




Source: Compiled by the authors.

**44** Bergman, M., Karp, B. and Rosen, R. (2020), 'ESG Disclosures: Frameworks and Standards Developed by Intergovernmental and Non-Governmental Organizations', Harvard Law School Forum on Corporate Governance, 21 September 2020, https://corpgov.law.harvard.edu/2020/09/21/esg-disclosures-frameworks-and-standards-developed-by-intergovernmental-and-non-governmental-organizations.
**45** GRI (2020), 'Topic Standard Project for Waste, Global Reporting Initiative', https://www.globalreporting.org/standards/standards-development/topic-standard-project-for-waste.

# Circular economy investment funds

Since 2017, many new investment funds have been created specifically to invest in circular economy projects and businesses. The most prominent example is the Circular Economy Investment Fund issued and managed by BlackRock, which reached a fund value of more than $1 billion within less than a year of its launch, in October 2019, with capital of $20 million.[46] Although this value is very low compared to the multi-trillion dollars' worth of assets under the management of this global investment institution, the rapid value growth of the Circular Economy Investment Fund indicates that there is an appetite among institutional investors to diversify their investments in packaging, chemicals, electronics, fast-moving consumer goods, textiles and garments, and forestry services and products, towards activities that accelerate the transition from a linear to a circular economy.

Based on the analysis conducted by Just Economics for this paper,[47] it is estimated that the funds that are investing in the circular economy have a total value of around $21 billion. Many of the funds form part of larger green/environmental/sustainability funds, and value adjustments have been made to take account of these – i.e. the authors have estimated the proportions of those funds' portfolios that are circular economy-related. About 4 per cent of generic green bonds are estimated to be invested in the circular economy, which implies that around $24.5 billion is invested in the circular economy via these instruments. This would suggest that the total value of private circular investment funding is in the order of $45.5 billion. Table 1 provides an overview of the major circular economy investment funds established to date.

**Table 1.** Selected circular economy investment funds by instrument category, sector and value (February 2021)

| Investor | Sector | Instrument | Adjusted value (€ million) |
|---|---|---|---|
| Intesa Sanpaolo | Circular business models | Debt; guarantees | 6,000.00 |
| BlackRock | Mixed | Public equities | 1,700.00 |
| Archipelago Eco Investors | Plastics/packaging | Private equity | 1,500.00 |
| Lloyds Bank | Mixed | Investor commitments | 1,484.74 |
| Credit Suisse Rockefeller | Circular oceans | Public equities | 1,276.91 |
| ABN AMRO | Mixed | Debt; guarantees | 1,000.00 |
| Ambienta | Resource efficiency | Private equity | 668.84 |
| Spring Lane Capital | Waste/recycling | Project finance | 578.82 |

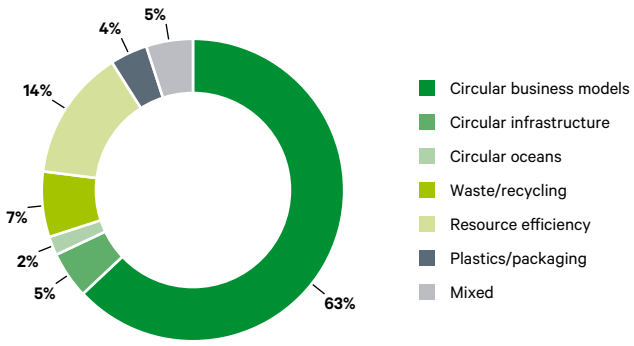
**46** BlackRock (n.d.), 'Equity: BGF Circular Economy', https://www.blackrock.com/ch/individual/en/products/310165/blackrock-circular-economy-fund.
**47** Lawlor, E. and Spratt, S. (2021), *Circular investment: A review of global spending and barriers to increasing it*, Working Paper, May 2021, Just Economics and Royal Institute of International Affairs.

| Investor | Sector | Instrument | Adjusted value (€ million) |
|---|---|---|---|
| Danish Green Investment Fund | Mixed | Debt | 442.59 |
| Goldman Sachs | Waste/recycling | Green bonds | 427.10 |
| Circulate Capital | Plastics | Venture capital | 306.95 |
| NN Investment Partners | Mixed | Public equities | 186.33 |
| Allianz Clean Planet Fund | Mixed | Public equities | 179.66 |
| Ultra Capital | Waste/recycling | Equities; debt | 175.40 |
| Goldman Sachs | Plastics/packaging | Green bonds | 162.25 |
| Decalia | Mixed | Public equities | 146.34 |
| BNP Paribas | Circular business models | Public equities | 139.11 |
| Anima Investimento | Mixed | Mutual fund | 123.00 |
| Candriam | Circular business models | Public equities | 101.60 |
| Circularity Capital | Circular business models | Private equity | 100.00 |
| H&M CO: LAB | Sustainable fashion | Equity (Venture capital) | 100.00 |
| Closed Loop Partners | Mixed | Mixed debt/equity | 87.70 |
| RobecoSAM | Mixed | Public equities | 84.64 |
| Tin Shed Ventures | Innovative, circular economy start ups | Equity (Venture capital) | 75.00 |
| Breakthrough Energy Ventures | Circular business models | Venture capital | 69.28 |
| Tesi | Circular business models | Private equity | 68.41 |
| Taaleri | Mixed | Private equity | 65.00 |
| Prelude Ventures | Circular business models | Venture capital | 55.00 |
| Goldman Sachs | Mixed | Public equities | 50.78 |
| The Westly Group | Tech and artificial intelligence; some circular economy | Equity (Venture capital) | 50.00 |
| Generate Capital | Circular infrastructure | Project finance | 46.48 |
| Althelia Sustainable Ocean Fund | Plastics | Equity | 44.00 |
| Tesi | Plastics/packaging | Private equity | 40.00 |
| Pangaea Ventures | Advanced materials | Equity (Venture capital) | 35.00 |
| Circular Capital | Waste/recycling | Debt; guarantees | 30.70 |
| Sky Ocean Ventures | Plastics | Venture capital | 30.00 |
| Prelude Ventures | Env/circular business | Equity (Venture capital) | 20.00 |
| Alante Capital | Circular economy textiles | Equity (Venture capital) | 15.00 |

Source: Lawlor and Spratt (2021), *Circular investment*.

It is important to note that the information presented in Table 1 provides insufficient detail on the resulting investments as regards indicators and selection criteria, which in most cases remain relatively vague. Therefore, classifying these investments by category is challenging. A general categorization, based on best available data, is presented in Figure 3.

**Figure 3.** Circular economy investments: value share by sector




Source: Lawlor and Spratt (2021), *Circular investment*.

As Figure 3 shows, circular business models account for the largest share of investments in terms of value. Generally, these refer to either investments in companies that want to transition to more circular activities, or, more commonly, that want to create new circular technologies or products. Plastics and packaging, which are very dominant in corporate and government investments, only make up a small proportion of investment from the finance sector. One likely reason is that much of this investment needs to be made by large, incumbent firms with respect to their own packaging and value chain operation – hence the high level of corporate investment. It may also be that there is little scope to break into this type of activity profitably, given the presence of large incumbent firms. Finally, it may be that circular business models are being applied within this and the other identified sectors.

## How large is the corporate circular economy in financial terms?

While circular economy finance is expanding and the market has strong potential, there is still not enough available investment in most sectors. In addition, opportunities for SMEs to access venture capital and loans can be very constrained during the start-up and initial growth stages; in contrast to the opportunities available to established companies requiring financing for larger projects, to change their existing practices and supply chains. In addition to investment funds, corporate spending on the circular economy has also increased. The working paper prepared by Just Economics[48] provides estimates for corporate investment in circular economy

**48** Ibid.

approaches across a number of sectors, including consumables (fashion and textiles, electronics), construction, automotive, food and beverages, agriculture and non-specific wastes. These sectors account for the highest levels of both emissions resource usage – housing, mobility and food alone produce 70 per cent of life cycle emissions.[49] Although the share of circular spending has been growing fast, it continues to be outstripped by linear spending.

For example, the fashion industry is a global business with an estimated value of $1.5 trillion,[50] which has been growing faster than the aggregate global economy over the past decade and is projected to continue doing so. While there is evidence of new circular business models around the resale and rental of clothing – which are attracting investment, giving rise to expectations of strong growth in these markets – such models currently account for only about 0.05 per cent of the global industry ($7 billion[51] and $1.26 billion,[52] respectively, in 2019). The largest share of circular spending in textiles is destined for the eco-fibres subsector, which is estimated to be worth $40 billion.

Another example can be found in the sector of electronics and e-waste. For some electronics manufacturers, circularity appears to be increasingly integral to their core business. Schneider Electric, for example, reports that circular activities now account for 12 per cent of its revenues (equivalent to €3.2 billion in 2019),[53] while Philips has pledged to generate 25 per cent of its income from circular activities by 2025.[54] Currently, as little as 17 per cent of global e-waste is recycled in formal recycling centres with adequate worker protection.[55] E-waste is also the world's fastest growing waste stream, and investment in recycling facilities lags behind the growth in new electronic products. Evidence suggests that this has been exacerbated by homeworking trends during the COVID-19 pandemic.[56] There is clear scope to improve e-waste recycling and reduce the potential harmful impacts to workers through exposure to toxins. However, corporate investments are more focused on e-waste recycling than designing electronic products that last longer and are repairable.

Overall, the Just Economics research has estimated that global spending on corporate circular models is in the order of $800 billion, across eight selected sectors. While corporate circular economy initiatives and spending have exhibited very rapid growth in the last two years, Table 2 shows that this equates to just 3 per cent of the $35.4 trillion spent via linear models over the same period.

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**49** Circle Economy (2021), *The Circularity Gap Report 2020*, Amsterdam: Circle Economy.
**50** Shahbandeh, M. (2021), 'Global Apparel Market – Statistics & Facts', Statista, 22 January 2021, https://www.statista.com/topics/5091/apparel-market-worldwide.
**51** Clark, T. (2020), 'Fashion's new trend: The rise of resale', 365 Retail, 21 October 2020, https://www.365retail.co.uk/fashions-new-trend-the-rise-of-resale.
**52** ResearchAndMarkets.com (2020), 'Global Online Clothing Rental Market, Forecast to 2025 – ResearchAnd Markets.com', Business Wire, 5 May 2020, https://www.businesswire.com/news/home/20200505005656/en/Global-Online-Clothing-Rental-Market-Forecast-to-2025---ResearchAndMarkets.com.
**53** Thornton, A. (2019), 'These 11 companies are leading the way to a circular economy', World Economic Forum, 26 February 2019, https://www.weforum.org/agenda/2019/02/companies-leading-way-to-circular-economy.
**54** Philips (n.d.), 'Decoupling growth from resource consumption', https://www.philips.com/a-w/about/sustainability/circular-economy.html.
**55** International Telecommunication Union (2020), 'Global E-waste Monitor 2020', https://www.itu.int/en/ITU-D/Environment/Pages/Spotlight/Global-Ewaste-Monitor-2020.aspx.
**56** Cunningham, K. (2020), 'New study highlights the rise in e-waste during global pandemic', Recycling Today, 17 November 2020, https://www.recyclingtoday.com/article/study-highlights-pandemic-drives-increase-e-waste.

**Table 2.** Comparison of linear and circular corporate spending, 2019–21

| Sector | Linear model value ($ billion) | Circular component | Circular model value ($ billion) | Circular as a proportion of linear |
|---|---|---|---|---|
| Fashion | 1,500 | Resale | 7.00 | 3% |
| | | Rental | 1.26 | |
| | | Artisanal | 34.00 | |
| | | R&D/new business models | 2.00* | |
| | | Hemp | 0.20 | |
| Electronics | 2,000 | E-waste market | 42.00 | 2% |
| Construction | 10,500 | Retrofit market | 132.80 | 3% |
| | | Green cement | 0.61 | |
| | | Green construction | 40.00 | |
| | | Recycling | 126.00 | |
| Mobility | 2,000 | Electric vehicles | 52.00* | 6% |
| | | Battery recycling | 1.00* | |
| | | Mobility-as-a-service | 74.00 | |
| Food and beverage market | 6,000 | Vegan food market | 12.69 | 2% |
| | | Cell-based meat | 0.02 | |
| | | R&D | 128.00* | |
| Agriculture | 8,000 | Indoor farming | 14.00 | 1% |
| | | Food waste | 34.00 | |
| | | Insect feed | 0.69 | |
| Non-specific waste | 1,358 (less e-waste, food and construction waste and government expenditure) | Bioplastics | 4.60 | 8% |
| | | Plastic recycling | 27.00 | |
| | | Unaccounted-for recycling | 79.00 | |
| Mining and extractives | 3,600 (mining and oil and gas) | Waste to energy | 35.00 | 1% |
| | | Waste to chemicals | N/A | |
| | | E-waste market | Already counted | |
| | | Carbon capture use and storage | 10.45 | |
| **Total** | **34,958** | | **858** | **3%** |

Source: Lawlor and Spratt (2021), *Circular investment*.
Note: *Estimates.

Thus, while investment directed at the circular economy is significant and growing, in some sectors it equates to only a small percentage (in the low single digits) of overall corporate investment in the linear economy. Furthermore, precision is generally elusive in deriving these estimates. Due to a lack of indicators and vague definitions, it is impossible to identify to what degree spending in a specific sector is or is not circular. Finally, for all corporations, the tension between the financial imperative to sell an increasing number of products, business models based on principles of planned obsolescence, and the environmental need to reduce waste generation and to slow and narrow resource flows creates a difficulty for companies and regulators.

# 02
# The SDGs and how circular economy finance can contribute

**The circular economy can contribute to achieving the SDGs, however, circular economy solutions remain severely underfunded. Many emerging circular innovations and business models in low- and middle-income countries offer new investment opportunities for urgently needed private capital.**

The United Nations Development Programme's Human Development Report 2020 highlights the need to design and incentivize a transition to a circular economy to meet human development targets in the Anthropocene age.[57] In practice, circular economy activities can contribute both directly and indirectly to achieving numerous social, economic and environmental targets of the SDGs, most obviously and directly SDG 12 (sustainable consumption and production). Given its connection with most other SDGs, through a focus on implementing SDG 12 targets via circular economy solutions, wider SDG progress is possible.[58] For example, circular economy activities can make positive contributions to SDG 2 (zero hunger) by reducing food losses and food waste, and building circular, regenerative food systems. Reducing waste

**57** United Nations Development Programme (2020), *The next frontier: Human development and the Anthropocene*, *Human Development Report 2020,* New York: UNDP.
**58** Bengtsson, M., Alfredsson, E., Cohen, M., Lorek, S. and Schröder, P. (2018), 'Transforming systems of consumption and production for achieving the sustainable development goals: moving beyond efficiency', *Sustainability Science*, 13(6): pp. 1533–47.

and food losses is also important in the agricultural sector. SDG target 12.3 pledges to 'reduce food losses along production and supply chains, including post-harvest losses' by 2030. Making agricultural supply chains more circular can address SDGs 2, 8, 12 and 15, and is key to improving food security and reducing hunger, especially in rural areas, while also creating income opportunities for producers and small rural businesses.

Furthermore, circular solutions can support SDG 3 (good health and well-being) through the reduction of waste and pollution; SDG 6 (ensure access to water and sanitation for all); SDG 11 (make cities inclusive, safe, resilient and sustainable), for example, by improving housing conditions in informal settlements; and SDG 13 (take urgent action to combat climate change and its impacts). In addition, both SDG 8 (inclusive and sustainable economic growth, employment and decent work) and SDG 9 (resilient infrastructure, sustainable industry and innovation) offer opportunities to apply circular economy solutions, by improving working conditions in informal sectors processing secondary resources, or by establishing industrial symbiosis networks for resource-efficient industrial development.[59]

**Making agricultural supply chains more circular can address SDGs 2, 8, 12 and 15, and is key to improving food security and reducing hunger while also creating income opportunities for producers and small rural businesses.**

The question, then, is: how can circular economy finance be made to work for human development and the SDGs? In low- and middle-income countries, most circular economy-related development finance is directed towards waste management and recycling sectors. This is important to tackle the waste crisis facing many developing countries. For low-income countries, to achieve SDG 11, SDG 12 and SDG 15 (sustainably manage forests, combat desertification, halt and reverse land degradation, halt biodiversity loss) the estimated investment needs for large-scale waste treatment and recycling technologies ranged between $6 billion–$42 billion in 2015, which was expected to triple to $17 billion–$125 billion by 2040, given current population growth, urbanization patterns and increase in per capita waste generation.[60]

Due to the job-creation potential of the circular economy, development finance also has an important role to play in supporting higher-value circular economy opportunities in developing countries to achieve SDGs 8 (decent work and economic growth) and 9 (innovation, industry and infrastructure). This is even more important now in the context of the COVID-19 pandemic, which has exposed vulnerabilities in both developing countries and global value chains (GVCs). For instance, developing

**59** Schröder, P., Anggraeni, K. and Weber, U. (2018), 'The Relevance of Circular Economy Practices to the Sustainable Development Goals', *Journal of Industrial Ecology*, 23(1), doi:10.1111/jiec.12732.
**60** Richter, U. H. (2018), 'Financing waste management', in Godfrey, L. (ed.) (2018), *Africa Waste Management Outlook*, Nairobi: UNEP, pp. 151–74, https://wedocs.unep.org/handle/20.500.11822/25514.

countries specialized in textile and garment supply chains have seen a severe disruption of their manufacturing sectors and labour markets during the pandemic. Circular economy solutions for textile manufacturing, such as recovering, reusing and recycling textile waste, can save resources and create higher-value products.[61] However, small and medium-sized suppliers face many capacity constraints in shifting from linear to circular modes of production and to new business models. These constraints include a lack of skills and management capacity for circularity, outdated technology and equipment, and a lack of finance to upgrade factories, facilities, and logistics systems.[62] Promoting circular economy approaches in SME and entrepreneurship support in development cooperation programmes can be a way forward.

Another issue that circular economy finance could help to address is the prevalence of poor-quality employment and informality, through investments that improve working standards and increase incomes. This has been identified by the International Labour Organization (ILO) as the main issue for global labour markets, with millions of people being forced to accept inadequate working conditions. ILO research shows that a majority of the 3.3 billion people employed globally in 2018 had inadequate economic security, material well-being and equality of opportunity.[63] Development finance institutions (DFIs) will need to generate data to measure the poverty-alleviation benefits of circular economy practices in order to make circular economy finance work for this area of human development – in particular for the poverty reduction goals of SDG 1, but also in terms of other social SDGs such as gender equality (SDG 5), reducing global inequality (SDG 10) and quality of work (SDG 8). For example, in addition to data on material use, waste reduction and environmental performance, data will be required on the total number of jobs created, as well as new metrics on the distributional impacts on the quality of work, upskilling, the division between skilled and unskilled jobs, formal and informal work, gender and youth, as well as rural and urban employment.[64]

## Financing the SDGs and circularity

While the SDGs have achieved several of their objectives since they were initiated in 2015, as highlighted in 2020 by the UN's special rapporteur on extreme poverty and human rights, they are currently failing in relation to key goals such as poverty eradication, economic equality, gender equality and climate change.[65] There are calls for the SDGs to be recalibrated in response to the COVID-19

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**61** Platform for Accelerating the Circular Economy (2021), *The Circular Economy Action Agenda for Textiles*, The Hague: PACE, https://pacecircular.org/action-agenda/textiles.
**62** Hofstetter, J. S., De Marchi, V., Sarkis, J. et al. (2021), 'From Sustainable Global Value Chains to Circular Economy – Different Silos, Different Perspectives, but Many Opportunities to Build Bridges', *Circular Economy and Sustainability*, doi:10.1007/s43615-021-00015-2.
**63** International Labour Organization (2019), 'Poor working conditions are main global employment challenge', 13 February 2019, https://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_670171/lang--en/index.htm.
**64** Attridge, S. (2019), 'Three things Development Finance Institutions can do to help reduce poverty', Overseas Development Institute, 25 September 2019, https://www.odi.org/blogs/10789-three-things-development-finance-institutions-can-do-help-reduce-poverty.
**65** United Nations, Office of the High Commissioner of Human Rights (2020), *The parlous state of poverty eradication*, Report of the Special Rapporteur on extreme poverty and human rights, A/HRC/44/40 (advance unedited version), https://www.ohchr.org/EN/HRBodies/HRC/RegularSessions/Session44/Documents/A_HRC_44_40_AUV.docx.

pandemic, the accompanying global economic recession and accelerating climate change. Based on calculations by the International Monetary Fund (IMF)[66] and UNCTAD,[67] the funding gap for the realization of the SDGs in developing countries alone is estimated to be $2.5 trillion per year for the sectors of power, transport, telecommunications, water and sanitation, food security and agriculture, climate change mitigation and adaptation, ecosystems/biodiversity, health, and education. According to the Sustainable Development Solutions Network (SDSN), the average SDG financing gap per year for all low-income developing countries (numbering 59 in 2019) was to be around $400 billion between 2019 and 2030.[68]

International development finance relying on ODA alone will not be able to address this gap. Pre-pandemic, total ODA fell by 4.3 per cent in 2018, and ODA to least developed countries (LDCs) by 2.1 per cent.[69] In 2020, total ODA rose by 3.5 per cent in real terms compared to 2019, to reach the highest level ever recorded. This positive development is in part due to the support given by members of the OECD's Development Assistance Committee (DAC) to an inclusive global recovery from the pandemic.[70]

Still, the current global context poses risks in terms of reductions in the financing available to developing economies. Developing nations are facing debt distress, exacerbated by the pandemic, which further decreases the amount of public funding available for sustainable development initiatives. The OECD estimates that external private finance inflows could drop by $700 billion in 2020 compared to 2019 levels, which would exceed by 60 per cent the impact caused by the 2008 global financial crisis.[71]

Such outcomes would exacerbate the threat of major development setbacks that would increase global vulnerability to emerging environmental and public health risks: future pandemics, climate change and other global public damages such as biodiversity loss or plastics pollution. In the current context of the post-COVID-19 economic recovery, the mandates of DFIs mean that they will be expected to offer countercyclical financing to provide sufficient financial stability for low- and middle-income countries to address long-term challenges.[72] However, this has the potential to have a negative impact on investment volumes dedicated to SDG and climate finance, through the provision of increased working capital and refinancing.

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**66** Gaspar, V., Amaglobeli, M. D., Garcia-Escribano, M. M., Prady, D. and Soto, M. (2019), 'Fiscal Policy and Development: Human, Social, and Physical Investments for the SDGs', International Monetary Fund, Staff Discussion Notes, https://www.imf.org/en/Publications/Staff-Discussion-Notes/Issues/2019/01/18/Fiscal-Policy-and-Development-Human-Social-and-Physical-Investments-for-the-SDGs-46444.
**67** UNCTAD (2014), *World Investment Report 2014: Investing in the SDGs: An action plan*, New York: United Nations, https://worldinvestmentreport.unctad.org/wir2014.
**68** Sachs, J. D., McCord, G. C., Maennling, N., Smith, T., Fajans-Turner, V. and Loni, S. S. (2019), *SDG Costing & Financing for Low-Income Developing Countries*, Sustainable Development Solutions Network, https://resources.unsdsn.org/sdg-costing-financing-for-low-income-developing-countries.
**69** United Nations (2020), *Financing for Sustainable Development Report 2020*, New York: Inter-agency Task Force on Financing for Development, https://developmentfinance.un.org/sites/developmentfinance.un.org/files/FSDR_2020.pdf.
**70** OECD (2021), 'COVID-19 spending helped to lift foreign aid to an all-time high in 2020 but more effort needed', 13 April 2021, https://www.oecd.org/newsroom/covid-19-spending-helped-to-lift-foreign-aid-to-an-all-time-high-in-2020-but-more-effort-needed.htm.
**71** OECD (2020), *The impact of the coronavirus (COVID-19) crisis on development finance*, http://www.oecd.org/coronavirus/policy-responses/the-impact-of-the-coronavirus-covid-19-crisis-on-development-finance-9de00b3b.
**72** O'Donohoe, N. (2020), 'Opinion: Building resilient businesses and economies in the coronavirus recovery', Devex, 6 May 2020, https://www.devex.com/news/sponsored/opinion-building-resilient-businesses-and-economies-in-the-coronavirus-recovery-97160.

Globally, UNCTAD expects that foreign direct investment (FDI) will fall from its 2019 value of $1.54 trillion to below $1 trillion in 2021. Developing economies are expected to see the biggest fall in FDI, because they rely to a greater extent on investment in GVC-intensive sectors such as manufacturing and extractive industries. For some countries, this could imply a need to reindustrialize, or even to cope with a premature deindustrialization. Upgrading along the GVC development ladder becomes more difficult for developing countries in the post-pandemic recovery.[73]

Against this background, the new developments in instruments and other ways to finance the circular economy could provide opportunities to contribute to the SDGs through specific circular economy solutions and business innovations across a range of different sectors: these could include textiles, plastics and packaging, renewable energy, water and sanitation, electronics including e-waste, automotive, and food and drink.

## How is the circular economy currently financed across the SDGs?

How is the circular economy currently being funded through international development finance in the context of the SDGs? Overall, existing circular economy initiatives and projects are small in scale, and inadequate to address the entirety of sectoral investment needs. In the case of Africa, the African Circular Economy Alliance has identified multiple opportunities for increased circularity and the SDGs in five key sectors: food systems, plastics and packaging, the built environment, electronics and e-waste, and fashion and textiles,[74] at the same time emphasizing the need for new investment activities and instruments. Investments and adequate incentives are required to make the economic and financial case for the circular economy in the context of international development.

Both DFIs and climate funds (e.g. the Green Climate Fund, which resides within the UN Framework Convention on Climate Change) have a role to play in providing concessional finance – lines of credit that can help to scale up circular economy finance. Since many waste management and circular economic activities in developing countries rely on the informal sector (e.g. for the repair, refurbishment or repurposing of second-hand materials) this informal aspect also makes it difficult to scale up existing activities with formal finance mechanisms.

So far, current circular initiatives have been relatively small in scope, and accelerating investments for the SDGs requires access to additional financing instruments and a transformative change by participating stakeholders. Focusing on SDG 12 – the core SDG for the circular economy – is a reasonable proxy, since SDG 12 targets relate most closely to the 9R circularity behaviours framework. Although the SDGs do not map perfectly on to circular economy categories and

**73** UNCTAD (2020), *World Investment Report 2020: International Production Beyond the Pandemic*, New York: United Nations, https://unctad.org/system/files/official-document/wir2020_en.pdf.
**74** World Economic Forum (2021), *Five Big Bets for the Circular Economy in Africa*, African Circular Economy Alliance Insight Report, April 2021.

business models, there is some overlap. Most importantly, SDG 12 concerns sustainable (responsible) production and consumption, which is obviously core to the circular economy. Elements of the circular economy models are also contained in other SDGs, such as SDG 6 (clean water and sanitation), SDG 9 (industry, infrastructure and innovation) or SDG 15 (life on land) to assess the importance that donors place on circular economy issues in their ODA strategies.

According to the OECD's SDG Financing Lab, annual flows of ODA that can be directly associated with SDG 12 varied within a relatively slim range in 2012–17, having reached $3.4 billion (in nominal US dollar terms) in 2012 and a low of $2 billion in 2014 before rising to $2.9 billion in 2017. The share of ODA that can be associated with one or more SDGs varied between 1 per cent and 2 per cent over the same period, with no clear upward trend being discernible in either case. Cumulatively, ODA investment totalled $16.1 billion in 2012–17.[75]

**Table 3.** SDGs ranked by ODA allocations, 2012–17

| Rank | SDG | % share of ODA (cumulative, 2012–17) |
|---|---|---|
| 1 | Industry, innovation and infrastructure (SDG 9) | 10.64 |
| 2 | Good health and well-being (SDG 3) | 10.60 |
| 3 | Peace, justice and strong institutions (SDG 16) | 8.91 |
| 4 | Zero hunger (SDG 2) | 8.74 |
| 5 | Partnerships for the goals (SDG 17) | 8.70 |
| 6 | Reducing inequality (SDG 10) | 8.43 |
| 7 | Affordable and clean energy (SDG 7) | 7.60 |
| 8 | Quality education (SDG 4) | 7.40 |
| 9 | Sustainable cities and communities (SDG 11) | 6.02 |
| 10 | Decent work and economic growth (SDG 8) | 5.79 |
| 11 | Clean water and sanitation (SDG 6) | 4.73 |
| 12 | Climate action (SDG 13) | 3.32 |
| 13 | No poverty (SDG 1) | 3.20 |
| 14 | Life on land (SDG 15) | 2.09 |
| 15 | Gender equality (SDG 5) | 1.60 |
| 16 | Responsible consumption and production (SDG 12) | 1.32 |
| 17 | Life below water (SDG 14) | 0.92 |

Source: The SDG Financing Lab (n.d.), 'The Aid Globe'.

**75** The SDG Financing Lab (n.d.), 'The Aid Globe', https://sdg-financing-lab.oecd.org.

Table 3 compares spending associated with specific SDGs between 2012 and 2017 on a cumulative basis, ranking each SDG in descending order of investment. The core circular economy goal, SDG 12, is ranked 16th out of the 17 SDGs, with only SDG 14 (life below water) receiving a lower allocation of the total ODA spend. This gives a further indication that the circular economy has so far not been an explicit priority for donors and DFIs in the SDG context. Of course, there will be interventions of relevance to the circular economy in other SDGs – particularly SDG 11 (sustainable cities and communities), but also SDGs 14 and 15 (life below water and on land) and SDG 6 (clean water and sanitation).

**Table 4.** Leading donors and recipients of circular economy ODA, 2012–17

| **Donor** | | | **Recipient countries** | | |
|---|---|---|---|---|---|
| | **Value of ODA linked to SDG 12 ($ billion)** | **% of all ODA linked to SDG 12** | | **Value of ODA linked to SDG 12 ($ billion)** | **% of all ODA linked to SDG 12** |
| EU institutions | 2.9 | 18 | Vietnam | 1.5 | 14 |
| Germany | 2.5 | 15.8 | Bilateral, unspecified | 1.4 | 13 |
| US | 2.2 | 14 | Egypt | 0.9 | 8.7 |
| International Development Association | 1.5 | 9.4 | Jordan | 0.7 | 6.5 |
| Japan | 1.3 | 8.4 | Turkey | 0.6 | 5 |
| Asian Development Bank | 0.9 | 5.9 | China | 0.5 | 4.8 |
| France | 0.8 | 4.8 | India | 0.4 | 4 |
| Global Environment Facility | 0.5 | 3 | Ukraine | 0.4 | 3.9 |
| Canada | 0.5 | 3 | Afghanistan | 0.3 | 3 |
| Norway | 0.4 | 2.6 | Tanzania | 0.3 | 2.9 |
| South Korea | 0.3 | 1.7 | Sub-Sahara regional | 0.3 | 2.8 |
| Netherlands | 0.2 | 1.5 | Cambodia | 0.3 | 2.5 |
| UK | 0.2 | 1.4 | Peru | 0.3 | 2.5 |
| Switzerland | 0.2 | 1.4 | Nigeria | 0.3 | 2.5 |
| Inter-American Development Bank | 0.2 | 1.2 | Ethiopia | 0.3 | 2.4 |
| Sweden | 0.2 | 1 | Georgia | 0.3 | 2.3 |
| Australia | 0.2 | 1 | Nepal | 0.3 | 2.3 |

Source: The SDG Financing Lab (n.d.), 'The Aid Globe'.

Another question is which donors (including multilateral donors) and recipient countries are most likely to prioritize the circular economy. Table 4 shows that, according to data from the OECD's SDG Financing Lab, 17 donors contributed more than 1 per cent of their total ODA to SDG 12 between 2012 and 2017. Those donors contributing the largest proportions were the EU (18 per cent), Germany (15.8 per cent), the US (14 per cent), the International Development Association (9.4 per cent) and Japan (8.4 per cent). To some extent, these rankings reflect the size of the donor agencies: other, smaller countries that are known to prioritize these issues (and are thus significant SDG 12 donors) include Austria, Belgium, Finland and New Zealand. Of the major recipient countries in 2012–17, the most important by far was Vietnam, which received around 14 per cent of all ODA linked to SDG 12. The next largest individual recipient countries were Egypt (with 8.7 per cent), Jordan (6.5 per cent), Turkey (5.3 per cent), China (4.8 per cent) and India (4.1 per cent). Given the industrial character of these countries' economies, it seems likely that ODA is being focused on increasing the sustainability of existing and/or new production and manufacturing facilities. This is done, for example, by moving industrial zones towards greater circularity through industrial symbiosis and other resource-efficiency approaches.

### **Box 3.** Financing eco-industrial park development and industrial symbiosis in Vietnam

Industrial parks have been promoted as cornerstone strategies for economic development in many countries around the world, including Vietnam. In 1991, the country had just one industrial zone. By 2015, the Vietnamese government had established 300 industrial zones, with an average of 90 companies in each zone, covering an area of more than 84,000 hectares.[76] Given their focus on economic objectives, environmental regulation and enforcement capacity in these industrial zones was weak. As a result, approximately 70 per cent of effluents from the industrial zones were directly discharged without prior treatment, causing the severe pollution of water resources and marine ecosystems.[77] The transformation of conventional industrial zones that have high resource intensity and emissions into eco-industrial parks with lower impact is a key approach to achieving not only SDG 12, but also SDG 9 (industry, innovation and infrastructure). It presents an effective opportunity to attain more sustainable industrial development, as well as increasing the economic competitiveness and resilience of businesses located in these industrial parks. A key approach is industrial symbiosis, which aims to connect resource and information flows among industrial actors through (1) the use of secondary materials, water, and energy resources; and/or (2) utility- and service-sharing across a network toward net sustainability outcomes.[78] Industrial symbiosis can offer solutions to practitioners and policymakers, as the private and public

**76** Stucki, J., Flammini, A., van Beers, D., Phuong, T., Tram Anh, N., Dong, T., Huy, V. and Hieu, V. (2019), 'Eco-Industrial Park (EIP) Development in Viet Nam: Results and Key Insights from UNIDO's EIP Project (2014–2019)', *Sustainability*, 11(17), 4667, doi: 10.3390/su11174667.
**77** United Nations Industrial Development Organization (2020), *Fostering eco-industrial parks in Viet Nam*, Vienna: UNIDO, https://www.unido.org/stories/fostering-eco-industrial-parks-viet-nam#story-start.
**78** Boons, F., Chertow, M., Park, J., Spekkink, W. and Shi, H. (2017), 'Industrial Symbiosis Dynamics and the Problem of Equivalence: Proposal for a Comparative Framework', *Journal of Industrial Ecology*, 21(4), pp. 938–52, doi:10.1111/jiec.12468.

sectors are paying more attention to circularity in industrial development. Businesses can create value through applying a circularity-driven business model that includes symbiotic exchanges among industries.[79]

In 2014–19 the United Nations Industrial Development Organization (UNIDO) cooperated with the Vietnamese planning and investment ministry to work with 73 companies located in four industrial zones to identify opportunities to optimize their production processes and improve resource efficiency. Training was provided to improve the companies' capacity to implement industrial symbiosis solutions to reduce $CO_2$ emissions, freshwater consumption and industrial waste generation. The financial payback time for implementing these measures ranged between three months and eight years.[80] The industrial initiative was financed through ODA grants and public and private sector co-financing. The Global Environment Facility endorsed a grant for $3,524,000 for an implementation period of three years (subsequently extended to 4.5 years). Several ministries, provinces, and funds in Vietnam, the State Secretariat for Economic Affairs (SECO) of Switzerland and UNIDO committed to co-financing a total amount of $49,597,265. As for national co-financing, a total of $1,800,000 of in-kind payments and $47,797,265 in cash was pledged by the provincial authorities of Da Nang, Can Tho, and Ninh Binh, the Vietnam Environment Protection Fund, the green Credit Trust Fund of SECO, the Vietnam Development Bank and the Ministry of Industry and Trade.[81]

## Financing circular technologies and innovations for the SDGs

According to a survey conducted by the Bond network and the UK's Department for International Development in 2019, the circular economy is considered the second most important technology innovation space for the SDGs and international development, after big data.[82] Circular economy solutions cut across the traditional distinction between low- and high-technology solutions. For example, innovations in bio-based material science often combine traditionally used natural fibres with enhanced biotechnology applications, such as using mycelium composites as building materials and packaging solutions, or using residues from pineapple leaves as high-quality textile and leather substitutes.[83]

**79** Shi, L. (2020), 'Industrial Symbiosis: Context and Relevance to the Sustainable Development Goals (SDGs)', in Leal Filho, W. et al. (eds) (2020), *Responsible Consumption and Production: Encyclopedia of the UN Sustainable Development Goals*, Cham, Switzerland: Springer, doi:10.1007/978-3-319-71062-4_19-2.
**80** UNIDO (2020), *Fostering eco-industrial parks in Viet Nam*.
**81** Flammini, A. and Stucki, J. (2020), 'Eco-industrial park initiative for sustainable industrial zones in Viet Nam 2014–2019', Vienna: UNIDO.
**82** Wilkinson, J. (2019), '5 frontier technology trends shaping international development', Bond, 4 June 2019, https://www.bond.org.uk/news/2019/06/5-frontier-technology-trends-shaping-international-development.
**83** Okie, S. (2021), 'Lessons from 3 emerging bio-based material technologies', GreenBiz, 19 February 2021, https://www.greenbiz.com/article/lessons-3-emerging-bio-based-material-technologies.

The role of digital technologies has gained prominence in both the circular economy and the SDG context, affecting nearly every sector. Several factors still hamper the diffusion of digital solutions and other technologies to developing countries, such as a lack of 'hard' digital infrastructure and fibre optics and 'soft' factors such as intellectual property issues, insufficient absorptive capacities of industries and sectors, the digital skills gap among the workforce, and a lack of economic incentives and financing.[84]

For development finance, the focus on technology innovation and R&D could take the form of financing frugal innovation[85] that focuses on smart, clean and affordable solutions for low-income communities and low- and middle-income countries. Frugal innovation is a concept and practice that motivates entrepreneurs to respond to limitations in resources – whether financial, material or institutional – and turn these constraints into innovative ideas and practical solutions. Specific examples of frugal innovations that have been developed and implemented by non-governmental organizations and social enterprises range from using drones to supply medicines in remote rural areas with limited road access to the development of solar mini-grid electricity, decentralized sanitation, or 3D printing facilities to provide spare parts for the repair and maintenance of local agricultural machinery.[86]

**Frugal innovation is a concept and practice that motivates entrepreneurs to respond to limitations in resources – whether financial, material or institutional – and turn these constraints into innovative ideas and practical solutions.**

Frugal innovations can contribute to the SDGs by addressing issues that are often underserved by markets and institutions, by providing resource-efficient solutions that are affordable and easily available to a large number of people in low-income groups. Other characteristics of frugal entrepreneurship and businesses include decentralized and local solutions that are regenerative as well as self-organized and resilient, so as to allow for adaptation to external shocks.[87] The overlap of frugal innovations with the principles of circular economy could act as a driver for the latter and ensure better environmental sustainability outcomes.[88]

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**84** Kosolapova, E. (2020), *Harnessing the Power of Finance and Technology to Deliver Sustainable Development*, IISD Earth Negotiation Bulletin, Brief#7, December 2020, https://www.iisd.org/system/files/2020-12/still-one-earth-finance-technology.pdf.
**85** Centre for Frugal Innovation in Africa (n.d.), https://www.cfia.nl/home.
**86** Knorringa, P. and Bhaduri, S. (2018), *Frugal Innovation in EU Research and Innovation Policy*, Working Paper 6, Leiden, Delft, Rotterdam: Centre for Frugal Innovation in Africa.
**87** The Circular Collective (2020), 'Frugality and Circularity – Aiming for Sustainable Growth', 1 August 2020, https://www.thecircularcollective.com/post/frugality-and-circularity-aiming-for-sustainable-growth.
**88** Herstatt, C. and Tiwari, R. (2020), *Opportunities of frugality in the post-Corona era*, Working Paper 110, Hamburg: Hamburg University of Technology (TUHH), Institute for Technology and Innovation Management (TIM).

Interestingly, in the deep tech start-up finance space, contribution to SDGs is significant. The goals receiving the most deep tech attention are SDG 3 (good health and well-being) and SDG 9 (industry, innovation, and infrastructure), targeted by 51 per cent and 50 per cent of deep tech start-ups, respectively. Mitigating the human impact on the environment also features strongly, with SDG 11 (sustainable cities and communities) being targeted by 28 per cent, SDG 12 (sustainable consumption and production) by 25 per cent, and SDG 13 (climate action) by 22 per cent.[89] These goals align broadly with circular economy priorities. Yet again, most of this investment is targeted at tech start-ups and SMEs located mainly in the US, China, Europe and Japan. Such innovations and deep tech solutions need to be made available and accessible to companies and consumers in low- and middle-income countries, but current financing models are not set up accordingly. The rapid developments in deep tech solutions could support implementation of the SDGs through circular business solutions, especially those that prioritize individual well-being and inclusion. Digital technologies can enable social inclusion, provide wider access to products and financial services, and increase efficiencies in transactions and markets. However, many people remain excluded from the digital economy, particularly women and girls in the developing world.[90]

A selection of existing circular business models in key sectors of developing countries, which require investments to scale up, expand their markets and realize trade opportunities, is presented in Box 4.

### **Box 4.** Circular business models offering investment opportunities

**Digitally enabled circular plastics economy models.** In such models, SMEs and start-ups make use of digital innovations to improve collection rates for waste plastics, set up digital payment systems and offer 3D printing with recycled plastics. An example is Mr Green Africa, a tech-enabled plastics recycling company aiming to disrupt the current informal and exploitative plastic recycling sector in Kenya. Supported by the Global Innovation Fund, the company offers an in-house end-to-end process for recycling, purchasing directly from about 2,000 waste collectors, many of whom are informal 'waste pickers' and are some of society's most marginalized people.[91] Investments are needed to open plastics trading points, onboard additional sourcing agents, invest in IT upgrades, and upgrade processing machinery to increase the scale of collection and the quality of recycled plastics materials and products.

**Textiles and garments.** New business models such as clothing repair and garment upgrading services, leasing services, resale sections for pre-owned branded garments within stores, and peer-to-peer exchange are emerging trends in the sector. Many of these trends are already present in developing countries, being promoted through local businesses, designers and tailors. The used textile industry in Pakistan is an example: the Karachi Export Processing Zone has become an international trading hub, active in the sorting and recycling of used textiles. Investment in state-of-the-art

**89** Boston Consulting Group and Hello Tomorrow (2019), *The Dawn of the Deep Tech Ecosystem*.
**90** United Nations (2020), *Financing for Sustainable Development Report 2020*.
**91** Global Innovation Fund (2019), 'Investments: Mr Green Africa', https://www.globalinnovation.fund/investments/mr-green-africa.

facilities is important to ensure that exporting used clothing overseas does not simply push the end-of-life problem somewhere else, but that it creates decent jobs and gives societies' poorest people access to low-cost clothing.[92] New innovations and technologies from Europe, e.g. for garment-to-garment recycling and textiles fibre recycling, as well as the reprocessing of cotton waste and fibre by-products, offer emerging business opportunities, but require investments and transfer of new technologies and processes.[93]

**Regenerative agriculture and bio-waste valorization.** These opportunities refer to business models that are involved in regenerative agricultural practices, including the use of agricultural or domestic waste to produce compost or animal feed. An example of this type of business model is found in Thailand, where public and private organizations have launched the Regenerative Coconuts Agriculture Project (ReCAP) to transform coconut farming practices through regenerative agricultural techniques and improving soil health.[94] Specific circular practices valorizing agricultural waste include revaluing manure, spent grain and wood chips to produce compost, potting soil and other derivatives.[95] Coconut husks, food waste from hospitality businesses and urban organic waste can produce biogas and heat generation. Ecodudu,[96] in Kenya, is another example. The company produces animal feed through a process of bioconversion, using black soldier fly larvae that convert waste into fertilizer while the larvae themselves are used to make a high-protein feed.

**E-waste repair, remanufacture and recycling.** Many countries in the developing world have become dumping grounds for the electronic waste the world throws away. Informal recycling channels have sprung up to turn this into a business opportunity. Repair and refurbishment practices prolong the useful life of much equipment that is thrown away, while recycling captures the value from materials and metals. E-waste can also be remanufactured into higher-value products. An example of a successful business model in this sector is AB3D in Nairobi, Kenya: a start-up that is lowering the barriers obstructing local access to 3D printing technology by building high quality and affordable 3D printers from e-waste and locally sourced secondary materials.[97]

## Integrating the circular economy into renewable energy finance

To achieve SDG 7 (access to affordable and clean energy) and SDG 13 (climate action) will require a significant amount of investment in low-carbon infrastructures, in particular for renewable energy. According to the International

**92** Roberts, T. (2020), 'The end of textile recycling', Circular, 9 September 2020, https://www.circularonline.co.uk/opinions/the-end-of-textile-recycling.
**93** Taylor, B. (2020), 'Textiles recycling gaining global investments', Recycling Today, 9 October 2020, https://www.recyclingtoday.com/article/textile-recycling-saya-hkrita-handm-sustainable-composites-leather.
**94** Brown, A. (2021), 'Regenerative Agriculture Gains Traction in Southeast Asia', Triple Pundit, 9 March 2021, https://www.triplepundit.com/story/2021/regenerative-agriculture-southeast-asia/719426.
**95** Warner, H., Bingham, J. and Ohui Nartey, D. (2020), *The Circular Economy: Our Journey in Africa So Far*, Footprints Africa, https://irp-cdn.multiscreensite.com/40a0e554/files/uploaded/CEcasereport_Footprints.pdf.
**96** Ecododu (n.d.), 'Welcome to Ecododu: Feeding the future with an insect-based circular economy', https://ecodudu.com.
**97** Adeyooye, O. D. (n.d.), 'AB3D is Revolutionizing Africa's Manufacturing Industry With 3D Printing Technology', video, https://www.builtinafrica.io/videos/ab3d-nairobi.

Renewable Energy Agency (IRENA), investment in the sustainable energy transition will have to increase by a further 30 per cent over currently planned investment to a total of $131 trillion between 2021 and 2050, corresponding to investment of $4.4 trillion per year on average.[98]

Sustainable energy assets are designed to be low emitters of carbon when in use, but mostly do not take into consideration wider requirements in terms of materials and waste generation. The integration of circularity principles into energy sector financing will become necessary to reduce the impacts stemming from the material intensity of the energy transition. Significant investments in renewable energy and other low-carbon energy technologies are expected to limit global temperature rise to 1.5°C and bring $CO_2$ emissions closer to net zero by mid-century.

Being a low-carbon technology is not sufficient. For renewable energy technologies to be sustainable, the renewable energy infrastructure will need to be built according to circularity principles. To optimize resource use from a whole-system perspective, it is thus essential that the components of renewable energy and low-carbon infrastructures are designed within the context of the circular economy – designed for durability, reuse and remanufacturing of components and materials.[99]

A circular design approach to renewable energy infrastructure would reduce the additional costs for project developers and the public that are associated with end-of-life management and decommissioning. For example, the total cost of decommissioning offshore wind farms alone in the UK until 2045 is estimated at between £1.28 billion and £3.64 billion, with public liability at between £1.03 billion and £2.94 billion.[100]

The transition to a low-carbon energy system will be material- and mineral-intensive. The World Bank estimates large increases in demand (of up to 500 per cent) for certain minerals, especially those concentrated in energy storage technologies, such as lithium, graphite and cobalt.[101] Renewable energy technologies such as photovoltaic (solar) power require up to 40 times more copper per unit generated than fossil fuel combustion, and wind power up to 14 times more iron.[102] Copper is a key metal for generators in wind energy technologies and electrical engines. The predicted growth in installed wind capacity is expected to require an average of 600,000 tonnes of copper per year by 2028.[103] Although crystalline

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**98** International Renewable Energy Agency (2021), *World Energy Transitions Outlook: 1.5°C Pathway*, Abu Dhabi: IRENA.
**99** Jensen, P. D., Purnell, P. and Velenturf, A. (2020), 'Highlighting the need to embed circular economy in low carbon infrastructure decommissioning: The case of offshore wind', *Sustainable Production and Consumption*, 24: pp. 266–80.
**100** Department of Business, Energy and Industrial Strategy (BEIS) (2018), *Cost estimation and liabilities in decommissioning offshore wind installations*, public report, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/725316/Cost_and_liabilities_of_OWF_decommissioning_public_report.pdf.
**101** Hund, K., La Porta, D., Fabregas, T., Laing, T. and Drexhage, J. (2020), *Minerals for Climate Action: The Mineral Intensity of the Clean Energy Transition,* Washington, DC: World Bank.
**102** Hertwich, E. G. et al. (2015), 'Integrated life-cycle assessment of electricity-supply scenarios confirms global environmental benefit of low-carbon technologies', PNAS, 112(20), pp. 6277–82.
**103** Kettle, J. (2020), 'Mining sector faces energy transition conundrum', *Financial Times*, 19 February 2020, https://www.ft.com/content/36ef7ab2-4f44-11ea-95a0-43d18ec715f5.

silicon photovoltaic panels are mostly made of glass, which requires inputs of sand and lithium, they also contain a range of metals, such as copper (used for interconnectors), silver, tin, lead, indium and cadmium.[104]

This resource demand aspect of low-carbon energy infrastructures brings new challenges for renewable energy finance. Financial institutions are becoming increasingly risk-averse when it comes to providing financing for metals, because of the ESG risks associated with the extraction of materials such as cobalt, which are often mined in settings with low levels of regulation. Ninety-eight per cent of cobalt resources with high social risks also have a high governance risk, while 53 per cent of lithium resources located in high environmental risk contexts are also located in countries with high governance risks.[105]

An acceleration of the investments in the primary extraction of critical minerals for renewables such as platinum group metals, rare earth metals or silver and cobalt might appear as an opportunity for resource-rich countries, especially as a recovery opportunity, but these investments could become obsolete and economically stranded. Mining companies are still risk-averse and are focusing on OECD markets. Over-investing in production may therefore cause supply to outstrip demand and could lead to minimal benefits for many countries.

**Ninety-eight per cent of cobalt resources with high social risks also have a high governance risk, while 53 per cent of lithium resources located in high environmental risk contexts are also located in countries with high governance risks.**

Waste generation from renewable energy technologies is another emerging risk for the transition. Solar photovoltaic (PV) deployment has grown at unprecedented rates over the last two decades. As the global solar PV market grows, so will the volume of decommissioned PV panels. Large amounts of solar e-waste are anticipated by the early 2030s, which presents a new environmental challenge for the global renewable energy sector.[106]

In addition, the problem of wind blade disposal is beginning to emerge as a significant factor for the sustainability of the wind energy industry. Waste from wind turbines, in particular composite materials from turbine blades, is estimated

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**104** Giurco, D., Dominish, E., Florin, N., Watari, T. and McLellan, B. (2019), 'Requirements for Minerals and Metals for 100% Renewable Scenarios', in Teske, S. (ed.) (2019), *Achieving the Paris Climate Agreement Goals*, Cham, Switzerland: Springer, https://link.springer.com/chapter/10.1007/978-3-030-05843-2_11.
**105** Lèbre, É., Stringer, M., Svobodova, K., Owen, J., Kemp, D., Côte, C., Arratia-Solar, A. and Valenta, R. (2020), 'The social and environmental complexities of extracting energy transition metals', *Nature Communications*, 11, 4823, doi:10.1038/s41467-020-18661-9.
**106** International Renewable Energy Agency (2016), *End of life management: Solar Photovoltaic Panels*, Abu Dhabi: IRENA, https://www.irena.org/publications/2016/Jun/End-of-life-management-Solar-Photovoltaic-Panels.

to increase to a cumulative 43 million tonnes worldwide by 2050, with China possessing 40 per cent of the waste, Europe 25 per cent, the US 16 per cent and the rest of the world 19 per cent.[107]

By integrating circularity thinking into renewable energy investment plans, these risks could be reduced. Increasing recycling rates and material efficiency of renewable energy technologies can significantly reduce primary demand for metals.[108] New economic opportunities and circular business models based on optimal use principles and resource recovery can be developed. For instance, recycling or repurposing solar PV panels at the end of their lifetime could provide an estimated stock of 78 million tonnes of secondary raw materials and other valuable components. The estimated value of these recovered materials could exceed $15 billion globally by 2050.[109]

From an investment perspective, renewable energy project development will require more whole life cycle costing. Often, the circularity aspects and associated costs of end-of-life and decommissioning of energy infrastructures are either not included at all or underestimated. When looking at the life cycles of these assets, including their design, building and decommissioning stages, financial incentives are needed to increase the use of secondary materials throughout the full life cycle.

What is needed, in terms of project finance, is the creation of a bond or escrow account to hold funds for the decommissioning of the sites or for the transfer of ownership of equipment and recycling activities. An important question relates to the time period over which the funds must accumulate. The optimal approach, from the preservation of public funds perspective (and to reduce insolvency risk), is for funds to be deposited at the outset prior to construction, but this may not always be viable for developers.

Financial assurance requirements have been used for end-of-life obligations in the traditional energy sector. These obligations cover the decommissioning of project installations, disposal of equipment, and restoration of the site to its original condition or a condition that may accommodate another productive use. Financial assurance requirements necessitate that operators evidence their ability to pay for the end-of-life obligations. However, these requirements are often absent in frameworks governing the renewable energy sector across North America and the UK, and even where they are present, they are often weak and easily compromised.[110] As a result, the overall life cycle costs of producing energy are not fully accounted for. This is exacerbated by the fact that end-of-life costs for energy installations are mostly underestimated. The costs of increased decommissioning due to the ageing of installed technologies will become a growing concern for financially involved parties such as owners (and companies associated with them, as liability for decommissioning costs may be extended to them under certain legal frameworks, for example, the UK's Energy Act 2004), banks, or pension funds.

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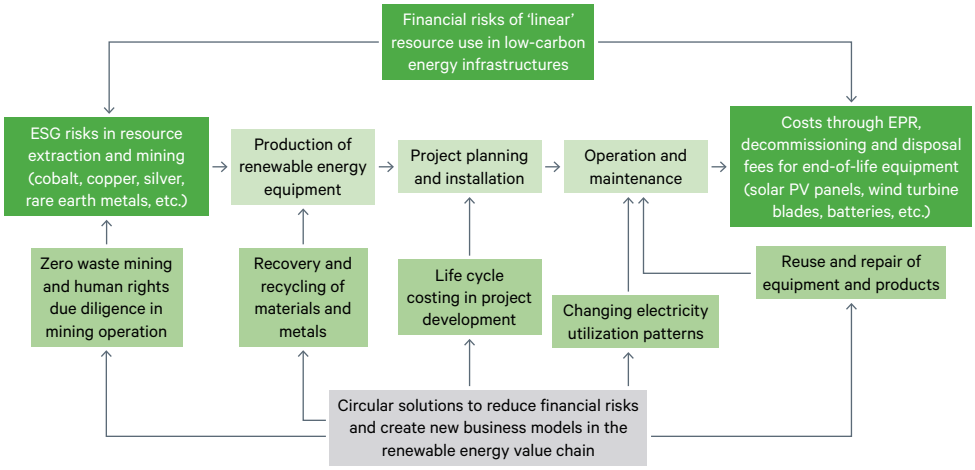
**107** Liu, P. and Barlow, C. (2017), 'Wind turbine blade waste in 2050', *Waste Management*, 62: pp. 229–40, doi:10.1016/j.wasman.2017.02.007.
**108** Giurco et al. (2019), 'Requirements for Minerals and Metals for 100% Renewable Scenarios'.
**109** International Renewable Energy Agency (2016), *End of life management: Solar Photovoltaic Panels*.
**110** Mackie, C. and Besco, L. (2020), 'Rethinking the Function of Financial Assurance for End-of-Life Obligations', *Environmental Law Reporter,* 50(7), Washington, DC: Environmental Law Institute.

Integrating circularity thinking and applying circular economy solutions to low-carbon energy infrastructures can reduce risks both upstream and downstream (see Figure 4).

**Figure 4.** Circular economy solutions to reduce linear risks in renewable energy finance




Source: Compiled by the authors.

Renewable energy financing will need to extend its scope from the mitigation benefits to incorporate circular benefits based on embodied emissions and full life cycle emissions, among other co-benefits. A Swedish example that addresses materials use for sustainable energy solutions in the R&D stage concerns the power generator Vattenfall, which has started a collaboration with Modvion, a Swedish engineering and industrial design company, to use wooden towers for onshore wind turbines. It is expected that embodied $CO_2$ emissions at the design and manufacturing stage will decrease by more than 25 per cent.[111] In a separate development, a US company, Global Fibreglass Solutions, has developed the technology to process the carbon fibres from wind turbine blades into pellets that are utilized in various products such as decking materials and piping. Meanwhile, thermal processes can break apart composite fibres from end-of-life blades: the fibres are then recovered and sold on to companies making items such as glue and paint.[112] Similarly, the solar PV industry and businesses are beginning to realize the importance of circularity for solar technologies (see Box 5).

**111** Vattenfall (2020), 'Wooden tower set to reduce carbon dioxide footprint from future wind turbines', press release, 19 September 2020, https://group.vattenfall.com/press-and-media/pressreleases/2020/wooden-tower-set-to-reduce-carbon-dioxide-footprint-from-future-wind-turbines.
**112** Action Renewables (2020), 'Wind power and the circular economy: How the industry is making turbine materials more sustainable', 10 June 2020, https://actionrenewables.co.uk/news-events/post.php?s=wind-power-and-the-circular-economy-how-the-industry-is-making-turbine-materials-more-sustainable.

### **Box 5.** Bringing circularity into solar energy financing

In 2019, about 115 gigawatts (GW) of solar PV capacity was added worldwide, cementing solar energy technology as a leader in new electricity generating capacity.[113] Solar PV is now among the cheapest options for new power generation and has relatively short investment cycles. These investments also make good sense in the post-pandemic context: renewable power companies in advanced economies have delivered higher equity returns over the past decade than those in fossil fuel sectors and have weathered the COVID-19 pandemic better.[114]

However, when solar PV infrastructure and products reach their end of life they become e-waste, already one of the fastest-growing waste streams globally. The industry standard life span is around 25 to 30 years. However, due to innovation in photovoltaics and their relative cost per kilowatt hour (kWh) generated, decommissioning can be earlier than these standard periods for financial reasons. Worldwide, it is estimated that solar PV e-waste will reach around 78 million tonnes by 2050, if investments and installation continue at current rates.[115] There is a growing need to ensure that the release and impact of solar related e-waste is minimized as much as possible. In Europe, the Waste from Electrical and Electronic Equipment (WEEE) Directive already requires all producers supplying PV panels to the EU market to finance the costs of collecting and recycling of end-of-life PV equipment and panels. In other regions, new regulations on e-waste – such as EPR – will increasingly apply to solar energy infrastructure and products.[116]

Off-grid solar products are part of a fast-growing sector to address the urgent need to provide access to clean energy. According to GOGLA's Investment Database,[117] the total investment into the off-grid solar sector in 2020 remained stable, despite the COVID-19 pandemic. The total volume of investments in the sector has increased slightly from 2019 to a total of $316 million worth of commitments. This development underpins the continued confidence of investors in the off-grid industry's business models and ability to deliver positive impact. As a recent World Bank report highlights, financing off-grid solar is being done through a wide range of established financing instruments such as grants, venture debt, securitization, convertible notes, high-risk mezzanine debt, and development impact bonds, as well as more innovative ways of raising finance, such as reward- and equity-based crowdfunding, peer-to-peer lending, online debt-based securities, and government-issued mobile bonds.[118] However, none of these financing mechanisms considers the end-of-life issues of solar energy products, because of the

**113** REN21 (2020), *Renewables 2020 Global Status Report,* Paris: REN21 Secretariat, https://www.ren21.net/gsr-2020/chapters/chapter_01/chapter_01/#target_200.
**114** IEA (2020), 'World Energy Investment 2020: Key Findings', https://www.iea.org/reports/world-energy-investment-2020/key-findings.
**115** Chowdhury, S., Rahman, K. S., Chowdhury, T., Nuthammachot, N., Techato, K., Akhtaruzzaman, M., Tiong, S. K., Sopian, K. and Amin, N. (2020), 'An overview of solar photovoltaic panels' end-of-life material recycling', *Energy Strategy Reviews*, 27, 100431.
**116** International Renewable Energy Agency (2016), *End of life management: Solar Photovoltaic Panels*.
**117** GOGLA (n.d.), 'Investment Data', https://www.gogla.org/access-to-finance/investment-data.
**118** Energy Sector Management Assistance Program (2020), *Funding the Sun: New Paradigms for Financing Off-Grid Solar Companies*, Washington, DC: World Bank.

currently applied tenor of loans. Most projects do not allocate financial resources to arrange appropriate solutions for solar e-waste management. Furthermore, research conducted by CDC and M-KOPA, one of the largest off-grid solar companies in Kenya, shows that there is a need – and that it is important – for companies to take action on the issue of solar e-waste and establish collection systems that can transition solar energy companies from a linear to a circular economy model.[119]

**119** Di Bella, V. (2021), 'How are off-grid solar customers in Kenya managing their electronic waste?', CDC Research Insight, 15 January 2021, https://www.cdcgroup.com/en/news-insight/insight/articles/how-are-off-grid-solar-customers-in-kenya-managing-their-electronic-waste.

# 03 De-risking financing for the circular economy

**Investing in circular economy solutions and business models is still considered high risk for financiers. To de-risk investments, both policy instruments and financial instruments are needed.**

Investments in circular economy innovations and new business models, especially in developing countries, are still considered to be high risk compared to ongoing and growing finance experiments in industrialized economies. The initial investments required for the build-up of circular economy infrastructures such as eco-industrial developments, waste collection and recycling systems, or clean water and sanitation solutions based on circular technologies, can pose a substantial challenge for low- and middle-income countries.

The use of ODA to mobilize private finance is increasingly regarded as essential to meet the SDGs. A significant number of development agencies and DFIs have set up diverse de-risking initiatives with the goal of attracting private investment to international development projects.[120] These initiatives and measures to decrease investors' capital costs aim to address the underlying sources of investment risk (in what is termed policy de-risking) or shifting risk away from private sector investors (financial de-risking).

**120** Bayliss, K., Dimakou, O., Laskaridis, C., Sial, F. and van Waeyenberge, E. (2020), *The use of development funds for de-risking private investment: how effective is it in delivering development?*, Directorate-General for External Policies, Policy Department, Study, Brussels: European Parliament.

**Policy de-risking instruments** can help to remove the underlying barriers to circular economy business models. These instruments include, for example, support for circular economy policies beyond waste management: these might include EPR, product eco-design polices, institutional capacity-building, assessments about taxation reforms, green investment policies and public-sector skills development.

**Financial de-risking instruments** can help to transfer some of the risks that investors face to public actors, such as DFIs. These instruments can include, for example, loan guarantees, PRI, public equity co-investments or public–private blended finance.

## De-risking through policy development

As discussed above, the voluntary adoption of circular economy finance into the financial services industry is taking shape through the actions of leaders in the sustainable finance space.[121] However, the speed and volume of adoption remains very modest when compared to the amount of money that goes to the linear global economy on a yearly basis.

One way to de-risk and grow circular economy finance is to make it an 'opt-out' rather than an 'opt-in', through setting relevant standards and criteria. This means that regulators and policymakers on multiple domains would need to nudge financial intermediaries towards making more sustainable and ethical investment decisions.[122] (The environmental objectives of the EU taxonomy for sustainable finance can be considered a regulatory nudge.) It also requires a 'connecting of the dots' on various policy terrains to increase the volume of circular economy finance as part of mainstream sustainable finance. In addition, the recognition of embodied greenhouse gas emissions of used materials and resources can facilitate the integration of circular economy solutions into net zero climate policy goals. Policymakers would need to make efforts to ensure that policy and regulations around climate finance converge with policies governing the materials and resource agenda of circular economy finance. This can be achieved, in a way that helps with implementation, by tackling policies that do not explicitly carry the circular economy label, but which support the adoption of the circular economy (e.g. fiscal policies or product eco-design policies). The advantage is that policymakers can remain in their field of expertise, rather than overburdening national policymakers and their international partners with circular economy terminology.

Circular economy finance will benefit from a level playing field in a number of specific policy areas:

**National circular economy roadmaps and strategies:** Many governments around the world have included circular economy elements in their national development plans, as well as their policy frameworks for environment and climate, including Nationally Determined Contributions (NDCs), submitted in accordance with the

**121** ABN AMRO, ING and Rabobank (2018), *Circular Economy Finance Guidelines*.
**122** Cai, C. (2019), 'Nudging the financial market? A review of the nudge theory', *Accounting & Finance*, 60(4), https://onlinelibrary.wiley.com/doi/10.1111/acfi.12471.

Paris Agreement. These strategies include targets for the recycling and reuse of waste materials as well as plans for linking the circular economy and climate action, and plans to stimulate innovation and job creation through the shift to a circular economy. Circular economy roadmaps often include stakeholder processes to bring together important national players, including the finance sector. For example, the Finnish government created new financial instruments and investment subsidy arrangements as part of the implementation of the country's national circular economy roadmap. Investments by national banks and institutional investors such as pension funds have been steered and utilized to promote circular economy solutions.[123] Such government plans will work best if they are based on concrete targets for sustainable resource use and include investment proposals. Furthermore, aligning circular economy principles with public procurement can create positive dynamics, as circular procurement criteria can be used in investment proposals aimed at circular resource use and sustainability performance. At the international level, the integration of resource efficiency, circularity and embodied greenhouse gas emissions targets in consumption and production as part of the long-term strategies (LTSs) and NDCs under the Paris Agreement would be serving both the climate and circular economy agenda. But the signs are that when it comes to COP26, scheduled to be held in Glasgow in November 2021, the extent and programming of the circular economy track within the conference will once again expand, compared to its earlier iterations.[124]

**At the international level, the integration of resource efficiency, circularity and embodied greenhouse gas emissions targets in consumption and production as part of the long-term strategies and NDCs under the Paris Agreement would be serving both the climate and circular economy agenda.**

**Material resource efficiency and recycling targets for industrial activity:** Resource efficiency covers a range of resources, including materials, water, energy, biodiversity and land. It refers to the sustainable use of these resources through reduced use, optimization and recycling to reduce material intensity – with the focus on producing the same level of output with fewer material inputs. Resource efficiency can be supported through adopting practices such as 'lean' manufacturing and product lifetime optimization, which in many industrial sectors are not being used at anywhere near their full potential.[125]

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**123** Sitra (2016), 'Finnish road map to a circular economy 2016–2025', https://www.sitra.fi/en/projects/leading-the-cycle-finnish-road-map-to-a-circular-economy-2016-2025.
**124** Booker, D. (2020), 'The circular road to COP26', Circular Glasgow, 12 November 2020, https://www.circularglasgow.com/the-circular-road-to-cop26.
**125** van Nes, N. and Cramer, J. (2006), 'Product lifetime optimization: a challenging strategy towards more sustainable consumption patterns', *Journal of Cleaner* Production, 14(15–16), pp. 1307–18.

The International Resource Panel estimates that, through material resource efficiency, significant emission reductions can be achieved in the use of materials in the building and mobility sectors: these range between 60 per cent and 80 per cent across the G7, India and China.[126] Arguably, policies that address resource efficiency only through the lower-end 9R solutions (e.g. materials recycling) can potentially lead to a further linear 'lock-in'. Still, because of its dominance and size, the further optimization of a linear economy can make sense financially as well as providing a transitional pathway towards circular systems.

**Extended producer responsibility:** EPR is a financial and/or operational instrument that aims to internalize environmental externalities related to end-of-life management.[127] According to the OECD, under this policy approach producers of goods are given a significant responsibility for the recovery, treatment or disposal of post-consumer products and waste.[128] This approach shifts responsibility away from national, subnational or local authorities. The aim is to incentivize waste minimization at source, promote more environmentally conscious product design (see below), and support the management of waste by the public sector. If producers of goods take on increased responsibility for the recovery of materials or repair of products further along the value chain, then changes in production methods will favour materials and goods that are more easily recovered, remanufactured, repurposed, repaired and reused. These extended responsibilities can compromise the financial attractiveness and profitability of linear industries and level the playing field for circular businesses.

**Product policies (including eco-design, bans on single-use products and product lifetime extensions):** Eco-design is an approach to products that considers environmental impacts during a product's whole life cycle. Eco-design can also facilitate easier repair and optimize remanufacturing processes, further saving resources. For new products, the design process needs to include principles such as designing for energy efficiency, reparability, recyclability, the minimization of packaging, and chemical safety. Product design policies – as they currently exist – need to change considerably in order to enable a circular economy. Eco-design policies have mostly focused on energy efficiency but will need to take a wider material focus. At a national policy level, the UK is in the process of designing a new regulation to govern eco-design and energy efficiency requirements.[129]

**Fiscal policies and taxation regimes** are considered key policy tools that can help create markets for circular business models, address social and environmental externalities and generate public funds to finance the transitions. The transformation of taxation systems on both international and national levels is key to shifting to an inclusive circular economy. Tax regimes – in some cases,

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**126** Hertwich, E., Lifset, R., Pauliuk, S. and Heeren, N. (2020), *Resource Efficiency and Climate Change: Material Efficiency Strategies for a Low-Carbon Future*, International Resource Panel, Nairobi: United Nations Environment Programme.
**127** Pouikli, K. (2020), 'Concretising the role of extended producer responsibility in European Union waste law and policy through the lens of the circular economy', *ERA Forum*, 20, pp. 491–508, doi: 10.1007/s12027-020-00596-9.
**128** OECD (n.d.), 'Extended producer responsibility', https://www.oecd.org/env/tools-evaluation/extendedproducerresponsibility.htm.
**129** Department for Business, Energy & Industrial Strategy (2020), 'Draft Ecodesign and Energy Labelling Regulations 2021', https://www.gov.uk/government/consultations/draft-ecodesign-and-energy-labelling-regulations-2021.

the absence of taxes – are a way for national governments to attract companies to establish operations in their country. In terms of the circular economy, countries can reap an economic advantage by structuring their tax incentives according to their national resource priorities. The alignment of tax incentives makes sense for countries lacking within their territory certain critical resources crucial for their economic development (for example, rare earths for battery components) or for solving awkward environmental issues related to waste streams, as in the case of plastics. Specific measures include cutting taxes on labour and long-term investment returns, as well as increasing the tax burden on primary resource extraction and polluting energy generation. For financial institutions, it is important to have clarity about the taxes to which their clients are subject, as this relates to the profitability of the companies that they finance. Taxation is part of any economic analysis and informs risk-adjusted returns, which in turn inform the decision to invest.

Various taxation measures have been suggested as ways to promote the transition to a circular economy:

1. **Taxes on virgin plastics:** In order to reduce plastic waste and to promote a transition to a circular economy for plastics, various policy proposals have included different forms of taxation on single-use plastics. Thus far, in most countries these reforms have concentrated on applying taxes at the consumer level (for example, taxing sales of plastic carrier bags in supermarkets). Plastics taxes can also be targeted at the production level, for instance taxing the use in the production process of virgin plastic as opposed to recycled materials. In the UK, for example, HM Treasury announced plans in 2018 to introduce a new tax on the manufacture and import of all plastic packaging containing less than 30 per cent recycled content, to come into effect by April 2022.[130] Taxation on plastics production in low- and middle-income countries can complement existing goods and services tax regimes, and should be considered as part of ongoing tax reforms. Although tax revenues are not generally earmarked by national governments for specific purposes, revenues from plastics taxes could be allocated to enhancing plastics collection and recycling infrastructure as well as to improving working conditions for people in the informal waste and recycling sectors.[131]
2. **Taxes on raw materials extraction:** Taxes on the extraction of sand, gravel and aggregates used in the construction industry have been introduced by various EU member states, as well as the UK, generating incentives for the recycling of construction and demolition waste.[132] Comprehensive fiscal regimes already exist around extractives production – these guide mining sector investment, and are core to investment decisions in the sector. Developing countries typically offer lower tax burdens, and any attempts

**130** Hook, L. (2018), 'UK to introduce plastics tax for packaging by April 2022', *Financial Times*, 29 October 2018, https://www.ft.com/content/ce4b8cfc-dba0-11e8-9f04-38d397e6661c.
**131** Schröder, P., Narayanan, L. and McCluskey, R. (2019), 'Taxing plastic production: a solution to India's plastic waste crisis?', International Centre for Taxation and Development, 28 May 2019, https://www.ictd.ac/blog/taxing-plastic-production-a-solution-to-indias-plastic-waste-crisis.
**132** Söderholm, P. (2011), 'Taxing virgin natural resources: Lessons from aggregates taxation in Europe', *Resources, Conservation and Recycling*, 55(11): pp. 911–22.

to raise these taxes can result in capital flight. Furthermore international dynamics may prevent countries from imposing such tools, despite a desire to do so.

3. **Value added tax (VAT) reductions for reuse and repair:** A circular economy taxation framework that can be applied across the life cycle of products would need to include tax relief on reuse and repair activities,[133] as well as VAT reductions for the use of recycled content and secondary materials, and for the reselling of products. Relevant relief policies for repair businesses have been proposed to EU member states[134] and in the UK,[135] and have been implemented in Sweden since 2017, as an economic policy instrument in favour of the circular economy.[136]

4. **Shifting the tax burden from labour or education to material inputs:** The collection, recovery and processing of secondary materials are labour-intensive, and therefore incur more tax than using virgin materials. Shifting taxation from labour would reduce costs for the collection and sorting of waste, making secondary materials more competitive with primary materials. Similarly, the remanufacturing and refurbishing of products is relatively labour-intensive in comparison to the manufacture of new products, especially given the increasing use of automation in manufacturing activities.[137] These processes require a specific skill set, which means that shortages of skilled professional labour can also be an issue. Fiscal incentives that support training and hiring in circular economy businesses could be considered by policymakers.

5. **Active labour market policies** reformulate laws to protect against hyperflexible employment protection contracts, the use of which is sometimes referred to as 'Uberization' under product-as-a-service or sharing economy business models of the circular economy. Staffing these new optimal-use services can bring about unintended consequences in terms of the lowering of employee protection standards. Amended social policies can prevent the erosion of basic employment protection measures such as a minimum wage, health insurance, or the right to paid sick leave. Recent developments around the ride-hailing companies Uber and Lyft in California around the treatment of their drivers as employees, and agreeing to basic rights for workers in the UK in March 2021,[138] constitute an important legal verdict that is expected to drive and inspire the evolution of these policies on an international scale.

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**133** Milios, L. (2021), 'Towards a Circular Economy Taxation Framework: Expectations and Challenges of Implementation', *Circular Economy and Sustainability*, doi:10.1007/s43615-020-00002-z.
**134** Ecopreneur.eu (2019), 'Press Release: EU member states gain traction towards waste-free economy', 5 May 2019, https://ecopreneur.eu/2019/05/05/press-release-bold-policies-needed-to-mainstream-sustainable-fashion-2.
**135** Harvey, F. (2021), 'Cut VAT for green home improvements and repairs, MPs urge', *Guardian*, 17 February 2021, https://www.theguardian.com/environment/2021/feb/17/cut-vat-for-green-home-improvements-and-repairs-mps-urge.
**136** Rreuse.org (2017), 'Reduced taxation to support re-use and repair', 9 March 2017, http://www.rreuse.org/wp-content/uploads/RREUSE-position-on-VAT-2017-Final-website_1.pdf.
**137** Vence, X. and López Pérez, S. D. J. (2021), 'Taxation for a Circular Economy: New Instruments, Reforms, and Architectural Changes in the Fiscal System', *Sustainability,* 13(8), 4581, doi: 10.3390/su13084581.
**138** Duffy, N. (2021), 'Uber to treat drivers as workers after Supreme Court defeat, guaranteeing living wage and holiday pay', 16 March 2021, inews, https://inews.co.uk/news/business/uber-treat-drivers-workers-supreme-court-defeat-guaranteeing-living-wage-holiday-pay-gig-economy-917380.

6. **Investment policies** to attract FDI will be important for low- and middle-income country economies that have seen a contraction in FDI inflows since the outbreak of the COVID-19 pandemic. Reduced flows of FDI to developing countries due to the pandemic have specifically affected export-oriented and commodity-linked investments.[139] However, many pre-pandemic policies that promoted and governed FDI have been largely inadequate for preventing environmental harms and advancing progress on environmental protection. Investment policies tend to involve reducing the fiscal and regulatory burden for FDI – precisely the opposite of what is required for advancing circular business models. Linking FDI to market access, product premiums and value creation is key. Although they are difficult to define, several concepts, such as 'low-carbon FDI' or 'green FDI', which concern greenfield investments in renewable energy or environmental goods and services, is important to ensure FDI does not do harm and, instead, generates benefits.[140] Green FDI agreements between countries can be expanded to include provisions for circular economy investments.

## Financial de-risking instruments

Private sector capital is urgently needed, as current levels of development financing are not sufficient. A number of de-risking instruments could be applied to finance circular economy projects and provide access to funds for SMEs in developing countries. The authors of this paper identified four instruments (loan guarantee schemes, political risk insurance, public equity co-investments and public–private blended finance) as potential instruments for de-risking and scaling up investments for circular solutions (see Table 5).

**Table 5.** Financial de-risking instruments to finance circular economy solutions

| Instrument | Description | Application for circular economy finance |
|---|---|---|
| Loan guarantee schemes (LGS) | LGS backed by governments can facilitate and encourage commercial banks to provide loan finance to small firms that, because of the high risk involved or lack of collateral, are unable to obtain conventional loans. | This instrument can be used for SMEs operating in the value chain of key sectors of the economy in developing countries to invest in circular solutions. In the context of the COVID-19 pandemic, it can also help SMEs in key sectors to deal with the liquidity challenges that have been created.[141] |

**139** UNCTAD (2020), *World Investment Report 2020*.
**140** GreenInvest (2017), *Green Foreign Direct Investment in Developing Countries*, Geneva: UNEP, http://unepinquiry.org/wp-content/uploads/2017/06/Green_Foreign_Direct_Investment_in_Developing_Countries-input-paper.pdf.
**141** United Nations (2020), *Financing for Development in the Era of COVID-19 and Beyond: Menu of Options for the Consideration of Heads of State and Government (Part II)*, New York: United Nations.

| Instrument | Description | Application for circular economy finance |
|---|---|---|
| Political risk insurance (PRI) | PRI is a tool for businesses to mitigate risks arising from the adverse actions of governments, situations of armed conflict, civil strife and unrest, and terrorism. PRI helps companies to provide a more stable environment for investments into developing countries, and to unlock better access to finance. Most public providers of PRI are national export credit agencies.[142] | PRI has been used to facilitate financing for infrastructure projects and investments in natural resources sectors of developing countries.[143] PRI could be used to finance infrastructure necessary for the circular economy, such as fixed-line broadband, waste management and recycling infrastructure, or equipment-leasing models. |
| Public equity co-investments | This instrument is a minority investment, made directly into an operating company by partners of investment funds. In conjunction with a financial sponsor or other private equity investor, co-investments allow a manager to make larger investments while avoiding risk exposure issues. | Equity co-investment is being used to fund forestry plantation projects.[144] The instruments could be expanded to finance regenerative agroforestry or non-timber forestry projects. |
| Blended finance | Public–private blended finance aims to use the investment from the public sector to catalyse commercial finance for the public good. Blended finance has a catalytic effect and helps overcome major barriers by attracting much-needed private capital. It also enables investment managers to take a higher-risk approach when dealing with their portfolio target companies.[145] | As a structuring approach, blended finance has been applied to create investment opportunities in developing countries to help achieve the SDGs, crowding in additional private sector funds in higher volumes. Examples include financing of water and sanitation, and clean energy projects. |

Although it is no 'silver bullet', blended finance is emerging as a promising de-risking approach that can potentially be used to finance circular economy innovations and businesses at scale. In 2018, the Tri Hata Karana Roadmap for blended finance was launched on the sidelines of the IMF/World Bank Meeting in Bali, Indonesia, setting out a shared value system for blended finance.[146] The OECD's DAC has developed a set of five blended finance principles, with the goal of unlocking commercial finance for the SDGs as a policy tool for providers of development finance.[147] These principles are: anchoring blended finance use to a development rationale; designing blended finance to increase

**142** Multilateral Investment Guarantee Agency (n.d.), 'About Political Risk Insurance', https://www.miga.org/political-risk-insurance.
**143** Tan, C. (2015), 'Risky business: political risk insurance and the law and governance of natural resources', *International Journal of Law in Context*, 11(2): pp. 174–194.
**144** FMO (n.d.), 'Investing in sustainable forestry contributes to curbing deforestation and climate change', https://www.fmo.nl/forestry.
**145** de Schrevel, J.-P. (2020), 'How Blended Finance Can Plug The SDG Financing Gap', OECD Development Matters, 22 January 2020, https://oecd-development-matters.org/2020/01/22/how-blended-finance-can-plug-the-sdg-financing-gap.
**146** Government of Indonesia and OECD (2018), *Tri Hata Karana Roadmap for Blended Finance*, https://search.oecd.org/dac/financing-sustainable-development/development-finance-topics/_THK%20Roadmap%20booklet%20A5.pdf.
**147** OECD (n.d.), 'OECD DAC Blended Finance Principles: Unlocking Commercial Finance for the Sustainable Development Goals', https://www.oecd.org/dac/financing-sustainable-development/blended-finances-principles.

the mobilization of commercial finance; tailoring blended finance to local contexts; focusing on effective partnering for blended finance; and monitoring for transparency and results.

Blended finance transactions often have three signature characteristics, which are also relevant for circular economy development finance.[148] First, transactions tend to contribute towards achieving the SDGs. However, not every stakeholder involved in blending needs to have this explicit objective. Financially motivated private investors in a blended finance model might simply be seeking a reduced risk for market-rate financial returns on their investment. Second, the transaction is expected to yield a positive financial return. Different investors in a blended finance structure will have different return expectations, ranging from concessional to market-rate. Third, the public and/or philanthropic parties are catalytic, which means that their participation is crucial for improving the risk/return profile of the transaction and for attracting involvement from the private sector.

**Blended finance has become an important piece in the puzzle and is estimated to have mobilized approximately $152 billion in capital towards sustainable development in low- and middle-income countries as of 2018.**

Blended finance has become an important piece in the puzzle and is estimated to have mobilized approximately $152 billion in capital towards sustainable development in low- and middle-income countries as of 2018.[149] The SDSN estimates that blended finance could mobilize additional private investments to the value of about $50 billion, particularly for SDG infrastructure needs.[150]

However, there are also shortcomings in current blended finance models, including a lack of information and transparency regarding often complex blended financing structures. This has hindered both accountability and the effective implementation of blended projects. Furthermore, it is often not clear how private sector partners for blended finance projects are selected and procedures are often not transparent.[151] Also, relatively few projects have been financed through blended projects in low-income countries (which account for only about 6 per cent of the total), as these are relatively unattractive to private investors and the costs of de-risking are high. To address these deficiencies, the UN has emphasized the need to harmonize reporting on additionality and on certain *ex ante* transparency procedures, including transparency of bidding processes and the terms and conditions of finance.[152]

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**148** Convergence (n.d.), 'Blended Finance', https://www.convergence.finance/blended-finance.
**149** Ibid.
**150** Sachs et al. (2019), *SDG Costing & Financing for Low-Income Developing Countries.*
**151** Bayliss et al. (2020), *The use of development funds for de-risking private investment*.
**152** United Nations (2020), *Financing for Development in the Era of COVID-19 and Beyond: Menu of Options for the Consideration of Heads of State and Government (Part II).*

Applying blended finance to de-risk circular economy investments in developing countries can build on approaches that have been used over the last decade to de-risk renewable energy investment in low- and middle-income countries.[153] Public sector support plays an important role in reducing financing costs and ensuring profitability. For example, the EIC's blended finance scheme – under the EIC Accelerator – was introduced in 2019. It offers capital in the form of equity or quasi-equity up to €15 million, blended with a grant component of up to €2.5 million, to potentially game-changing EU start-ups and SMEs that are carrying out breakthrough and disruptive non-bankable innovation.[154]

In the context of SDG 6 (clean water and sanitation), blended finance has been used to go beyond grant models. From 2012–17, about $2.1 billion of private finance was mobilized in the water and sanitation sector. Blended finance instruments accounted for 58 per cent of the private finance.[155] Blended finance can help build local markets for off-grid sanitation solutions, many of which operate on circular principles to recycle sewage sludge, or integrated solutions for organic solid waste and biomass.[156] These innovations are often developed by small-scale businesses, which private investors perceive as being comparatively high-risk, due to such technologies and business models being relatively new and to their need for long-term capital. To finance circular off-grid sanitation models, government or philanthropic grant facilities could be blended with DFI resources to generate investment opportunities in the long run.[157]

Waste management has historically been financed by the public sector and, in particular, by municipal governments. However, public sources of finance alone – even supported with ODA – are falling short of meeting requirements, given the growing volumes of waste.[158] Private-sector finance can be a source of additional investments for more circular solutions in the waste sector, but such investments need to be incentivized through policies such as EPR and the creation of better market conditions for secondary materials use. In addition, blended financing instruments can be used as investment vehicles to mobilize commercial investment and to bridge the financing gap in order to tackle the waste crisis faced by many countries.

Figure 5 provides an overview of blended finance and other financial de-risking instruments for circular solutions and contributions to the SDGs.

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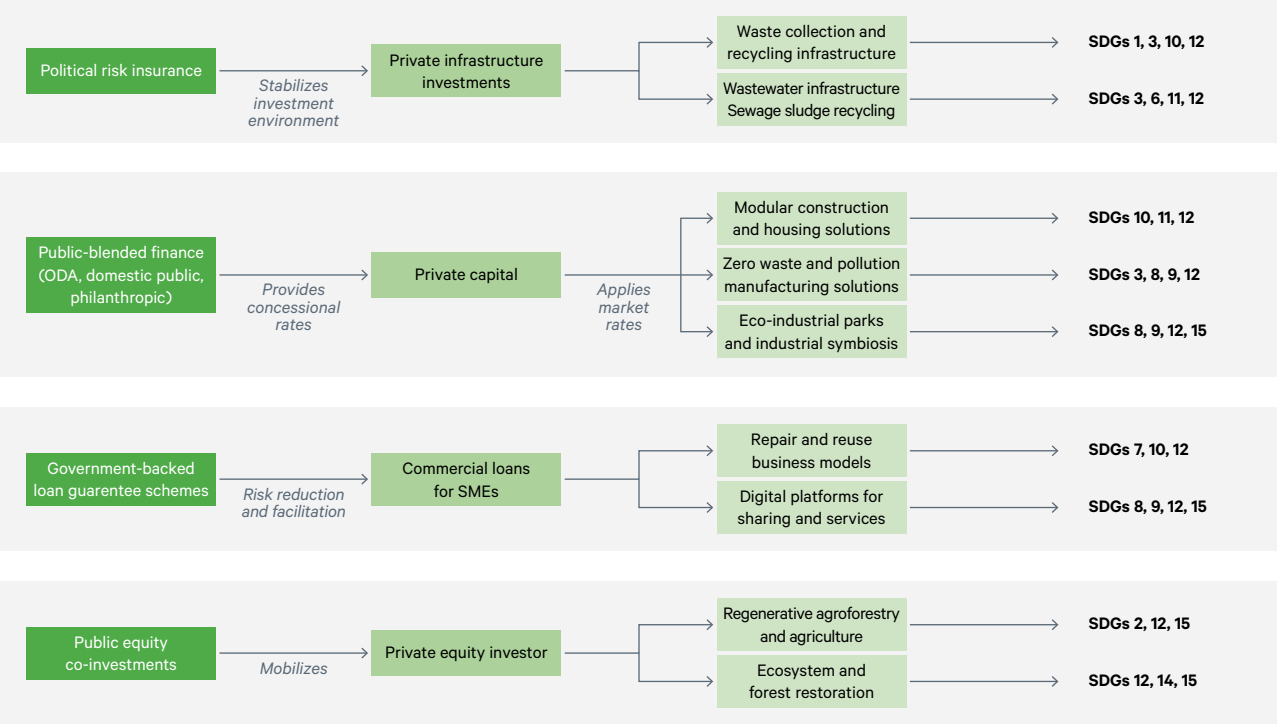
**153** United Nations Development Programme (2013), *Derisking Renewable Energy Investment*, New York: UNDP, https://www.undp.org/content/undp/en/home/librarypage/environment-energy/low_emission_climate resilientdevelopment/derisking-renewable-energy-investment/derisking-renewable-energy-investment.html.
**154** European Commission (2020), *Deep Tech Europe: European Innovation Council Pilot Impact Report 2020*, Brussels: European Commission.
**155** OECD (2019), *Making Blended Finance Work for Water and Sanitation: Unlocking Commercial Finance for SDG 6*, OECD Studies on Water, Paris: OECD.
**156** Mallory, A. et al. (2020), 'Evaluating the circular economy for sanitation: Findings from a multi-case approach', *Science of The Total Environment*, 744, 140871, https://www.sciencedirect.com/science/article/pii/S0048969720344004.
**157** OECD (2019), *Making Blended Finance Work for Water and Sanitation*.
**158** Plastic Smart Cities (n.d.), 'Blended Financing', https://plasticsmartcities.org/products/blended-financing.

**Figure 5.** De-risking instruments for circular economy solutions for the SDGs




Source: Compiled by the authors.

## **Box 6.** Blended finance for circular solutions and the SDGs

**FINILOOP** stands for Financial Inclusion and Improved Livelihoods Out of Plastics.[159]

It is an investment initiative in Africa and Asia, focusing on building local capacities in facilitating loans to improve recycling infrastructure, plastics recycling business development, and waste segregation at source. By encouraging reduced usage of plastics, developing alternatives and keeping plastics longer in the loop, FINILOOP directly contributes to the circular economy. Integrating local financial resources and developing new finance products, it aims to create green jobs and local circular economies by optimizing the sorting and collection of household waste and improvements in recycling.

FINILOOP partners with stakeholders in cities in Asia and Europe[160] to reduce, redesign and improve municipal management of plastics. The approach aims to bring together government, households, entrepreneurs and financiers to organize and sustain local plastics recycling value chains and ensure that citizens can live in a clean and healthy environment. Financiers are mostly microfinance institutions and impact investors who

**159** WASTE (n.d.), 'FINILOOP (Financial Inclusion & Improved Livelihoods Out of Plastics)', https://www.waste.nl/causes/finiloop.
**160** Plastic Smart Cities (n.d.), 'FINILOOP', https://plasticsmartcities.org/products/finiloop.

see market opportunities in financing businesses with solutions to plastics pollution. Accordingly, they develop and promote new credit products to provide local waste management solutions.

**The Agri-Business Capital (ABC) Fund** is an example of a blended finance capital fund that combines sources from multilateral organizations. In 2020, the International Fund for Agricultural Development (IFAD) initiated an investment of $9 million into the ABC Fund. It catalyses blended capital for underserved segments of agricultural commodity value chains (e.g. cocoa), focusing on farmer organizations, financial intermediaries and agribusiness SMEs. The goal is to help small-scale farmers and micro-, small- and medium-sized rural enterprises in developing countries to create jobs and increase incomes.[161] The ABC Fund prioritizes climate-smart projects that promote sustainable agricultural production. Any loss is absorbed initially by the multilateral investors, including IFAD, making the fund more attractive to risk-averse investors.[162]

**Islamic blended finance:** Innovative blended finance models offer opportunities to combine circular principles, such as zero waste or zero emissions, with Islamic finance principles such as zero interest and zero foreclosures.[163] Blended financial contracts could provide incentives to mobilizing funding for impactful SMEs, saving costs as well as generating revenue for self-sustainability. In the contract design, the private sector provides capital and philanthropic stakeholders pay for the costs of funds, while the public sector facilitates and backs the initiatives. Since the blended nature of these contracts provides a social subsidy to fund the cost element of the financing, the proposed structure can create a win-win result for the stakeholders involved. Blended Islamic finance models could attract additional resources towards enhancing development impact in areas of low-cost housing or solar energy, while the funding structure will reduce risk perception. Furthermore, Islamic social finance tools – *Zakat* (mandatory almsgiving), *Sadakah* (charitable giving) and *Waqf* (endowments) – are aligned with the spirit of the SDGs. In 2018, the United Nations Development Programme established a partnership with the Indonesian finance ministry to support a sovereign green *sukuk* (bond), which raised $2.75 billion from three annual issuances.[164] This *sukuk* demonstrates the vital potential to leverage Islamic finance partnerships for green investments: such partnerships could potentially also be a vehicle for financing the circular economy.

**161** International Fund for Agricultural Development (2020), 'IFAD announces landmark investment in impact fund helping rural SMEs', 23 April 2020, https://www.ifad.org/en/web/latest/-/news/ifad-makes-landmark-investment-in-impact-fund-helping-rural-smes.
**162** *Financial Times* (2020), 'Blended finance eases burden for farmers in poor countries', FT Food Revolution, 7 October 2020, https://channels.ft.com/foodrevolution/blended-finance.
**163** Khan, T. and Badjie, F. (2020), 'Islamic blended finance for circular economy impactful SMEs to achieve SDGs', *Singapore Economic Review*, pp. 1–26, doi:10.1142/S0217590820420060.
**164** United Nations Development Programme (2020), 'Pioneering the Green Sukuk in Indonesia', 11 November 2020, https://www.undp.org/stories/pioneering-green-sukuk-indonesia.

# 04
# Financing a circular economy transition post-COVID-19

**The post-COVID-19 economic recovery and stimulus packages provide opportunities to increase investments in the circular economy. It is important to finance a just transition and inclusive recovery through investments in new jobs, skills and decent work.**

## Circularity of pandemic stimulus packages

If governments are committed to a green recovery, investment in the circular economy will need to be a key element of economic stimulus packages. Investments for circular economy models, bio-based circular products and sustainable consumption and production strategies have been included by the UN as priorities for governments in preparing their national plans for recovery from COVID-19.[165]

According to the Greenness of Stimulus Index (GSI) analysis by Vivid Economics, as of February 2021, governments have announced a total of $14.9 trillion in public stimulus spending to offset the economic effects of the pandemic. So far, the balance between green and non-green spending is not favourable in terms of support given to positive environmental outcomes. Stimulus spending is more heavily tilted towards measures that will be net negative for the environment, including higher subsidies for fossil fuel infrastructure than for renewable energy.[166] In total, $4.6 trillion have been directed into sectors that have

**165** United Nations (2020), *Financing for Development in the Era of COVID-19 and Beyond: Menu of Options for the Consideration of Heads of State and Government (Part II)*.
**166** Vivid Economics (2021), *Greenness of Stimulus Index*, February 2021, https://www.vivideconomics.com/wp-content/uploads/2021/02/Greennes-of-Stimulus-Index-5th-Edition-FINAL-VERSION-09.02.21.pdf

a large and lasting impact on carbon emissions and nature, namely agriculture, industry, waste, energy and transport, but only 12 per cent of the total has been green ($1.8 trillion). The Vivid Economics analysis does not include the US green infrastructure or stimulus bills (totalling about $3.9 trillion), of which at least half is said to be on environmental spending – more than the proportion announced by the rest of the world. Another analysis, by UNEP and Oxford University, found that the fiscal rescue and recovery efforts by 50 leading economies (excluding announcements by the European Commission) only amounted to $368 billion in green spending, or only 2.5 per cent of a total $14.6 trillion in COVID-19 induced spending for rescue and recovery in 2020.[167]

**In total, $4.6 trillion have been directed into sectors that have a large and lasting impact on carbon emissions and nature, namely agriculture, industry, waste, energy and transport, but only 12 per cent of the total has been green ($1.8 trillion).**

The recovery spending analyses also show that the environment is a higher priority for some countries than for others. A significant proportion of the EU's 'Next Generation EU' recovery package is considered to be green spending. Of the €750 billion ($830 billion) package, 37 per cent will be directed towards green initiatives, with measures to reduce the EU's dependence on fossil fuels, improve energy efficiency and investments to restore natural capital.[168] Several national governments, including those of Germany, Sweden and the UK, have announced issuances of sovereign green bonds in 2021 as part of their post-pandemic stimulus planning and recovery.[169]

While no specific circular economy breakdowns have been provided in the various announcements, there was in general a greater emphasis on renewable energy and transport. An exception is France's new stimulus package, France Relance (France Reboot), which includes $264 million for circular economy efforts to implement the country's Circular Economy Roadmap. Similarly, Slovenia's recovery plan takes a systemic approach to the introduction and embedding of the circular economy in the built environment.[170]

Table 6 provides details of government announcements on green stimulus spending and includes an estimate as to the proportion of this spending that is destined for circular economy activities. In general, it is assumed that a higher proportion

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**167** O'Callaghan, B. (2021), *Are We Building Back Better? Evidence from 2020 and Pathways for Inclusive Green Recovery Spending*, UNEP, https://wedocs.unep.org/bitstream/handle/20.500.11822/35281/AWBBB.pdf.
**168** Vivid Economics (n.d.), 'Greenness of Stimulus Index', https://www.vivideconomics.com/casestudy/greenness-for-stimulus-index.
**169** edie.net (2021), 'Chancellor Rishi Sunak confirms UK's first sovereign green bond, mandatory TCFD disclosures', 10 November 2020, https://www.edie.net/news/11/Chancellor-Rishi-Sunak-confirms-UK-s-first-sovereign-green-bond--mandatory-TCFD-disclosures.
**170** Dirth, E., Barth, J., Davies, W., Gründahl, M., Hafele, J., Korinek, L., Kiberd, E. and Miller, C. (2021), *A future-fit recovery? A sectoral analysis of practices for promoting systemic change in the NRRPs based on the Recovery Index for Transformative Change (RITC)*, Bonn: ZOE-Institute for future-fit economies.

is identified as circular in those EU member states where the circular economy is a priority and is considered an important part of the long-term recovery. Total circular economy spending is estimated, on the basis of these announcements, at around $632 billion. A major caveat to these figures (and, indeed, to all government spending announcements) is that these are often repackaged from previous (in this case, pre-pandemic) announcements. There is a risk, therefore, of double-counting with other commitments listed in this paper. For example, of the £12 billion green stimulus announced by the UK in November 2020, only £4 billion was new funding.[171]

The announcements detailed below are multi-year government investments. Annual figures have been calculated by dividing the total amount of stimulus spending by five, since spending within these packages tends to be carried out over several years.

**Table 6.** Circular spending estimates of governments' green stimulus packages (multi-year)

| Country | Total green stimulus spending ($ billion) | Purpose | Circular spending estimate ($ billion) |
|---|---|---|---|
| EU | $269 | Amounts to some 30 per cent of the EU's total stimulus spending. | $183 |
| Germany | $59.8[172] | This 'future package' of investment, with a focus on the transition to a greener economy, and allocations for research in areas such as artificial intelligence and quantum computing. Huge sums will be spent on expanding Germany's charging infrastructure for electric cars. | $29 |
| China[173] | $1.4 | Amounts to 0.3 per cent of China's total stimulus spending. | $0.35 |
| UK | $1.37 | Green homes and public sector decarbonization. | $1.37 |
| | $0.48[174] | Circular activities include cutting emissions from heavy industry; reuse/recycling and innovative materials in industry and construction; efficient battery technology. (Including $31 million for circular textiles and construction materials.) | $0.48 |

**171** International Institute for Sustainable Development (2020), 'UK Government Outlines 10-Point Plan for a Green Industrial Revolution', 18 November 2020, https://www.iisd.org/sustainable-recovery/news/uk-government-outlines-10-point-plan-for-a-green-industrial-revolution/#:~:text=on%20november%2017%2c%202020%2c%20the,electric%20vehicles%2c%20and%20renewable%20energy.
**172** Chazan, G. (2021), 'German stimulus aims to kick-start recovery 'with a ka-boom'', *Financial Times*, https://www.ft.com/content/335b5558-41b5-4a1e-a3b9-1440f7602bd8.
**173** Larsen, K., Larsen, J., Chaudhuri, P., Kirkegaard, J. and Wright, L. (2021), *2020 Green Stimulus Spending in the World's Major Economies*, Rhodium Group, 2 February 2021, https://rhg.com/wp-content/uploads/2021/02/2020-Green-Stimulus-Spending-in-the-Worlds-Major-Economies.pdf.
**174** UK Government (2020), 'PM commits £350 million to fuel green recovery', press release, 22 July 2020, https://www.gov.uk/government/news/pm-commits-350-million-to-fuel-green-recovery; UK Research and Innovation (2020), 'Circular economy centres to drive UK to a sustainable future', https://www.ukri.org/news/circular-economy-centres-to-drive-uk-to-a-sustainable-future.

| Country | Total green stimulus spending ($ billion) | Purpose | Circular spending estimate ($ billion) |
|---|---|---|---|
| Spain | $8.13[175] | Total net green investments in 2021. | $8 |
| South Korea | $161 [176] | Includes $17.3 billion from the private sector. Will cover renewables, electric vehicles and a circular economy element (although breakdown not available). | $39 |
| France | $36 [177] | $8.3 billion for retrofitting homes; $4.2 billion for public buildings; $8.3 billion for clean tech and business; $1.5 billion for biodiversity; $1.4 billion for green agriculture. | $22 (all earmarked for circular economy projects) |
| Canada | $4.7 | Home insulation, green transport and clean energy. | $1.56 |
| US | $480 | Amount of green fund allocated for manufacturing subsidies and R&D. | $160 |
| | $561 | Amount of green fund allocated for green housing, schools, power and water upgrades (including many builds). | $187 |
| | $1,900 | Rescue package. | unknown |
| India | $0.83 | Green economy. | $0.28 |
| **Total (multiyear)** | | | **$632** |
| **Total (annual estimates)** | | | **$126** |

Source: Lawlor and Spratt (2021), *Circular investment*. Based on data from Greenness of Stimulus Index, Vivid Economics.

# Just transitions for an inclusive recovery

The concept of a just transition is gaining traction in public and private investment. The financing of a just transition is the 'connective tissue' that binds together climate and environmental goals with positive socio-economic outcomes, which

**175** Netherlands Ministry of Agriculture, Nature and Food Quality (2021), 'The Spanish Government allocates €766.47 million for hydraulic investments in 2021', 14 January 2021, https://www.agroberichtenbuitenland.nl/actueel/nieuws/2021/01/14/spain-the-spanish-government-allocates-%E2%82%AC766.47-million-for-hydraulic-investments-in-2021.
**176** Kim, S.-Y., Thurbon, E., Tan, H. and Mathews, J. (2020), 'South Korea's Green New Deal shows the world what a smart economic recovery looks like', The Conversation, 9 September 2020, https://theconversation.com/south-koreas-green-new-deal-shows-the-world-what-a-smart-economic-recovery-looks-like-145032.
**177** Cossardeaux, J. (2020), 'Plan de relance: la transition écologique se taille la part du lion', 3 September 2020, https://www.lesechos.fr/politique-societe/societe/plan-de-relance-la-transition-ecologique-se-taille-la-part-du-lion-1238889.

can help overcome barriers and accelerate the transition.[178] The need to support workers and communities affected by the transition to a net zero economy is referenced in the preamble to the Paris Agreement. But understanding of how to finance just transitions has until recently been lacking from ODA and climate finance, and sustainable investment more broadly, including circular economy investments.

In the context of the COVID-19 pandemic, the need for a just transition has gained prominence as the impacts of the pandemic have laid bare inequality and social vulnerability. Currently, too little recovery spending focuses on providing structural social benefits. Investment opportunities in public infrastructure and services to address poverty, unemployment, rising inequality and stagnant living standards are mostly not realized.[179] An analysis of 13 EU member states' recovery plans, which form part of the €672.5 billion EU Recovery and Resilience Facility, shows that several, most notably France and Slovenia, have included circular economy elements. However, the potential for a just transition has largely not been harnessed in European recovery plans to date.[180]

**Incorporating just transition principles in circular economy financing can help identify opportunities that facilitate wider socio-economic transformation, while reducing waste and stimulating product innovation.**

In the sustainable development and climate context, initial efforts are under way to facilitate the inclusion of just transition concepts in the revised NDCs and long-term strategies (LTS) of developing countries, which are to be submitted in the run-up to COP26.[181]

Incorporating just transition principles in circular economy financing can help identify opportunities that facilitate wider socio-economic transformation, while reducing waste and stimulating product innovation. Article 4(g) of the European Commission regulation establishing the Just Transition Fund highlights that it will support 'investments in enhancing the circular economy, including through waste prevention, reduction, resource efficiency, reuse, repair and recycling'.[182] Waste incineration is an excluded activity that belongs to the lower part of the waste hierarchy.

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**178** Robins, N. (2020), 'How a just transition can speed up the race to net-zero', London School of Economics and Political Science, Commentary, 17 November 2020, https://www.lse.ac.uk/granthaminstitute/news/how-a-just-transition-can-speed-up-the-race-to-net-zero.
**179** Griffith-Jones, S. (2021), 'Europe's 'green and just' transition starts with its recovery fund', *Financial Times*, 30 March 2021, https://www.ft.com/content/07f45f77-fbfd-4794-afd3-7b28274a007b.
**180** Dirth et al. (2021), *A future-fit recovery?*.
**181** Climate Strategies (2021), *Incorporating Just Transition Strategies in Developing Country NDCs and post-Covid responses*, Briefing Paper, https://climatestrategies.org/publication/project-brief-incorporating-just-transition-strategies-in-developing-country-ndcs-and-post-covid-responses.
**182** European Commission (2020), 'Proposal for a Regulation of the European Parliament and of the Council establishing the Just Transition Fund': Explanatory Memorandum, 14 January 2020, https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020PC0022&from=EN.

In the international development context, a just transition is needed to reduce socio-economic inequalities within and between countries, to ensure that the commitment of the UN SDGs to leave no-one behind is fulfilled.[183] For a just circular economy transition, this means that decent work in the Global North cannot come at the expense of working conditions in the Global South,[184] with poor practices being either 'outsourced' to the latter or reinforced through the exploitation of social externalities in trade. Similarly, environmental standards on waste prevention and resource efficiency must be secured, together with due diligence on working conditions along the global value chain in key sectors such as textiles, electronics, food, plastics or mining. Recent legislation in European countries and at the EU level is an indication that this paradigm shift is beginning to emerge.[185]

A just transition requires the active participation and support of the finance sector. Financing a just transition towards a net zero and circular economy requires the creation of decent jobs and the placing of skills development at the forefront of the change,[186] in addition to public financial management and the redefining of work and social protection. However, to date only a few financial sectors and regulators have operationalized social values or justice concerns in their decision-making in a way that would ensure investments will benefit the poor and reduce income inequality. Building new alliances and strategies is necessary to achieve the aims of environmental and social benefits, and to 'ensure that decision-makers in global and domestic financial systems consistently consider the broader society that these systems exist to serve'.[187]

As providers of local employment and as the economic 'backbone' of many communities, it is vital that SMEs secure adequate support to shield them from the economic downturn. Recovery funding is an opportunity to provide the necessary finance to furnish SMEs and start-up entrepreneurs with circular economy solutions. This needs to be seen in context: over the last decade, many DFIs have invested in linear industries, such as plastics manufacturing facilities, in developing countries.[188] Start-ups and SMEs are emerging as disruptive and innovative players driving a transition to a circular plastics economy, but need investments to reach scale.

An example of how the Welsh government is applying recovery funds for a just transition is presented in Box 7.

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**183** Schröder, P. (2020), *Promoting a Just Transition to an Inclusive Circular Economy*, Research Paper, London: Royal Institute of International Affairs, https://www.chathamhouse.org/2020/04/promoting-just-transition-inclusive-circular-economy.
**184** Scurrah, E. (2021), 'What a 'Just Transition' Would Really Look Like', *Tribune*, 4 February 2021, https://tribunemag.co.uk/2021/02/what-a-just-transition-would-really-look-like.
**185** Sarkis, J., Dewick, P., Hofstetter, J. and Schröder, P. (2021), 'Changing of the guard: A paradigm shift for more sustainable supply chains', *Resources, Conservation and Recycling*, 170, 105587, doi:10.1016/j.resconrec.2021.105587.
**186** CDC (n.d.), 'Climate Change Strategy', https://www.cdcgroup.com/en/climate-change-strategy.
**187** Sim, L.-A. (2020), 'Influencing the social impact of financial systems: alternative strategies', *International Affairs*, 96(2): pp. 501–515, doi:10.1093/ia/iiz256.
**188** CDC (n.d.), 'Silafrica Plastics and Packaging Intl. Ltd', https://www.cdcgroup.com/en/our-impact/underlying/silafrica-plastics-and-packaging-intl-ltd; CDC (n.d.), 'Unicent Limited (Universal Plastics Factory Plc)', https://www.cdcgroup.com/en/our-impact/underlying/unicent-limited-universal-plastics-factory-plc.

### **Box 7.** Green and just transition processes in Welsh recovery funds

A strategic approach to achieving a just transition is being taken in Wales and involves multiple stakeholders, including unions. The stakeholder processes and discussions revealed that in the context of climate change, the just transition will require a radical change in the structure of the economy: towards greater employee ownership or participation, on the one hand, and towards greater circularity, on the other, within an economic model that is oriented less firmly on the production of consumer goods. In this context, the Welsh government is considering a range of policy levers that it can access to promote a just transition. Establishing a set of core climate 'just values' to underpin a just transition process in Wales is as important an element as making decisions about the funding of carbon-intensive industry, which is especially relevant in the recovery context.

Just transition pilot projects that are being planned include projects that would allow local communities to be involved in natural resource management, with the potential to promote environmental goods and services, while also providing sustainable, locally focused employment.[189]

The Welsh government's recovery fund is linked with both the just transition and a circular economy in Wales. A key aspect of the reconstruction is 'a commitment to embrace greener and just initiatives, which support our places in Wales to reconstruct in a sustainable way.'[190] The fund aims to support existing initiatives taking place in towns and communities in this field, such as repair cafés, libraries of things and zero waste shops, all of which are becoming more commonplace – as are facilities to share and repair items ranging from food to electrical appliances. The objective is to rejuvenate town centres as economic and community hubs. During the pandemic, many Welsh citizens have reconnected with their local communities and considered the resources that are used in their country.[191]

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**189** Price, J., Roberts, M. and Bristow, D. (2021), *Towards a Just Transition in Wales*, Cardiff: Wales Centre for Public Policy.
**190** Welsh Government (2020), 'Green recovery circular economy fund 2020 to 2021: application form', 6 November 2020, https://gov.wales/green-recovery-circular-economy-fund-2020-2021-application-form.
**191** Ibid.

# 05 Conclusions and recommendations

**Accelerating the shift to a circular economy is more urgent now than ever. However, despite a rising interest in sustainable investments in recent years, spending on the circular economy remains limited.**

Circular economy finance and spending has developed quickly from modest beginnings as economies have experienced a much broader shift in the finance sector towards sustainable loans and investments. Yet it remains small-scale in comparison with other green finance and with spending in the linear economy. Despite data limitations and ongoing work on definitions and indicators, this paper presents a tentative, optimistic current estimate for the total value of circular spending, taking into account public spending, stimulus packages, corporate spending and financial industry funds (see Table 7).

**Table 7.** Summary of global spending by sector in 2019/20

| Sector | Circular economy estimate ($ billion) |
|---|---|
| Government | 636 |
| Government (less stimulus) | 510 |
| Corporate | 858 |
| Finance | 46 |
| **Total** | **1,540** |
| **Total (less stimulus)** | **1,414** |

Source: Lawlor and Spratt (2021), *Circular investment*.

Although it is not meaningful to compare circular with linear economy spending in every sector, it can be useful to put these figures into context. Global government spending in 2019 was about $13 trillion, suggesting that 4 per cent of government spending is circular (rising to 5 per cent when stimulus spending is included, based on an annual estimate). The value of spending by the corporate sectors included in the calculation is about $35 trillion annually, suggesting that the circular economy's share of this is only about 3 per cent each year. The finance sector is more difficult to compare, as annual investments are not a meaningful metric. However, to put the above circular economy estimate in context, the total value of financial assets managed by the 500 largest asset managers alone was more than $100 trillion in 2019.

Investors are becoming aware of the high levels of risk inherent in unsustainable supply chains and the requirement that organizations tackle those risks effectively. The growth in both public initiatives and corporate spending on circular initiatives in key sectors, and in circular economy funds in the finance industry, are indications that the circular economy is here to stay. However, investment levels in the circular economy are still well below where they would need to be to deliver real change.

**The growth in both public initiatives and corporate spending on circular initiatives in key sectors, and in circular economy funds in the finance industry, are indications that the circular economy is here to stay.**

Two key challenges for financiers are, first, that linear risks are not priced properly into risk models, and second, that the positive impact created by circular business models is not rewarded. In addition, a lack of – and widespread unfamiliarity with – circular economy data continues to constitute a major barrier that has limited the implementation of strategies to promote the circular economy and the scaling-up of financing for circular business models and pilots. Financial risk models are based on historical track records, and when no such track record is available, it is more or less up to the risk managers themselves to estimate the risk. Risk committees of financial institutions generally lack sufficient experience to assess circular economy datasets. The connection to the whole value chain also introduces new data requirements on subscription volumes, balance sheet extension, inputs, outputs and the origin of virgin or secondary resources, that can often not be fulfilled.

Addressing the lack of standardized and comparable data and metrics is therefore one of the key challenges for the finance sector, especially when it comes to assessing the risk/return ratio for circular economy financing that is geared towards SMEs and start-ups.

Making an economy-wide move from a linear to a circular economy would require significant shifts in investments in key sectors such as electronics, construction, food and agriculture, textiles and garments, automotive and plastics. Linear sectors of the economy will also likely need to apply the 'reduce' principle of the 9Rs and

shrink to change the composition of the economy towards a model based on higher degrees of circularity, with reduced material throughput. Companies that launch circular economy initiatives and business models that aim to slow down or reduce material throughput still encounter many financial, organizational, operational and legal barriers. The structure of finance and the role of accounting must change in order to accelerate the circular economy transition. While it is beyond the scope of this paper, accounting is the primary tool that defines a company's value, and consequently defines the main rules governing investment decisions, activities and financial management. Without normative accounting rules that include natural and social capital, most financial and economic decisions will never effectively improve global public goods. It is necessary to broaden the traditionally narrow scope of financial accounting frameworks to capture non-monetary values.

The authors make the following recommendations to accelerate the shift to a circular economy, facilitated through finance and investments:

— **Turning regulatory pressure into commercial opportunity.** In the short term, policymakers and regulators need to 'nudge' the finance sector towards circularity through clear policy directions. Policy instruments such as circular economy roadmaps, EPR initiatives and tax reforms provide the necessary policy signals to the finance sector. Long-term institutional investors will then be able to build effective coalitions and investment vehicles to accelerate the transition to a circular economy. While the early adopters of circular economy finance are primarily based in Europe, major players in North America and Asia are beginning to adopt the concept and principles into their lending and investment criteria. Leadership in finance that champions the integration of circular economy principles into a long-term value creation strategy will be crucial. Those companies and investors that are able to acknowledge and study circular economy-related regulatory pressures, and convert these pressures into investment strategies, will monetize their obligatory compliance costs into increased commercial activity.

— **Incorporating 'linear' risks into financial decision-making.** This includes thoroughly analysing the long-term risks of linear investments and developing incentive-compatible solutions to counter short-termism on investment decisions. Additional evaluation metrics will be needed to account for and reduce the risk of stranded assets linked to linear sectors. Adoption of the existing EU taxonomy for sustainable finance, which establishes a common classification system for sustainable business models, will be an increasingly important reference point for investors. Initiatives such as EU Ecolabel for retail financial products can guide investors to identify the right investment products. Also, ongoing government initiatives such as the UK's Green Taxonomy provide an opportunity to create binding and commonly adopted financial standards and guidelines for circular economy investments.

— **Leveraging circular economy finance to support SDG implementation.** Circular economy finance can make a contribution to achieving a range of SDG targets, but development finance needs to catch up. Several existing private finance mechanisms have already started to include circular economy finance and could potentially be adapted to fit the international development context. The circular economy can provide an opportunity for actors to collaborate

closely to 'build back better' in the context of international development finance. Coordination among DFIs will be critical to make circular economy finance work towards the SDGs. Intergovernmental bodies, like the Technology Facilitation Mechanism of the Addis Ababa Action Agenda and the Inter-agency Task Force on Financing for Development, that provide global frameworks for development financing are in a good position to advance investment for the SDGs, and, in turn, investment for the circular economy. While ODA alone will not be sufficient, public finance can play an important role in de-risking private sector investment in circular economy businesses. Instruments such as loan guarantees, risk insurance and blended finance will be crucial to de-risk circular economy finance in developing countries and markets.

— **Building back better through investments in the circular economy.** Multilateral platforms and partnerships – such as Global Alliance on Resource Efficiency and Circular Economy (GACERE) – can be used to leverage private investment for circular economy solutions, especially across priority value chains such as electronics, textiles and garments, plastics packaging, batteries, and food and agriculture. Supporting suppliers and SMEs in these value chains will be crucial to achieve more circular outcomes. Initiatives such as the G7 Build Back Better World (B3W), which aims to leverage billions for infrastructure investments in low- and middle-income countries, will need to have circularity principles built into investment decisions. Similarly, the G20's Infrastructure Working Group (IWG) has identified sustainable infrastructure and circular economy as one of its priorities and will need to develop appropriate financing instruments.

— **Financing a just circular economy transition.** Financial institutions need to internalize both the circular economy and the principles of just transition into their operational processes. Questions for investors engaging with companies in the just transition include how to mitigate risks and create opportunities for consumers, employees and workers along the value chain, as well as managing risks for communities affected by changes in economic composition and industrial restructuring over the short, medium and long term. Furthermore, it will be crucial to establish links between governments, donors and investors to ensure the necessary technical cooperation in this emerging area of development finance becomes available.

Finally, based on the findings from the research paper, we identified a set of research questions that require answers in order to move the circular economy forward.

— As interest in circular economy finance and investments continues to grow, how does one ensure that circular economy finance is aligned with achieving the objectives of an inclusive, regenerative circular economy?

— What needs to be done to prevent 'circularity washing' by the financial industry?

— What role will the EU taxonomy play for circular economy finance and investments? How can wider uptake of the framework beyond the EU be facilitated?

- How will finance be integrated into and benchmarked against achieving national or supranational resource consumption reduction targets, and the UN's SDG targets in the wider sustainable development context?
- In the context of the energy transition, new technologies such as batteries, fuel cells and renewable energy technology will continue to shift the future material volumes within the circular economy. How will finance volumes follow these changes?
- What types of innovation/reform of the financial system are needed to finance circular economy solutions that achieve absolute reductions in waste and resource consumption for developed countries, and relative decoupling for low- and middle-income countries?
- Looking beyond investment opportunities, what are the costs of the circular economy transition, and how will the transition be financed to ensure socially equitable outcomes?
- Can all 'linear finance' become circular, or will it be necessary to shrink the overall size of finance and investments? What would be the strategies and approaches for achieving this?
- What learning can we apply from the climate finance journey, e.g. disinvestments from fossil fuels? How would disinvestment strategies from business models of planned obsolescence be managed?

# Appendix: Notes on methodology and data gaps

## Methodology

In preparing this research paper, the authors applied a mixed-method approach that included a desk review of circular economy-related literature, both grey and academic literature, and reports on sustainable finance initiatives, SDG finance and UN publications.

In addition to the literature review, the authors conducted two stakeholder discussion workshops, in March and October 2020, with experts from the finance sector and the circular economy research and practitioner community.

Furthermore, to inform our analysis and recommendations, the authors conducted an online expert survey on circular economy finance trends, the role of policy, and other measures to overcome current barriers. The methodology of the quantitative analysis of circular economy financing is published as a separate working paper by Just Economics that was commissioned by Chatham House. The working paper is entitled *Circular investment: A review of global spending and barriers to increasing it*. As well as details of the approach used, it includes more granular data on circular spending, which could not be included in full in this research paper for reasons of space.

For the quantification of current levels of spending and investment in circular economy businesses, programmes and initiatives, both top-down and bottom-up approaches to data analysis were used. For the former, areas of spending/investment relevant to the circular economy (waste management, energy efficiency and so on) were identified, and global estimates compiled by other organizations were collated. To obtain these, the authors conducted internet searches for specific countries, companies or economic institutions with the largest economic or environmental footprints using key search terms (e.g. circular construction + investment). For some corporates, the annual reports of key actors were accessed to extract data.

Estimating public spending on the circular economy was challenging, due to a lack of consistency in how the circular economy is classified. Appropriate breakdowns of spending on environmental protection are lacking in most public financial statistics. Moreover, there is no single entity that consistently tracks and verifies announcements. This paper used a top-down approach that aggregates estimates of public spending on waste, R&D, international development and energy efficiency and a bottom-up approach that involved searching and collecting data from a variety of key countries and companies, such as annual reports and online searches.

Data for the SDG analysis was drawn from the OECD's SDG Financing Lab.[192] Analysis of circular economy spending as part of green economic stimulus packages is based on the Greenness of Stimulus Index (GSI).[193]

Despite these caveats, the authors believe that the data presented in the working paper and this research paper give a useful indication of the scale and pattern of current circular economy spending, including how it compares with investment in the linear economy. Due to the limitations listed above, it is recommended that the data presented in the working paper and this paper are used for illustrative purposes only. It is the authors' hope that this work can be developed over time so that circular economy spending can be effectively tracked both sectorally and globally.

## Data gaps in quantifying circular economy finance

Lack of data continues to be a major barrier that has limited the implementation of circular economy strategies. While the literature on the circular economy, financial products and initiatives promoting circular initiatives has grown significantly, there remains an absence of systematic data collection methods and a great variety of definitions, elements and underlying models around the circular economy. At this point in time, non-standardized and varied types of data are used to measure circularity.[194]

Although the circular economy is, by definition, a holistic concept, different actors tend to focus on particular elements, reducing comparability. Some activities may be positive from a circular economy perspective, but are not defined as such by those engaged in them – i.e. they are inherently circular, but have not been seen in this way traditionally. In many cases, unless explicitly described as such, circular economy investments are not externally identifiable. In some instances – recycling projects, for example – the circular economy link is obvious. In most cases, however, an activity can be undertaken on a circular or a linear basis. Data on investment in manufacturing, for example, does not contain information

**192** The SDG Financing Lab (n.d.), 'The Aid Globe', https://sdg-financing-lab.oecd.org.
**193** Vivid Economics (2021), Greenness of Stimulus Index, February 2021, https://www.vivideconomics.com/wp-content/uploads/2021/02/Greennes-of-Stimulus-Index-5th-Edition-FINAL-VERSION-09.02.21.pdf.
**194** Biancini, A., Rossi, J. and Pellegrini, M. (2019), 'Overcoming the Main Barriers of Circular Economy Implementation through a New Visualization Tool for Circular Business Models', *Sustainability*, 11(23), doi:10.3390/su11236614.

on whether this has circular features or is purely linear. Not least because of these difficulties, there is a paucity of data on circular economy investment in terms of overall level, composition and trends over time.

The absence of consistent data of coherent quality makes it difficult for investors to evaluate the impact of prospective circular economy projects and companies. Investment decisions impelled by contestable understanding and inadequate information could also prove counterproductive and could direct capital towards projects with suboptimal environmental outcomes.[195] The same lack of information is also an obstacle to scaling up small circular economy start-up businesses and pilot projects. There is often not sufficient publicly available data on SMEs, for example, to determine whether they meet green or circular finance criteria. A lack of standardized and comparable data is therefore one of the key challenges for the banking sector, especially when it comes to SME financing for the circular economy.

**195** Dewick, P. et al. (2020), 'Circular economy finance: Clear winner or risky proposition?'.

## About the authors

**Patrick Schröder** is a senior research fellow in the Energy, Environment and Resources Programme at Chatham House, specializing in the global transition to an inclusive circular economy. His current research focuses on identifying collaborative opportunities between key countries to support the implementation of the SDGs, closing the investment gap, and building an evidence base for trade in the circular economy.

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Cover image: Extinction Rebellion environmental activists stage a loud demonstration outside the Bank of England to protest against the distribution of funds through the Covid Corporate Financing Facility to carbon intensive industries on 2 July 2020 in London.
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