



Financing Circular Economy – Insights for Practitioners

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Abbreviations

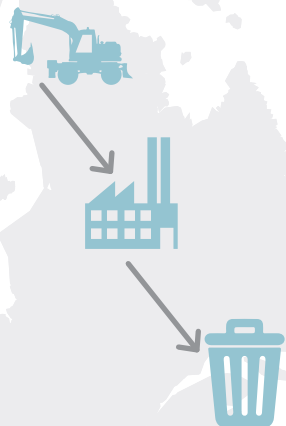
| | |
|-------|--|
| BM | Business Model |
| BMZ | Bundesministerium für wirtschaftliche Zusammenarbeit und Entwicklung |
| CE | Circular Economy |
| CIBIO | Circular-Impact-Bond Issuing Organization |
| EBRD | European Bank for Reconstruction and Development (EBRD)'s |
| EIB | European Investment Bank |
| EPR | Extended Producer Responsibility |
| ETF | exchange-traded fund |
| GHG | Greenhouse Gas |
| GIZ | Deutsche Gesellschaft für Internationale Zusammenarbeit (GmbH) |
| ICMA | International Capital Market Association |
| ICT | Information and Communications Technology |
| KfW | Kreditanstalt für Wiederaufbau |
| KPI | Key Performance Indicator |
| LMIC | Low- and Middle-Income Countries |
| MSCI | Morgan Stanley Capital International |
| MSME | Micro, Small and Medium Enterprises |
| NDC | Nationally Determined Contribution |
| PoC | Proof of Concept |
| PPP | Public-Private-Partnership |
| SAB | Sustainability Awareness Bonds |
| SDG | Sustainable Development Goals |
| SEZ | Special Economic Zones |
| SIB | Social Impact Bonds |
| SIDS | Small Island Developing States |
| SME | Small Medium Enterprises |
| UNEP | United Nations Environment Programme |
| UNIDO | United Nations Industrial Development Organization |

Why another study on financing circular economy?

Our current consumption and production patterns are quite linear: take-make-waste is the model. As known by Many but taken seriously by Few this model leads to depletion of resources, pollution, as well as habitat and biodiversity losses. It threatens ecosystems, human health and economic welfare in the long run. Decoupling economic activity from the consumption of finite resources is therefore one of today's big challenges.

So, let's start today.

take » make » waste



By



And by



While activities to counteract climate change are well defined and underpinned by respective metrics, circular economy-related measures, due to their cross-sectoral character, are still less bundled. The same is true for finance: a multitude of mechanisms, compensation schemes and facilities have come to the market and supplied money for climate investments. Circular finance, however, has only recently made its way into financial markets.

Why? Because one of the major bottlenecks to the transition towards circular economy is the supply as well as the access to finance. For a broad range of actors in development cooperation who aim to advance circular economy in and with low- and middle-income countries, a thorough understanding of the multiple barriers to financing circular activities and related business models is crucial and needs to be facilitated. These barriers concern: financial instruments and mechanisms as well as technical and regulatory aspects that need to be addressed to promote circular economy from a finance stance. At the same time, barriers to financing can constitute promising entry points for future development cooperation to scale the circular economy.

In timely response to current crises – war, climate change, biodiversity loss, disrupted global supply chains – circular economy and circular finance can contribute to:

- ⊙ a just, green, and peaceful transition,
- ⊙ resource efficiency and higher resource independence, and
- ⊙ internalising external costs and thus giving natural resources a real price tag.



With this publication we want to provide some prospective guidance on how development cooperation could contribute to closing the financing gap for circular economy in low- and middle-income countries. It is based on selected chapters of the study 'Financing Circular Economy in Low- and Middle-Income Countries' by Frankfurt School of Finance and Management and Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH.^[1] This study assesses distinct barriers that hinder as well as drivers that stimulate circular economy in low- and middle-income countries. It sets a focus on five selected countries:

- 🌐 Colombia,
- 🌐 the Dominican Republic,
- 🌐 Vietnam,
- 🌐 Albania, and
- 🌐 Rwanda.

We welcome any reaction to this report and invite you to contact us: gocircular@giz.de

Background:

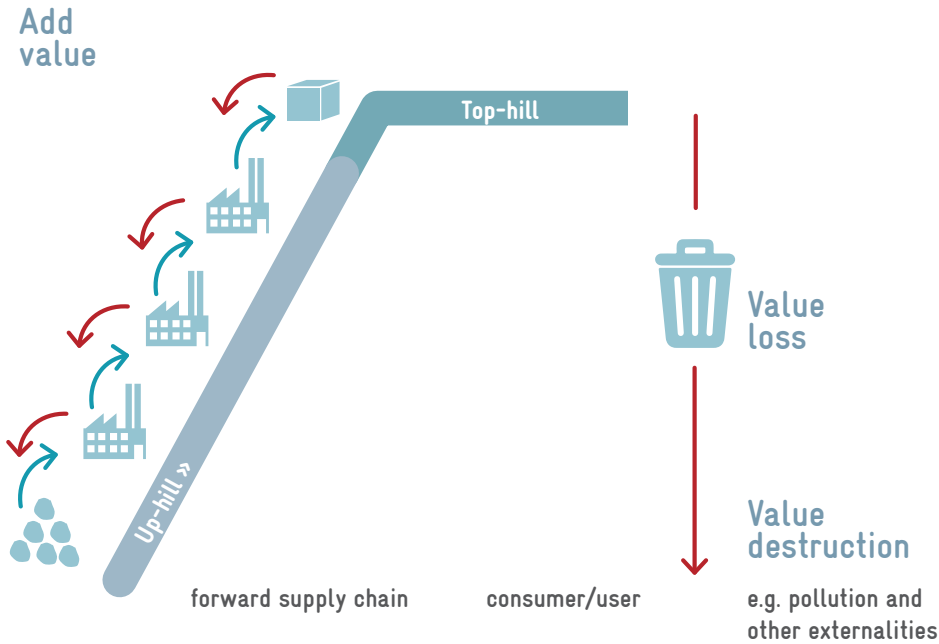
We like the Value Hill business model tool for circular economy!^[2]

In March 2020, the European Commission and the European Investment Bank defined 14 circular economy categories which aim at resource efficiency and reducing environmental harm throughout value chains.^[3] These circular activities are organised into four sections which represent the different stages of a production cycle shown in a simplified figure A. This corresponds with the Value Hill business model tool developed by Circle Economy:^[2]

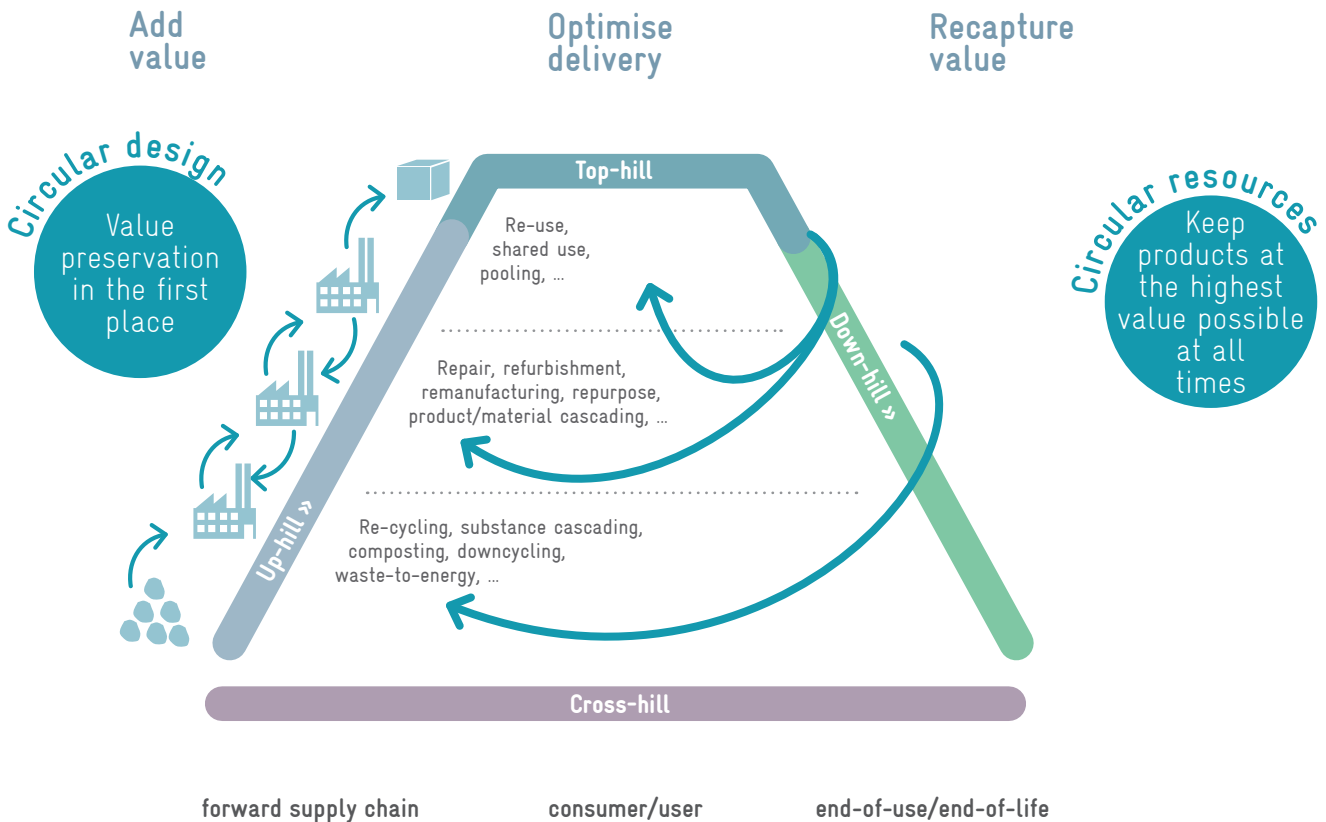
- ⊙ **Circular design and production (up-hill)** – pre-use phase – including development and distribution of reusable, recyclable or compostable materials, in substitution for the use of virgin materials. The up-hill category contains e.g. the circular supplies business model.
- ⊙ **Circular use (top-hill)** – optimal use phase – including development of and transition to circular business models based on reuse and extended use of products. The top-hill category contains e.g. the product-service-system model organised through leasing, renting, pay-per-use or performance based business models and sharing economy.
- ⊙ **Circular value recovery (down-hill)** – post use phase – including repair, refurbishing, remanufacturing, separate collection, reverse logistics, recycling. The down-hill category contains e.g. the resource recovery model, the extended product value and the waste value model.
- ⊙ **Circular support (cross-hill)** including tools, applications, and services enabling CE.

Figure A Simplified Value Hill model representing the linear and circular activities

1. Linear economy



2. Circular economy



Source: Adapted from 'Financing Circular Economy in Low- and Middle-Income Countries' 2022 FS/GIZ

In order to develop finance mechanisms for the purpose of scaling the circular economy, related measures can – and finally should – address all stages of the circular Value Hill. As a general observation, fostering investment in circular economy activities always requires a combination of instruments, especially when engaging and facilitating the financial sector. Based on responsive policies and legal frameworks (still to be developed in most countries), an effective promotional impact from the financial sector to the circular economy would not only need the design and delivery of financial services responding to the economic return on investment. Even more importantly, the return on circular economy investment is also an environmental, social and, in the end, developmental return on investment. Still, there is a long way to go from mere cash-flow-based lending towards a more circular business-compatible way of investment finance such as life-cycle costing.

To contribute to further activities for development cooperation in financing circular economy, the present report proceeds as follows »

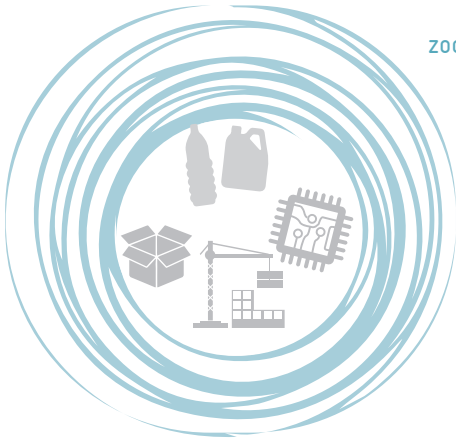
Section 1



serves as a **guiding introduction to circular economy finance instruments** and their political and institutional environment. It describes their mode of operation thereby focussing on opportunities for leveraging and disseminating circular approaches. It also takes into account ongoing funding activities by (international) financing institutions as well as prospects for future activities. Moreover, a mapping of finance instruments analyses different instruments and mechanisms in terms of applicability at the different stages of the circular economy production process.

[Go to section 1 »](#)

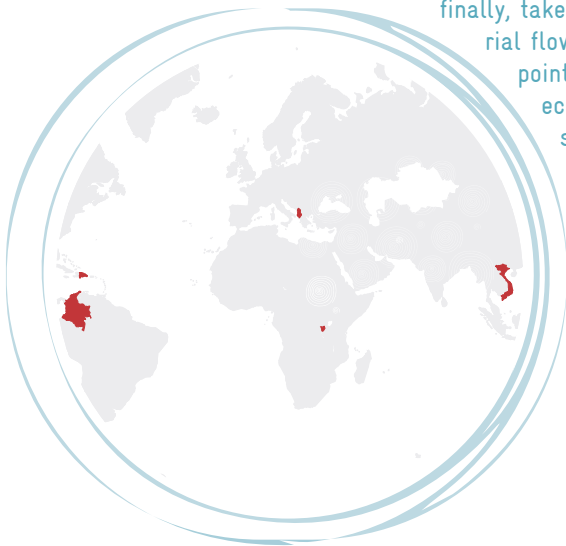
Section 2



zooms into barriers to circular economy in selected real economy sectors and relevant material flows and identifies **levers and entry points** to introduce and strengthen circular economy approaches.

[Go to section 2 »](#)

Section 3



finally, takes a closer look into two selected sectors and material flows in each of the **sample countries** and describes entry points and **promising interventions** to promote circular economy in the context of national priorities, existing structures and the legal framework. The selection of the country examples has been guided by a country classification (low- and middle-income countries), stage of and prospects for circular economy, as well as from the perspective of regional coverage.

[Go to section 3 »](#)

Findings and proposed interventions presented hereunder are possible entry points and can provide stimulus and ideas for development cooperation in support of a transition to circular economy in low- and middle-income countries.



Financial instruments for circular economy

Circular economy (CE) entails major economic and investment potentials and environmental benefits, hitherto largely untapped. This chapter looks into main barriers and market imperfections that hamper the exploitation of those opportunities. It also examines a set of responding mechanisms which can be harnessed to address barriers, referring to existing experiences wherever possible. Moreover, the financial instruments are mapped according to their scope of application on the different levels of bankability as well as on the circular economy Value Hill.

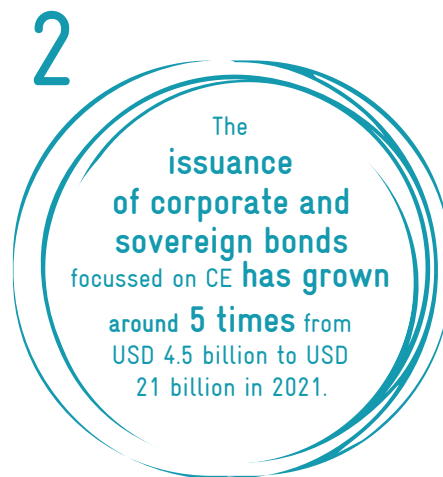


The economic potential of circular economy

On a global level, it is estimated that currently only 8.6 per cent of the global economy can be defined as circular (in terms of tons of material use that is cycled).^[4] According to this low level of circularity, the Circularity Gap Report 2021 estimates the potential for greater circularity at USD 4.5 trillion additional economic output by 2030 for circular businesses.^[5] This opportunity is already acknowledged by many stakeholders, inter alia the financial services industry: Investment managers started to launch specialised circular equity funds, for example, the US-based BlackRock and Swiss peer RobecoSAM. Index providers have launched specialised products. For example, the ECPI group launched a Circular Economy Equity Leader Index comprising categories such as circular supplies, resource recovery, product life extension, sharing platforms, and product as a service. The index provider Solactive established a sharing economy focused index, and Morgan Stanley Capital International (MSCI) introduced a CE and renewable energy index. The asset management arm of the French bank BNP Paribas created an exchange-traded fund (ETF) that tracks the ECPI Circular Economy Leaders Index. In summary:^[6]



Only 8.6 %
of the global
economy
is **circular**





Barriers to investments in a circular economy

The tremendous circular-related investment needs across the globe are confronted by considerable barriers due to **market imperfections** such as:

- ③ **unpriced positive and negative externalities** (e.g. greenhouse gas (GHG) emissions, related health hazards, pollution or biodiversity loss): in a linear economy, the real costs, including environmental or, more broadly, social costs of economic activities, are not, or only partially, reflected in market prices. Any loss resulting from not pricing in those costs into market prices is to be assumed by the society, neither by consumers nor by producers. This puts CE in a disadvantaged position. A circular investment, taking into consideration all social costs of production and consumption is doomed to a lower return compared to linear business models reflecting mere production costs. This can reduce investment into CE,
- ③ **imperfect capital markets** (e.g. short-termism, home-bias, market frictions through subsidies): lack of a liquid, long-term capital market may curb CE investments,
- ③ **lack of information** and **asymmetric information** (e.g. unknown co-benefits): may lead to a sub-optimal allocation of capital in the economy as it may prevent private actors from making optimal investment decisions,
- ③ other **market distortions** such as corruption and subsidies to other sectors.

Existing market imperfections reduce the profitability of circular activities either via a reduced return of investments or via increased risks associated with the investment for investors. Consequently, this leads to underinvestment in sustainable circular activities – compared to a situation without barriers or market imperfections. **Barriers** that trigger financial market imperfections include:

- ③ investments requiring **large upfront costs** for circular infrastructure investments (esp. challenging for micro, small and medium enterprises (MSMEs), which are more sensitive than large enterprises),
- ③ lack of financial resources, budget constraints and limited access to credit facilities due to missing tracked records (esp. for MSMEs and municipalities),
- ③ **lack of available blending instruments** (e.g. risk mitigation instruments),
- ③ **market uncertainties** (e.g. return-based finance requires a degree of certainty that the project/promoter can generate cash flows in the future),
- ③ **political uncertainty**: missing credible commitments by public authorities (governments) are posing additional risk on (long-term) investment decisions for private sector actors, and
- ③ **insufficient regulatory environment**: well-intentioned policies, however ambitious they are, often lack enforceable regulation and a lack of experience from a range of regulatory authorities. This may create additional uncertainty to circular investment from a regulatory perspective. In addition, this is of particular relevance to **small and medium enterprises** (SMEs), as they both lack legal assistance as well as bargaining power in the local political context. On the other hand, potential for CE is more likely to be with SMEs rather than with larger corporations.

From a theoretical standpoint that maximises social welfare in an open economy, circular investments will be turning to the economically viable side, when properly reflecting full-life-cycle costs and pricing-in of societal benefits (e.g. given the public good character of a CE).

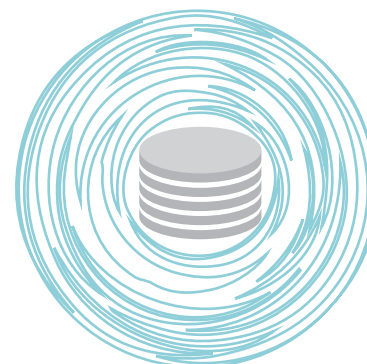


Financial instruments to promote circular economy

Based on governmental priorities, including Sustainable Development Goal (SDG) targets and Nationally Determined Contributions (NDCs) set in the Paris Agreement, different circular investment priorities can be identified, partly of private or public goods – and which require a combination of instruments and measures – across all sectors and material flows of interest.

Investment in CE may be divided into ‘investment in a CE-enabling framework’ and ‘investment in CE-related assets’:

- ④ Finance for developing a CE, i.e. financial resources as well as financial knowhow are largely conditioned by the respective national framework: **Investment in a CE-enabling framework** comprises investment in sector relevant regulation, assistance in formulating policies of regulators and institutions in the financial sector, development of skills, demand analysis etc. Those framework conditions determine the time frame and the amount of financial and technical resources required. A systematic pricing-in of various environmental damages related to linear activities would presumably boost CE by means of appropriate price signals. Therefore, adjusting existing frameworks to better internalise environmental costs (e.g., via regulation or industry standards) and addressing related capacity building needs remain crucial for creating a level playing field and for overcoming market failures and barriers so far identified.
- ④ **Investment in CE-related assets:** Investment in productive assets is a prior obligation for supporting CE. Access to adapted finance for those assets, through CE-aligned loan finance, equity injections, leasing agreements as well as risk mitigation instruments, is essential. Aligning finance is both, leveraging existing supply for more availability as well as developing new financial instruments in considering demand patterns of circular business models as well as capacities of financial institutions.



The respective responding mechanisms to overcome market failure are sketched in the following table.

Table 1 Different needs ask for different mechanisms and financial instruments

| Investment needs | Needs to overcome investment barriers | Responding mechanisms and instruments |
|------------------|--|--|
| | <p>Investments in enabling frameworks <i>(targeting policies/regulation and capacities)</i></p> <ul style="list-style-type: none"> ⊙ Modify institutional, regulatory and policy framework (correct systemic market failures), and ⊙ Adjust or develop new policies and regulations ⊙ Information and capacity building <p>Investments in assets <i>(targeting project-level assistance)</i></p> <ul style="list-style-type: none"> ⊙ Facilitate investment and management of assets to compensate investors for effects on the risk/return profile, reduce risks and provide access to finance. | <p>Internalise environmental costs; provide incentives for applying circular concepts via market and regulatory instruments, including:</p> <ul style="list-style-type: none"> ⊙ National strategies, regulation, standards and codes, and other policies (e.g. Extended Producer Responsibility (EPR) schemes), ⊙ Financial regulation (e.g. implicit taxes, monetary policy), and ⊙ Fiscal policies (e.g. virgin material or landfill taxes, reduced value added taxes and reform of environmentally harmful subsidies). <p>Address capacity building needs, including:</p> <ul style="list-style-type: none"> ⊙ Technical assistance and programmatic and tailored training (e.g. adjusted curricular in universities, trainings for local bank officers). <p>Provide funds for development at different stages <i>(transaction and scaling financial mechanisms)</i>, including:</p> <ul style="list-style-type: none"> ⊙ Access to finance: loan finance, equity investment, leasing (particularly <i>for profit</i>) and public finance instruments, grants (particularly for <i>non-for profit</i>), ⊙ Risk mitigation: such as loan default guarantees. |



For the selection of financial instruments, it is crucial to consider the stage of development (or **level of bankability**) as it also determines the opportunity for revenue-making of investments. While e.g. grant funding is recommended in the development phase of technologies (e.g. R&D for a modular built environment sector), which is far away from commercialisation, it is not recommended to distort scaled-up markets (e.g. electric vehicles) with non-reimbursable grant instruments. Financial market interventions must be studied with care, especially reflecting dynamics in the interaction with private capital (i.e. leveraging potential). Thus, grants can serve in the development phase as a risk mitigation part and leverage equity or debt markets, but can crowd out private sector actors in scaled-up markets due to public subsidies.

In summary, the **degree of concessionality** – the level of benefit provided to a borrower when compared with financing available at full market rates – should increase proportionally to the magnitude of the barriers to implementation. The following instruments are typically relevant for **three stages of development**:

- ⊙ **Proof of Concept (PoC)** for innovative projects, R&D, new technologies, products, or services: grants and venture capital,
- ⊙ **Commercialisation:** a combination of grants, equity financing and subordinated loans,
- ⊙ **Scale-up:** equity and debt financing (potentially with preferential conditions)

and have different functions – either enable access to finance, reduce risks or provide for an enabling environment.



Access to finance



Equity

For small projects, own funds might be enough to invest in project assets such as efficiency equipment. In case of large projects and limited own funds, project developers need to mobilise sufficient equity, e.g. via interested investors (private equity) or through the listing of the company on the public markets (public equity). Equity investments have the potential for high returns but are associated with higher risks.

Private equity funds invest generally in existing companies, particularly in firms with a more mature technology that need an equity injection to realise a specific (sustainable) project, introduce new products/product types or expand their production. These investors look for a positive return on investment in the double-digit range. This implies that private equity investors are also ready to absorb higher risks.

World Circular Economy
and
Natural Capital
Equity Index

Private equity and circular economy (selected samples)

- © BlackRock, Candriam, Crédit Suisse and ROBECO, amongst others offer private equity targeting CE projects, particularly in Europe through equity funds. Also, BNP Paribas provides a CE-based exchange-traded fund (reflecting the CE Leaders Equity Index).
- © The private equity Leadership Fund by Closed Loop Partners targets USD 300 million and focuses on acquiring CE-relevant companies (incl. recycling, packaging, organics).
- © The private equity fund of Circularity Capital (USD 78 million) invests in (European) circular SMEs (e.g. Grover, Winnow).
- © The global equity fund DWS Concept ESG Blue Economy invests primarily in companies that contribute to reduce ocean acidification and marine pollution, and to conserving the use of marine resources as well as sustainable fishing.
- © Public-driven equity is initiated among others by the European Commission and European Investment Fund that launched the BlueInvest Fund to provide financing to underlying equity funds and supporting companies in the marine environment to land-based businesses producing goods or services that contribute to the maritime economy (objective: improve access to finance and investment readiness for start-ups, early-stage businesses, and SMEs active in the Blue Economy).
- © The Moringa Partnership Fund is a private equity fund but also fed via public investors (incl. different development finance institutions) for larger scale profitable and sustainable agro-forestry projects (with integrated smallholder farms/value chain partners) in Latin America and Sub-Saharan Africa.

Venture capital (and angel investors) may also target interventions at the PoC stage, focus on companies at a (very) early stage of development at which new technologies are developed, or new markets are explored. This involves a high risk of failure, which consequently leads to highest return expectations. The return expectations must be seen in light of the fact that only a small fraction of the start-ups will actually succeed, and that the number of failed investments is high. The typical investment horizon is less than 10 years which are not in favour of circular activities, given their naturally long-term materialisation of revenues. The amounts invested are typically smaller than for private equity funds (e.g. in the sphere of around USD 10 million per start-up). Business models with no track records and limited profitability may benefit from equity injections to bridge the gap from pilot to growth stage.

Venture capital and circular economy (selected samples)

- © Investing in early-stage innovations that may require long-time horizons is offered by e.g. the VC private equity Plastics Fund 1 by Archipelago Eco Investors which targets EUR 100 million for impact investments in SMEs that are developing alternatives to single use plastic packaging or recovering value by recycling in a CE model (enabling businesses to transition from pilot to growth), the Blue Oceans Partners' venture capital support to CE innovators (primarily for reusing, recycling, and replacing plastics), and the Closed Loop Partners' Closed Loop Venture Fund that provides early-stage capital for companies (for increased product and packaging recycling), etc.
- © The American finance company MSCI has established a World Circular Economy and Natural Capital Equity Index to assess the performance of 30 stocks, etc.
- © Singapore-based Circulate Capital, a private equity fund targeting investments in waste management and circular solutions to combat plastic waste in South(east) Asia has raised USD 146 million across 3 funds (Disrupt Fund: USD 25 million in 2021, Ocean Fund: USD 106 million in 2019, Fund I: USD 15 million). Among the investors are PepsiCo, Procter & Gamble, Danone, Chanel, Unilever, and The Coca-Cola Company.

Debt (loans)

Debt finance instruments (e.g. lending) typically consist of loans provided by banks/financial institutions. Institutional investors and bonds (securities) issued by corporates or (sub-national) public authorities and sold to investors raise fixed-income capital. In general, lenders are more risk-averse than equity investors. While commercial loans tend to focus on more conservative risk/return calculations, concessional loans with more favourable terms (e.g. longer-term maturity, longer grace period) offer opportunities for circular business models. Concessional loans represent a subsidised financing for investors. For instance, traditional finance methods typically calculate the financing costs based on pure future cash-flows which is naturally not in favour of progressive circular activities, as it requires a more



Plafond – a dedicated credit facility with a focus on innovative CE projects

complex (e.g. considering full-cost accounting for the product life cycle and EPR and broader consideration (e.g. public good character).

Currently, very few dedicated circular credit lines or lending products with underlying CE metrics are available. However, associated initiatives that target for instance energy efficiency in manufacturing and housing do exist. For the scaling of viable CE concepts via lending, either CE metrics and principles should be built into existing (efficiency) actions and credit lines, or new CE credit lines or lending products should be developed and built on good practices (incl. networks and relationships with on-lending banks and final beneficiaries like SMEs).

Loan finance and circular economy (selected samples)

- © European Bank for Reconstruction and Development (EBRD)'s Circular Economy Regional Initiative (CERI) includes concessional co-financing in Turkey, Albania, Bosnia-Herzegovina, Montenegro, North Macedonia, Serbia for improving management of raw materials during the full lifecycle of products and diverting waste from landfills and the marine environment, reducing/avoiding GHG emissions, eliminating, preventing and improving management of harmful chemicals – specifically Persistent Organic Pollutants (POPs) and unintended Persistent Organic Pollutants (UPOPs).
- © European Investment Bank (EIB) reports about EUR 2.5 billion in lending for circular projects over the last five years, such as collection and recycling infrastructure for Waste Electrical and Electronic Equipment or the chemicals company Indorama Ventures that has committed USD 1.5 billion for investments in plastics recycling infrastructure.
- © IFC has provided a sustainability-linked loan to Corsan in Brazil to reduce water losses and decrease the loan's interest rate when the target is achieved^[7] This is the first sustainability-linked loan in the Brazilian water sector.
- © The Italian Intesa Sanpaolo banking group (private financial institution) manages Plafond, a dedicated credit facility (EUR 6 billion) with a focus on innovative CE projects – it includes (especially Italian) company solutions for lifetime extension of goods and materials, the regeneration of natural capital (e.g. restoration of degraded soils), and circular design with focus on reducing waste and pollution).

Debt (bonds)

When a bank loan is insufficient to finance corporates or (sub-) national governments, bonds can provide an alternative to attract capital. Bonds are debt securities sold to investors. While still in their infancy, new types of thematic bonds have emerged and include sustainability-linked, climate-aligned, or transition bonds. Internationally acknowledged are green, social and sustainability-linked bonds, defined by the International Capital Market Association (ICMA). For each type of bond, the ICMA has developed principles^[8] which serve as voluntary best practice guidelines, and which are updated regularly. Those thematic bonds are specifically earmarked to be used for thematic sustainable/social projects. Thus, 'green' is a bonus feature to the bond where the 'greenness' of a bond is defined by the projects the proceeds are financing and not by the issuer. Notably, with the development of sustainable finance and the increasing integration of climate-related risks into portfolio management, green bonds are highly attractive as investment opportunity.

To guarantee the 'greenness' of green bonds, several policy initiatives have been set up to support their issuance and development such as Green Bond Standards by ICMA, but also taxonomies incl. the Climate Bonds Taxonomy, the Green Bond Endorsed Projects Catalogue, or the proposed EU Taxonomy for sustainable activities. There is no established Circular Bond Guide available. However, the Circular Economy Practitioner Guide refers to the proximity to the ICMA Green Bond Principles as several of these opportunities cover elements of the CE, including energy efficiency, sustainable waste management, sustainable land use (including sustainable forestry and agriculture), clean transportation, and clean water.



New types of thematic bonds have emerged » sustainability-linked, climate-aligned, and transition bonds.

Bond finance and circular economy (selected samples)

Corporate bonds

- © BASF's green bond (EUR 1 billion) enables CE-adapted products and processes.
- © Kaneka chemical corporation promotes developing and manufacturing a bio-based polymer, which can contribute to circular plastics if it is biodegradable or recyclable.
- © PepsiCo's green bond (USD 1 billion) funds activities that lead e.g. to reduction of virgin plastics.
- © Haina Electricity Generating Company (EGE Haina) recently issued the first Dominican corporate 'green bond' (USD 100 million, max. 15-years, +5 per cent yield) de-nominated to ICMA green bond principles and sold pre-dominantly to local market actors.^[9] The issuance program obtained an 'A' risk rating by the Feller Rate Dominicana rating agency showcasing a strong market trust. Notably, the compliance with the standards has been validated by Pacific Corporate Sustainability and presents the first Climate Bond certification in the country, approved by the Climate Bonds Initiative.

World Bank's blue bonds targets plastic waste pollution in oceans.



Public international financial institutions

- © EBRD's green transition bond (USD 500 million) finances investments that enable circular manufacturing (incl. chemicals, cement, and steel production).
- © EIB's first Sustainability Awareness Bonds (SAB) (EUR 500 million) earmark partly CE-related lending (incl. waste prevention and recycling), and the Sustainability Bond (EUR 750 million). On January 2021, EIB issued a new EUR 1.5 billion SAB due 2041 allocated only to environmental and social projects contributing substantially to EU sustainability objectives. Notably, the SAB extends its objectives to 'protection and restoration of biodiversity and ecosystems'.
- © World Bank's Sustainable Development Bond (USD 10 million), also referred to as blue bonds, targets plastic waste pollution in oceans.
- © The Inter-American Development Bank (IDB) invests in B-bond structures to crowd-in institutional investors, who typically prefer to invest in more developed markets. The B-bond is sold to a special purpose vehicle and privately placed with an institutional investor agreement.

The Circular City Funding Guide highlights the relevance of **social impact bonds (SIBs)**, also known as 'pay-for-success bonds', 'social benefit bonds', or just 'social bonds') for circular city development. SIBs provide opportunities for e.g. city governments to raise funds to invest in innovative circular city initiatives without financial risk. SIBs are issued by (sub-) national authorities and there is no established standard yet.

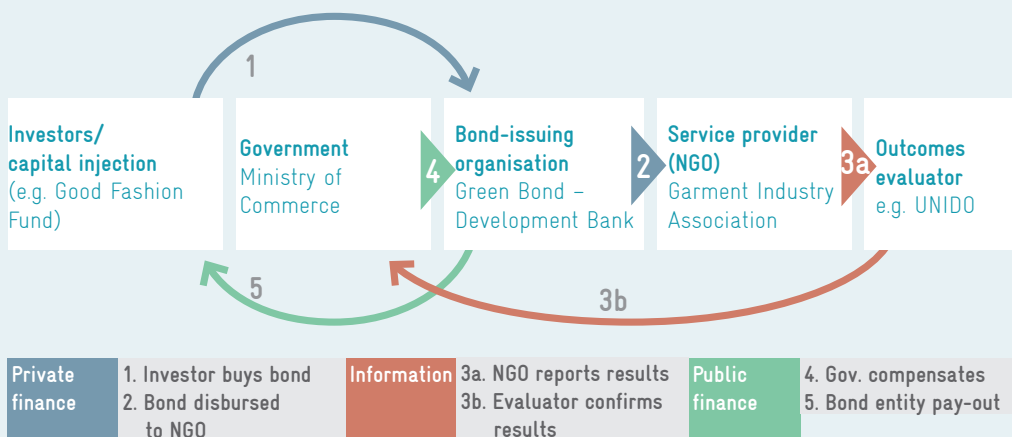
Social impact bonds can raise funds for innovative circular city initiatives

Generally, a social impact bond is an innovative agreement between a public authority (e.g. government), a service provider (e.g. non-for-profit organisation), and the bond-issuing organisation (e.g. financial institution). It is essential for the agreement that outputs (better: outcomes) are clearly defined. There are several actors with specific characteristics. First, a social impact entity that provides services against payments. Second, private investors with respective capital for circular impact. Third, a governmental entity who can sign effective performance-based contracts. Forth, a bond-issuing organisation that represents the intermediary between investors, service providers, and public authorities. Finally, an independent evaluation actor might be used to confirm results. Thus, an investor funds a non-profit organisation to produce a social outcome via the bond-issuing organisation, which disburses the invested funds to the service providers for financing operating costs. The governmental entity pays the bond-issuing organisation if circular outcome targets are met. The bond-issuing organisation uses these payments to reimburse the private investors and potentially provide the investors with a return on their initial investment.

Hypothetical circular impact bond example

Service provider (non-for-profit): Garment industry association; circular-impact-bond issuing organization (CIBIO) (e.g. International Finance Institute); private capital (e.g. Good Fashion Fund); government (e.g. Ministry of Commerce); evaluation unit (e.g. UNIDO, pioneer in chemical leasing). Output target: specific number of trainings for the business model chemical leasing to SMEs in the textile sector. Needed framework contract: a public authority signs a prepared contract with the CIBIO and the service provider (additionally, the outcome evaluator may be part of the contract for specifying technical details).

Figure 1 Practical example of a circular impact bond for the garment industry after the framework contract has been signed



The bond-issuing organisation issues the respective SIB. An investor buys liabilities from the CIBIO (individual contract between CIBIO and the investor). The CIBIO disburses the invested funds to the service provider. The service provider starts with the trainings. The outcome evaluator confirms the results to the governmental focal point. The government compensates the CIBIO with the agreed amount. The CIBIO buys back the liabilities from the investor and money flows back to the investor (incl. profit if agreed). This basic mechanism can be adjusted accordingly. For instance, government and investor (in case of philanthropic motives) can agree on splitting the required investment. Notably, the governmental actors must pay only after successful implementation but play a key role in the framework contract.



Reduce risks



Leasing

Leasing options can be seen as precursor of the large ‘**as-a-service**’ movement (esp. in digital services). The leasing commodity industry has been established in recent decades and is at the most favourable position to support circular activities. As-a-service models focus on allowing customers to efficiently access the equipment they need to run their business, rather than owning it. A crucial characteristic is the point of ownership in leasing models, as the lessors retain ownership of an asset throughout its lifecycle. This momentum is essential in a more circular thinking, as it maximises the EPR principle. The lessors take the responsibility for extending its useable life, recovering it for reuse and remanufacturing. In doing so it maximises its economic utility while minimising its environmental impact. The pay-per-service unit model (e.g. chemical leasing model^[10]) defines the payment (tied to the quantity or quality of service) and ownership (product manufacturer or retailer is responsible for installation). Sharing models are a variation of leasing, but the usage is typically shorter, and the pool of users is larger (e.g. for vehicle ride sharing, tools and equipment). For financial institutions ‘finance lease’ models are partially known. In this commercial arrangement, the lessee (e.g. borrower, user) and the lessor (e.g. financing entity) agree on terms and conditions (T&C) of using an asset (e.g. equipment, vehicle etc.). The lessee (s)elects the asset. The lessor purchases (!) the asset. Based on the T&C, the lessee pays the leasing fees. The ownership of the asset remains at the finance company. The contract period is defined in the T&C. After the contract termination, the asset can be returned to the lessor or retained by the lessee.

As-a-service models allow customers to access the equipment they need, rather than owning it.

Certain enabling factors are needed for leasing options. It is essential to allow secondary use of exempt assets for leasing. In addition, innovative thinking and applicability of best practices how to deal with financial risk insurance are needed. A strong political commitment in the development of secondary markets for equipment by introducing standards and codes spurs the development of leasing options. To facilitate the leasing concept, it needs to be considered during product design and for the end-of life cycle (incl. proper dismantling, and reuse or recycling of valuable parts or general refurbishment). Technical assistance for the development of a legislative environment that facilitates the development of leasing services in countries and promotes leasing in financial institutions is needed.

Leasing and circular economy (selected samples)

© BNP Paribas provides Leasing Solutions (together with 3 Step IT) that tracks the life cycle of corporate technology equipment (incl. computers, smartphones, printers, software, health-care) to avoid waste and encourage refurbishing and reuse, focusing rather on service than on the product. BNP Paribas Leasing Solutions proposes rental contracts of four to five years. Solutions are offered to manufacturers of charging stations which deal directly with companies such as electricity fitters (e.g. propose equipment with services), companies (e.g. propose long-term car rental packages), energy providers (e.g. lease charging points to customers), and vehicle manufacturers (e.g. offer cars with charging stations).^[11]

© Philips Healthcare Partnership is a business model that builds on upgradable equipment, system refurbishment and re-use of parts to reduce the total lifecycle costs of equipment and extend equipment lifetimes.^[12]

© Signify, formerly Philips Lighting, offers the ‘Pay per Lux’ service – selling lighting service rather than light bulbs, incentivising durability.^[13]

Guarantees

Guarantees are not direct financing as such but are offering **protection against associated risks** (loan defaults) and can help to access funding sources with improved financial terms and conditions. Public guarantees (endorsed by public authorities) are especially powerful in mobilising private financing for sustainable (but not yet commercially viable) activities. Guarantees can compensate for limited collateral from circular business models and strongly activate traditional debt and equity investors. Guarantees typically cover a portion of the losses to the financier if default events materialise.

Generally, the guarantees do not cover all potential losses, as this would remove the incentive to conduct an extensive due diligence from the investor's perspective. The split of losses might relate to, for example, protecting the financier against extreme losses, or the expected appetite of the financier to better manage their risks over time. In the case of a government-backed guarantee, a government agency guarantees that it will purchase the debt from the lending financial institution and take on responsibility for the loan.



Guarantees and circular economy (selected samples)

- © The Multilateral Investment Guarantee Agency (MIGA) provides political risk insurance and credit enhancement for private sector investors and lenders; e.g. in 2013, MIGA issued guarantees for covering equity investments by Suez Environment, Infilco Degremont, Inc. (IDI), and Morganti Group Inc. (Morganti) for the AS Samra Wastewater Treatment Project in Jordan for up to 20 years against the risk of breach of contract.
- © Multilateral IFC Blended Finance Fund, supported by a sovereign guarantee from Sweden's SIDA and separately a USD 1 billion green bond fund by International Finance Corporation (IFC) and Europe's Amundi asset manager, buys green securities (issued by developing country banks financing local currency climate investments).
- © EIB (COVID-19 response) guarantee schemes have been expanded, e.g. a EUR 25 billion European Guarantee Fund has been created to support up to EUR 200 billion of financing (debt and equity) for companies throughout the EU. At least 65 per cent of the financing will go to SMEs. Other relevant European public guarantee initiatives are e.g. the COSME – Loan Guarantee Facility^[14] (e.g. guarantee 80 per cent of loan amount), EaSI Guarantee^[15] (range of EUR 25,000 – 500,000), InnovFin Guarantees^[16], InvestEU – Guarantees^[17], the Modernisation Fund^[18] or other National public guarantees schemes.
- © ABN AMRO asks suppliers to issue a lifetime guarantee covering the functionality of a product or a specific part. If it breaks down earlier than expected, ABN AMRO pays for the repair on a pro-rata basis. Such an agreement incentivizes suppliers to look more critically at their products' lifespan and try to extend it using innovative and new solutions. In addition, the bank asks suppliers for a buy-back guarantee. The duration of this depends on the technical life cycle of the product.

Guarantees
can compensate for
limited collateral
from circular business
models.



Public private partnerships (PPPs)

Partnerships among governments, private sector, and civil society organisations (CSOs) are often useful to explore new business models and/or co-ordinate different economic activities. Core criteria are formalised partnership, risk-sharing mechanism, and financial incentives for private parties. Implications for CE activities are multifold. Generally, Key-Performance-Indicators (KPIs) are linked to time, labour, resource efficiency indicators and not specifically to circularity-related criteria. As the principles of the CE become increasingly relevant, as well as the corresponding benefits, more and more governments take the opportunity to combine benefits of the CE with the procurement of major infrastructure and utilities through partnerships with private sector actors. PPP models could be considered to structure public and private contributions and to **balance the early-stage (risky) character of projects** as well as the limited risk appetite of the private sector. PPP procurement for circular projects can provide an ‘ideal contractual environment’ which embeds circular economic principles in infrastructure and utilities projects. Governments should also be mindful that bid documentation and KPIs which encourage and reward innovation must be both pragmatic and implementable – prescribing unfamiliar new technologies, practices and materials can likely increase risk and inevitably decrease sponsor and lender appetite. Thus, circular innovation requires flexibility.

PPPs and circular economy (selected samples)

- © KfW's eco. business Fund in Latin America focuses on PPPs and the mobilisation of private funding towards preserving biodiversity and the sustainable use of natural resources.
- © ExpoLAB from the Netherlands formed a PPP to apply the Cradle-to-Cradle principles and exploit the CE concept in the built environment e.g. for the Venlo city hall (comprising a raw-materials databank based ‘passport’, detailing production and origin of materials and determined for high-grade reuse when reaching the end of their useful life.^[19])
- © Different PPPs are used e.g. as a procurement model by the public sector to address waste management challenges, e.g. to recycle construction and demolition waste, or in Belarus to improve the municipal waste management system by incorporating the private sector for collecting waste and recovering recyclables.^[20]



Enabling environment

The transition to CE entails the emergence of new and innovative business models incl. product-as-a-service via leasing, or tailored insurance for business-to-consumer rentals. However, those business models are often perceived as very uncertain given the lack of track record and the deviation from the standard linear business. Consequently, circular business models are considered as risky with uncertain returns given hardly predictable future outcomes. Strong enabling framework conditions are needed to create a level playing field for circular business models.

Public sector planning and finance plays a crucial role for mainstreaming circular principles (incl. resource efficiency and material recovery, etc.) across national policies.^[21]

A policy mix including economic instruments, regulations, information-based and voluntary approaches (e.g. green share reporting), environmental labelling (e.g. building codes), and public financial support (e.g. budget allocation) is needed to internalise environmental costs and provide incentives for applying circular concepts. Policy instruments can be grouped in three main categories:

eco. business Fund focuses on PPPs to preserve biodiversity.

- ⊗ **Market instruments** can be used to generate public revenues, but also to internalise environmental costs to facilitate resource efficiency (e.g. taxes on virgin material, environmentally motivated subsidies for incentivizing the re-use of materials and recycling, pay-as-you-throw schemes, tradable landfill permit schemes), to reform environmentally harmful subsidies. Generally, the use of market instruments requires a full reflection of possible outcomes to prevent contra-productive policies (e.g. incineration facilities and policies such as increased landfill taxes and landfill bans, which could make incineration more attractive to investors, but reduce progress towards recycling).
- ⊗ **Regulatory instruments** may comprise recycling targets, product (quality) standards (eco-product design mandates), recycled content requirements, requirements on the reparability of products, requirements for recyclability, lifetime warranties, bans and restrictions, and deposit-refund systems (DRS).
- ⊗ Other instruments, incl. information programs and campaigns or specific public procurement policies.

Groups of instruments can slightly differ across disciplines. Thus, the list is only illustrative, overlapping and different allocation is possible.

Within the set of market and regulatory instruments, the following are **particularly relevant to enable a CE**:

- ⊗ **EPR** schemes based on the polluter-pays principle internalise the end-of-life management costs of materials, including collection and recycling (e.g. of packaging, electronic and electric equipment, batteries, tires and end-of-life vehicles, furniture and textiles) and are usually set on a per-unit or per-weight basis. They should encourage manufacturers to take responsibility for the environmental impacts that are associated with their processes and products. They can include benefits such as waste prevention, reuse and recycling, use of recycled material, generation of economic value, and reduced incineration.
- ⊗ **Green and circular public procurement** incl. due diligence guidance for responsible business conduct, and for alignment with environmental and social standards. An example represents the OECD Due Diligence Guidance for Responsible Supply Chains in the Garment and Footwear Sector.^{[22],[23],[24]}
- ⊗ **Information and capacity building** for improving data, indicators and accounts on resource efficiency and waste (e.g. based on material flow accounts), R&D, and improving knowledge on the environmental impacts and costs of material resource use, environmental labelling and information schemes, voluntary agreements and other private sector initiatives.

As instruments such as trainings and policy-based support are not generating direct revenue streams, grant funding and policy-based lending are important levers for shaping an enabling framework for CE.

- ⊗ Generally, **non-reimbursable grants** as one-time payments/upfront installment cover a percentage of capital cost investments and can therefore function as an enabler by financing non-revenue generating parts (e.g. R&D, technical assistance). Grant financing in the area of soft costs investment, such as the creation of a suitable regulatory environment, including sectoral reforms, can be a prerequisite for the supply of commercial financing for the deployment of technologies.
- ⊗ To shape enabling environments such as policy reforms and institutional changes, **policy-based loans (PBLs)** are provided by multilateral and bilateral development finance institutions. Often, PBL projects are designed as multi-donor programmes and in combination with other financing instruments.

CE business models are considered as risky with uncertain returns.



Applicability of financial instruments on the circular economy Value Hill

For the selection of the best suited financial instruments to promote CE, it is crucial, as mentioned above, to consider the stage of development as well as the targeted phase in the production cycle. The following table maps selected financial instruments on the CE Value Hill according to their applicability along the stages of development:

Table 2 Stages of development and the choice of instruments on the CE Value Hill (Marker: + common choice, – less common choice)

| Degree of bankability » | Proof of concept (PoC) | | Commercialisation | | Scale-up | | |
|-------------------------|------------------------------|------------|-------------------|------------|----------|------------|----------|
| | Choice | Value Hill | Choice | Value Hill | Choice | Value Hill | |
| Access to finance | (E) Private equity | + | | + | +++ | All | |
| | (E) Venture capital | ++ | All | + | + | | |
| | (E) Public markets | -- | | - | + | | |
| | (D) Commercial loans | --- | | + | +++ | All | |
| | (D) Concessional loans | - | | +++ | All | -- | |
| | (D) Green/social bonds | | | ++ | Top | +++ | All |
| | (E/D) Peer-to-peer lending | + | | ++ | Top | - | |
| | (E/D) Payment for success | ++ | Top | ++ | Top | + | |
| Reduce risk | (G) (Loan) guarantees | ++ | All | ++ | All | + | |
| | (G) (Purchase) guarantees | - | | + | | + | |
| | Grants | +++ | Up/Down | --- | | --- | |
| | (G) Insurances | - | | + | | ++ | All |
| | Leasing options | | | ++ | Top | ++ | Top/Down |
| Enabling environment | Capacity building (training) | +++ | Up/Down | + | | - | |
| | Define sustainable standards | - | | + | | ++ | Up |
| | Fiscal policy development | + | | ++ | Up | ++ | Up |

Note: This is a simplified non-exhaustive depiction and only indicative, suitability of financial instruments depend on national context, incl. financial sector development, depth of capital markets, financial regulation etc. Overlapping possible. (E)=Equity; (D)=Debt; (G)=forms of guarantees.

Grant funding and policy-based lending are important levers for shaping CE-enabling frameworks.





2

Circular economy approaches in relevant sectors and material streams – barriers and potential entry points

The first chapter underlined that financial instruments have to be selected carefully in order to unfold the intended impact. This chapter therefore zooms into sectors and material streams that are of particular relevance for circular economy globally, describes the specific barriers and challenges herein, locates them on the Value Hill, and identifies levers and potential entry points to introduce and strengthen circular economy approaches.



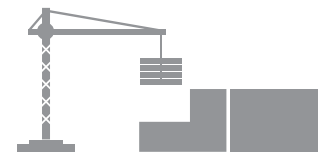
Construction, buildings and demolition waste

The construction sector is responsible for a significant share of current and projected material consumption. A GI Hub analysis indicates that infrastructure consumes around 63 per cent of the world’s materials, while the G20 share of this consumption is around 80 per cent.^[25]

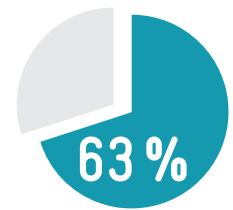
The majority of materials used in construction are non-metallic minerals. Their annual consumption is projected to double by 2050.^{[26],[27]} The sector’s GHG emissions account for approximately 40 per cent of global GHG emissions. The major contributors to these emissions are the materials used^[28] as well as the heating, cooling, and lighting of buildings and infrastructure. Especially the production of concrete is a major source of CO₂ emissions due to the high carbon footprint of cement (about 109 Mt of CO₂ per year).^[29]

Because of the linear design of buildings, most construction materials are discarded or down-cycled at the end-of-life stage. The introduction of CE approaches in the construction sector is one of the most promising concepts in order to keep construction materials in the value chain for as long as possible. CE offers opportunities e.g., in avoiding 500 Mt of additional primary steel production by 2050, corresponding to GHG emission savings of more than 1 billion tonnes per year.^[30]

The following figure illustrates common barriers to circularity in the construction sector, as well as potential entry points for circular approaches and suitable financial instruments.



Infrastructure consumes



of the world's materials

Figure 2 Construction » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy

BARRIERS

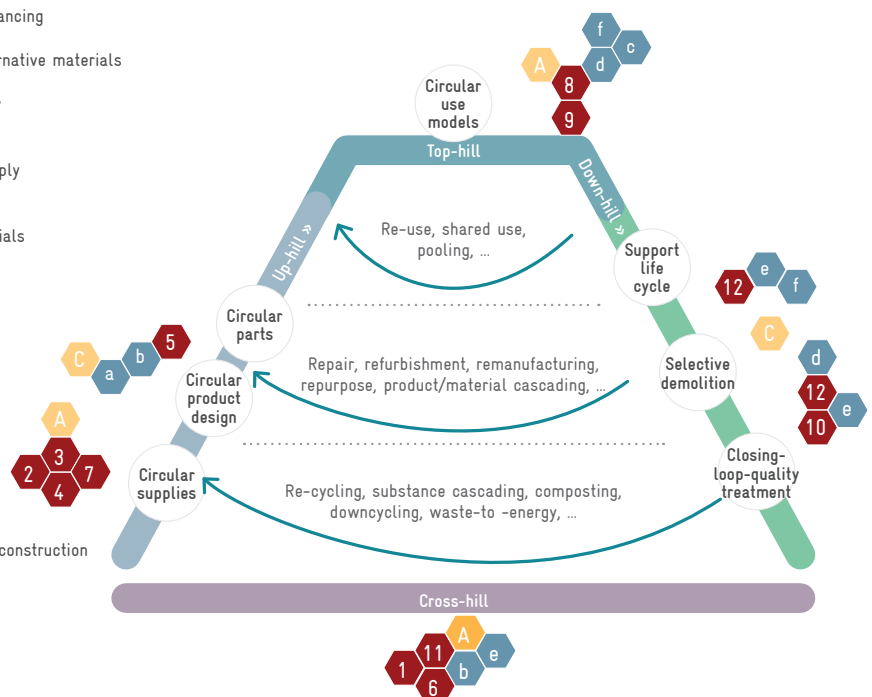
- 1 Long life span hampers resource flow, value sharing, and financing
- 2 Price disadvantage for low-carbon intense materials
- 3 Lack of agreement/regulation on industry standards for alternative materials
- 4 Unstable secondary (quality) material supply
- 5 Limited knowledge and collaboration on design for circularity
- 6 Limited incentives along the value chain
- 7 Lacking characteristics of organic materials
- 8 Complex and multi-module value chains hamper circular supply
- 9 Unfavorable financing and tax schemes
- 10 Lack of traceability of products and materials
- 11 No reliable information and database for products and materials
- 12 Lack of construction and demolition waste management

POTENTIAL ENTRY POINTS

- A Incentives for secondary markets
- B Standards and norms for construction and materials
- C Waste/resource treatment infrastructure and technology

FINANCIAL INSTRUMENTS

- a Grant-funding and technical assistance (e.g., standards and norms)
- b Finance R&D on circular construction (e.g., housing solutions)
- c Develop finance mechanisms for B2B and B2C focusing on circular BMs
- d (Non-) concessional loans (e.g., KPI-linked) for e.g., modular construction
- e PPPs and circular procurement
- f Long-term, low-interest finance for SMEs for circular BMs (e.g., eco-friendly / construction)



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

Buildings and other infrastructure are amongst the longest lasting products, which expand the value chain not only across countries but also across a long time span. This makes value sharing with other stakeholders challenging, e.g. between resource and material providers, constructors, beneficiaries of constructions, and recyclers. Value sharing, however, would be key to decrease costs per construction phase for the beneficiaries of the buildings. Additionally, as costs and benefits are not shared over time, and frameworks for the transfer of ownership for built-in products can be demanding, the bankability of circular construction projects as well as for product-service-systems is still inadequate.

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the construction sector.

Table 3 Circular economy approaches for construction – overview of sector characteristics

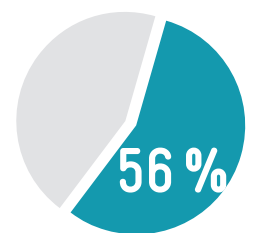
| Main challenges | Potential entry points | Main drivers |
|--|---|---|
| <p>Cross-hill: Overconsumption and long-time stocking of natural resources in infrastructure buildings.</p> <p>Up-hill: Underuse and premature end of use of available infrastructure resources.</p> <p>Down-hill: Premature end of life of construction material (downcycling or dumping of construction waste).</p> | <p>Cross-hill: Enable value sharing over long time horizons and along the complex value chain. Supporting and financing business models for the reuse of resources and materials.</p> <p>Up-hill: Finance innovation for reduced resource and material input and incentivise design for recycling and collaboration along the value chain (i.e. building passports, modular construction).</p> <p>Top-hill: Support and finance optimal use and life cycle models for infrastructure.</p> <p>Down-hill: Finance technology and business model development to increase reuse and recycling of construction material.</p> | <p>Main driver is a policy framework as well as enabling financial instruments to overcome the long-time horizon of construction and allow for innovative value creation and sharing of architecture along the value chain.</p> <p>Additionally, a close collaboration of all stakeholders is necessary to develop and work towards a joint long-term use vision for buildings.</p> |



Capital equipment

Capital equipment incorporates a vast range of physical hardware, e.g. machinery and equipment, from data servers to medical scanners, and from power plants to ships. While essential for serving society’s needs around the world, capital equipment manufacturing consumes 7.2 billion tonnes of raw materials globally each year and accounts for more than half (56 per cent) of global ore consumption. It is critical to optimise the inventory of capital equipment and its uses through circular strategies to reduce and minimise environmental impact, address resource scarcity, increase market resilience, and develop value chain sustainability.

7.2 billion tonnes of raw materials are needed annually for capital equipment manufacturing which accounts for



of the global ore consumption.

Capital equipment, together with buildings and infrastructure, represent key components of the overall economic stock (materials in long-term use). Their lifespan covers decades. The demolition of long-lived assets represents 23 per cent of global waste generation every year. The specific characteristics of the construction sector are treated in the previous chapter.

Capital equipment is designed, built, and acquired to last. Therefore, circular strategies, that are applicable to short-living products and consumables (‘products that flow’), might not be effective and/or suitable. Capital equipment as long-life products (‘products that last’) require a specific approach.

The following figure illustrates common barriers to circularity for capital equipment, as well as potential entry points for circular approaches and suitable financial instruments.

Figure 3 Capital equipment » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy

BARRIERS

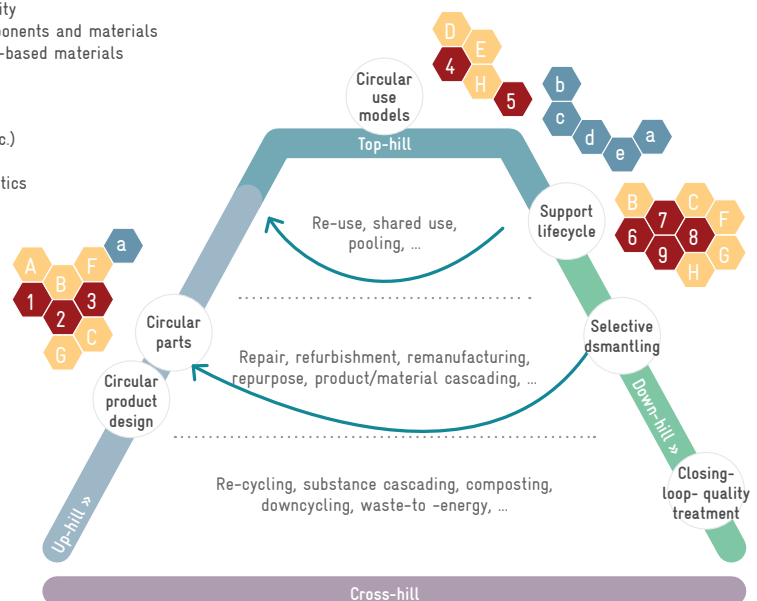
- 1 Lack of industry-wide standards and definitions for design for circularity
- 2 Lack of transparency on origin, quality, and content of secondary components and materials
- 3 Low-demand nascent markets for used components and secondary bio-based materials
- 4 Short innovation cycles impede technical longevity
- 5 Data inconsistency and silos (e.g., for sharing equipment)
- 6 Regulatory disincentives to product use extension (e.g., current accounting rules for depreciation favour new products, etc.)
- 7 Regulatory obstacles to return end-of-use equipment
- 8 Complex regulatory processes/high transaction costs for reverse logistics
- 9 ‘Second life’ enabling technologies underdeveloped

POTENTIAL ENTRY POINTS

- A Standards and regulations (e.g. product passports)
- B Removing incentives for linear solutions
- C Cooperation and collaboration, e.g., on traceability standards
- D ‘Circular-ready design’
- E (Governmental) procurement guidelines
- F Policy incentives for circular solutions like reverse logistics, and tracking mechanisms
- G Data collection and analysis
- H Favourable investment conditions

FINANCIAL INSTRUMENTS

- a Policies/regulations via grant funding/technical assistance on circular procurement and end-of-use management
- b Promote capital equipment leasing options (incl. leasing finance) for as-a-service circular BMs
- c Crowdfunding for commercializing digital solutions
- d Debt/equity instruments for leasing, as-a-service, pay-per-unit, and pay-as-you-throw BMs
- e (Non-)concessional loans (e.g., KPI-linked) for circular BMs (e.g., focussing on durability, modularity)



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc.
 Source: adapted from GLZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

Capital equipment has a strong potential for resource-efficient value creation. Its long lifespans can be extended even further, be shared in use, and slowing down their degradation could contribute to major waste avoidance, given the extensive size of the existing economic stock of equipment. The treatment of retired aircraft, for example, showcases the potential of circularity: 85 to 90 per cent of its content is reused or recycled, with around 40 to 50 per cent redistributed as useable components. Any unserviceable materials are recycled and fed back into the supply chain as raw materials.^[31] CE strategies targeting capital equipment should aim at retaining the highest possible value of the equipment, focusing on reuse including repurposing, refurbishing, and remanufacturing as well as on remote and predictive maintenance, remote and on-site upgrades, and software solutions that improve use rates of hardware or can even replace hardware (e.g. a mobile app instead of a dedicated screen). Still, recycling remains the final solution when the technology or condition makes the equipment no longer viable. In the capital equipment sector, the financial capital invested and at stake is relatively high. Therefore, customers are already more used to keeping their investment through service models. With stakeholders in a business-to-business setting, this makes it easier to arrange new business models, such as ‘product-as-a-service’, compared to business-to-consumer settings. Against this background, circular strategies such as maintenance and refurbishment have been applied as common practice in the capital equipment sector for quite some time. This makes the capital equipment sector a CE frontrunner in some respects, that has good practices and learnings to share with other sectors. However, there is still a need to improve the economics of reuse models.

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the area of capital equipment.

Table 4 Circular economy approaches for capital equipment – overview of sector characteristics

| Main challenge | Potential entry points | Main drivers |
|---|---|--|
| Cross-hill: Large resource consumption and long-term stocking. | Up-hill: Support the extension of usage time of products by e.g. investment in technology options and regulatory and market frameworks for circular business models. | Main drivers are technological solutions as well as regulatory and market frameworks to enable extended use cycles such as supporting taxation. |



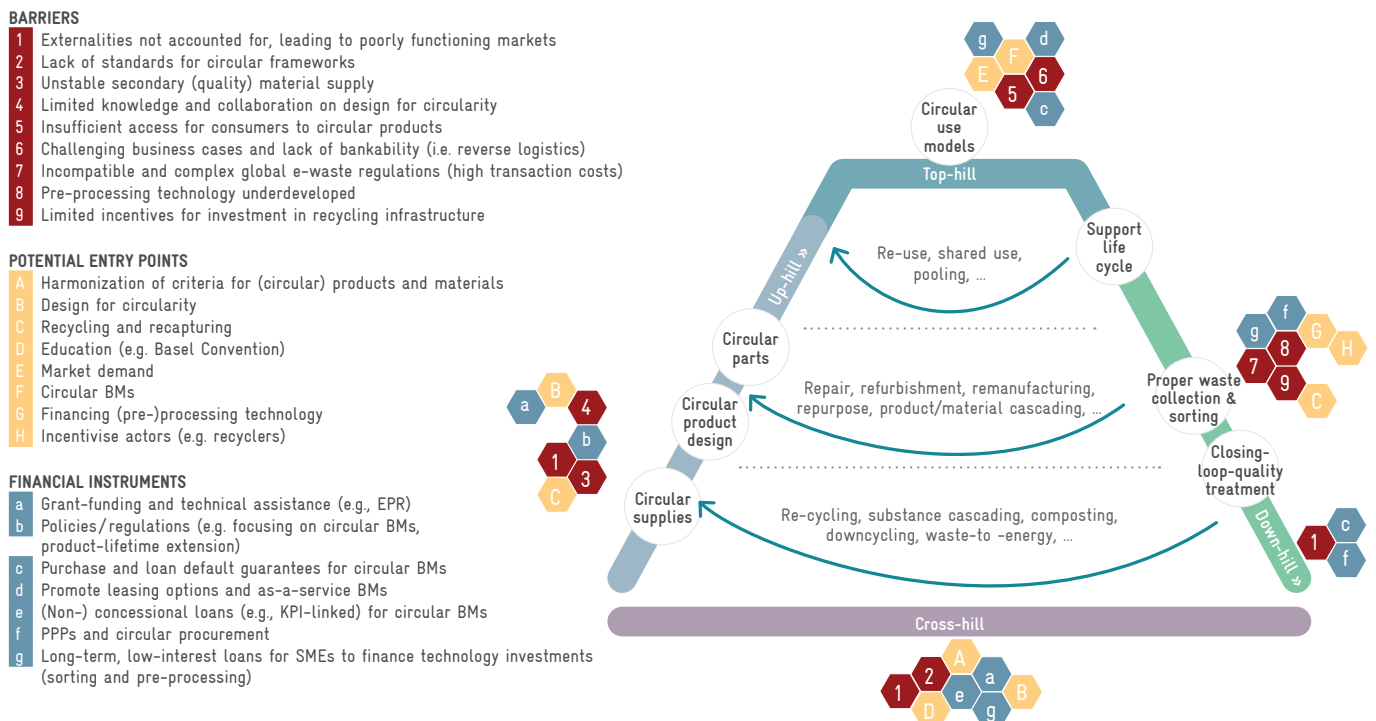
Electronics/Information and Communications Technology

Electronic and electrical waste (e-waste) is the fastest-growing waste stream in the world. In 2018, about 50 million tonnes of e-waste (incl. 150 million phones) were generated globally.^[32] Only about 20 per cent of e-waste is collected and recycled appropriately. The other 80 per cent end up in the residual waste streams or are traded or treated under inadequate conditions. Theoretically, nearly all electronic waste could be recycled but metals are difficult to extract from e-waste. It could be profitable as e-waste is worth at least USD 62.5 billion annually. ‘Urban mining’, where resources are extracted from complex waste streams, can now even be economically more viable than extracting metal ores from the ground. Despite the dire need and important opportunities, a circular transition for the electronics industry faces many barriers beyond the control of any individual stakeholder. The key barriers can only be overcome by collaboration and cooperation along the value chain and amongst all stakeholders like governments, businesses, and civil society.^{[33],[34]}



The following figure illustrates common barriers to circularity in the electronics/information and communications technology (ICT) sector, as well as potential entry points for circular approaches and suitable financial instruments.

Figure 4 Electronics » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

Electronic consumer goods are amongst the fast-flowing goods (especially in relation to the value of the input materials). Policy frameworks as well as support for business models that enable long product lives are necessary to stop material losses and reduce pollution.

The supply chain is global, highly complex and laden with environmental and social conflicts. Due to the participation of countries with weak or non-existing regulations, global regulatory intervention is mandatory to prevent exploitation of regulatory loopholes and allow for circular solutions and value sharing. Beyond that, economically viable reverse cycles are crucial for closing resource loops. Hence, design for recycling as well as investment in innovative recycling technologies is needed.

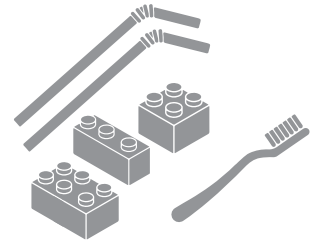
The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the electronics sector.

Table 5 Circular economy approaches for electronics/ICT – overview of sector characteristics

| Main challenges | Potential entry points | Main drivers |
|--|--|---|
| <p>Top-hill: Many electronic products are designed to be fast-moving consumer products that underly electronic ‘fashion-trends’, adding to the waste crisis.</p> <p>Down-hill: Immense amounts of electronic waste are generated and about 80% cannot be accounted for or are known to be (illegally) disposed of. Even as product-life extending markets exist, the products eventually end up as waste.</p> <p>Recycling of electronic products is complex and costly.</p> | <p>Cross-hill: Prevention of loss of electronic waste (e.g. enforcement of policy frameworks, setting up mandatory and tangible reverse logistic cycles, ownership of material remaining with the provider, etc.)</p> <p>Cross-hill: Closing the material cycle by designing for easy recycling, supporting recycling-technology innovation, and fostering value chain collaboration.</p> <p>Top-hill: Substantial extension of the use-phase and possibility of refurbishment of products needs to be supported.</p> | <p>The key barriers for circularity can only be overcome by collaboration and cooperation along the value chain and amongst all stakeholders.</p> |

Plastics

Plastic is widely used in many sectors for good reasons. The generation of plastic waste, however, is strongly influenced by the lifetime and cost of the product. While the main problem of short-term products is current waste generation (96 per cent of plastic packaging ends up as waste^[35]) and its leakage into the environment, products with a long mean lifetime, like building products (in average about 35 years), create other problems: they delay crucial issues like the treatment of toxic or non-recyclable materials into the future. Therefore, also for those applications, it is important to rethink material composition and design.



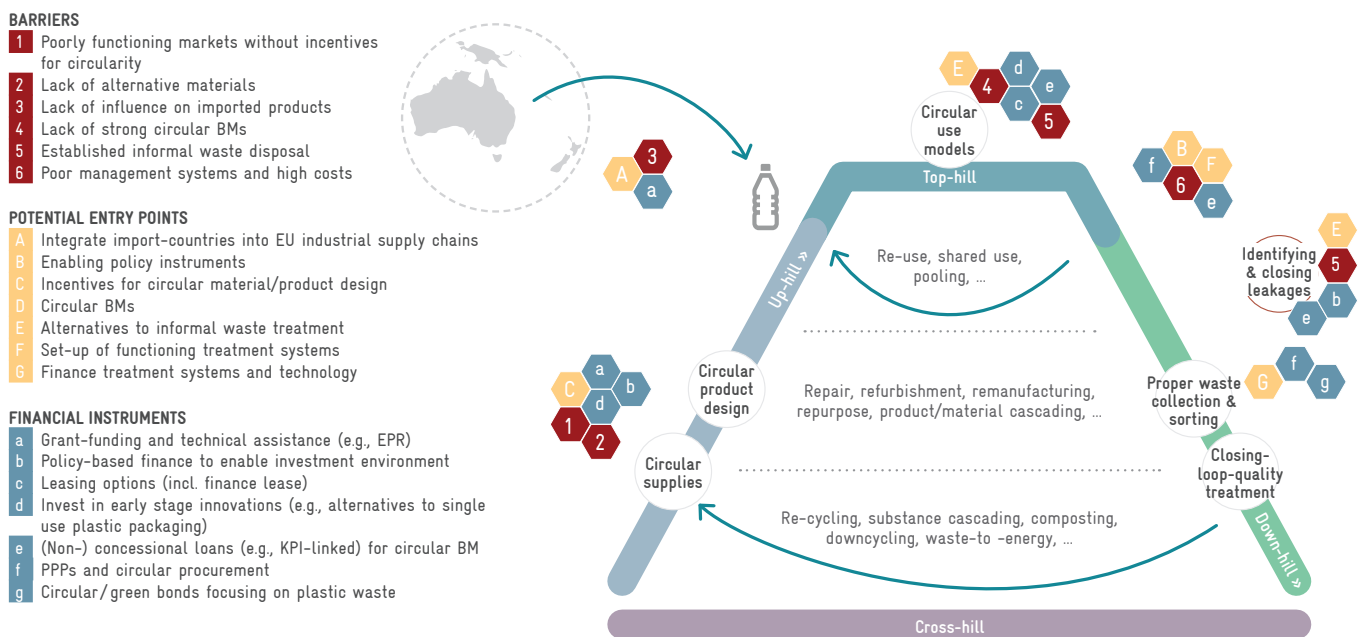
A common problem of all plastic products is their reliance on and consumption of fossil resources. The plastic industry in the United States of America, for example, releases along its value chain at least 232 million tonnes of GHG emissions each year. That is the equivalent of 116 coal-fired power plants.^[36] Another joint problem is a tremendous addition of (problematic) additives to enhance the materials performance such as plasticizers, flame retardants, antioxidants, acid scavengers, light and heat stabilisers, lubricants, pigments, antistatic agents, slip compounds and thermal stabilisers.^[37] These substances can migrate, be emitted, leak, fragment or be released^[38] into the environment and thus put ecosystems and human health at risk. Moreover, they pose obstacles to recycling.

The plastic industry in the US releases annually GHG emissions equivalent of 116 coal-fired power plants.



The following figure illustrates common barriers to circularity in the plastics stream, as well as potential entry points for circular approaches and suitable financial instruments. The specifics of plastic packaging are considered in the next chapter.

Figure 5 Plastics » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GLZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

The use of plastics allows to create tailored product characteristics. Plastics are comparably cheap, with low part-complexity, lightweight, and can exhibit diverse material properties through customisation with a variety of additives. With these prerequisites, plastic most likely will remain part of our economic life. Alternatives for fossil fuel-based raw materials as well as for the use of problematic additives (e.g. flame retardants for textiles used in airplanes or in building insulation, etc.) need to be explored and solutions for a safe product life and end-of-life treatment to be found. Currently, for example, styrofoam scraps containing flame retardants used e.g. on building construction sites are released into the environment where they are mechanically broken down into microplastics and further dissipate into ecosystems. The choice of input material, product design as well as transparent data about material composition (i.e. digital product passports) are decisive factors for the recyclability of the products.

In general, mid- to long-lasting plastic products (e.g. parts for cars or machinery, windows, kitchen machines, etc.) can be traced to a manufacturer or could be designed for traceability. Plastic products that last can be part of mid- to high-pricing product groups, which allows for certain use-extension or take-back schemes. Supply and value chains of slow-flowing plastic products are often semi-complex and expand over two or more countries. Moreover, the reduction of plastic production through prevention, reuse and new delivery models offers the biggest potential to reduce plastic pollution and therefore exhibits the highest mitigation opportunity for GHG emissions.^[39]

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the plastics stream.

Table 6 Circular economy approaches for slow-flowing plastics – overview of sector characteristics

| Main challenges | Potential entry points | Main drivers |
|---|--|---|
| <p>Top-hill: General (over)-consumption of resources, mostly due to a still 'premature end-of-use' of products (e.g. windows or floorings are destroyed when buildings are refurbished or torn down) and 'underused product capacity' (e.g. kitchenware, like mixers are present in many households but are seldomly used).</p> <p>Top-hill: uncontrollable leakage of materials containing problematic substances along the production and use process.</p> <p>Down-hill: end-of-life treatment of toxic or non-recyclable materials (e.g. flooring, plastics in electronic products) is delayed into the future, where they prevent safe and like-for-like recycling.</p> | <p>Up-hill: Address (over)-consumption of resources and delay of treatment of problematic substances during the design phase of a product by choosing (alternative) input materials as well as by design for re-use or recycling.</p> <p>Top-hill: Depending on the kind of product, innovative product life cycle extension models (e.g. product longevity, re-use, sharing-models, etc.) can help to keep products in use for longer.</p> <p>Down-hill: Closed material loops or similar adequate end-of-life collection and treatment has to be ensured.</p> | <p>Plastic has a fractured manufacturing chain with an asymmetric power balance. Formulators – the ones able to design-in recyclability – are generally not the decision makers in terms of product composition. Neither the manufacturer nor the customers and recyclers, demand circularity. Therefore, regulatory frameworks that address all actors along the whole value chain are certainly the main driver.</p> |

Packaging including plastic packaging

The primary purpose of packaging is to **protect its contents** from any damage that could happen during **transport, handling, and storage**. The packaging sector is highly complex with many stakeholders involved. Packaging belongs to the very low-priced products and manufacturing rarely expands over more than two countries. However, stakeholders from other sectors such as retail, distributors, and of course the consumers as end-users are important decision makers when it comes to packaging design. The packaged goods are usually distributed globally, and the packaging material can hardly be traced or re-routed back to the producer.

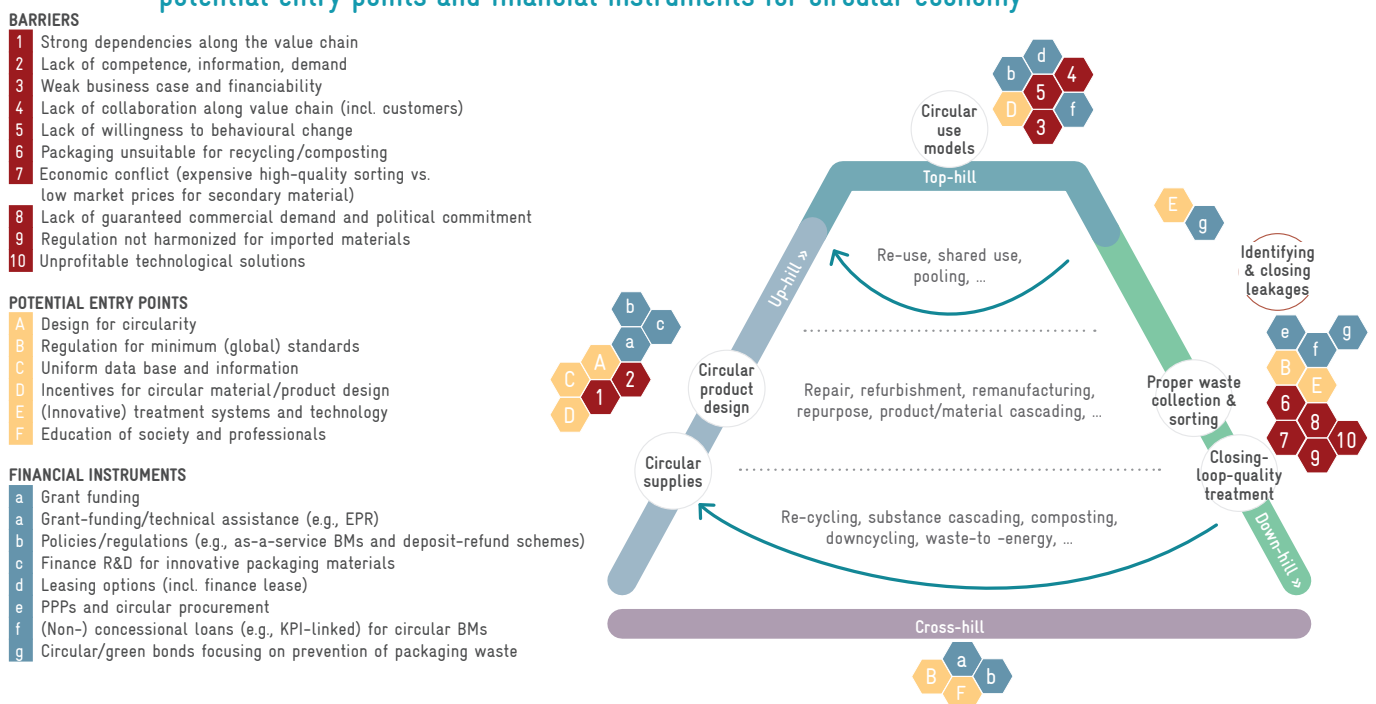


Over the last decades, packaging has become a massive problem. The majority of packaging is designed for single-use and a large proportion of it leaks as waste into the environment (see also the section about waste management below). In 2019, a total volume of 79.3 million tonnes of packaging waste was generated in the EU. Paper and cardboard (40.6 per cent), plastic (19.4 per cent), glass (19.2 per cent), wood (15.6 per cent), and metal (5.0 per cent) are the most common types of packaging waste. The EU reports a recycling rate of packaging waste of 64.8 per cent for 2019.^[40] While these amounts at least did not end up in the environment, the figures also do not represent the kind of like-for-like recycling we need to see in a CE. Packaging waste that is downcycled, used as substitute fuel, and in some cases incinerated, is included in those recycling figures. While paper, plastics, metal, and glass in general have very good recycling properties, the packaging and its material compounds are usually designed in a way that prevents single-origin collection and like-for-like recycling.

79.3 million tonnes of packaging waste was generated in the EU in 2019

The following figure illustrates common barriers to circularity in the packaging stream, as well as potential entry points for circular approaches and suitable financial instruments.

Figure 6 Packaging » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

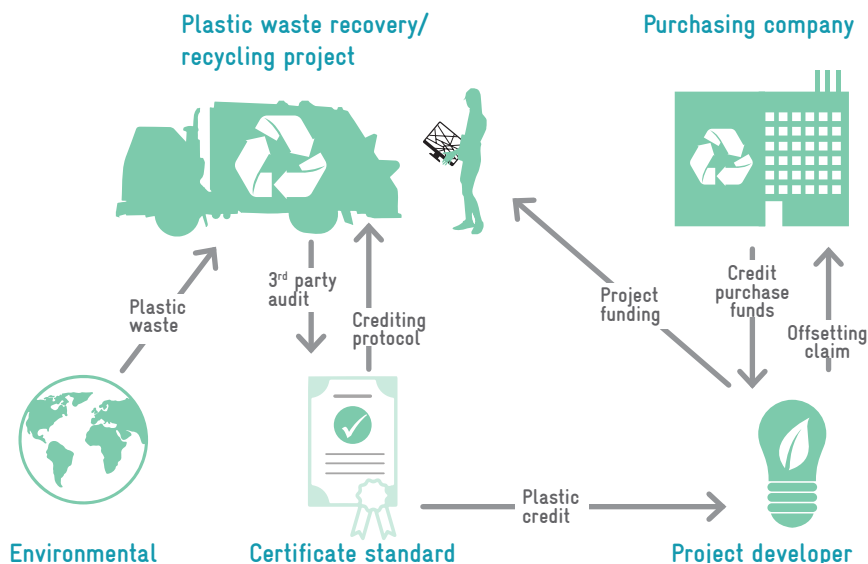
Packaging is usually a single-use product and is amongst the fastest-flowing resources in our economy. One way to address packaging waste challenge is to design out packaging wherever possible, and to slow down the resource flow by designing re-usable packaging. However, the majority of packaging might remain single-use. In that case, the resource flows need to be organised and controlled. The current design of packaging allows for a wide range of improvements, e.g. by phasing out fossil-based input materials, design for recycling, tracer-based sorting of materials, etc. Beyond that, lacking waste management still leaves many opportunities to improve resource flows.

Plastic credits – an innovative finance mechanism?

Plastic credits can be bought by both companies as well as private consumers to compensate for their plastic footprint. While not necessarily creating sufficient and sustainable funding, they promise to be an efficient instrument to improve the collection and treatment of plastic waste in areas without sufficient waste management infrastructure while creating socio-economic co-benefits by improving income opportunities for waste workers. There is no commonly agreed definition of plastic credits yet. The various schemes differ greatly with respect to their standards and processes. Hence, plastic credits still entail some risks for (unintended) consequences like green washing or undermining of EPR schemes.^[41]

A plastic credit is a transferable unit representing a specific quantity of plastic pollution removed from the environment and/or fed back into the CE (i.e. collected and/or recycled) in excess of what would have happened in the absence of the credit-generating activity (i.e. business as usual). Plastic credits reduce the amount of plastic in the environment (or that which would have ended up in the environment) and increase the circularity of plastics through funding waste collection and/or recycling activities.^[42] The following figure describes the basic mechanism of plastic credits.^[43]

Figure 7 Plastic credit creation



Source: Adapted from Sustainable Plastics (2021). Giving credit where due: finding more value in plastic. <https://www.sustainableplastics.com/news/plastic-credits-can-help-scale-recovery-and-recycling-efforts>.



Provided that the (potential) shortcomings of plastic credit schemes are taken into account, the general blueprint of plastic credits can be used as starting point to address market imperfections, especially at the end-of-life phase of plastic. However, focusing on one material only limits synergies in waste management severely, i.e. collecting plastic waste together with metal or glass. As such, plastic credits are still a linear answer to a linear problem – a fix of the system instead of a systemic approach to transform the system. Such frameworks need to be developed further in order to become an impactful lever to address market imperfections.

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the packaging stream.

Table 7 Circular economy approaches for packaging – overview of sector characteristics

| Main challenges | Potential entry points | Main drivers |
|---|--|--|
| <p>Up-hill: General (over)-consumption of resources and materials and lack of optimised packaging design for re-use and recycling.</p> <p>Top-hill: The anonymity of packaging producers makes packaging waste a problem of the importing countries.</p> <p>Down-hill: Packaging waste leaking into the terrestrial and marine environment (illegal dumping, landfills and littering).</p> | <p>Up-hill: The recyclability and reusability of packaging material, the optimal use of material as well as the substitution of harmful materials needs to be addressed already in the design phase.</p> <p>Top-hill: Countries need to provide frameworks to control materials or products that enter their country and to ensure their readiness for circularity.</p> <p>Down-hill: The leakage of packaging waste into the environment needs to be stopped by ensuring secure waste collection systems in countries will lacking collection coverage and by preventing the export of wastes into such countries.</p> | <p>Relevant actors in the complex and fractured (global) system are packaging developers, material providers (formulators), product providers, commerce and distributors and customers, as well as waste collectors, and recyclers.</p> <p>Tight regulatory and political frameworks, especially for food packaging which prevent circular approaches (i.e. reusable packaging) is often in place. Changing packaging means to change a very complex system.</p> |

Textiles



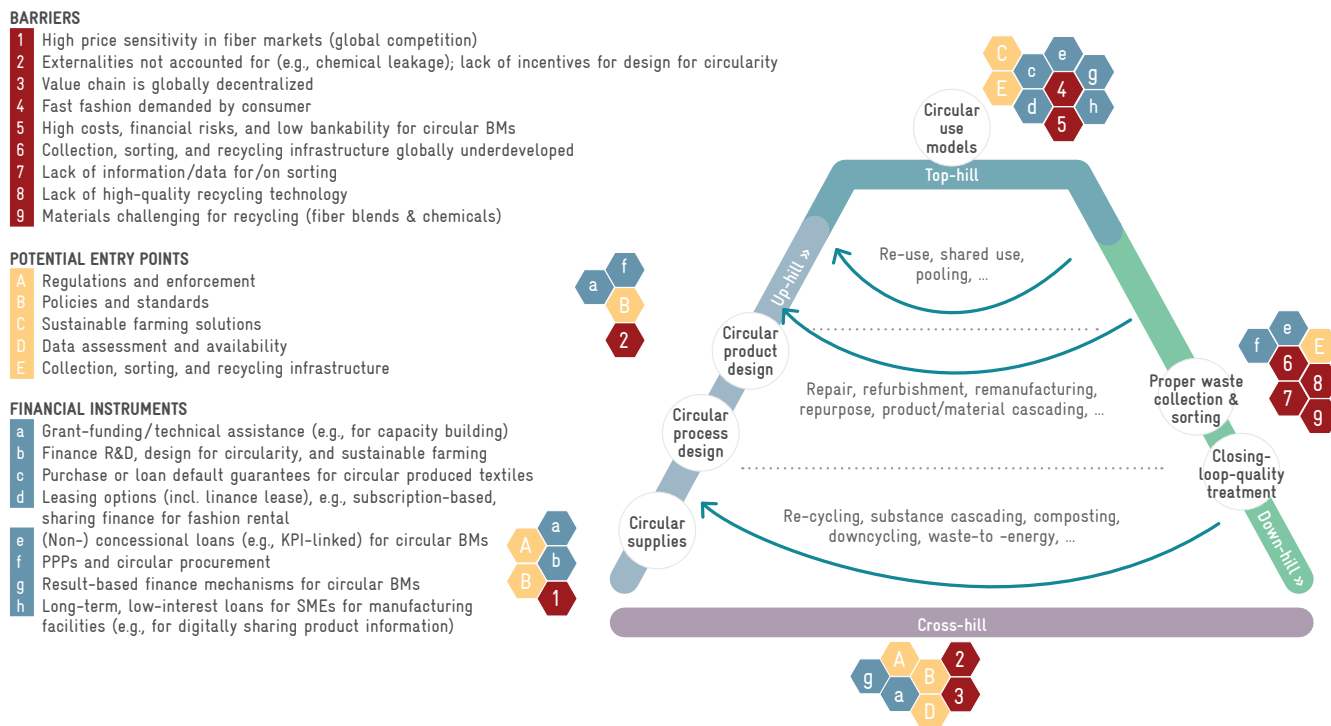
Due to current practices, at least **USD 100 billion** worth of textiles are lost annually.

Today, clothing belongs to the fast flowing and low-priced consumer products. The global value chain is one of the most complex of all sectors and with highly asymmetric balances of power. Problematic parts of the value and supply chain keep shifting around the world, temporarily settling in low-income economies. Admittedly, the wandering textile industry helps countries to grow out of poverty, raises the countries productivity, wages, and working conditions across the local economy over time, while the countries production and export baskets diversify into more sophisticated goods and services. However, as the textile industry moves on, the major challenges within this industry remain the same: ensuring fair and decent conditions for workers and reducing environmental impacts along the value chain.

The textiles industry (specifically clothing and cotton production, etc.), hence, is critical for many economies in terms of employment. Globally, supply chains of clothing, footwear and household textiles cause significant pressure on primary raw materials, water, and land use. After food and construction, the fashion industry and its supply chain are considered to be the planet’s third largest polluter. Between 2000 and 2014, clothing production doubled with the average consumer buying 60 per cent more pieces of garment compared to 15 years ago. At the same time each clothing item is now kept for only half as long.^[44] Global fibre consumption is expected to increase even more and reach between 130 and 145 million metric tonnes by 2025.^[45]

Figure 8 illustrates common barriers to circularity in the textiles sector, as well as potential entry points for circular approaches and suitable financial instruments.

Figure 8 Textiles » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

Just a fraction of end-of-life textiles is recycled and only one per cent is estimated to be recycled to produce new fibres of similar value, while about 73 per cent of textiles go to landfills or is incinerated. About 12 per cent are downcycled to other lower-quality products like insulating materials or cleaning cloths. Another 12 per cent is estimated to be lost during manufacturing as offcuts or destroyed as unsellable surplus stock. Another 0.5 million tonnes of the volume (which accounts for almost one per cent) finds its way into waters in form of microplastic fibres, mostly as a result of washing synthetic textiles.^[46] Due to the current practices, at least USD 100 billion worth of materials are lost annually.

A transition to a CE is expected to unlock economic opportunities in the fashion industry worth up to USD 500 billion by better capturing the value of underutilised, landfilled, and incinerated clothes.^[47]

The Professional Clothing Industry Association Worldwide Ltd.^[48] highlights that the textile industry can turn 80 per cent circular by 2030, but it requires substantial investments especially in recycling technologies and infrastructure. Globally, the sector needs between USD 5 to 7 billion capital investment in recycling technologies (besides collection and sorting infrastructure) by 2026.

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the textiles sector.

Table 8 Circular economy approaches for textiles – overview of sector characteristics

| Main challenges | Potential entry points | Main drivers |
|---|---|---|
| <p>Up-hill: Use of harmful substances in manufacturing processes and pollution, as well as devastating working conditions.</p> <p>Up-hill: Over-consumption of resources due to 'fast fashion' (e.g. low-quality and/or quickly changing fashion standards).</p> <p>Down-hill: Extremely large volumes of textile wastes, which in practice are mostly not recyclable (mixed materials).</p> | <p>Cross-hill: Economic and policy frameworks are needed for sustainable, circular, and 'slow fashion' practices along the value chain (e.g. (globally binding) regulatory frameworks and standards for environmental protection, internalisation of external costs and fair working conditions).</p> <p>Up-hill: Finance innovation and incentivise design for recycling as well as collaboration along the value chain.</p> <p>Top-hill: Awareness rising of consumers and incentivising and enabling sustainable consumption for industry and consumers.</p> <p>Down-hill: Support and finance technology development to increase textile recycling and close the resource loop.</p> | <p>Major drivers are the consumers, a globally binding regulatory framework, and equally impactful industry standards.</p> |



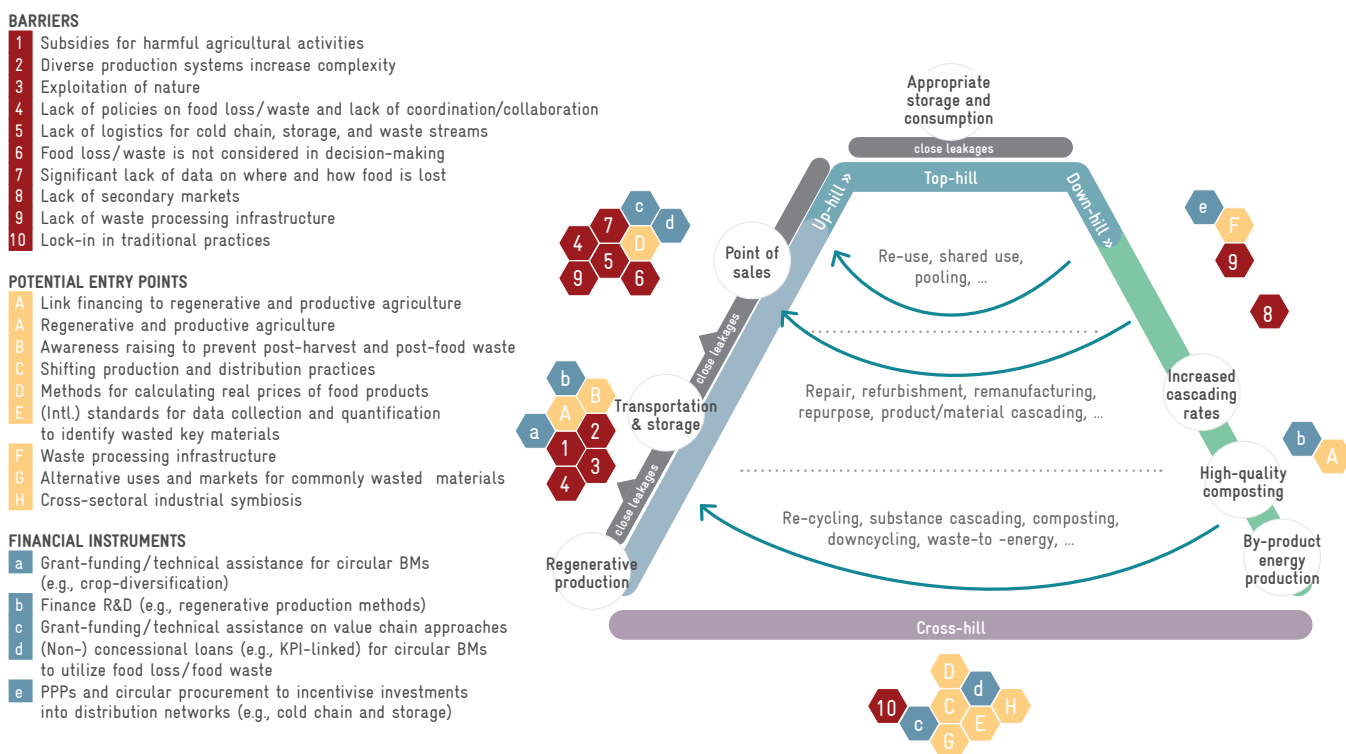
Eliminating waste in the food industry could reduce annual GHG emissions by 1.4 billion tonnes by 2050.

The terms ‘food waste’ and ‘food loss’ are commonly used terms but refer to different things. While ‘food loss’ typically refers to losses in earlier stages of production such as during harvest, storage, and transportation, ‘food waste’ refers to items that are fit for human consumption but are thrown away, often by supermarkets or consumers.^[49]

According to the Food Waste Index, about 17 per cent of global food production is wasted, with 61 per cent of this waste coming from households, 26 per cent from food services and 13 per cent from retail.^[50] Eliminating waste in the food industry could reduce annual GHG emissions by 1.4 billion tonnes by 2050 (that is more than the entire airline industry pre-pandemic). Additionally, regenerative nature through ecosystem-focused agricultural practices and switching to regenerative food production globally would reduce emissions by 3.9 billions tonnes of GHG per year by 2050.^[51]

The following figure illustrates common barriers to circularity in the food sector, as well as potential entry points for circular approaches and suitable financial instruments.

Figure 9 Food » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

The loops of nutrients and organic matter can be partly closed by reusing food, by-products, and food waste. A minimisation of food surplus and waste reduces the overall consumption of organic matter in the economy and decreases nutrition consumption. Circular measures must be implemented both at the producer and consumer levels and, finally, in waste management. In the transition towards sustainability, small-scale experiments offer opportunities for local and national policy development.^[52]

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the food sector.

Table 9 Circular economy approaches for food – overview of sector characteristics

| Main challenges | Potential entry points | Main drivers |
|---|--|---|
| <p>Up-hill: Food loss along food production and distribution, especially in low- and middle-income countries leads to high resource consumption and nutrition losses.</p> <p>Top-hill: Waste of food that is fit for consumption e.g. by consumers, supermarkets or restaurants leads to resource consumption and nutrition losses.</p> <p>Down-hill: Nutrition destruction along the waste-management.</p> | <p>Up-hill: Stop food loss by e.g. education of stakeholders (technology and knowledge transfer) and fostering innovation and organisational solutions.</p> <p>Top-hill: Educate consumers, supermarkets, and other stakeholders on how to avoid food waste and support local initiatives, technologies, and businesses to prevent or process food waste.</p> <p>Down-hill: Close the nutrition cycle by re-routing organic waste streams (in particular phosphorus) back to agricultural land.</p> | <p>Actions are required along the entire value chain. Introduction and investment in (innovation of) technologies, innovative solutions, new ways of working and manage food quality are essential.^[53]</p> |



Waste management



The world is consuming 100 billion tonnes of materials every year^[54], while it is estimated that the world's cities generate up to 10 billion tonnes of solid waste annually.^[55] Waste composition differs across income levels, reflecting various patterns of consumption. High-income countries generate relatively little food and green waste (32 per cent) but generate more dry and therefore recyclable waste (51 per cent) including plastic, paper, cardboard, metal, and glass. In low-income countries, materials that could be recycled account for only 20 per cent of the waste stream.^[56]

2 billion people worldwide still lack access to solid waste collection

Waste collection is critical to managing waste, but the rates vary largely by income levels, with upper-middle- and high-income countries reaching nearly 100 per cent waste collection. Low-income countries collect about 48 per cent of waste in cities, but this proportion drops to 26 per cent outside of urban areas.^{[57],[58]} Of the 2.01 billion tonnes municipal solid waste generated globally each year, at least 33 per cent – estimated extremely conservatively – is not managed in an environmentally safe manner.^[59] An estimation in 2015 showed that at least 2 billion people worldwide still lack access to solid waste collection and at least 3 billion people worldwide still lack access to controlled waste disposal facilities.^[60]



As world population grows, rural-urban migration intensifies, economic prosperity widens, and due to economic development and increased consumption, the generation of waste is increasing steadily. At the same time, **circularity is in reverse**: the Circularity Gap Report 2022 states that the global economy is only 8.6 per cent circular, while the 2018 edition reported 9.1 per cent. Moreover, due to lacking data, one-time recycling and even downcycling are already counted as 'circular' in that study, which is not the closed-loop circulation we are striving for.^{[61],[62]} This shows, that we are even further away from circularity than we generally think.

3 billion people worldwide still lack access to controlled waste disposal facilities.



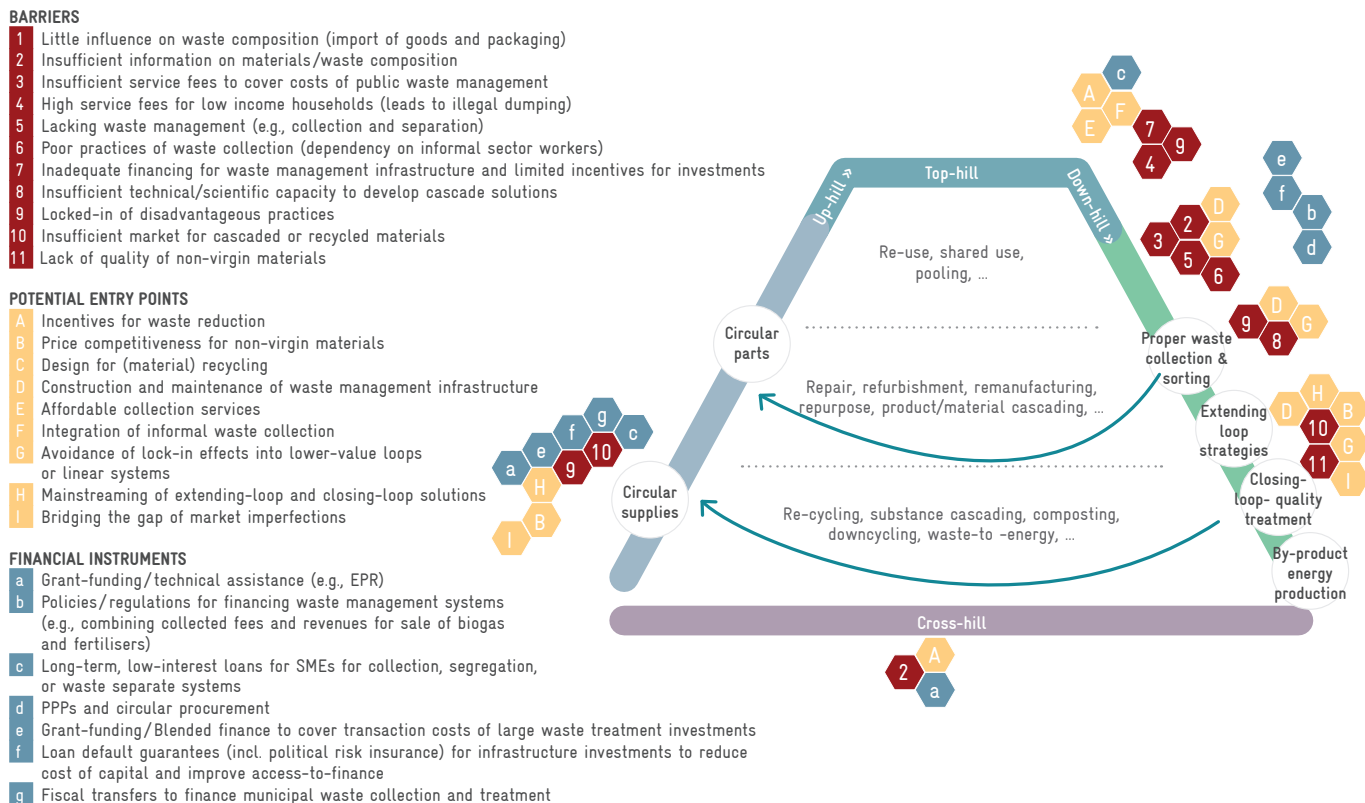
Waste management has a huge impact on GHG emissions. Around 5 per cent of global GHG emissions are annually generated from solid waste treatment and disposal. This corresponds to 1.6 billion tonnes of CO₂ equivalent GHG emissions.^[63] The strong growth in population and income in regions with under-developed waste management systems contributes to a large increase in emissions. It is projected that methane emissions will increase to about 13 million tonnes per year in the waste and wastewater sectors alone, while anthropogenic methane emissions will reach around 380 million tonnes per year by 2030.^[64]

Moreover, mismanaged waste leaks into the environment, alters habitats, harms wildlife, damages ecosystem functions and services, and poses risks for human health. For example, between 5 and 13 million tonnes of plastic waste leak into the sea each year – adding to the 150 million metric tonnes already in the oceans^[65] – adversely impacting more than 1400 species, including marine megafauna such as sea turtles and mammals.^[66]

Proper waste management plays a crucial part in a CE. Separate collection allows for the preservation of valuable materials and thereby enables the closing of material loops through recycling. Moreover, it contributes to regenerating nature by keeping waste out of the environment.

The following figure illustrates common barriers to circularity in the waste sector, as well as potential entry points for circular approaches and suitable financial instruments.

Figure 10 Waste management » Value Hill illustration on barriers, potential entry points and financial instruments for circular economy



Finance options are not limited and only listed exemplary. Use of instrument highly depend on context, incl. financial sector development, depth of capital markets, financial regulation etc. Source: adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

Sound solid waste management is dramatically cheaper than to clean up the ‘sins of the past’ in future years.^[67] Moreover, improved treatment and disposal of solid waste could reduce methane emissions by 29–36 million tonnes per year by 2030.^[68] Moreover, through enabling recycling, waste management also contributes notably to GHG savings in other sectors.

The following table sums up the main challenges, potential entry points and main drivers for CE approaches in the waste sector.

Table 10 Circular economy approaches for waste management – overview of sector characteristics

| Main challenges | Potential entry points | Main drivers |
|---|---|--|
| <p>Down-hill: Lacking waste management (strategy, regulatory framework, enforcement) poses a major threat to the environment as harmful waste and substances leak and endanger ecosystems.</p> <p>Waste management systems are largely designed as end-of-pipe solutions to decrease waste volumes and destroy harmful substances and not for preserving value. Revenues rely on stable waste volumes in the future.</p> <p>Lack of technology for like-for-like recycling, partly even for materials that themselves are still under development.</p> | <p>Cross-hill: Economic and policy frameworks are needed to phase out linear waste management practices and incentivise circular solutions.</p> <p>Cross-hill: Support technological innovation and up-scaling through political frameworks and financial support.</p> <p>Down-hill: Functioning waste management systems (collection, sorting, treatment) need to be installed, improved, and expanded to recover resources and protect the environment while considering socio-economic aspects (including informal sector collectors).</p> | <p>For developing waste management systems, the main drivers are regulatory frameworks and enforcement. For countries that are transitioning towards a CE, a supporting framework for enabling innovation is necessary.</p> |



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3

Circular economy country briefs – barriers and potential entry points

The first two parts of this publication have mapped suitable financial instruments to promote CE and identified potential barriers in relevant sectors and material streams at a global level. This last chapter applies these findings to five countries: **Colombia, Dominican Republic, Vietnam, Albania, and Rwanda**. For each country, the specific characteristics of two selected sectors or material streams in terms of challenges, policy framework, and important stakeholders for CE are described. On this basis, entry-points and promising interventions to promote CE are identified. These interventions are only indicative and should be considered as a first step to provide impulses and ideas for development cooperation actors aiming at supporting the transition to CE in low- and middle-income countries (LMIC). Each intervention should be studied in-depth before considering implementation.

Country brief Colombia



Based on political and economic priorities of Colombia as well as relevance for circular economy (CE), the following two areas of interest are addressed in this country brief:

1. **Production and consumption**
2. **Construction and demolition waste**

© Further information about these areas as well as considerations for other sectors and material streams can be found in the full study ‘Finance for Circular Economy in Low- and Middle-Income Countries’^[1], particularly in Section 3.5.

1 Production and consumption

Major challenges for CE: Innovative circular thinking has not yet taken root among industrial manufacturers and hence, ‘take-make-dispose’-models prevail in the production and consumption sectors. On the decision-maker level, a lack of knowledge about environmental management, e.g. to identify challenges and potential CE business models, exists. The application of the globally established ISO 14001 standard for the management of environmental responsibilities is broadly perceived as costly, complex, and difficult to implement. In addition, a considerable share of business informality – up to 2/3 in some sectors – hinders the application of existing programmes and benefits to foster economic development, as they are targeting formal businesses only.

Relevant strategies and frameworks for CE: The Green Growth Policy adopted in 2018 represents a key strategy to foster productivity, growth, and economic competitiveness, while ensuring the sustainable use of natural capital and social inclusion in line with climate targets by 2030.^[2] As a way to implement the policy, a National Strategy on Circular Economy was released in 2019 by the Ministry of Commerce (MINCIT) and the Ministry of Environment and Sustainable Development (MADS). The strategy serves as a guideline to support the transition towards a CE in prioritised material and resource flows such as packaging, building, industrial materials, mass consumption products, as well as natural resources, by increasing durability, reusability, reparability and recyclability. The implementation of this strategy requires a series of enabling conditions to which international resources, finance and knowledge, can significantly contribute. There is a need to formalise businesses via technical assistance and financial support. Moreover, the uptake of certification schemes for sustainable practices (e.g. eco-labels to foster competition and sustainability) also needs support. In addition, 22 national commercial and development banks have voluntarily signed a Green Protocol together with the National Planning Department (DNP) and the Ministry of Environment and Sustainable Development. The objectives are to move towards sustainable and low-carbon growth, protect and ensure the sustainable use of natural capital and improve environmental quality and governance, as well as to achieve resilient growth and to reduce vulnerability by providing lending for green projects and improving environmental screenings and performance. While some banks have already issued green bonds,^[3] the country seeks to

Herausgegeben von:

mainstream sustainable finance in all financial operations via standardisation and improved reporting directives. To this end, a green finance taxonomy is under development to provide technical screening criteria that allow classifying activities as sustainable, while developing green capital markets and contributing to effective mobilisation and tracking of private and public resources. With the EU Sustainable Finance Taxonomy as main reference, the focus areas of the Colombia taxonomy are: 1. climate change mitigation; 2. adaptation to climate change; 3. ecosystems and biodiversity; 4. water management; 5. soil management; 6. circular economy; 7. pollution prevention and control.

Table C1 Production and consumption in Colombia – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Top-hill | Down-hill |
|---|---|---|
| Promote eco-design and manufacturing of sustainable packaging for consumer goods. | Formalise business and introduce certification schemes for sustainable practices. | Extended producer responsibility (EPR) should be broadened and optimised. |

➔ Promising interventions for CE in Colombia – production and consumption

1a. Support the establishment of green businesses and improve the environmental performance of SMEs in line with the National Circular Economy Strategy: Generally, environmental management of businesses needs to be improved. This is particularly urgent for SMEs. Due to lacking financial capacities they are more price-sensitive to integrating circular concepts into their production processes. The most pressing issues identified by the National Strategy on CE are material input intensity, resource inefficiency and poor waste management. To achieve the goals of this strategy, Colombia has highlighted the necessity to cooperate with international partners including on technical assistance for green business development e.g. capacity building and innovation hubs. The Colombian Presidential Agency of International Cooperation (APC) and the Ministries will coordinate programs and projects with international cooperation agencies such as Inter-American Development Bank (IDB), Andean Development Bank (CAF), the Directorate-General for Environment of the European Commission.

1b. Support the development of the Sustainable Finance Taxonomy component 6 on CE and co-finance the Latin American and Caribbean CE Coalition: The Colombian Green Finance Taxonomy seeks to develop green capital markets and promote the effective mobilisation of private and public resources towards investments that allow the fulfilment of the country’s commitments towards sustainable development. In the ongoing first phase of developing technical screening criteria, only components 1 to 5 (see above) are under consideration. CE (component 6) will be regarded in the next phase. Assess the opportunity to support the development of technical screening criteria for the CE-component of the taxonomy (via grant funding). While it is expected that the green taxonomy provides more regulatory clarity and prevents greenwashing, other policies should be aligned e.g. the legislation on EPR should be expanded to additional products and activities and optimised to ensure that environmental damage is properly reflected. Additionally, support the Latin America and the Caribbean Circular Economy Coalition via technical assistance/grant funding to upscale their activities on improving access to financing by governments and the private sector for circular activities, to close regulation gaps, and to identify and promote CE-related activities for businesses and financial sector players.

2 Construction and demolition waste (CDW)

Major challenges for CE: Strong growth and high economic performance have been driven by extensive use of natural resources coupled with low material recycling rates of around two per cent in recent decades. The main barrier for CE in CDW in Colombia is the lack of reuse markets and supply chains, which is amplified by a perceived risk of using recycled materials, e.g. in relation to quality standards and sourcing.

Relevant strategies and frameworks for CE: To promote circular approaches for CDW management, the enabling framework needs to be adjusted and access to finance for circular business models improved. Required production and construction components in industrial manufacturing have become more expensive, and disruptions in the supply chains have delayed deliveries due to the COVID-19 pandemic.^[4] In line with the solid governmental commitment to CE, the post-pandemic economic build-back measures offer a window of opportunity for establishing more circular practices. The Integrated Management of Construction and Demolition Waste Plan established in 2021 builds on the National Circular Economy Strategy and obliges major construction and demolition waste generators to set up industrial symbiosis with other companies to exchange material flows.

Table C2 Construction and demolition waste in Colombia – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Down-hill |
|---|---|
| Reduce virgin material use by using CDW as raw material and mineral filler (e.g. converted into mineral aggregates for concrete and asphalt). | Target setting for processing of CDW and deconstruction. Establish demolition audits. |

➤ Promising interventions for CE in Colombia – construction and demolition waste:

2a. Support the enforcement of CE-related regulations in the construction sector by improving data collection and capacity building on full-cycle costing and natural capital accounting:

Circular actions in the construction sector have the potential to drive significant change as 96 per cent of construction and demolition waste are potentially recyclable.^[5] It is therefore vital to support the introduction of CE principles into construction such as the reuse of CDW in construction processes. The lack of knowledge and data hinders the enforcement of regulations. Therefore, support by development cooperation (via grant funding) could be valuable to improve data collection, availability, and transparency, to establish indicators and accounts on resource efficiency and waste, e.g. based on material flow accounts, and to improve knowledge on environmental impacts and costs of material resource use. Concretely, offer trainings to public and private stakeholders on full-cycle costing and natural capital accounting (e.g. see World Bank WAVES programs) and improve awareness on true cost accounting in the construction sector.

2b. Support research and development on recycling of construction waste and circular construction: Explore supporting R&D activities (via grant funding) to develop innovative recycling methods for construction waste and promote circular approaches in the construction sector. For instance, it could be considered to channel support through TESTEO^[6], the ‘living laboratory for sustainable construction’ in Colombia. TESTEO was designed and built by the Santand-



er Construction Cluster with support of the Swiss Embassy in Colombia – Economic Cooperation and Development (SECO), taking the NeighborHub, a Smart Living Lab project in Switzerland, as a role model. The lab promotes research activities, innovation and technological development in the construction sector in co-operation with public and private sector actors. Finance corporates carry out financial evaluations for TESTEO to identify opportunities for saving material and increasing profitability, thus, de-risking investment decisions through transparency, awareness building, and a strong network. Additionally, the lab provides a suitable environment to develop capacity and technical trainings on circular construction.

Key stakeholders for circular economy in Colombia

- ⊗ Since March 2020, the Ministry of Environment and Sustainable Development (MADS), the Ministry of Finance and Public Credit (Minhacienda), the National Statistics Department (DANE), the National Planning Department (DNP), and the Superintendence of Finance, together with representatives from the financial sector are developing the green finance taxonomy.
- ⊗ The Asociación Nacional de Empresarios de Colombia (ANDI) is a non-profit entity with objective of disseminating and promoting economic, environmental and social policies in the industrial sector. It develops capacity building activities, pilot projects and cooperation initiatives with private sector actors and international organisations.
- ⊗ Colombia is a member of the Platform for Green Industry and seeks to increase efficiency in the use of resources, improve waste management, better utilise renewable energy, and support research and innovation for green industry.
- ⊗ The global Resource Efficient and Cleaner Production Network (RECPnet) promotes eco-innovations, supporting especially manufacturing SMEs. In Colombia, the Centro Nacional de Producción más limpia y tecnologías ambientales Colombia (CNPMLTA) is a partner of the network.

^[1] GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries. <https://www.giz.de/de/weltweit/15109.html>.

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Country brief Dominican Republic

Based on political and economic priorities of the Dominican Republic as well as relevance for circular economy (CE), the following two areas of interest are addressed in this country brief:

1. **Tourism**
2. **Waste management**

© Further information about these areas as well as considerations for other sectors and material streams can be found in the full study ‘Finance for Circular Economy in Low- and Middle-Income Countries’^[1], particularly in Section 3.2.

1 Tourism

Major challenges for CE: The ‘sand, sea, sun’ model is the dominating and persisting tourism model in the Dominican Republic and beyond. This tourism model puts increasing pressure on available resources, especially in sensitive ecosystems. Companies in the tourism sector, particularly (M)SMEs tend to invest on a short-term horizon given the high degree of uncertainty of touristic inflows and generally lack ecological/sustainable certification or accreditation. The large dependency on external factors hinders alternative (long-lasting) investments such as in circular tourism models. The additional waste generated by the tourism sector increases pressure on the island’s waste management system.

Relevant strategies and frameworks for CE: The Government of the Dominican Republic recognises the long-term need for adapting the ‘sand, sea, sun’ model within the framework of sustainable development. In the 20-year National Development Strategy to 2030, a further diversification of the tourism sector by developing more sustainable alternatives such as eco-tourism is envisaged. Moreover, with the endorsed Roadmap for Low Carbon and Resource Efficient Accommodation the government commits to reducing food waste by 50 per cent until 2030. Finally, in its updated Nationally Determined Contributions (NDCs) from December 2021, the Government reiterated its plans to implement concrete CE processes in relation to i.e. accommodations, single-use products, sustainability certificates and procurement practices.

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Table D1 **Tourism in the Dominican Republic – entry points for circular economy on the Value Hill (excerpt)**

| Up-hill | Top-hill | Down-hill |
|--|---|--|
| Integrating explicitly circular concepts for lowering environmental impact of the current hotel tourism model. | Forming local alliances with sharing platforms (to stimulate local economic supply and demand). | Foster the Climate Compatible Development Plan (CCDP) and consider options to improve waste management (Integrated Waste Management through sustainable/green infrastructure). |

➤ Promising interventions for circular economy in the Dominican Republic – tourism

1a. Promote more circular procurement practices in the tourism sector and financially support (M)SMEs in developing circular business models including quality certification systems: A supportive entry point for impactful development assistance is the promotion of sustainable procurement practices by private and public actors (e.g. commodities, infrastructure, hotel resorts). The need for offering high-level trainings have been identified in due diligence guidance for responsible business models, and application of ecological standards in the up-hill phase for new accommodations and retrofitting of existing ones (e.g. integrating re-use and high-value recycling of components and materials concepts). In addition, offering financial assistance to support the plans to establish a sustainability certification that simplifies procurement standards (e.g. for new accommodations). Such a certification could be approved by the Global Sustainable Tourism Council (GSTC), but it might be necessary to rather develop a stand-alone circular certification scheme (e.g. reflecting circular principles such as prevent, reuse, and recycle instead of adapting established certificates, that only partly recognize circular practices).

1b. Capitalize the Central American Mezzanine Infrastructure Fund II (CAMIF II) investing in circular infrastructure for tourism activities in the region: Validate opportunities to provide finance (e.g. first loss equity via existing funding vehicles) to the Central American Mezzanine Infrastructure Fund II (USD 250 million, Assets under Management), which could potentially be pegged to existing circular related indicators (e.g. mutualisation of resources, materials and idle assets for tourism activities such as asset re-circulation, eco-tourism, sharing platforms), but also facilitate investment opportunities via capacity building (e.g. for implementing planned Environmental Management Systems to monitor energy consumption, resource use, emissions, food waste and associated operational cost savings opportunities, as outlined in the NDCs).



2 Waste management

Major challenges for CE: Produced and exported goods shifted in the recent decades from labour-intensive manufacturing (garment industry) to primary commodities (e.g. cash crops). Large, administrative costs of the bureaucracy, low electricity stability, and weak contract enforcement puts pressure on more long-term investment with public good character, especially for (M)SMEs. In addition, access to credit and fiscal space is still very limited and expensive, despite the strong uptake of digital financial activities. Regarding waste management mechanisms, the legal framework is put in place, but leveraging the private sector remains challenging. Currently, there are only limited private waste business models, most of them collect garbage/solid waste from hotels with trucks; sort waste in rudimentary facilities; or sell sorted/separated waste to export markets or waste to energy facilities.

Relevant strategies and frameworks for CE: In the Dominican Republic various sustainable and green finance market initiatives have been successfully launched: i.e. the endorsement of national green bond guidelines by Securities Market of the Dominican Republic (SIMV) has paved the way for issuing green bonds at the stock exchange. Regarding waste management, the endorsed 'Integral Management and Co-processing of Solid Waste Law' constitutes the legal framework to promote reduction, reuse, recycling, and recovery of waste. It allows for waste taxes and establishment of extended producer responsibility schemes for specific products such as batteries, heavy capital equipment, electronics, packing, tires, and oils.^[2]

Table D2 **Waste management in the Dominican Republic – entry points for circular economy on the Value Hill (excerpt)**

| Up-hill | Top-hill | Down-hill |
|--|---|--|
| Train financial sector actors (e.g. local banks) on CE and optimise tax base for waste management via fiscal policy trainings. | Support reverse supply chain management principles (e.g. reuse) to reduce waste generation. | Support integrated waste management systems to prevent waste leaking into the environment. |

➤ Promising interventions for circular economy in the Dominican Republic – waste management

2a. Consider funding opportunities to Circulate Capital (Circulate Capital Ocean Fund): The Inter-American Development Bank (IDB) committed a USD 4 million equity injection to Circulate Capital focusing on capacity development programmes for regional innovative ecosystem actors to improve e.g. circular recycling systems. The Circulate Capital Ocean Fund (USD 106 million Assets under Management) is the flagship model in successfully leveraging private sector capital for circular activities (e.g. PepsiCo, Procter & Gamble, Danone, Chanel, Unilever, The Coca-Cola Company). The Fund is backed by international support such as the United States Agency for International Development (USAID) and the European Investment Bank (EIB), which offers low-cost capital (e.g. (quasi) equity and concessional loans) channelled to early-stage start-ups and SMEs with investment sizes of around USD 2 million. The investment experience with the European Investment Bank could be validated and further funding, before next (third) financial close, considered.

2b. Offer fiscal policy capacity building for waste tax development and capitalise the Public-Private Trust for Comprehensive Waste Management: The legal framework for solid waste management allows to tax every legal person, entity, and public institution for certain types of waste. These waste taxes capitalise the existing ‘Public-Private Trust Fund for Comprehensive Waste Management’ that is charged to mitigate the negative effects of the current waste disposal. The trust fund is open for capitalisation by international donors. Development cooperation could provide trainings to tax designers (focus on progressive tax structure to ensure that this tax is income-elastic and no additional burden to the bottom of the pyramid) and capitalise the ‘Public-Private Trust Fund for Comprehensive Waste Management’.

Key stakeholders for circular economy in the Dominican Republic

- © The Ministry of Environment and Natural Resources^[3] is responsible for CE activities (by public and private actors). It is guiding the work of the National System for Comprehensive Waste Management and stipulates a mandatory waste tax. Its Directorate of Sustainable Consumption and Production coordinates with other ministries, such as the Ministry of Industry and Commerce, the Ministry of Agriculture and the Ministry of Tourism.
- © The General Directorate of Public Procurement (DGCP) is the main body with competence for setting government procurement policy and enforcing compliance. It also oversees public bidding processes.

^[1] GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries. <https://www.giz.de/de/weltweit/15109.html>.

^[2] CEPAL (2021) Economía circular en América Latina y el Caribe: oportunidad para una recuperación transformadora. <https://www.cepal.org/es/publicaciones/47309-economia-circular-america-latina-caribe-oportunidad-recuperacion-transformadora>.

^[3] Gobierno De La República Dominicana. Medio Ambiente. <https://ambiente.gob.do>.

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Country brief Vietnam

Based on political and economic priorities of Vietnam as well as relevance for circular economy (CE), the following two areas of interest are addressed in this country brief:

1. **Production and consumption (including eco-industrial parks)**
2. **Textiles and garments**

© Further information about these areas as well as considerations for other sectors and material streams can be found in the full study ‘Finance for Circular Economy in Low- and Middle-Income Countries’^[1], particularly in Section 3.3.

1 Production and consumption incl. eco-industrial parks

Major challenges for CE: Due to the low level of financial inclusion organisations - especially SMEs – face hurdles to access dedicated finance with explicit criteria, thereby impeding investments for green/circular production. This is accompanied by a lack of awareness for opportunities and benefits provided by CE on the supply (e.g. manufacturer) and demand (e.g. client or consumers) side. Despite the progress on institutional, policy and regulatory level in CE-related areas (see entry points below), fragmentation and insufficient coherence within policy planning remains high. The private and public sector investment environment is not fully ready to promote responsible investments on the needed long-term basis.

Relevant strategies and frameworks for CE: The Government of Vietnam aims to promote CE via various initiatives to prolong material lifespans, reduce waste and emissions, and restore the ecological system.^[2] Concretely, the National Action Plan on Sustainable Production and Consumption (2021 to 2030) emphasises the commitment to a CE by setting specific targets for reducing the use of certain materials and resources and aiming at eco-friendly products and packaging, e.g. by 2030, seven to ten per cent decrease in resources and materials used by major production sectors such as textile, steel, plastic, chemical, cement, alcohol and beer, beverage, paper, seafood processing and some other production sectors.

Different endorsed national legal frameworks such as Decree 82/2018/ND-CP on the management of industrial parks and economic zones, Decree 54/2015/ND-CP on regulating privileges for water saving and efficient practices and Decree 38/2015/ND-CP on management of waste and discarded materials aim at more sustainable production. Currently, the Ministry of Natural Resources and Environment (MONRE) and the Ministry of Finance (MOF) together with the State Bank of Vietnam (SBV) develop a taxonomy for sustainable finance, which is expected to be aligned with the EU Taxonomy. This comes in line with a continuously rising investors’ interest in sustainable investment products in recent years.

Herausgegeben von:

A key entry point represents the Eco-Industrial Park Initiative that addresses a range of activities partly reflecting circular concepts. While only a small number of industrial zones is targeted, this offers potential investment opportunities by integrating ecological considerations in other industrial zones. Finally, critical drivers for more sustainability are the participation in Free Trade Agreements (FTAs) including their favoured conditions like tax reliefs for certified sustainable production.

Table V1 Production and consumption in Vietnam – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Top-hill |
|--|--|
| Introduce the CE concept along the value chain of (eco-) industrial parks. | Support the transition of industrial zones into eco-industrial parks addressing sustainable infrastructure (incl. recycling, biogas plants, wastewater treatment). |

➤ Promising interventions for circular economy in Vietnam – production and consumption

- 1a. Facilitate the integration of circular concepts in Vietnam’s industrial zones and build on good practice of the Eco-Industrial Park Initiative:** Assess (via technical assistance/grant funding) investment needs for upgrading industrial zones to eco-industrial parks and integrating the CE concept and compare it with available funding that does not explicitly address CE, but encompasses circular-relevant investments (e.g. International Finance Corporation – World Bank Group (IFC) for cleaner production, Agence Francaise de Developpement (AFD) and World Bank for energy efficiency, and the Vietnam Environment Protection Fund (VEPF) for environmental protection at industrial zones, the Green Credit Trust Fund, the Vietnam Development Bank (VDB) and the National Technology Innovation Fund, etc.). Tailored loan and equity finance through a sustainable green/circular credit line could be provided to corporates in industrial zones to implement circular measures. Such a credit line needs to be endowed with explicit investment criteria and indicators that encourage green production and the integration of circular concepts including circular product design and shared services.
- 1b. Assess opportunities to leverage alternative finance sources for CE such as pension funds as long-term saving vehicles:** Consider to support leveraging alternative refinance sources, such as pension funds (e.g. in cooperation with the Ministry of Finance and the State Bank of Vietnam). Private pension funds could be considered as one form of long-term saving vehicles and funding mobilisation via the capital market (taking Environmental, Social, and Governance risks and opportunities into account). A deep-dive analysis would be needed to assess opportunities and incentives.

2 Textile and garment sector

Major challenges for CE: Strong economic growth has been accompanied by extensive natural resource exploitation in the recent decades. The current textile production facilities are very energy-, resource-, and pollution-intensive. International export competition preserves the business-as-usual linear mode as a pre-dominant business model, especially among SMEs. Insufficient financial, technological, and human resources besides clients' and customers' preference for 'fast' fashion cycles and more sales rather than high quality and durable products are also barriers for circular approaches in the textile sector.^[9]

Relevant strategies and frameworks for CE: To spur circular opportunities in the textile sector, the enabling framework and access to finance must be improved. While the international export market sets prices that are not reflecting true social and environmental costs, there are emerging global driving forces for integrating circular concepts due to increasing consumer awareness and buyer requirements. Some global players with high production standards (GAP, H&M, or Levi Strauss & Co) have started to reflect sustainability targets in their strategies and supply chains, including recycled materials, sourcing organic or sustainable raw materials, reducing energy consumption, and conservation of non-renewable resources. Such initiatives are also promoted by the introduction of environmental certifications and eco-labels such as the Global Recycled Standard, Better Cotton Initiatives, Cradle-to-Cradle, Global Organic Textile Standard, ISO 14001, bluesign PRODUCTS, and EU Ecolabel. With support of the Vietnam Textile and Apparel Association (VITAS), the textile and garment industry is gradually recognising the need to apply circular activities, emphasizing sustainable production, clean water management and reducing green house gas (GHG) emissions to be in line with national priorities as the National Strategy on Environment Protection and global commitments, particularly the Paris Agreement, and Kigali Amendment. Finally, the endorsed national legal framework also requires a more sustainable garment production (e.g. Law, 55/2014/QH13, Environmental Protection). To green the textile sector through resource efficiency, decreasing waste release, stopping microfiber discharge, and addressing the 'throw away culture', capacity building is needed.

Table V2 Textiles and garments in Vietnam – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Top-hill | Down-hill |
|--|---|--|
| Design and planning of garment production without harmful residuals and less virgin materials. | Facilitate coordinating vehicles to drive circular ambitions/standards. | Improve chemical end-of-use processing (in combination with chemical leasing). |

➤ Promising interventions for circular economy in Vietnam – textiles and garments

2a. Assess circular concepts and business models in the textile sector including chemical leasing in cooperation with the Vietnam Cleaner Production Centre (VNCPC): Support a sector assessment (via grant funding) in collaboration with Vietnam Cleaner Production Centre and Vietnam Textile and Apparel Association to identify relevant circular interventions and business models for the textile sector in Vietnam. This could be done via a detailed environmental impact assessment as well as reviewing and comparing good practices in Vietnam and in neighbour countries such as the international operating company PTT Global Chemical PCL from Thailand which ranks best in an Asian chemical company sector rating by RobecoSAM that covers also sustainability aspects.



Moreover, bankable circular business models in the textile sector need to be identified and/or developed. For instance, the economic viability of chemical leasing, a performance-based business model, that supplies chemicals to customers rather by selling-a-service than selling-a-product, could be assessed for Vietnam’s textile sector. It allows for more efficient use of chemicals (see Figure V1) and shifts responsibility for disposal up the Value Hill to the producers. A pathway to enable chemical leasing could be via extended producer responsibilities (EPR) and introduction of tight restrictions on disposal ‘outputs’, thereby catalysing innovations in the production process. Interventions could build on experiences in India where GIZ supports the development of a national framework for treated wastewater, and the Nation Mission of Clean Ganga (NMCG) develops policies including zero-liquid discharges (ZLD) and provides trainings. Moreover, South-South knowledge transfer of best practice examples with other countries experienced in textile production should be considered.

2b. Capitalise the National Technology Innovation Fund (NATIF) to support circular innovation in the garment sector:

Facilitate access to finance (via e.g. concessional loan finance) for circular concepts, such as urgently needed textile recycling activities. This could be in cooperation with Vietnam Cleaner Production Centre and the World Bank thereby building on results of a recent ‘textiles sector assessment and feasibility study to implement wastewater reuse in industrial parks’. In addition, consider additional capitalisation (via e.g. equity injection) of the National Technology Innovation Fund (NATIF) as key national finance vehicle, which already provides soft loans, guarantees or financial aid for organisations to research, apply, transfer, innovate, and complete innovative technology.

Key stakeholders for circular economy in Vietnam

- ☉ The Vietnam Cleaner Production Centre (VNCPC) has the objective to disseminate the cleaner production concept and is gradually integrating circular concepts in Vietnam’s industry.
- ☉ The Vietnam Circular Economy Network/Hub^[4] has been introduced in October 2021 with support from the Norwegian Embassy and technical support from the Dutch Embassy. It has the objective to raise awareness and build capacities in adopting CE principles.
- ☉ The Institute for Circular Economy Development (ICED) established in July 2020 – a private/government/university collaboration – has the objective to propose policies in application and development of CE models for related agencies.

^[1] GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries. <https://www.giz.de/de/weltweit/15109.html>.

^[2] UNDP VietNam (2021). Consultation on Circular Economy Policies and the Viet Nam Circular Economy Hub – ways towards a low-carbon and circular Viet Nam. <https://www.vn.undp.org/content/vietnam/en/home/presscenter/pressreleases/consultation-on-circular-economy-policies-and-the-viet-nam-circu.html>.

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^[4] Viet Nam Circular Economy. Accelerating the circular economy in Viet Nam. <https://vietnamcirculareconomy.vn/en>.

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Country brief Albania

Based on political and economic priorities of Albania as well as relevance for circular economy (CE), the following two areas of interest are addressed in this country brief:

1. **Waste management**
2. **Construction**

© Further information about these areas as well as considerations for other sectors and material streams can be found in the full study ‘Finance for Circular Economy in Low- and Middle-Income Countries’^[1], particularly in Section 3.4.

1 Waste management

Major challenges for CE: The Albanian government shows ambitions to implement circularity in the waste sector. The respective political framework, however, still needs to be developed further. Currently, $\frac{4}{5}$ of the waste ends up on landfills. All sectors (consumer goods, capital infrastructure) are open to foreign investors as there are no legal barriers to market entry. Thus, add foreign investment and imports of consumer goods and infrastructure to waste generation in Albania.

Relevant strategies and frameworks for CE: The revised Integrated Waste Management Strategy (IWMS) – referencing EU targets and directives – is developed around the concept of ‘zero waste’. It aims at waste being collected and treated as raw materials. Waste is to be managed in accordance with the concept of circular systems, serving the criterion of use and preservation of raw material resources. Beyond the IWMS, the current legal framework, does not provide a sufficient basis for implementing a circular concept. Hence, there is an urgent need for improvements in the current legal framework that will increase the country’s ability to better utilise its resources and prolong the lifecycle of materials, products, and services. Waste management infrastructure requires modernisation, starting with the closing or making use of (illegal) landfills and implementing sound waste collection, sorting and treatment systems. However, this leaves opportunities to leap-frog and tap into underestimated circular opportunities.

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Table A1 Waste management in Albania – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Cross-hill |
|---|--|
| Regulate or ban the import of non-CE conform products; phase out landfills and illegal dumping. | Support and finance businesses and innovations that collect organic household waste. |

➤ Promising interventions for circular economy in Albania – waste management

1a. Support the establishment and cost-coverage of more efficient waste collection and treatment schemes: Support local entrepreneurship by building capacity (via technical assistance/grant funding) of value chain stakeholders, including banks (increase knowledge about bankable waste collection and treatment concepts), and supporting public authorities, financing of start-ups, setting up networks, creating innovation hubs, financing and supporting experimentation pockets, and spreading the insights, etc.. Support municipalities/local authorities (via technical assistance/grant funding) to cover the full costs for waste collection and treatment by increasing the fee collection rate and fiscal transfers from central governments, but also to introduce adequate fiscal policy measures covering direct product tax reduction on circular products and/or suspension of income tax for waste management firms.

1b. Support economic exploitation of the high-value organic waste streams by local entrepreneurs: Urban waste consists of 60 per cent of high-valuable organic waste and can be transformed into carbon-rich and nitrogen-rich compost – closing the nutrition gap that results from intensive agriculture – or into biogas. Support economic exploitation of the high-value organic waste stream by local entrepreneurs (in line with recommendation 1a.). This could be done by providing access to finance (e.g. via equity injections or low-cost debt, KPI-linked loans to local corporates to set up technology, such as high-level composting plants and other infrastructure to treat organic waste), but also capacity building (e.g. via information, education, and consultation of potential stakeholders), as well as financial and organisational support to develop early-stage firms and leverage established actors. Seed grants could finance the identification and mapping of food losses, agricultural waste, and by-product streams along the harvest and post-harvest infrastructure.

Inspirational best practices

The city of Milan (Italy) collects food waste directly from commercial sources like restaurants. Considering the level of organic waste collection unsatisfactory, the government started a programme to produce compost and biogas from residential waste separated at source and sent to an anaerobic digestion and composting facility.^[2]

As part of an effort to improve waste management in Riga (Latvia), the landfill was upgraded to capture landfill gas, and to produce electricity and heat. Revenues are generated through a combination of electricity sales, and heat used in local greenhouses to produce tomatoes, which are sold at the local market.^[3]

2 Construction

Major challenges for CE: Due to the ‘slow-flowing’ product character of buildings, infrastructure, and capital equipment, decisions taken in the construction sector impact the economy and the environment for a long time. Insufficient integration of CE principles in procurement regulations, particularly when it comes to large investment projects, leads to the risk of critical linear lock-in effects.

Relevant Strategies and frameworks for CE: The National Strategy for Development and Integration 2015 to 2020 (NSDI-II) is the key national planning document currently in place (adopted by the Government of Albania in May 2016). This strategic document reflects the vision, priorities, objectives and means for social and economic development of the country up to 2020. The overarching goal of NSDI-II was the accession to the European Union (EU).

Due to the aftermath of the COVID-19 crisis, a strong consumer confidence and external demand, as well as a policy stimulus support a strong economic recovery. Sector-wise, those initiatives are majorly driven by activities in the construction sector. The current dynamics can be beneficial to implement circular strategies into infrastructure solutions like building and construction as well as connected public services (e.g. healthcare facilities). There is the risk, if momentum is not used in large investment projects, linear business as usual solutions can be locked-in for a long time.

Table A2 **Construction in Albania – entry points for circular economy on the Value Hill (excerpt)**

| Up-hill | Top-hill |
|--|--|
| Identify and support use of sustainable input materials (e.g. open-loop re-use or recycling materials like recycled concrete or used window frames, alternative materials like natural insulation or clay plaster, closed-loop recyclable materials) and integrate respective regulations into procurement policies. | Intensify use of existing infrastructure (e.g. re-assignment of use); develop building-as-a-service models (like e.g. public hospitals). |

➤ Promising interventions for circular economy in Albania – Construction

2a. Support the integration of circular aspects into procurement regulations in the construction sector: Infrastructure projects, such as the proposed Tirane-Durres-Rinas railway and prospects for a new international airport and new docks have garnered attention from domestic and foreign investors. Government-financed infrastructure projects focus mainly on roads, water supply, and sewerage. Given this investment pipeline, the demand for heavy machinery, equipment, and services is expected to increase.^[4] Regarding the investments in infrastructure, circular strategy opportunities exist for the use of heavy construction machinery, as well as for buildings and constructions like roads, railway, airports, tunnels, and ports. In addition, ongoing and future investments in construction-waste treatment and processing offer potential for closing resource loops in the building and construction sector. To avoid critical linear lock-in effects in the long term, the integration of circularity aspects into public procurement procedures is crucial. Industry standards and building codes that align with EU standards are well suited to address the mentioned risks. The feasibility of including product service models as part of public procurements could be assessed. Therefore, to address a system change, governmental participation and risk-sharing will be necessary, as well as the identification of project and experimentation pockets that allow for trusting and narrow stakeholder collaborations.



2b. Assess the opportunity to establish an innovation hub for circular construction in Tirana: E.g. through a digital platform for construction sector activities. Such a (virtual) platform (upfront investments for the capital expenditures via primarily grant funding and operated via pay-for-performance fees for the benefitting service suppliers). The platform could be aligned with the existing Circular Economy Club Tirana, and could bring together various actors, such as commissioning parties (e.g. municipalities, public authorities); supply side actors (e.g., manufacturers, construction materials suppliers, architects/engineers, demolition firms), and customers (e.g. chamber of commerce, governmental actors) by fostering demand-driven innovation and leveraging private sector engagement.

Key stakeholders for circular economy in Albania

- ⊗ The responsibilities of the National Environmental Agency include permitting, environmental impact assessment, and public information as well as supporting the retrofitting and expansion of the country's existing observational network of weather and hydro-met stations.
- ⊗ The Ministry of Tourism and Environment is responsible for Albania's climate change related activities and scientific evaluations.
- ⊗ Environmental Center for Development Education and Networking (EDEN)
- ⊗ Environmental & Territorial Management Institute (ETMI-AI)
- ⊗ Youth and Environment Europe – Albania
- ⊗ Circular Economy Club – Tirana
- ⊗ GO2 Albania – Sustainable Urban Planning Organization

^[1] GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries. <https://www.giz.de/de/weltweit/15109.html>.

^[2] Ellen MacArthur Foundation (2017). Urban Biocycles. <https://emf.thirdlight.com/link/ptejjurhaj5-iigai0/@/preview/1?o>.

^[3] World Bank Group (2016). Financing Landfill Gas Projects in Developing Countries, Urban development Series, Knowledge Papers. <https://openknowledge.worldbank.org/handle/10986/26302>.

^[4] International Trade Administration (2021). Albania – Country Commercial Guide. <https://www.trade.gov/country-commercial-guides/albania-market-opportunities>.

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Country brief Rwanda

Based on political and economic priorities of Rwanda as well as relevance for circular economy (CE), the following two areas of interest are addressed in this country brief:

1. **Construction including urbanisation**
2. **Production including procurement policies**

© Further information about these areas as well as considerations for other sectors and material streams can be found in the full study 'Finance for Circular Economy in Low- and Middle-Income Countries'^[1], particularly in Section 3.1.

1 Construction incl. urbanisation

Major challenges for CE: Fast population growth (17 per cent between 2014 to 2019 to 11 million inhabitants), strong economic momentum (six per cent growth per year in the last decade to USD 820 per capita in 2019), and ongoing Urbanisation (forecasted urban share to be doubled between 2020 and 2024 to 35 per cent) put enormous pressure on available urban eco-systems in Kigali and the six secondary city districts. In the City of Kigali alone (0.8 million) more than 0.3 million additional houses need to be constructed/retrofitted until 2032 in order to address governmental plans. While the green building agenda for the Green City Kigali Project (1 per cent area of City of Kigali) already integrates energy efficiency, sustainable waste management, and urban forests, there is a lack of capacities for sustainable building and construction needs (especially in the residential development) in other parts of the country (e.g. secondary cities). Overall, there is a low level of resource and energy efficiency standards in construction of domestic and commercial buildings.

Relevant strategies and frameworks for CE: Various legal documents (e.g. National Strategy for Transformation, National Roadmap for Green Secondary City Development, Green Growth and Climate Resilience Strategy) are promoting a sustainable agenda in the next decades and highlight circular activities. In addition, there is an increased interest by various private and public stakeholders in circular built environment initiatives. Thus, from a legal and institutional perspective, there is strong willingness to foster a green transformation and be recognised in the global community as a role model in (East) Africa. On the CE Value Hill (Table R1), key levers are synthesised based on the national priorities and planned outcomes.

Herausgegeben von:

Table R1 Construction incl. urbanisation in Rwanda – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Top-hill | Down-hill |
|---|---|---|
| Establishment of functioning markets for non-virgin/eco-friendly materials, e.g. via green public procurement (and stricter construction regulation). | Capitalise the Green Investment Facility (FONERWA) through one of its four investment windows; support private and public stakeholders. | Address huge import-export deficit for construction material by enabling circular concepts; build on 'Made in Rwanda' initiative promoting use of local construction materials. |

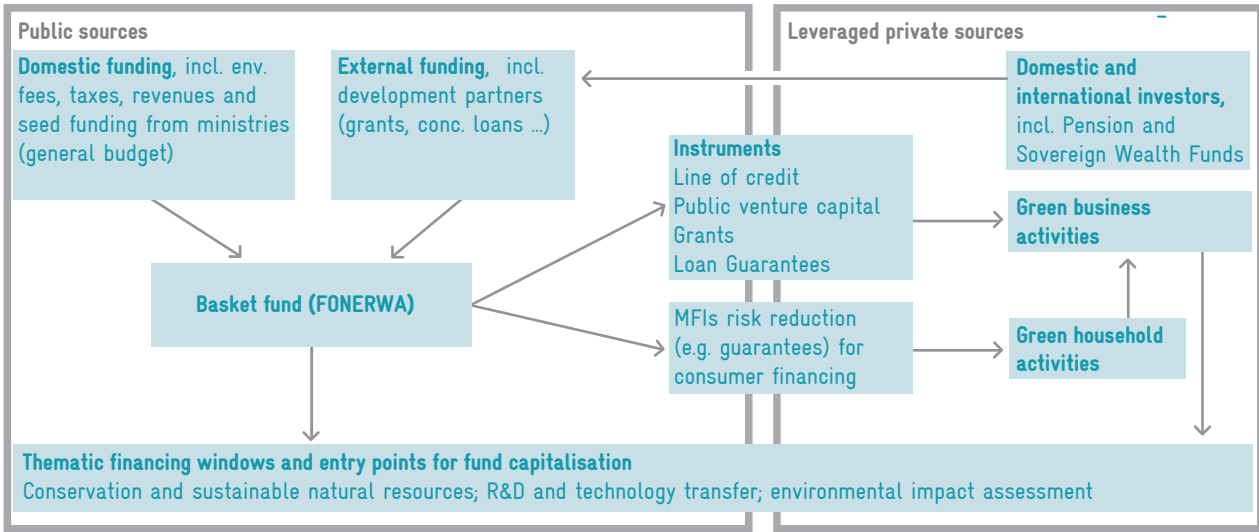
➤ Promising interventions for circular economy in Rwanda – construction including urbanisation

1a. Support the Rwanda Environment Management Authority (REMA) to implement the adopted Green Building Minimum Compliance System (GBMC), particularly its circular-aligned sustainability standards – through ongoing awareness programmes, outreach, and capacity building: The Rwanda Green Building Minimum Compliance System (GBMC) established in 2019 represents the first mandatory Green Building Code in an African country, that supports the development of partly circular-aligned sustainability standards for commercial and public buildings. While it is not mandatory for residential developments, real estate developers are encouraged to adopt the system on a voluntary basis. In the light of the enormous housing demand, the updated Nationally Determined Contributions (NDCs) indicate that under the Business-as-Usual scenario, emissions from the building sector increase six-folded, but could be reduced by 50 per cent when applying consistent building standards until 2030. Thus, a major lever has been identified in co-supporting (via technical assistance; grant funding) the Rwanda Environment Management Authority (REMA), and the Rwanda Housing Authority (RHA) in implementing the Rwanda Green Building Minimum Compliance System through ongoing awareness programs, outreach, and capacity building. This helps to ensure that environmental, economic and social benefits of green buildings tickle down the construction value-chain.

1b. Provide external funding to the national basket fund (FONERWA) to support the use of more regenerative including non-virgin materials in the construction sector: In the light of the large amount of planned infrastructure projects, substituting cement and steel with more regenerative, incl. non-virgin materials (i.e. construction and demolition waste), is essential, but requires additional funding from international partners. The closed-meshed green fund (FONERWA) mobilises international aid and private funding injections to local corporates/SMEs with lines of credit (well below market rate of ten per cent per year), loan guarantees, and public equity capital. For circular activities, the 'innovative grant mechanism' and the 'green incubator program' aim to leverage sustainable and innovative business opportunities. The green investment facility is permanently looking for further capitalisation (already funded by UNEP, GCF, NDF, AfDB, KfW, and other ODA donors) through grant funding and low-cost loans (high concessionality).

Figure R1 describes potential funding mechanisms, entry points, and thematic funding windows for the capitalisation of FONERWA. The capitalisation of FONERWA represents a prime funding opportunity in the African country context as the fund is well established and internationally recognised (e.g. FONERWA won the UN Momentum for Change Award in 2018).

Figure R1 Proposed capitalization of FONERWA (non-exhaustive, only-illustrative)



Source: Adapted from GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries.

2 Production, incl. procurement policies

Major challenges for CE: Against the background of high population and economic growth, the prevalent ‘take, make, dispose’ business models in Rwanda add to the degradation of natural ecosystems. Main drivers are survival concerns by (M) SMEs and lack of awareness of circular business opportunities, even in the time of tight regulation such as the single-plastics ban in 2008. While special economic zones (SEZs) provide basic infrastructure for corporates, they often still lack proper waste management, and major challenges regarding environmental degradation are present despite various existing policies. Innovative Business models for e.g. shared equipment (e.g. in SEZs) or more resource efficient practices are still lacking.

Relevant strategies and frameworks for CE: The Government of Rwanda is aware of the range of environmental challenges, e.g. driven by continuous land degradation and fossil fuel dependency as well as lack of material standards and green infrastructure development (see recommendation 1a.).

Table R2 Production including procurement policies in Rwanda – entry points for circular economy on the Value Hill (excerpt)

| Up-hill | Top-hill | Down-hill |
|--|---|--|
| Improve legal base of eco-industrial parks/special economic zones. | Reshape business models for a more service-based economy to capitalise on longer use. | Develop progressive waste collection schemes to activate the private sector. |

➤ Promising interventions for circular economy in Rwanda – production including procurement policies

2a. Support the development of green/circular procurement practices, particularly in SEZs: Currently, Rwanda envisages the establishment of nine new SEZs. Under the Green Growth and Climate Resilience Strategy (GGCRS), green industry development – including efficient and zero waste technologies, practices, and design in SEZs – is addressing energy and water efficiency, green site preparation, building and design as well as waste treatment options. Against this background, co-supporting (via technical assistance/grant funding) the Rwanda Public Procurement Authority (RPPA) in the development of the planned Green Procurement Policy represents an impactful lever to strengthen circular approaches in SEZs. Concretely, the intervention can cover considerations such as general circular practices (e.g. full life-cycle costing), and investments in more circular SEZ-facilities (e.g. applying integrated solutions and holistic approaches such as privileged access to intermediate supply of raw materials from local companies). Activities can build on good practice of REMA's initiative to develop eco-industrial parks and their cooperation with Cleaner Production and Climate Innovation Centre (CPCIC) to define a concrete CE-Investment pipeline as well as on Public Procurement Trainings by Global Green Growth Institute (GGGI).

2b. Financially support the Cleaner Production and Climate Innovation Centre in strengthening its approach of good CE practices: With the 'Made in Rwanda' initiative based on the Rwanda Vision 2020, the Government of Rwanda is committed to expand and diversify the economic base to strengthen domestic value creation for export markets. Hence, new and innovative production models are needed and envisaged. In this context, the Cleaner Production and Climate Innovation Centre – offering technical audits, advisory services, and capacity building including on resource efficiency and circular concepts for companies in e.g. leather production, garments, and textiles. The centre's momentum might benefit from further financial support to strengthening its circular approaches i.e. in terms of shared capital equipment, product-as-a-service models, and chemical leasing services.

Key stakeholders for circular economy in Rwanda

- 🕒 **Rwanda Environment Management Authority (REMA)** facilitates the implementation of national policies and focuses on sustainable use of natural resources through decentralised structures of governance.
- 🕒 **Cleaner Production and Climate Innovation Centre (CPCIC)** provides access to green technologies and business services and promotes circular practices, climate resilience, environmental compliance, and sustainable development.
- 🕒 **Ministry of Infrastructure (MININFRA)** aims to promote and supports policy making for circularity and enable regulatory frameworks.
- 🕒 For consultations on circular built environment MININFRA, the **Rwanda Housing Authority (RHA)** and the **City of Kigali (CoK)** are relevant public authorities. Relevant private sectors include MASS Design, SKAT Rwanda (Modern Bricks), Earth Enable (affordable, sanitary flooring using circular practices), Seyani Brothers (circular architects/construction), and Landmark Studio (circular architects).
- 🕒 In addition, the **Green Global Growth Institute (GGGI)** is a very pro-active development partner supporting the government in developing a CE.

^[1] GIZ, Frankfurt School, FS-UNEP Collaborating Centre for Climate & Sustainability Energy Finance (2021). Financing Circular Economy in Low- and Middle-Income Countries. <https://www.giz.de/de/weltweit/15109.html>.

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Entry points for circular economy at a glance

| Country | Sector | Promising interventions for circular economy |
|--------------------|---|--|
| Colombia | Production and consumption | <p>1a. Support the establishment of green businesses and improve the environmental performance of SMEs, in line with the National Circular Economy Strategy.</p> <p>1b. Support the development of the Sustainable Finance Taxonomy component 6 on CE and co-finance the Latin American and Caribbean CE Coalition.</p> |
| | Construction and demolition waste | <p>2a. Support the enforcement of CE-related regulations in the construction sector by improving data collection and capacity building on full-cycle costing and natural capital accounting.</p> <p>2b. Support research and development on recycling of construction waste and circular construction.</p> |
| Dominican Republic | Tourism | <p>1a. Promote more circular procurement practices in the tourism sector and financially support (M)SMEs in developing circular business models, including quality certification systems.</p> <p>1b. Capitalise the Central American Mezzanine Infrastructure Fund (CAMIF II) investing in circular infrastructure for tourism activities in the region.</p> |
| | Waste management | <p>2a. Consider funding opportunities to Circulate Capital (Circulate Capital Ocean Fund).</p> <p>2b. Offer fiscal policy capacity building for waste tax development and capitalise the Public-Private Trust for Comprehensive Waste Management.</p> |
| Vietnam | Production and consumption incl. eco-industrial parks | <p>1a. Facilitate the integration of circular concepts in Vietnam's industrial zones and build on good practice of the Eco-Industrial Park Initiative.</p> <p>1b. Assess opportunities to leverage alternative finance sources for CE such as pension funds as long-term saving vehicles.</p> |
| | Textile and garment sector | <p>2a. Assess circular concepts and business models in the textile sector including chemical leasing in cooperation with the Vietnam Cleaner Production Centre (VNCPC).</p> <p>2b. Capitalise the National Technology Innovation Fund (NATIF) to support circular innovation in the garment sector.</p> |
| Albania | Waste management | <p>1a. Support the establishment and cost-coverage of more efficient waste collection and treatment schemes.</p> <p>1b. Support economic exploitation of the high-value organic waste streams by local entrepreneurs.</p> |
| | Construction | <p>2a. Support the integration of circular aspects into procurement regulations in the construction sector.</p> <p>2b. Assess the opportunity to establish an innovation hub for circular construction in Tirana.</p> |
| Rwanda | Construction incl. urbanisation | <p>1a. Support the Rwanda Environment Management Authority (REMA) to implement the adopted Green Building Minimum Compliance System (GBMC), particularly its circular-aligned sustainability standards – through ongoing awareness programmes, outreach, and capacity building.</p> <p>1b. Provide external funding to the national basket fund (FONERWA) to support the use of more regenerative including non-virgin materials in the construction sector.</p> |
| | Production, incl. procurement policies | <p>2a. Support the development of green/circular procurement practices, particularly in special economic zones.</p> <p>2b. Financially support the Cleaner Production and Climate Innovation Centre (CPCIC) in strengthening its approach of good CE practices.</p> |



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