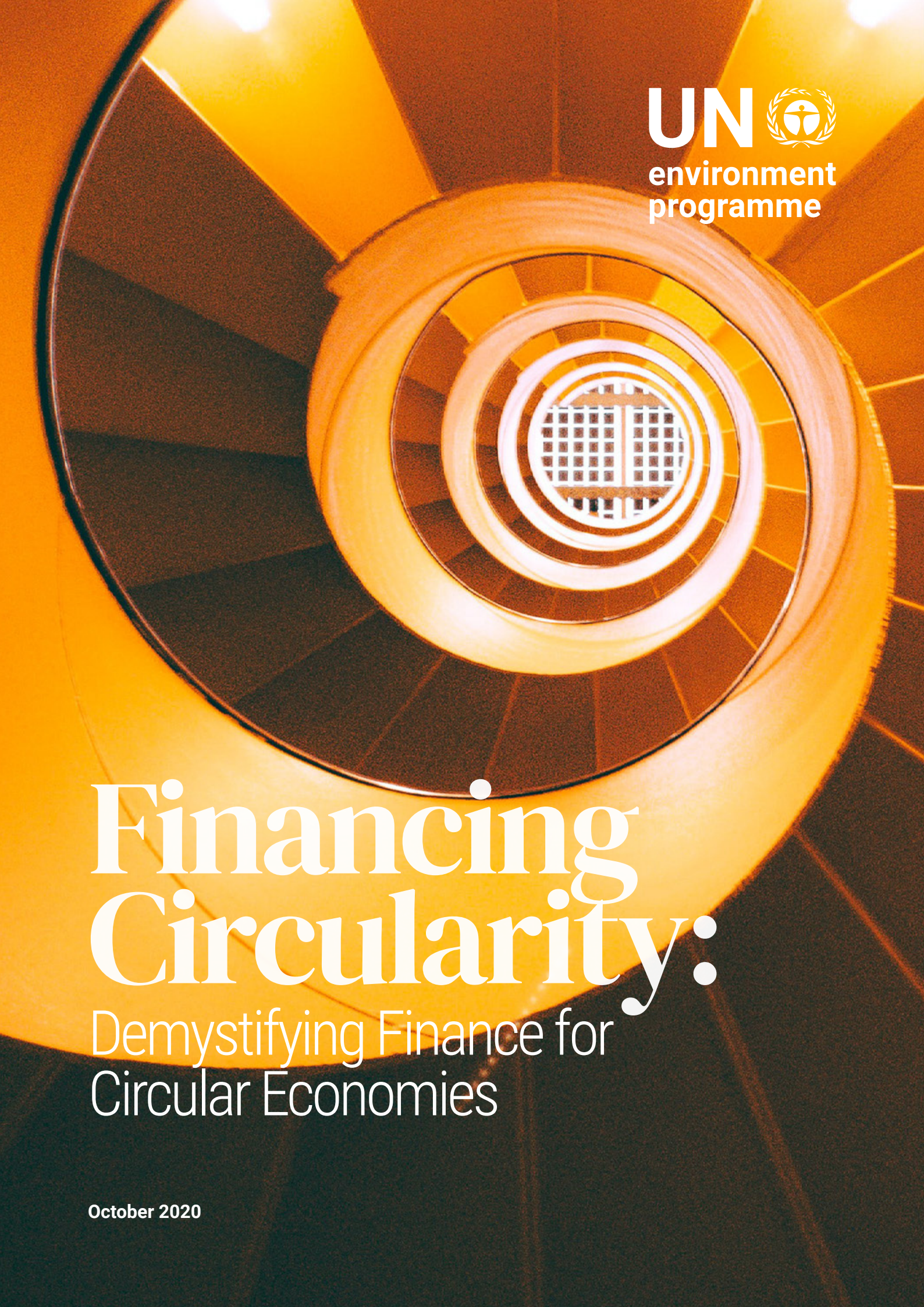

UN environment programme

Financing Circularity:

Demystifying Finance for Circular Economies

October 2020

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The United Nations Environment Programme Finance Initiative (UNEP FI) is a partnership between UNEP and the global financial sector to mobilize private sector finance for sustainable development. UNEP FI works with more than 350 members—banks, insurers, and investors—and over 100 supporting institutions – to help create a financial sector that serves people and planet while delivering positive impacts. We aim to inspire, inform and enable financial institutions to improve people's quality of life without compromising that of future generations. By leveraging the UN's role, UNEP FI accelerates sustainable finance.

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Foreword

Harnessing finance to build back better and greener

Economic disruptions during the pandemic in 2020 have brought to light the urgency of the transition to more sustainable consumption and production.

Emerging from this crisis is an opportunity to address vulnerabilities in our systems that have been exacerbated and exposed, including biodiversity loss, resource flows, and pollution impacts on the resilience of human health.

The better we manage our production and consumption, the better we manage the health of ecosystems that underpin our economies. The recovery has to be transformative to ensure the post-COVID-19 world improves human well-being, tackles climate change, protects nature and cuts pollution. This is critical to address underlying fragilities and identify opportunities to shift swiftly towards more just, equal and resilient societies and economies.[1]

Instead of going back to linear, wasteful and inherently unstable supply chains, we need to to align our economies with the UN Sustainable Development Agenda adopted by 193 UN Member States in 2015. Governments and the private sector can jointly transform resource use to shape a recovery that safeguards lives and livelihoods.

Financial institutions have a critical role in stimulating economic growth by investing in sustainable consumption and production, which sits at the heart of the Sustainable Development Agenda for 2030. Redesigning economies to embed circularity can change the way we produce and consume, addressing issues ranging from greenhouse gas emissions to plastics, resource scarcity, waste management, and use of hazardous chemicals, while increasing resilience.

This report offers emerging evidence of the potential to scale up finance to accelerate the shift away from a take-make-waste model of resource use and pollution to a circular economy, and practical steps to embed circularity into financing. The insights in this report can guide financial institutions to address the opportunities and threats offered by the transition, providing recommendations for policymakers for frameworks to accelerate financing for a circular economy, with examples of measures that have proven effective around the world.

The global financial system has a tremendous opportunity to scale up financing of solutions to tackle society's critical challenges, while managing downside risks from changes in business models and economies at all levels. Financial institutions that take risks and opportunities related to resource use, scarcity and effects on pollution and people into account will be well-positioned to be part of an economy fit for the future.

It is increasingly urgent to accelerate and scale up the transition to a circular economy. Allocating capital for the longer-term imperatives to address climate change, reduce pollution and improve resource efficiency and security is fundamental to ensure a transformational, inclusive and sustainable recovery.

Steven Stone
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Executive summary and recommendations

There is an urgent need for the transition to a circular economy (CE) that aims to keep resources at the highest possible value during their lifetime and to reduce waste in our economies. The CE provides an alternative to a linear economy that operates from a take-make-waste model that degrades resources and generates unacceptable levels of waste. Circular economy finance is growing as the financial sector allocates more capital to stimulate economic growth through the transition from a linear to a circular economy, contributing to more sustainable consumption and production as well as the 2030 Agenda more broadly. Substantial financial resources are needed to induce structural change in production and consumption alongside technology change to enhance economic efficiency and optimize use of financial capital.

The transition from our linear economy to a circular economy creates business opportunity for the financial industry. *Financing Circularity: Demystifying Finance for Circular Economies* explores the strategies and actions that financial institutions can take to accelerate financing of the transition towards a CE, and highlights ways in which financial institutions can manage related risks/barriers[2] and scale up innovation and opportunities related to products, services and financial instruments/investments. Opportunities include rethinking of the design and manufacturing of products and services, circular agriculture and digital solutions to transform industries, coupled with waste management models designed to close material and resource loops and water management for efficiency, quality and supply security.[3]

The report provides insights into practical approaches to financing circularity, such as the application of sectoral metrics in decision-making, and encourages financial institutions to formalise industry-wide support programmes and commitments for the transition to a circular economy and more sustainable patterns of consumption and production.

Recommendations for banks, insurers and investors to accelerate financing circularity include:

1. **Integrate the transition into your organization's strategy.** Re-orient investments towards more sustainable technologies and businesses that enhance the circularity of economies; finance restorative and regenerative business models in a sustainable manner over the long-term; start developing strategy execution pathways to contribute to the creation of a low-carbon, climate resilient and circular economy.
2. **Manage linear and circular risks and opportunities by applying the circularity or 9-R concept in your financial institution's risk policies, product development and client engagement**. Develop knowledge and identify risks and opportunities related to linear and circular business models by applying the 9-R circularity concept of Refuse, Reuse, Reduce, Redesign, Repurpose, Remanufacture, Repair, Refurbish, Recycle. Reflect potential of the CE transition to contribute to action to address climate change in risk policies. Leverage financial knowledge within climate-related risk policies and the global climate change agenda. Embed risks related to resources and materials in risk models.
3. **Develop sectoral competences in your financial institution and integrate with commercial activity**. Evaluate sectoral best practices for finance focusing on sectors such as construction, chemistry, electronics, food and agriculture, manufacturing, apparel and fashion, mining and energy which show linear and circular risks, specific to these sectors. The sectors where linear risks increase

fastest, are also most promising for risk mitigation by transitioning to a more circular economy. Develop an understanding of the circular economy market and the flow of materials, such as recycling infrastructure and capacity, relevant legislation, and changing consumer demand patterns. Develop knowledge of how changes of environmental laws, Extended Produced Responsibility (EPR) policy, the shift of tax policies from labour to resources and VAT on (secondary) resources affect the license to operate and potentially profit and loss.

4. **Monitor job creation and destruction from the transition**: Pro-actively monitor the threats and opportunities to jobs, internally for your financial institution, in the form of new CE-related financial jobs and externally for the employment and jobs destroyed and created in the businesses of your clients. Internally, circularity and the 9-R's can be added in financial job descriptions, career development paths and educational tracks. Assess job creation and destruction across clients in key sectors, and consider including this in questionnaires used for client onboarding and periodical reviews of client relationships.
5. **Raise awareness of the implications of resource efficiency and material flows in your organization and among clients.** Engage C-suite level, employees and clients on financing circularity. Enhancing understanding at board level is the critical to secure the necessary means for the circular transition. C-suite support allows for the integration and dashboard monitoring of CE policy changes based on the sectoral and geographic coverage of your organization's balance sheet. Train relationship managers to identify risks and opportunities related to CE business models and raise awareness of the linear take – make – waste economy and the circular economy among employees and clients. Briefings should reflect geographical and legislative differences amongst trade blocks, continents and countries. A key aspect is the influence of financial institutions on the boards of their clients, e.g. engagement with clients about the use of CE criteria, engagement about sectoral best practices and increased linear risks.
6. **Evaluate how your institution can contribute to financing the transition under key financial industry frameworks** (Principles for Responsible Banking, Principles for Sustainable Insurance and Principles for Responsible Investment). Integrate environmental, social and governance (ESG) issues, identify significant impacts and set targets related to resource efficiency and the transition. Explore ways in which scaling up financing for circularity can contribute to alignment of financial portfolios and balance sheets with the UN Sustainable Development Goals (SDGs) and related targets.
7. **Measure CE finance on your balance sheet and grow the CE finance footprint of lending, investment and insurance activities.** Disclosing the level of financing for circularity on your balance sheet can raise awareness about CE activities with clients, employees and investors. Explain in disclosures to investors how your organization has assessed the risks and opportunities of emerging regulation and changing consumer preferences. Provide examples of circularity that are already present in your business and highlight best practices from your client base to nudge the behaviour of other clients.

8. **Contribute to standardisation of CE metrics and financial instruments.** Financial institutions can integrate climate and CE finance for optimal mainstreaming of circularity. This can be achieved by using sector agnostic financial instruments such as green bonds and green loans, sustainability-linked loans, positive impact finance and ESG integration. Contribute to industry knowledge and insights to work towards the standardisation of ESG metrics for CE finance. Monitor relevant progress made by standard settings such as the International Standards Organization (ISO); emerging reporting standards (E.g., Global Reporting Initiative, Sustainability Accounting Standards Board (SASB); bodies developing CE taxonomies; ESG research offered by specialised rating agencies or service providers; and developments on CE indicators and approaches under initiatives such as the World Business Council for Sustainable Development and the Ellen MacArthur Foundation, among others.

   Research for this report also identified the need for governments to provide the financial sector with incentives and an enabling policy and legislative framework in order to accelerate a systematic, concrete and scalable approach to integrating CE concepts into financial products and services.

Recommendations for policymakers, financial industry regulators and supervisors to address barriers and stimulate opportunities include:

1. **Integrate measures to bring about the transition into existing and planned climate policies, rules and regulations**. Mechanisms to reduce greenhouse gas emissions should address barriers to circularity in the economy. Policies should take account of overlaps across the resource and the climate agendas, on fuels, as well as on how economies are organized around the production of biomass, metals and non-ferrous minerals. This will involve the inclusion of CE objectives in global and national climate agendas, as well as working towards realigning relevant government interventions that are currently counterproductive to the CE transition, such as fossil fuel subsidies.
2. **Build back better with circularity.**[4] Governments' post-pandemic economic support programmes should promote and accelerate the transition. Recovery plans across the public and private sectors should focus on a resilient recovery that meets societal needs of a healthy environment and stimulates growth of the circular economy. Options to build back better include:
   - Developing country- or region-specific CE technical advisory support. This would help prepare and develop new projects as the CE business model is often more challenging and multi-faceted for operational employees than linear business models.
   - Developing Sustainable Product Policy where circular design is the norm.
   - Raising consumers awareness by providing access to reliable information on product to promote circular behaviour.
   - Developing regulatory frameworks and policies for sectors that use the most resources and where the potential for circularity is high (e.g. construction).
   - Facilitating and harmonising due diligence, accountancy and valuation procedures for circular projects, materials and products.

3. **Implement transition related policies, laws and related instruments.** Examples include:
   - Clarify legal frameworks to influence the rate of adoption and the volume of circular economy finance by the private financial sector.
   - Introduce Extended Producer Responsibility (EPR) to integrate circularity, the 9-R concept and the transition from a linear to a circular economy into policy.
   - Design fiscal policies to shift the tax burden from labour to resources, address equal tax treatment between virgin and recycled materials and harmonise VAT regimes to correct market failures and foster the financial attractiveness of investments in circularity.
   - Integrate principles of circularity in digital national strategies, e.g. sector regulations can ensure and promote digital and physical tagging to increase the traceability of resources. Policy should enable open source and standardised data interfaces with financial institutions.
   - Deposit and collection schemes for resource recovery to create a level playing field for companies.
   - Safeguard the social and inclusive aspects of the transition to a circular economy to address the potential vulnerability of social protection under certain business models of the circular economy e.g. sharing economy.

These recommendations also reiterate and build upon previous UNEP policy recommendations to change public procurement criteria to circular procurement, such as the recommendations outlined in the UNEP report "Building circularity into our economies through sustainable procurement"; and to change policies to be conducive to the reduction of plastic use and plastic waste such as the recommendations outlined in the UNEP report "Unwrapping the risks of plastic pollution to the insurance industry".

Ultimately, the transition to greener and more circular economies will rely on demystifying the emerging opportunities for financing new investments that enhance resource efficiency, drive innovation, and create new sources of revenue and markets. This report shows how financing circularity can open up these opportunities for first movers, and the necessary steps forward for those pioneers of the circular economy — a key pathway to making our consumption and production more sustainable and for delivering on the 2030 Agenda.

Introduction

This section explains why circular economic models are important to the economic recovery. The 4th industrial revolution could change ownership, production and consumption patterns, while creating opportunities to decouple growth and job creation from resource use.

Building circularity in our economies requires designing out waste and pollution, retaining the value of materials and products and keeping them in the economy, while also regenerating natural systems. It leads to the transition from the current "take, make and dispose" extractive industrial model to a decoupling of economic activity from the consumption of natural resources and designing negative externalities such as waste and pollution out of the system.

The COVID-19 crisis in 2020 has created mixed signals regarding the shift to sustainable consumption and production and circularity. It has temporarily disturbed waste collection based on fears of collecting contaminated materials. The need for personal protection equipment has created unexpected volumes of single-use wastes and plastic products. These short-term pandemic related upsets can impose barriers, hurdles or even temporary downturns for the growth towards circularity in favour of the more wasteful linear take-make-waste principle.

However, the post-pandemic recovery is a chance to pivot economies towards more sustainable and resilient consumption and production patterns.[5] The COVID-19 lockdowns had a dramatic effect on global trade volumes and material flows in 2020. Although the global trade system has responded relatively well to a crisis of unprecedented global scale, trade conflicts over scarce resources (e.g. medical supplies) indicate that our production and consumption patterns will need to transform in order to become more resilient to economic shocks. The COVID-19 crisis revealed the exposure of geographically stretched value chains to linear system stresses. The geographical divide between production locations and consumption locations based on a linear system with low inventory, remote production and far-away mining operations adds to the vulnerability of trade.

Several plans for the post-pandemic economy recovery (e.g. Canada and Europe) connect recovery to climate change and environmental concerns.[6,7] In some countries, companies receiving government support will be required to publish climate-related disclosures and indicate how their future operations will support environmental, sustainability and climate goals. To advance on these effectively, companies will need to rethink their consumption and production approach, bringing circularity in as a key feature to build back better.

While governments in several regions are developing policies to support the shift to a circular economy, most financial institutions are yet to address related risks and lack awareness of financially viable opportunities. This UNEP research on circularity provides insight into finance sector strategies and market practice, metrics, policies, geographical variation as well as issues such as how the lack of risk assessment of linear value chains can have a material impact on financial performance.

Why now? The post-pandemic reality will have many consequences on the use of resources, particularly at the locations at which they are used and where wastes originate. Onshoring of production and the increase of disposables are just two of the many effects. Since the industrial revolution, the value chains that make up the largest part of our economies are linked in a linear way to use resources, more economic growth equals more resource usage. If a crisis happens on a global scale, as we have witnessed with COVID-19, events go all the way down the linear and global value chain. Circular economy redesign has the potential to build in "circuit breakers" that mitigate the effects of these chain reactions. One of the proposed routes is to shorten value chains and to onshore production, to increase supply security.

In June 2020, more than 50 chief executives and global leaders called for more ambitious targets to accelerate the transition to a circular economy as a solution to build back better and called on businesses and governments to invest in circular economy solutions across plastics, fashion, food, finance.[8]

Building circularity and resource efficiency in our economies can also contribute to mitigation and adaption to address the climate crisis. Whether we mitigate greenhouse gas (GHG) emissions through renewable energy sources (E.g., wind, solar, geothermal) or adapt our infrastructure and production to a changing climate (water infrastructure, revitalisation of soils and combating desertification).[9] More circular economic models foster the mindset to also consider the effects of the resources needed to implement these often far-reaching changes.

Although historically marginalised by conventional, linear economic growth, the transition from a linear to circular economic models started long before the arrival of COVID-19. Studies by the International Resources Panel (IRP)[10] and Organization for Economic Co-operation and Development (OECD)[11] suggest that a CE transition will primarily reduce the growth of material use. For very scarce or toxic materials in particular this transition is expected to reduce the absolute amount of materials used. While millions of tonnes of mineral and fibre scrap material are already recovered, more than 90 per cent of economic activity depletes resources,[12] instead of being regenerative and restoring them. This resource-centric transition is here to stay and will continue to rise up the agendas of policymakers and the finance community. For a more resilient global economy in the long term, accelerating financing for businesses to share, recover, reuse, remanufacture, recycle, redesign, and reduce resource use remains key. Underpinned by a transition to renewable energy sources and a more sustainable use of biodiversity and ecosystems, the circular model builds economic, natural and social capital simultaneously.[13]

Economic downturns make natural resource consumption temporarily go down. The rebound effect on the consumption of natural resources over the past centuries has always been greater than the original slump. Companies and governments need to integrate decoupling in their business model and policies to create more future-proof economic growth and job creation. A large part of our economy is still guided by development rules set out by the first and second Industrial Revolutions, focused on standardisation of manufacturing (concrete, steel, machines, physical products). While the third Industrial revolution brought about the digitisation of our manufacturing systems, the fourth Industrial revolution challenges our notions of ownership and our consumption patterns. Business are constantly redirecting their strategies to escape commoditisation. The services economy offers this possibility of strategic reorientation. Due to the rise of a services economy, job creation can be decoupled from resource use. For financial institutions the servitization of our economies, spells growth.

From a take – make – waste linear economy to a circular economy

This section explains the risks of a linear economy and value enhancement of circular economic models. It outlines the 9-R concept for behaviours that promote circularity — reduce, reuse, recycle, recover, redesign, remanufacture, refurbish, repair and refuse.

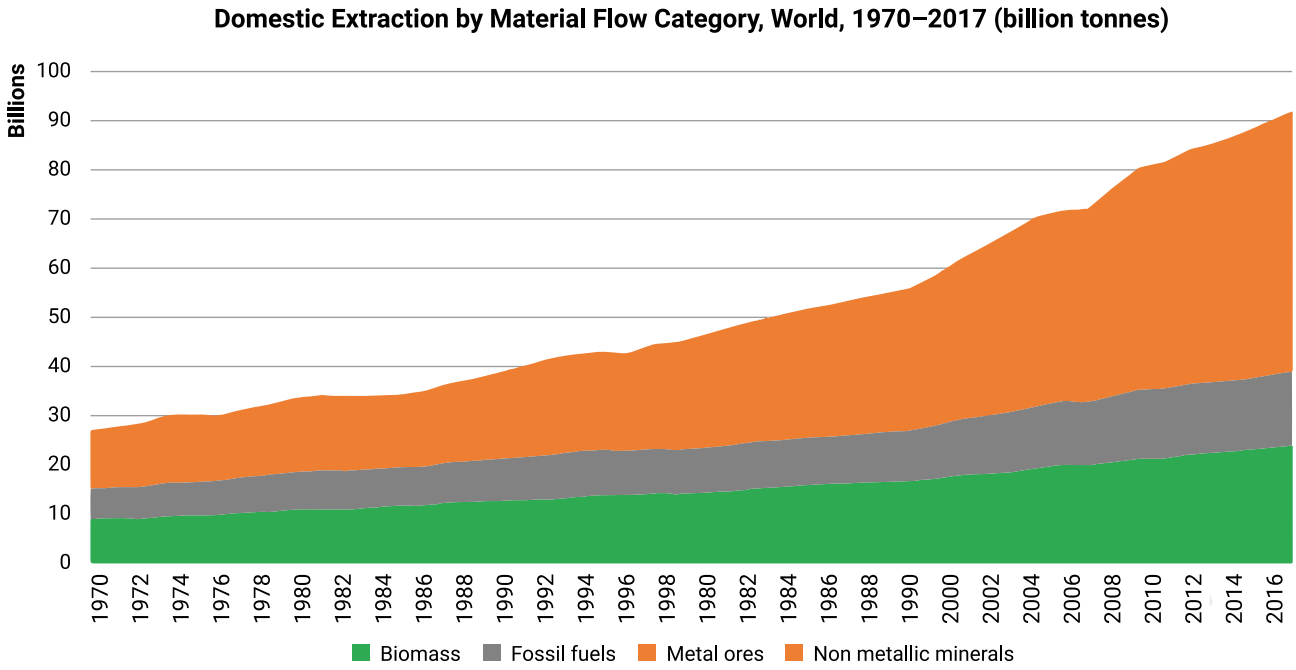
Most financial services currently stimulate economic growth of the linear economy. Linear economy finance grows our economies according to the take – make – waste principle. This 'principle' is the outcome of a system in which resource depletion and the environmental costs of waste have been largely ignored. In linear economies, producers take resources to make materials and products, consumers use them and dispose of them as waste. Our economies are predominantly organised in a linear way.

The volume of waste streams is strongly correlated to the patterns of production and consumption that in turn determine the level of use of resources to grow our economies. According to the World Bank,[14] the world generated more than two billion tonnes of municipal solid waste annually in 2016, and volumes are expected to continue to increase to 2050. More than 30 per cent of solid waste streams do not meet any environmentally safe treatment standard. And while this may imply that the majority of wastes are handled, municipal solid waste represents only a fraction of registered wastes, with enormous amounts of waste being omitted from statistics. These wastes remain unaccounted for and are in some cases illegally dumped.[15,16]

Global inequalities are reflected in waste trends. Worldwide, solid waste generated per person per day ranges from 100 grams to 4.5 kilogram per person,[17] the rate increasing with affluence. While high-income countries represent only one-sixth of the world's population, they generate more than one-third of global waste. With of the majority of the world's current seven billion people aspiring to obtain higher levels of consumption, the pressure of untreated waste volumes on our environment is a growing challenge, along with related impacts on human health.

Economic growth is based on the production and consumption of diversified goods and services. Resource intensity varies tremendously across different economic activities. The total volume of waste is generally closely corelated to the volumes of material flows to support our economic activity.[18] The International Resource Panel estimates that global material resource use is likely to more than double by 2050, based on the current linear economy trends.[19]

Figure 1: Historical growth between 1970 and 2017, extraction of materials continues to grow



Source: UNEP International Resource Panel

The take-make-waste triad of our global economy poses increasing risks to the license to operate of the financial sector and its clients. Among the risk drivers are:

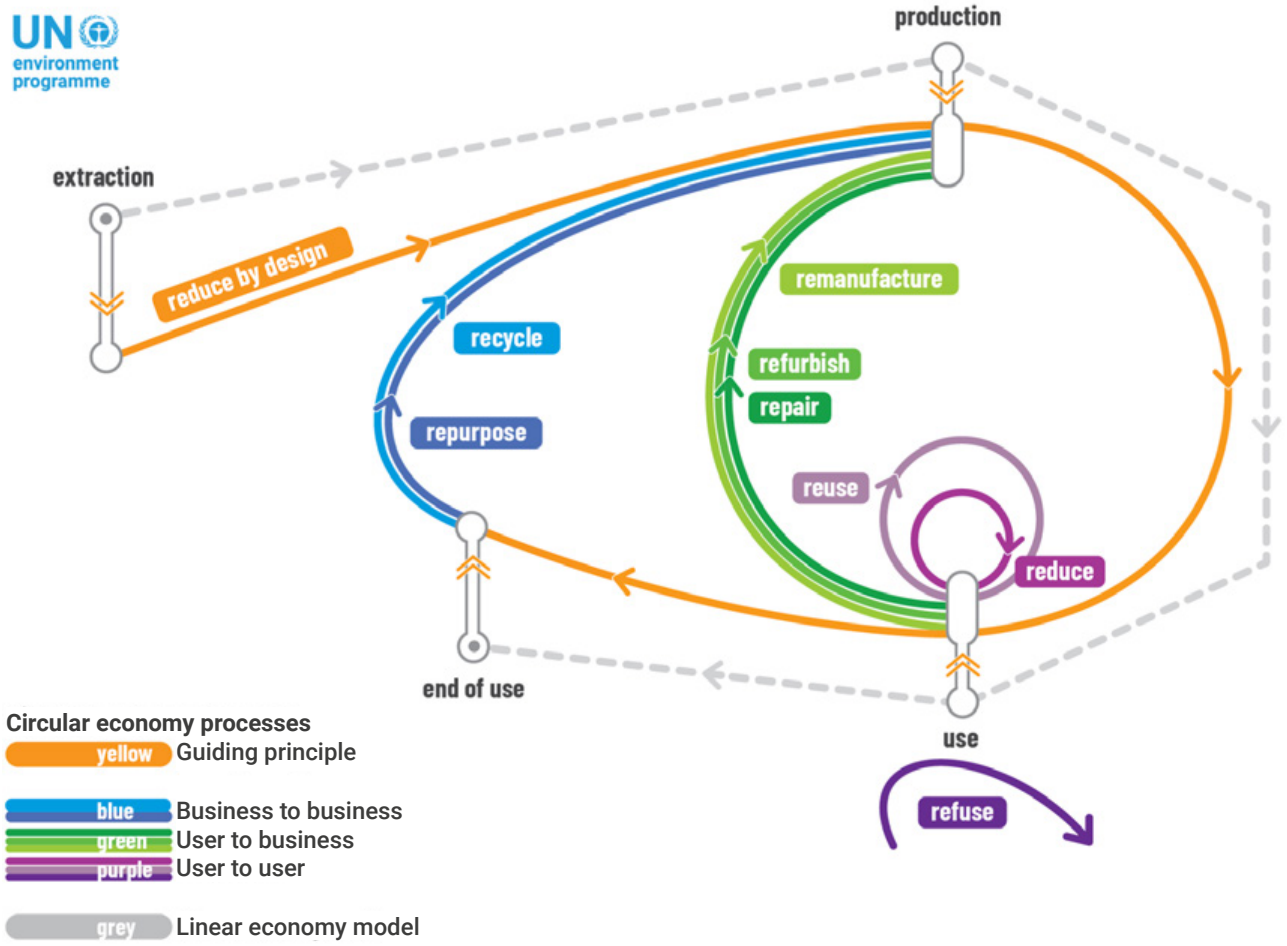
1. The pace of development and application of safe and environmentally-sound disposal methods[20] has trouble keeping up with the growing volumes of waste from material extraction, production and consumption.
2. The dominant disposal methods of sanitary landfilling and incineration[21] (E.g. waste to energy) techniques do not generate the highest level of value from resources.

What is a circular economy?

Separate solutions to the resource, waste and environmental degradation challenges have recently moved from being often marginalised efforts to converging under the circular economy agenda. A common theme is combating waste by continuously improving and redesigning our economy to keep products and natural resources in play for longer, before we discard them as waste. Value retention alternatives can increase the efficiency and productivity of resource use, and therefore the extraction of value. A uniform definition of what constitutes a CE is still lacking as outlined by a recent meta-study of 114 existing definitions.[22] All definitions focus on the aim of achieving better controls on the circulation of materials and closer ties to end-use markets for secondary materials.

Common economic behaviours associated with the circularity approach are outlined in a 9-R concept as a proxy for a CE definition (see figure below). Circularity is a term commonly used to indicate the toolbox of "R-behaviours" that promote the transition to a circular economy. These behaviours were originally coined as the 3-R concept (reduce, reuse, recycle), further elaborated to constitute the 6-R concept (with the addition of recover, redesign and remanufacture) and later evolved into the 9-R concept (with the further addition of refurbish, repair and refuse). The table and schematic below show each of the 9-R behaviours.

Figure 2: The UNEP Circularity approach using the 9-R concept



Source: Adapted from UNEP Circularity Platform, 2019

Reduce by increasing resource efficiency during manufacturing or use less natural resources;
Refuse and abandon the use of a resource or product through elimination without losing function;
Redesign the product or service as a product-as-a service or sharing business models;
Reuse of a product that is still functioning for its original purpose;
Repair a product in disrepair so it can be reused for its original purpose;
Refurbish Restore and increase the quality of an otherwise obsolete product to quality standard;
Remanufacture used parts into a just-as-new condition through combination of parts;
Repurpose Use a redundant product considered as waste, reprocess and give it a different function;
Recycle Recover materials from waste to be reprocessed as inputs for production, excludes energy recovery.[23]

Table 1: The UNEP Circularity concept refers to the 9 R's[24]

The key reason for including the 9th R of 'Refuse' is to prevent hazardous chemicals in products that run the risk of them preventing the return of resources in the economy while protecting health and safety. There is a need to further address toxic chemicals in our environment under this model. In particular, some brominated flame retardants, used in electronics products, can be found in toys from recycled materials.[25] They should be removed and replaced, ideally at the design stage. Policies could also encourage the removal of these substances at the recycling stage, although effective removal is often not technically nor economically viable. Chemicals of concern in products are therefore an impediment to a circular economy, underpinning the importance of avoiding and prohibiting the use of hazardous chemicals.

The 9-Rs clearly show that CE is about more than waste reduction. A definition by the Ellen MacArthur Foundation includes restoration and regeneration. While these are not included in the 9Rs, the restorative and regenerative nature of outcomes in relation to resource usage form the purpose of the 9R behaviours.[26] Slowing down the growth of resource use reduces the environmental effects of resource extraction and production. Time plays a key role, because the improvements need to be done in such a way that the pace of the extraction, use and depletion of renewable resources does not exceed the speed of the regenerative cycle for nature to replenish them.[27] Ultimately our current actions should support the quality of life and resource availability for future generations, in line with sustainable development that "meets the needs of the present without compromising the ability of future generations to meet their own needs."[28]

The schematic of the 9-R process indicates that the pace of extraction and production of primary materials decreases in favour of increased growth of end-of-use and use activity. The R-behaviours can have the following practical outcomes:

- Reducing manufacturing costs by resource-efficient design that focuses on material reuse, recycling, disassembling, and remanufacturing;
- Identifying by-product and waste streams in the value chain that could be avoided or monetised;
- Developing and optimizing reverse logistics systems to increase efficiency;
- More sophisticated hedging of risks related to uncertain future commodity supply and price volatility;
- Unlocking new business opportunities and markets based on the ability to extend the economic lifetime and generate revenues through repair and refurbishment;
- Challenging existing company culture and beliefs that have become barriers to change.

Innovative business models underlying finance for circularity

This section explains the steps needed to enable financing that advances circularity in economies and outlines promising circular business models. It outlines innovation needed to catalyze these changes in production and consumption and technology and implications for risk management.

Financing for circularity covers any type of financial service where money is exclusively used to finance, re-finance, invest in or insure in part or in full, new and/or existing companies or projects that advance the circularity of our economies.

To enable it:

1. Funds need to be earmarked in financial institutions for the allocation to be considered "exclusively" used to finance companies and projects contributing to a more circular economy. If the amount is not identifiable, its real world impact cannot be assessed (E.g., x amount of tonnes of toxins did not enter water streams or x amount of tons of recycled materials increase by making investment y). To properly earmark it, data will need to be disclosed by clients of financial institutions to fully track and assess the impacts on the circular economy.
2. To mainstream the 9-Rs in existing financial instruments, it needs to become an opt out rather than an opt in in mainstream financial instruments. Policy support for CE is needed at multiple layers of government to allow innovative business models to become structurally scalable and profitable while at the same time ensuring that robust data is generated to track their impacts.
3. Circularity needs to be embedded in environmental, social and governance (ESG) criteria mainstreamed in assessing business performance. With ESG factors included in the fiduciary duties of directors and in decision-making,[29,30,31] the ongoing sustainability shift favours the resource and material efficiency related disclosures needed for CE.

A UNEP FI survey of financial institutions found that although around 80 per cent of respondents lack awareness of the potential scale of financing opportunities, some 20 per cent is well aware of the potential opportunities. Findings also showed:

- The majority of respondents from the financial sector see Circular Economy integration in innovation strategy and mitigation of linear risks (take-make-waste);
- More than 35 per cent see integration occurring in investment strategy and procurement policy;
- None of the survey respondents see the Circular Economy currently being integrated in pricing of financial products and services.

While there are opportunities, many barriers and gaps for implementation remain to be addressed, including uncertainty about which business models will prove to be the winners or losers of the post-pandemic economy.[32] Finance is primarily focused on facilitating the growth of promising circular business models. In this publication we use the four categories of business models put forward by the EU's Categorisation System for the Circular Economy in 2020,[33,34] which in turn aligns with Circular Economy Finance Guidelines from 2018[35] and a Value Hill model from 2016.[36] The circular business models shown in Box 2 are applicable worldwide and offer a significant innovation challenge.

Box 1: Four circular business model categories

In March 2020 the EU's CE Finance Expert Group published "a generic, sector-agnostic circular economy categorisation system that defines distinct categories of activities substantially contributing to a circular economy; a set of minimum criteria to be met by activities under each defined category in order to be considered as substantially contributing to a circular economy; and methodological guidance including an indicative list of typical investments/projects for each circular economy category."

1. **Value and resources recovery business model**

   Separate collection and reverse logistics of wastes as well as redundant products, parts and materials enabling circular value retention and recovery strategies. Including biomass waste and residues as food, feed, nutrients, fertilisers, bio-based materials or chemical feedstock, reuse/recycling of wastewater.

2. **Circular Design and Production business models**

   Design and production focused on the increase of material / resource efficiency, durability, functionality, modularity, upgradability, easy disassembly and repair; materials that are recyclable or compostable and process technology that supports these circular benefits.

3. **Optimal Use Business Models**

   Reuse, repair, refurbishing, repurposing and remanufacturing of end-of-life or redundant products and any type of assets with product-as-a-service, reuse and sharing models based on leasing, pay-per- use, subscription or deposit return schemes, that enable circular economy strategies. Rehabilitation of degraded land to return to useful state.

4. **Circular support, facilitators and enablers, market places**

   Expert knowledge, advice and tools, software applications, market places and enabling services for all other circular economy business models.

Source: ec.europa.eu/info/publications/categorisation-system-circular-economy_en

The innovation challenge

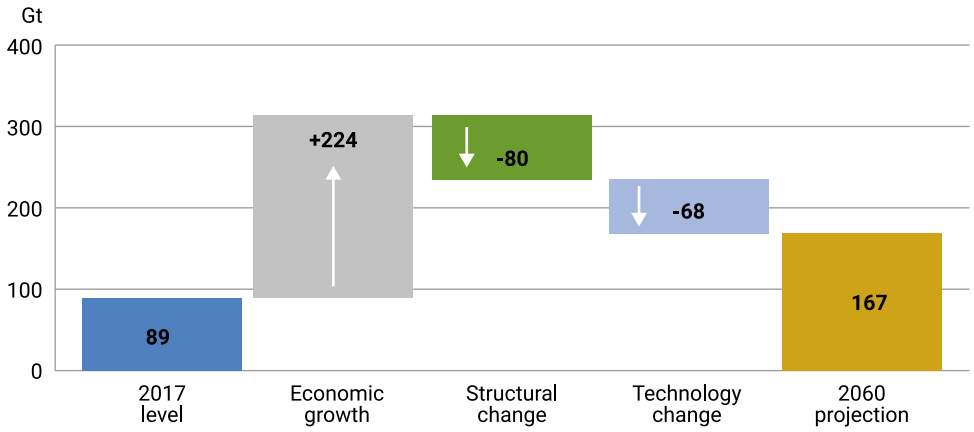
The growth of these circular business models will require structural change of production and consumption systems and corresponding technology change/innovation. All of these innovations require substantial financial resources and form a pathway for more resilient economic growth that enhances system-wide economic efficiency and the optimal use of financial capital.[37] The change is put into numbers by a scenario for the coming 50 years outlined in the Global Materials Outlook to 2060 and researched by the OECD (see graph below). A linear growth strategy is constrained by finite resources. This graph shows increasing levels of material use:

- In 2017, the global economy used 89 Gt of materials as a starting point for the scenario prepared by OECD
- In 2019, the global economy used 100 Gt of materials (not in the graph)[38] based on circularity gap research;
- In 2060, the global economy in the OECD scenario would use 313 Gt of materials, based on growth;

- By 2060, the economy can structurally change itself to reduce material use by 80 Gt (systemic shift);
- By 2060, the economy can technologically change to reduce material use by 68 Gt (technology shift);
- By 2060, the outcome for the economy can be 167 Gt of material use instead of a projected 313 Gt.

To achieve the reduction of 80 Gt material use by structural changes and a further 68 Gt reduction of material use by technology change and corresponding resource efficiency, our mainstream economic activity should increasingly and steadily focus on the 9-R circularity concept. To steer the pace of these activities, the transition to circularity requires monitoring on the mass-balance of materials entering and exiting the system.[39]

Figure 3: Structural and technology change is projected to slow down the growth in materials use



Source: OECD - Global Material Resources Outlook to 2060

The following innovations are key for structural and technological change to occur:

- Supply chain innovation optimizes global supply chains through reverse logistics systems.
- Product as A Service (PAAS) changes the balance between product sales and service offerings, with services becoming the driver of transactions.
- Improvement of the access to materials by re-imagining waste streams as upstream materials. What was considered downstream waste can now be an upstream secondary material.
- Collaboration along the supply chain where the actors in the supply chain work together to coordinate the process of assembling and disassembling products and services to maximize value.
- Accounting and valuation methods for secondary materials need to be updated.

Risk management

The transition towards a more circular economy creates complex and systemic challenges by rethinking, reengineering and replacing the design principles of the take – make – waste triad. This redesign is a gradual process of embedding the 9-R behaviours of reduce, reuse, recycle, recover, redesign, remanufacture, refurbish, repair and refuse in economies.

The contribution of financial institutions to the transition from a dominantly linear to a circular system is not yet mainstream. Barriers include the perceived complexity of circularity and of the balance between risks and returns. As with any emerging field within our global economy, the transition to circularity contains risks for the financial sector. A better understanding of risk management in the circular economy is a skill set under development. The risk profession has widely embraced climate-related risks. Risks related to resources and materials are important to develop to enhance financial institutions' risk models in the years to come.

From a risk perspective, observations in the financial sector include:

1. Higher perceived risk of circular business models as the new-kid-on-the block. Circular business models are considered risky with uncertain returns and require de-risking through public-private collaboration in the form of first-loss guarantees, government backed loans or participation; This is due to the higher (perceived) risks of innovative business models in general;
2. Lower perceived risk related to the linear economy. Economic risk management does often not pre-empt in a timely manner the effects of policy changes or crisis on existing, mainly linear financial portfolios (e.g. drop or rise in popularity and use of certain mining resources); Transition risk aimed at the avoidance of stranded assets in the financial portfolio are not properly assessed;
3. Physical risks such as noise, environmental damage, air pollution, hazardous materials affecting ecosystems are insufficiently priced into the risk profile of linear production systems; reputation risks can tarnish financial institution's image by a late adoption of the Circular Economy as a theme for risk management and commercial opportunity; Meanwhile the increased reputation risk goes hand in hand with increased liability risks that hold clients of the financial sector accountable for environmental clean ups.

Financial institutions need to understand and integrate CE terminology and indicators into operations, including risk models, in order to mitigate linear risks, as well as to identify business opportunities.

Sectoral focus for financing circularity

This section looks at emerging circular business opportunities in the chemicals and plastics, manufacturing and industrial agriculture, electronics, real estate and construction, fashion and textiles, mining and energy sectors.

Risks driven by the negative impacts of consumption and production based on our current take-make-waste model are often addressed defensively in financial institutions' sectoral risk policies. These sectoral risk models drive financial allocation in banking and insurance. The transition to a more circular world requires risk policies to be updated for specific sectors in light of changed consumer demands, health and safety concerns, competitive CE-related offerings and regulatory change. The risk profession can be a catalyst to highlight the emerging opportunities for the financial allocation to specific sectors. Circular business models can be found in a range of sectors.

Box 2: UNEP FI Survey: Top sectors for financing circularity

The majority of financial sector respondents to the survey sees most opportunity to finance circularity in the building and construction sector.

More than 30% see most opportunity in these sectors:

- Food and Agriculture
- Chemicals
- Electronics

None of the respondents recognise opportunities in the following sectors:

- Personal care
- Information Technology

Finance for chemicals that are "benign-by-design"

Every product is made out of chemicals so the chemical sector rightly calls itself the 'industry of industries'. This also means that bad decisions in the production stage of the chemical sector permeate throughout all other manufacturing sectors. Financial institutions' risk policies should include risk criteria and client questionnaires to assess the maturity of companies in the practice of green and sustainable chemistry (see box below). This applies to clients active in pharmaceuticals, chemical production and trading and industry at large. Mostly financial institutions will cover policy-related risks caused by hazardous materials in relation to for example the EU Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)[40] Regulation or equivalent in other jurisdictions, and the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal.[41] The most important change in risk policies that the circular economy requires of financial institutions is that they should focus on behaviours that increase circularity. This can tip the balance towards the prevention of pollution of air, water and soil and the avoidance of negative health and safety effects on humans, rather than focusing on mitigation of pollution effects.

Governments pledged in an international agreement to minimise the risk of manufactured chemicals to human health and the environment by 2020. The Fifth Session of the International Conference for Chemicals Management (ICCM5) postponed to 2021 was expected to acknowledge the many ups and downs of the co-signing governments that pledged to reach that goal. ICCM5 is also the start of the next generation of measures needed to contain the issue of manufactured chemicals.

The financial due diligence for lending and investment for the chemical and related manufacturing sector is based on the future returns that companies plan to make on the sale of their manufactured (chemical) products. It is in the financial institutions' self-interest to ask questions about the impacts of these products in order to avoid the risk of those products becoming prematurely redundant due to changing societal expectations, market boycotts, changing regulation, E.g. a ban on plastic microbeads[42] and other known problematic chemicals in products.[43] The questions asked by lenders, investors and insurers to assess the risks are a powerful force for change. There are several tools that the financial industry can use to help them in asking the right questions about the quality of chemicals management:

- Chemical Footprint Project[44] applied by the Investors Environmental Health Network
- ChemSec's Chemicals Criteria Catalogue for Investors.[45]

A barrier to circularity in the chemical sector can be the long technical lifetime of manufacturing equipment. When the financial commitments for lease or loans have been fulfilled on the basis of the economic lifetime of around five years, there is often a remaining technical life span of an additional 20, 30, in some cases up to 50 years. Chemical companies can be reluctant to change production protocol because the product still makes money, where it is not banned yet.[46,47] For example, machines that produce compounds or products that contain CFCs,[48] PFCs,[49] PFAS[50] continue to operate, even when companies themselves can see the damage the outputs of these machines bring about during production, use and as wastes. Based on sector knowledge and dialogue with industry peers, the finance industry is in a unique position to offer financial solutions for early decommissioning of obsolete or harmful chemical production technologies, even before problems become known on a broader scale. Financial institutions that are risk averse can act in their own best interest by talking to the management team of chemical companies as part of financial due diligence and the clients' duty of care commitments. Decommissioning costs of machinery should be an integral part of a pro-active dialogue during the annual review of the financial health and liquidity position of clients.

Financial institutions can mitigate their financial risks by ensuring they ask robust questions about circularity ahead of time, helping them to back companies most likely to gain an edge. As a further inspiration for asking the right risk-related questions, the following list outlines the principles for green chemistry first published in 1998 as "Green Chemistry, Theory and Practice" by Anastas and Warner,[51] recategorized and expanded in line with the concept of circularity:

- Refuse: Prevention – Refuse – make scrutiny of waste prevention activities of chemical clients a mandatory check in risk assessment of clients. Better to prevent waste than to recycle it afterwards;
- Refuse: Real-time analysis for Pollution Prevention – monitoring of chemical processes should be established and tested to put instant brakes on pollution, if it does occur;
- Refuse: Inherently Safer Chemistry for Accident Prevention – Accident prevention measures are a good indicator for inherent risk to financial institutions;
- Reduce: Safer Solvents – solvents can account for more than 70 per cent of the cumulative life cycle environmental impacts of a standard batch chemical operation. The choice of solvents or their elimination, where alternatives are available, can be used to differentiate in risk appetite of financial institutions focusing on circular economy;

- Reduce: Waste reduction or Atom Economy /reduction of derivatives – refers to resource efficiency at the level of the chemical process – what atoms used in the chemical process end up in the final product and how much is wasted;
- Reduce: Energy Efficiency – the amount of consideration given by the chemicals producer and user to temperature and pressure in light of energy consumption and yield;
- Redesign: Less Hazardous Chemical Syntheses – refers to the design of synthesis methods of chemicals that pose little to no health hazard to human health and safety and the environment;
- Redesign: Designing safer, yet effective chemicals – refers to designing a lower level of toxicity while maintaining effective function e.g. Paints with less toxicity and reduced volatile organic compounds, yet with easy application, durable performance and high aesthetics;
- Redesign: Renewable feedstocks and biomass – refers to the process of using biomass as a feedstock to replace fossil fuels. From a circular economy risk perspective it should be monitored that the resources used to produce and use the biomass alternative are lower than the fossil fuels alternative;
- Redesign: Design for degradation or recycling – how is the chemical designed to degrade or how can it be reused after first commercial use? Chemical recycling is on the rise and depolymerisation[52] to revert to virgin material is promising;
- Reuse: A catalyst is defined as "a substance that changes the velocity of a reaction without itself being changed in the process". In essence for the chemical process to reflect the circular economy, it should focus on catalysts that are reusable.[53]

These principles form the basis for what is sometimes referred to as benign-by-design chemistry. Financial institutions can use this mapping of the principles of green chemistry to the concept of circularity to align their risk policies with the concept of circularity and the circular economy. Integrating these principles in risk and customer acceptance policies can help stimulate green chemistry amongst clients of financial institutions and address risk prevention.

Box 3 : Promising trend in industrial chemicals: Chemical leasing

Since 2004, UNIDO in cooperation with Austria and Switzerland launched a Global Chemical Leasing Programme, promoting a performance-based business model for chemicals shifting the earnings model from quantity to performance.

As the chemicals supplier sells the performance of the chemical rather than a quantity, the functionality and performance of the chemical is the central element in this business model.

This model yields opportunity in sustainable finance for financial institutions. Chemical leasing classifies an "optimal use" business model according to the generic circular economy finance classification, mentioned earlier. The capital solution can be addressed with a number of conventional financial solutions ranging from financial lease, operating capital to corporate loans and investments. The legal documentation to the contract can be structured according to the principles of green chemistry and circularity outlined above.

Attempts to apply chemical leasing models or chemicals as a service have been hampered by the lack of acceptability of new business models in the financial industry. As long as the costs of chemical waste and pollution risks remain external to the financial business case, chemical leasing will remain relatively expensive compared to chemical sales. The height of the cost of responsible waste treatment plays a key role in the viability of the financial business case for chemical leasing. Another key to success for chemical leasing lies in the quality of the service, integration of logistics with the manufacturing plant in order to make sure that chemicals are brought on site, removed, regenerated and brought back again in a responsible and seamless way. For financial institutions this will mean that their contracts will need to cover the eventualities that can occur in the logistical process. The financial contract clauses need to reflect the value chain of the manufacturing process and go beyond plain vanilla covenants.

Source: unido.org/our-focus-safeguarding-environment-resource-efficient-and-low-carbon-industrial-production/chemical-leasing

Turning the plastics wave through circularity

A lot of what was written on the chemical industry applies to plastic producers as well. There are however some specifics for plastics[54] that influence the financial business case:

- How does the plastic producer hedge against the fluctuations in raw material prices for its the feedstock? What is the balance between recycled plastics and virgin materials? How do they make sure that the recycled content is not contaminated with harmful substances? Clients can be asked to do measurement, target setting and reporting on their production and use of recycled and virgin plastic volumes;[55]

- What are the plans and intended production volumes to shift from fossil fuel feedstock to biobased materials? This issue is complicated due to end-of-product-life considerations—biobased components in plastics can make plastics un-recyclable or lead to lock-in of unsustainable aspects, which can counter the purpose of circularity. Biobased inputs can lower the GHG emissions of production when they substitute fossil counterparts. The financial component of this can be related to prices of inputs, but also the susceptibility to carbon taxing of the business model operated by the client;[56]
- What are the revenues originating from products with intentionally added microplastics? Especially if the presence of microplastics prevents any meaningful reuse of materials.[57]

Financial institutions can contribute to the transition to circularity, particularly by engaging with their clients in the packaging industry. As well as bans, investors are exposed to plastic-related legislation in general (E.g., inclusion of x per cent of recycled material in packaging). Investors need to understand the implications of such legislation for companies and how they are ready to respond (risk perspective). Considerations include:

- The collection, deposit and incentive schemes for plastic packaging in the legal context of the clients' markets. Single-use packaging has been estimated to be responsible for USD 40 billion in external costs not borne by the producers. The total external cost is likely to exceed the profits of the packaging industry, which makes single-use plastics contentious and exposed to an increasing amount of production and usage bans around the globe.[58,59] Some questions for financial institutions to ask are: What type of single-use plastic packaging does the client produce? How does the company tackle the incompatibility of plastics? What are the annual volumes of the common types of plastics that are produced?[60] The compatibility of plastics plays a key role here and the chemical formula used by the upstream producer of the plastics determines downstream success for recycling. There's the challenge that new plastic packaging is put on the market but incompatible with the current recycling facilities, which cannot adapt fast enough to keep up with the new products.
- What public and private investments are there to incentivize consumers and producers to return plastic as a feedstock for recycling? Recyclability is not a good measure for plastic recycling. Although recyclable plastic is collected, local markets for secondary plastics may simply not exist. It is the actual amount of plastic that gets recycled that contributes to a truly circular economy.
- What investments go into R&D and redesign to shift to packaging models that require less packaging material or zero packaging?[61]

Box 4: Single-use plastic products and consequence for finance and insurance

Ministers adopted a Ministerial Declaration that commits to significantly reduce single-use plastic products by 2030 at UNEA-4 in March 2019 in Nairobi, Kenya, which was themed, 'Innovative Solutions for Environmental Challenges and Sustainable Consumption and Production'.

Financial institutions should be aware of the increasing amount of bans on single-use plastic products in light of the sustainability of the finance to the plastic producing customer base that they finance. The increase in producer liability risk should also be further documented and explored by financial institutions.

Based on UNEP research about 112 countries, states and cities around the world have already imposed bans on various single-use plastic goods. Of these measures, 57 are national and 25 are in Africa. And the list of these restrictions continues to grow.

The concern is that the bulk of plastics wasted into the environment do not biodegrade but instead decompose in microplastics, which can be traced into many organisms on Earth. The effect of these microplastics on human health are not fully documented and the precautionary principle should be applied by financial institutions when engaging with producers of single-use plastic products. Scrutiny of proactive behaviours to prevent plastic waste and risks related to uncontrolled wastes should be part of client onboarding and know-your-customer (KYC) procedures for financial institutions in light of the rise of the many legal restrictions emerging worldwide.

Sources: wedocs.unep.org/bitstream/handle/20.500.11822/25496/singleUsePlastic_sustainability.pdf?isAllowed=y&sequence=1
sdg.iisd.org/commentary/policy-briefs/what-did-unea-4-do-for-the-environment/

Manufacturing and industrial agriculture: Inroads to biodiversity

Manufacturing is a critical sector for the circular economy. Every output is produced before it can be consumed. The early ideas of William Stahel[62] on a performance economy and the manifesto of the Cradle to Cradle[63] Design model issued by Braungart and McDonough pushed technical and agricultural production to expand beyond the 3-R's of Reuse, Reduce, Recycle into what is now a more elaborate circularity concept. Circularity calls for a radical change in the manufacturing industry and industrial agriculture from waste generating to regenerative.[64] Practices such as remanufacturing, refurbishment, repair, and re-use could cut industrial waste by between 80 and 99 per cent. Advanced manufacturing and digital technologies, such as Artificial Intelligence, advanced analytics, robotics, material restoration through additive manufacturing which creates or modifies parts by adding materials in layers, and 3D printing are helping to reduce waste in value chains.[65]

Value-retention processes such as these ensure material value and functionality are retained within products, with potential to reduce costs and environmental impact while creating economic opportunities.[66] Achieving the benefits of value- creation, preservation and recovery requires a new approach to business model and product design, processes, and facilities, engaging value chain stakeholders in transformation and designing economic and production systems to enable system circularity. Product development needs to cover the entire product system; flows of global forward-and reverse-logistics systems must be connected, and the efficiency of these systems maximized.

Traditionally, financial institutions focus on avoiding financial losses due to earlier than expected write-downs, revaluations or producer liability. The circular economy concept helps financial institutions to identify stranded assets by addressing their exposures to linear risks.[67] As outlined above existing financial instruments already offer opportunity for the financial sector to service incremental changes to move from a linear to a circular model. Part of the solution is to have the financial institution ask what the products are made of to help inform decisions and align with supply chain transparency initiatives.

The next frontier is the integration of biodiversity and natural capital. The financial sector should increasingly focus on innovation that aligns manufacturing with respect for the biosphere,[68] biomimetics,[69] biomimicry,[70] natural capital and nature-based solutions supporting biodiversity.[71] This implies identifying manufacturers with an ability to learn from nature, instead of focusing on what can be directly extracted from nature. Solving human problems with this mindset yields inspiration for manufacturing techniques that are friendly to biotic life on earth. It also means that the impact on water, soil and air is used as an ecological standard to judge the sustainability of innovations in manufacturing. This implies that the financial industry should not only track climate policy outcomes, but also should monitor the policy outcomes of the Conferences of the Parties (COPs) to the Convention on Biological Diversity (CBD), which will be of increasing importance for the future (see box). The financial sector is expected to increasingly address biodiversity impacts, gains and losses linked to finance. UNEP FI will release guidance for banks to set targets on resource efficiency and biodiversity in 2021.

Box 5: Increasing the link between positive impacts on biodiversity and circularity

Financing circularity aims to accelerate the decoupling of economic growth from resource usage and pollution. This decoupling can also have positive impacts on biodiversity, which are often harder to quantify. The impacts on soil, air and water can however be the link between measuring effects of a circular economy that tie in the more complex science of biodiversity and ecosystem services.

For the financial sector, active in offering circular economy financial services, it is crucial to track the policy recommendations originating from the biodiversity COP meetings. Some 195 countries and the European Union are now party to the UN Convention on Biological Diversity (CBD). Only the United States and Vatican City have not ratified the CBD to date.

The CBD was agreed at Earth Summit in Brazil in 1992 and has three objectives:

- the conservation of biodiversity
- the sustainable use of its components, hence the link with circular economy
- the sharing of benefits from the use of natural and genetic resources.

The next COP, expected to be held in Kunming, China in 2021, will lead to a Post-2020 Global Biodiversity Framework as a stepping stone towards the 2050 Vision of ""Living in harmony with nature". The latest zero draft of the framework includes a goal to value, maintain or enhance through conservation and sustainable use nature's contributions to people, supporting the global development agenda for the benefit of all people. It also contains a proposed target target to increase by [X%] financial resources from all international and domestic sources by 2030, ... to meet the needs for implementing the framework.[72]

Source: cbd.int/doc/secretariat/es/es-briefing-2019-march-august-en.pdf
cbd.int/conferences/post2020

Transitioning the food and agriculture sector

One-third of all food produced in the world is lost or wasted every year and this results in US$1 trillion in economic losses per year. In practice this means that between planting seeds and the time the crop is served or sold as food for a meal, approximately 1.3 billion tonnes of food is lost or wasted.[73]

Financial institutions wanting to contribute to the transition to circularity should focus on companies displaying the following three behaviours, that can serve as indicators of long-term financial health of clients:[74]

1. Shorter and more resilient supply chains for companies involved in food production, farms, manufacturing and processing companies.[75] This relates to food security and the prevention of shortages and also reduces losses during transport.
2. Focus on prevention of food loss on the producer side. Food loss occurs in the supply chain, and is also referred to as harvest loss through landfill or incineration.
3. Focus on prevention of food waste on the consumer and retail side. Food waste is the amount of food that does not reach the end consumer due to non-conformity of colour, shape, size, freshness, the best-before date and food wasted by restaurants and households. Look for companies with zero waste targets.

For a financial institutions it is most important to understand what actually happens to food and at what stage it loses or gains economic value. Financial streams might be present by repurposing food e.g. as animal feed or as a non-food biobased material. From a risk management perspective, unsustainable production that contributes to deforestation, land use and soil management, use of toxic or excess chemicals, efficient use of inputs such as water, packaging waste, the landfilling of food, ploughing under, dumping into the ocean and incineration without producing biogas or energy require special attention.[76] Innovations include precision agriculture, permaculture, agroforestry, plant-based food products, and use of digital, smart and prediction technologies to improve the sustainability of production.[77]

Box 6: Waste reduction bonds, a potential solution to tackle food waste

According to UBS research from early 2020 only 4% of green bonds issued is related to waste. Meanwhile the Climate Bonds Initiative has published updated waste Management Bond criteria. The Waste Management Criteria are made available as a Climate Bonds Standard. These Criteria apply to assets and projects relating to the following aspects of the treatment of waste and could be customized to focus on food waste:

- Collection (including collection infrastructure, containers)
- Sorting to separate recyclables
- Reuse and recycling (including processing into secondary raw materials and repair)
- Composting & anaerobic digestion of green/garden/yard and food waste
- Thermal treatment with energy recovery of residual waste (outside the EU only)
- The installation of gas recovery systems for landfill sites

An example of food waste reduction bonds is a bond issue by the World Bank Group. In 2019 the World Bank launched the first Sustainable Development Bond to raise awareness of food loss and waste. It raised US$2 billion equivalent through the issue of 25 Sustainable Development Bonds in ten currencies. The proceeds will be used to finance assets and projects that combat food loss and waste. Food loss and waste should halve by 2030 as outlined in the Sustainable Development Goal target 12.3.

Source: ubs.com/global/en/wealth-management/chief-investment-office/investment-opportunities/investing-in-the-future/future-of-waste/2020/future-of-waste-part3.html
climatebonds.net/standard/waste
worldbank.org/en/news/press-release/2019/12/05/pressreleaseworldbankreaches-2billioninsdbissuedwhileraisingawarenessfor-flwwithstrongsupportfromjapaneseinvestors

Electronics: scarcity and pollution liability coverage

For financial institutions that manage country risks and political risks well, financial exposures related to electronic products show many vulnerabilities that can affect supply of critical rare minerals which are essential to the manufacturing process. The work done by the British Royal Society of Chemistry to assess the supply risk of the elements in the periodic table is revealing. Investors should ask the right questions to be aware of such vulnerabilities that can become liabilities

due to changing politics, conflict and social unrest. This can provide a step towards integrating resource and circularity related metrics in risk assessment and financial decision-making. The publicly available source consists of the following: parameters for supply risk for each element in the periodic table:[78]

- Relative supply risk;
- Recycling rate;
- Substitutability;
- Production concentration;
- Reserve distribution;
- Top producers & reserve holders;
- Political stability of top producer and top reserve holder.

Rare earths metals[79] and metals in general are increasingly used in the electronics industry. Rare earths are commonly used in electric appliances, electric vehicles, smartphones, computer hardware and data storage and network telecommunication systems.[80] Rare earth mining is highly concentrated in China[81] and generates surface water pollution by added chemicals during extraction and also radioactive by-elements, which poses an extra challenge for management of mine tailings and sludge.[82] While rare earths are not rare across the Earth, it is rare that they are mined in an environmentally-sustainable way. Cheaper techniques to separate rare earth metals from soil involve water and large amounts of chemicals, with impacts on soil and water quality.[83]

Less than 5 per cent of rare earths are recycled from electronic goods,[84] and R&D activity is underway to more effectively recycle rare earths from electronic waste streams.[85] The most advanced research focuses on next generation urban mining with robotised disassembly and recovery routines. The return of valuable materials from any electronic equipment increases strategic national reserves of scarce minerals and metals.

The end-of-life disposal and recycling of electronic equipment carries considerable risk. It is far from clean and can pose health risks to workers and the environment. While steel, copper, aluminium, plastics and glass are most prevalent in electronic waste, common ingredients of electronics include lead, cadmium, mercury and tin. These heavy metals are classified as hazardous waste and can cause contamination and adverse health effects.[86] Dose and bioavailability (e.g. level of absorption into the human body or into soil and water) of these substances steer the level of hazard, therefore recyclers take out extra pollution liability insurance that goes beyond general liability clauses. Instead of focusing on ever-higher insurance premium pricing, insurance companies will spend more effort and energy on risk prevention and risk mitigation for the industries related to electronics production that take out pollution liability insurance.[87] Again, it helps if financial institutions know what ingredients, components are used in the products or services that they provide their financial services to.

Extended or Individual Producer Responsibility schemes are an important step in the right direction. There are examples of this approach like Electronics Product Stewardship Canada[88] and Electronic Products Recycling Association in Canada.[89]

Box 7: E-waste pollution requires insurance to step up, similar required efforts on plastic pollution

Similar to the recommendations outlined in the UNEP report "Unwrapping the risks of plastic pollution to the insurance industry", insurers can take an equally active role in addressing the risks related to e-waste pollution and contribute to global efforts to reduce it. Steps to be taken to tackle and prevent e-waste pollution:

- Lead by example: Introduce internal policies to reduce e-waste from own operations;
- Integrate e-waste into ESG scoring and sustainability ratings of clients, champion, understand and prevent pollution risks by actively engaging with clients on the topic of e-waste;
- Support research and promote awareness amongst clients, industry and government;
- Adapt the risk assessment models for insurance and investment activities to e-waste specifics by developing relevant risk reduction measures, such as elimination of harder-to-recycle components, less hazardous materials and recovery of rare earths that are polluting during the mining and extraction stage, particularly for physical risk, transition risk, reputation risk, liability risk;
- Design innovative, prevention focused insurance products to address the risks associated with e-waste;
- Support innovations in the value chain of the electronics industry that increase refurbishment, reuse, repurposing;
- Report on e-waste related risks as part of the financial institution's reporting framework;

Source: unepfi.org/publications/insurance-publications/psi-unwrapping-the-risks-of-plastic-pollution-to-the-insurance-industry/

Circular Buildings and construction

Energy efficiency measures and renewable energy have been the mainstay of sustainable building finance and insurance for the past decades. While sustainable buildings were primarily vetted on the basis of their energy performance during the use phase until recently, the construction phase and the construction materials are starting to play a more prominent role in building codes.[90] The concept of Circular Buildings has gained momentum as architects and designers have come up with creative solutions to tackle the material and waste footprint of buildings. So a Circular Building focuses on the sustainability of the energy performance, the design and the amount of material used during construction, the presence of harmful chemicals, design for disassembly and choice of biobased and reused or reusable materials.[91]

Because circular building techniques are yet to become the mainstay of the construction industry, a premium for buildings costs currently deteriorates the short financial business case. The dilemma for the financial industry and the real estate sector involves hard decisions around short-term money, made by saving on construction cost versus long-term viability of buildings, made by the ability to more cheaply adapt, retrofit, disassemble and reuse materials.

One pathway for integrating circularity into construction and real estate finance is via the integration of CE metrics into mainstream building certificates widely used in the construction sector. Many ESG-related sustainable investment and finance policies and instruments already focus on the use of initiatives such as Building

Research Establishment Environmental Assessment (BREEAM),[92] Global Real Estate Sustainability Benchmark (GRESB)[93] and Leadership in Energy and Environmental Design (LEED).[94] LEED and BREEAM measure for reusing existing elements (e.g. superstructure), reducing material inputs, and harmful chemicals.

Potential Circular Building criteria metrics include:

1. Reduce – material usage for construction, the search for lighter, less carbon intensive materials e.g. by using wood instead of concrete;
2. Refurbish – upgrade existing buildings to avoid starting from scratch, E.g., restoration or stripping of facades and outer layers of the building to maintain the constructive core;
3. Retrofit – design the building for future disassembly, E.g., by developing and using non-destructive connections between various building materials. The decision on whether to demolish a building or to retrofit it can be supported by calculations of embodied emissions of the existing building in comparison to building a new structure;[95,96,97]
4. Reuse – design the building with as much reused material as possible, E.g., adding a percentage of reused material to concrete;
5. Redesign – use biobased materials or lighter materials or materials that are easier to disassemble;
6. Refuse – builders, users and companies in supply chains can avoid using chemicals harmful to humans and the environment.

Several gaps remain to be addressed for Circular Buildings to become mainstream:[98]

1. For the financial picture to work out the environmental costs (externalities) of the construction industry need to be included so that the measurement of the financial benefits of Circular Buildings really materialise. Lower upfront investment costs for conventional run-of-the-mill buildings, unconstrained by costs of externalities, will keep on attracting short-term investors. An accounting method that accounts for the true cost can help underpin the business case. "True cost or price" is the difference between the market price and the weighing of cost and benefits to society. These methods generally account for hidden costs that are not reflected by the unconstrained market price.[99,100]
2. Development of markets for secondary materials and building components. Without efficient market places for second-hand building materials, the costs of planning and designing Circular Buildings will be higher than a conventional building (take-make-waste). Recycled materials can potentially be more expensive due to processes for retrieval, logistics and cleaning;
3. Agreement on the timing of the future availability of building materials can potentially be facilitated by financial forward contracts. These forward contracts on building materials could financially settle the right to harvest the materials in a building as a financial and transferrable contract between building owner and the reusing party. Forward contracts on building materials would make a case for planned obsolescence of buildings;
4. Accounting (E.g., the amount to be written down) and valuation methods (E.g. residual value) need to be adopted to the creation of a market for secondary materials;
5. Material passports[101] need to standardise. Practical alignment of the use of the materials passport with the reduction of maintenance cost of the building is needed (E.g., reduce cost through planned preventive maintenance and less incident-based maintenance).

Box 8: Material passports and building material databases are key to Circular Building growth

Around the globe a number of local material market places are developed for exchange of secondary materials (E.g., Michigan Material Exchange in the US, Excess Materials Exchange in Europe). The prime prerequisite for such an exchange for the construction sector is that a material passport issued to a building or part of a building to facilitate resource identification. This material passport contains the description of all the materials in the building and their ability to be reused, remanufactured or repurposed in another building.

These material passports go under various names such as the circularity passport and "buildings as material banks (BAMB)". The common aim of these database is to reduce and prevent demolition waste, while reducing the use of building materials and construction waste and making the design of new buildings based on secondary materials an achievable option.

Financial institutions can partner with knowledge hubs and builders to integrate the material passport into financial services. The residual value, the ability to disassemble and reuse the circular materials should be taken into account for the finance or investment in circular real estate.

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Making fashion and textiles more sustainable and circular

The fashion industry is the second-biggest consumer of water and produces 20 per cent of global wastewater. Textile dyeing is the second-largest polluter of water globally.[102] The industry emits up to 10 per cent of global GHG emissions—more than all international flights and maritime shipping combined—and releases half a million tons of synthetic microfibers into the ocean annually.[103]

The average consumer buys 60 per cent more clothing items than 16 years ago and keeps each item for half as long. Garments can be used just seven or eight times before being discarded.[104] The number of garments made has doubled from 50 billion to 100 billion since 2000, according to the Ellen MacArthur Foundation. Sales and consumption of clothes has increased by more than 50 per cent in the same period,[105] while less than one per cent of textiles is recycled into new garments.[106]

The industry is ripe for the transition to circularity and halting its environmentally and socially destructive practices. The acceleration of fast fashion over the past 20 years[107,108] has increased reputational risk and there is growing liability risk due to lack of transparency and mismanagement in the fashion and apparel industry.[109] Similarly to health and safety checks introduced by financial institutions servicing the fashion and textiles industry, financial institutions should integrate environment and circularity-related metrics in the risk assessment of their clients, such as:

1. Reduction in water use and stronger wastewater management. Ask clients or portfolio companies about water use, wastewater management and plans to benchmark performance against peers. Water management is part of the

license to operate of textile and fashion companies, especially in geographies where water is scarce.

2. Design for Recycling and Reuse – assess the maturity of the deposit and collection schemes that enable the recycling of fibres in the textiles and garments industry. The circularity of a brand will be based on its ability to prevent textiles and garments going to waste too early. Unused garments can be recycled into feedstock for new collections. Assess the company's ability to design garments, textiles for optimal reuse.[110] These secondary material streams have a clear residual value component, that affects the financial business case and creates secondary cash flows to those from sales;
3. Refuse toxins – in textiles, given their proximity to skin, it is critical to avoid using chemicals harmful to humans and the environment. Recycling will require chemical substances to be kept to a minimum to avoid recycling toxins.[111] The presence of toxic elements can reduce the residual financial value of secondary material streams.

Box 9: Innovation in subscription-based finance for fashion rental

Finance fashion rental or fashion library models are emerging. Especially in the luxury brand segment these rental models show strong potential with good margin. Nevertheless, subscription services are struggling to build loyalty amongst their subscriber base compared to traditional sales-based retail. The advantage of a rental-based model is that consumers can change their wardrobe fast and still retain a low material footprint. These models are fairly new and still need to prove their ability to lower the material footprint for the industry at large. At moment this is niche, but is predicted to grow. The financial model that best aligns with this new sharing business models is subscription-based finance.

Financial services for innovation in the apparel industry will generally be more risky and might not be suitable for the moderate risk profile of mainstream finance. Financial contracting should manage the financial risks of these innovative subscription-based fashion rentals up close to be successful due to fierce competition and the fast moving, innovative aspects of the fashion rental business. Financial institutions can integrate the following criteria to better align their fashion or garment industry portfolio with the goals of the circular economy:

- Minimum level of recurring revenue;
- Minimum expected period of customer retention;
- Churn and renewal rates of the user base;
- Level of digital innovation of the rental provider;
- Strategic and variable pricing towards competing rental offers.

Sources:
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Finance for circularity in mining

The Circular Economy can raise questions about a financial institutions' role in project finance and insurance activity for the mining industry. Increasingly non-financial criteria on social, political and environmental aspects (ESG criteria) are included in the decision making of financial institutions. The advent of the Equator Principles (EPs)[112] has introduced a risk management framework for banks. While originally designed for larger tickets, the insights underlying the EPs are gradually trickling through into mainstream financial offerings.

The transition to circularity requires responsible extractive industry players to play a productive role in relation to recycled metals and minerals. In any scenario, mines are a solution to cover the shortfall of recycled material inventories. There is also the deep sector knowledge of mining companies about minerals and metals that can be used for the efficient industry grade recovery of used minerals and metals.[113] Financial institutions can benchmark mining companies on waste treatment optimization and management of inputs such as energy, water and chemicals, as well as performance on waste generation, emissions and effluent. Potential differentiators include use of industrial ecology designs and resource-efficient mining, ore processing or metallurgical processes.[114]

Some existing mining technology can be adapted to recover minerals and metals from end-of-life products. Some smelters accept recycled content to mix with concentrated metals from the mines. Under the current scenario, the amount of metal produced via mining is many times higher than the amount of metal recovered via recycling. Recycling is insufficient to meet demand. Moreover, the material specifications of end-users can demand a purity of inputs that cannot be currently achieved via recycling as some contaminants cannot be fully removed. Perhaps future technological improvement will overcome this issue.

Recycling of materials requires less energy and reduces GHG emissions. At the same time mines can close the gap by increasing the energy efficiency of their own mining operation and reduce impacts on environment and workers.

One of the most important criteria that financial institutions can include in their contracts with the mining industry relates to regeneration and restoration. As a minimum, financial contracts with the mining industry should contain the requirement to develop the mine in such a way that land reclamation is possible after the mine ceases operation. That means that the mine owner develops the mine in such a way that the land can be restored to nature or reused for another economically viable purpose. Regulators for the mining industry will often require the set-up of reclamation funds.[115]

Financial institutions can check the following aspects as part of due diligence on contracts with the mining industry:

- Is there an obligation to set up a reclamation fund? Also assess the risk that the earmarked funds will actually be available at the moment of reclamation;
- A check whether the plan of reclamation is part of a feasibility study, or not;
- Asses the maturity of mine inspection by local mining authorities;
- Asses the risk that increased or changed environmental liability of a mine overtime, may result in orphaned and abandoned mines, particularly when commodity prices change dramatically;
- Create a risk assurance mechanism that balances economic development with the importance of mine site restorations.

The improvement of mine operations is under way around the world to varied degrees. Best practices and guiding principles are developed by industry associations[116] and are seeing increased adoption around the world;[117] the International Council on Mining and Metals (ICMM)[118] and the Initiative for Responsible Mining Assurance (IRMA) are some of the organisations developing standards and certifications for responsible mining.[119] Companies should also comply with the Global Industry Standard on Tailings Management launched in 2020.[120]

The role of energy in the transition to circularity

The transition from energy derived from fossil fuels to renewable sources requires one of the largest infrastructure overhauls in recent economic history. The policies regulating the environmental impacts of the decommissioning of drilling platforms and offshore installations are nationally determined.[121,122,123] For financial institutions CE-related concerns are increasingly emerging in energy portfolios, due to increased decommissioning activity.

The financial ramifications of decommissioning costs have consequences for the balance sheets and liquidity of energy companies, as well as directly linking to recycling and restoration. Hence the 9-Rs are an important consideration in reprocessing the reclaimed steel and removal of the chemicals and hazardous materials. Upon removal of the installations, restoration of the habitats in which the installations were active involve management of physical risks (leakages), liability risks (environmental damages) and reputation risk (public outcry). Depending on the scale of the operation, these risks will be reflected in the financial health of clients in the energy sector.

The same dynamic surrounds renewable energy projects, since for some renewable energy projects decommissioning is already on the horizon. Financial contracts should pro-actively include covenants that address these end-of-life considerations for the materials involved in solar parks,[124] wind turbine farms[125] and hydropower.[126] A CE rule of thumb for the financial sector's exposure to the energy sector is to start with the end in mind.

The switch from fossil fuels (gas, oil and coal) to renewable energy sources will shift economic activity to metals[127] – steel, copper, aluminium, silver, gold, cobalt, lithium, graphite, nickel, various magnetic and rare earth minerals. It is important for the financial sector to realize that investments in renewable energy will move our economies away from the linear use of fossil fuels while making the circular use of metals and minerals more important. Issues to consider include:

- Hardware components of solar PV, wind turbines, cars and geothermal installations;
- Electric motors;
- Power grids and transmission wires;
- Energy storage.

More research is needed on the circular economy impacts of the energy transition.

Cross-cutting digital innovation for circular economies

Digital technology is enhancing traceability of goods and services and enabling supply chain transparency and new business models to emerge. A sharing economy, servitization and product-as-a service are some of the emerging data-driven opportunities

Digital revolution to accelerate the transition to circularity

Several digital and physical tagging solutions have been designed to promote behavioural change which can contribute to a more circular economy. Enhanced traceability can improve the financial due diligence of companies making use of tracking and tracing techniques for materials. Products, materials and resources are digitally tagged with a unique identifier to be traced down the supply chain. This prevents waste fraud as it monitors users to return the tagged resources for recycling or reuse. The challenge remains to accomplish this in a low-cost way.[128,129]

There are essentially several approaches:

- Software tags registered in a blockchain like ledger that tracks the unique identifier down the supply chain;
- DNA tagging technology has been experimented on for denim cloth. The DNA trace enable the denim to be traced down the supply chain to promote recycling. It can also be used to separate textiles from biological agriculture origins from conventionally produced textiles containing more chemicals;
- Hardware tagging with radio-frequency identification (RFID) chips has been used for products, again to prevent losing track of resources that can be recycled or reused;
- The increased use of artificial intelligence (AI) and algorithms is also an emerging issue for the financial sector;[130]
- Data quality of financial administration systems to enable the use of big data is also a general area of concern.

Financing the shift to a product-service system

The sharing economy, servitization and product-as-a-service are recognised as intertwined service-based business models under various circular economy classification schemes for the financial sector.[131,132] The sharing economy[133] offers tremendous economic opportunity due to the projected growth of sharing services to above USD 300 billion annually by 2025.[134] For financial institutions, sharing introduces both economic opportunity and new risks due to shared use of assets amongst a multitude of parties. In many cases the sharing economy offers an advanced and flexible commercial opportunity such as a rental service, facilitated by some form of IT support.

The circular idea behind the sharing economy, servitization and product-as-a-service (PaaS) is that fewer resources are needed to supply the same level of service, comfort and experience to larger groups, compared to an ownership-based model. Via platform apps, consumers and companies grant each other temporary access to under-utilized physical assets. This reduces idle capacity of the shareable good in exchange for money. Typical goods that are currently being shared are cars, bicycles, scooters, homes, appliances, camper vans.[135]

PaaS is a performance-based servitization model that puts the responsibility for the correct functioning of the service with the manufacturer or service provider. For a PaaS offering to reduce waste, the business model should be designed to prioritize waste prevention over reuse, recycling before materials flow towards energy recovery by incineration and landfill.[136] Companies that offer PaaS keep ownership of the product and the materials are guaranteed to return to them after use. Hence they have to deal with costly disposal procedures or maximise the residual value. If designed upfront with waste prevention in mind, PaaS business propositions can integrate the positive impacts of Extended Produced Responsibility (EPR) schemes.

The financial sector has an important role to play here,[137] since PaaS requires a new approach to financial due diligence and legal contracts between the client and financial institutions. These three financially related aspects are a minimum that need to be road tested in the context of a service delivery (PaaS with pay-per-use fee) rather than goods delivery (sale with ownership transfer);

- The PaaS P&L scenario will reflect growth and churn of the subscriber base, including seasonality effects. Revenue and cash flow estimation is driven by the number of subscribers, the ability to attract and retain repeat subscribers and the height of the subscription fee;
- The PaaS legal contract offered to subscribers to the PaaS prominently steers the financial assumptions of the underlying business case. Consumer protection laws cover both products and services and should be respected, based on relevant jurisdictions in which the PaaS supplier operates. To avoid stranded assets guarantees, warranties, claims, reverse logistics will all need to be explicitly drafted in legal texts describing the rights and duties of all the parties involved in the PaaS under any given circumstance.
- The balance sheet scenario for PaaS companies is different due to the retained ownership of goods by the PaaS supplier. The balance sheet value will be affected by inventory levels and the depreciation period of the assets in the inventory. A realistic estimate of the residual value at various stages of the lifetime of the goods offered as PaaS are key elements to estimate the financial viability and sustainability of financing PaaS business models.
- For successful PaaS financing the upscaling and downscaling of the inventory assets (E.g., cars, scooters, bicycles, washing machines, phones, etc…) needs to be flexible and resilient to downturns. The contractual agreement between the PaaS supplier and the manufacturer plays a key role here.

The sharing economy, servitization and PaaS offerings are disruptors to numerous industries. They also bring about new risks that affect the picture for the financial industry. There are issues around privacy,[138] worker conditions,[139] increase of actual use and lack of achievement of environmental benefits and waste reduction effects. These new business models need to sufficiently integrate the purpose behind the 9-R principles to be classified as circular business models. Otherwise they might be hard to differentiate from straight-forward, unconstrained rental business. Growth of these services has challenged policymakers around the world to mitigate public concerns.[140] For example, for mobility there are concerns about the erosion of public transport and the disappearance of local taxi services. For real estate and hospitality services there are effects on price levels in housing markets in cities and competition to local hotels. To mitigate these concerns, more attention needs to be given to the social, environmental and policy aspects of sharing economy business models. Approaches to address these issues include:

- Privacy concerns are mitigated by transparency about how data is used. Key questions are: What is the user generated data used for and does it remain stored or not?[141]

- Worker conditions[142] are improved if employers in the sharing economy offer better wages, more reliable work volumes and show willingness to respond to improvement suggestions for workers' situational needs (E.g., physical and mental health, family situation);
- Environmental concerns such as air pollution can be mitigated through the use of low-emitting technologies for shared services (E.g., electric cars).[143,144]
- Public transport is an early predecessor of the sharing economy and links between sharing services and public transport are complementary. The travel experience in public transport can be improved if the last or first mile of a journey can be handled by mobility services in the sharing economy (E.g., bike or scooter sharing).[145]
- Local taxi services have been at a disadvantage due to the technological advance of competing car sharing services. Investments in phone-based booking apps by local taxi companies are restoring the balance with technology driven disruptors.[146]
- Unwanted effects on house prices in cities due to sharing economy rentals of properties can be mitigated by city policy and integration in the economical agendas around tourism and travel.[147]
- The same demands need to be in place for health and safety for the incumbents in the sharing economy, as the demands in place for the traditional business models that they compete with or replace.[148]

Box 10: Growth opportunity for Fintech's micro-insurance for the sharing economy / PaaS

In the sharing economy or PaaS there are two users and they have to trust each other with regard to the shareable good that is rented out on that platform. This two-sided market is a source for new social conflict. Under conventional insurance, there are some shortcomings to support the sharing economy, as outlined in the Lloyd's report "Sharing risks, sharing Rewards":

- If you break or damage a shared good, traditional insurance premium pricing will make the premium go up after the damage. That will not create incentive to rent out a shareable good (boat, van, car, bicycle).
- Risk is traditionally calculated on the owner instead of the user, which makes sharing of an asset an extra risk for traditional insurance companies. Therefore insurance contracts will often exclude assets for being shares with punitive or restrictive terms and conditions.

Swedish Insurance Fintech Omocon has embraced this new reality by developing a microinsurance product that protects the actual owner of the shareable good or asset that needs protection against damage. This fintech company collects data on the sharing platform to look into the usage statistics of sharing transactions. This has changed the entire insurance process:

- The underwriting process has changed because under the right conditions, damage claims are actually de-risked by the sharing economy aspects because it is harder to commit fraud when two parties are involved in an arm's length transaction. After all, most users are anonymous to the owner. Omocom uses the usage data to do the risk calculation and the pricing of the insurance. Furthermore, the loyalty and historical behaviour of the customer of the platform can be used to create flexible preferential insurance rate conditions. The risk package is priced in accordance with the value of the shareable good and the likelihood of damage occurring, which now is linked to the user and not the owner.
- The insurance letter production process is automated and digitally customised to refer to the individual asset. If the user rents a lawnmower out, it is a specific insurance number that they can follow throughout the process. The microinsurance is offered as an opt-in schemes or all-in, where the insurance is default as part of the transaction cost. This is for example the case for an appliance sharing platform, where the insurance is a fixed item on the bill.
- The claims process has also changed, because stories now need to corroborate and can be checked from independent sources (the user and the asset owner side). Both sides can inform a decision in claims handling. The higher the distance between the owner of the asset and the user, the higher the likelihood of damages occurring. From a financial perspective these historical statistics enable insurers to price the risk correctly.

Source: omocom.se/

Circular Economy and industry frameworks

Financial institutions can embed circularity in strategies to implement voluntary industry frameworks such as the Principles for Responsible Banking, Principles for Responsible Investment and Principles for Sustainable Insurance to harness sustainable finance for the transition.

Principles for Responsible Banking

More than 190 banks representing some USD50 trillion in assets have signed the six Principles for Responsible Banking since UNEP FI launched them in September 2019 to provide a global framework for a sustainable banking system.[149] The strategy execution of the first three Principles can concretely stimulate the growth of circular economy finance.

Under Principle 1, signatories commit to aligning their business strategies societal goals, as expressed in the Sustainable Development Goals (SDGs). Strategically adopting the types of financial services that allocate capital to circular business models can contribute to achieving the SDG targets 8.4 and 12.2 through 12.6 (see page 65).

Under Principle 2 of the PRB, signatories will set, measure and report publicly on their targets. Target setting can include a focus on resource efficiency and scoping out circular economy activities supported through financial services. Banks can assess current and potential financing opportunities across the four categories of business models - value and resources recovery; circular design and production; optimal use; and circular support, facilitators and enablers and market places.

After classification of the type of activity, signatories can establish metrics to measure, report and steer their business growth in the various CE categories of business. Some examples are:

- The amount invested in or lent to companies that operate CE business models or run CE projects;
- Avoided material usage;
- Avoided polluting outputs to soil, water and air;
- Avoided GHG emissions due to circular versus linear business.

UNEP FI will develop guidance on setting targets on resource efficiency in 2021.

Principle 3 of the PRB focuses on the relationship with clients and customers, to encourage sustainable practices. For the commercial dialogue with banking clients on circular economy insights, bankers and relationship managers need to be sufficiently trained on the difference between linear and circular economy models. Commercial staff can explore and learn how to engage in public-private cooperation models. Customer dialogue can integrate questions that explore the circular economy aspects of a client's business, typically focused on value recovery, circular design, optimal use, product-as-a-service and any form of facilitation of circular economy.

Principles on Responsible Investment (PRI)

The UN-supported Principles for Responsible Investment now has more than 2,250 signatories, mainly asset owners and asset managers with around USD80 trillion in Assets Under Management.[150]

The Principles for Responsible Investment can provide a launchpad for investment in a circular economy through Environmental, Social and Governance (ESG) issues covered by Principle 1. Integrating ESG issues into investment analysis and decision-making processes involves addressing a wide range of topics[151] relevant to financing circularity, including;

- Environmental issues related to energy consumption, intensity of greenhouse gas emissions, the contribution to climate change, the use of scarce resources such as water, soil and air, waste management and recycling;
- Social issues related to guarantees for health and safety, employee productivity and education, diversity and inclusion – including access to digital finance to help close the gender gap in developing economies, where men are six per cent more likely than women to save at a financial institutions, the proficiency in supply chain risk management and human rights, variably including labour and/or land rights;
- Governance reflects the effectiveness of the executive board oversight.

One of the issues to address for the PRI signatories is that aspects related to the use of scarce resources such as water, soil and air, waste management and recycling are potentially weighed against many other factors. Different organisations use different indicators/metrics to score the ESG factors, there is no standardised system across the investment industry yet for ESG scoring.[152] Therefore trade-offs within ESG scoring between high or low scores on E, S or G can make the aggregate score hard to interpret.

The financial industry is in the early stages of integrating circularity measurements into ESG approaches. A recommendation for fund and asset managers is to review how ESG methodologies could be designed to contribute to the circular economy, based on relevant classifications. ESG data providers can include relevant indicators in datasets to enable transparency on how ESG investments support the transition towards sustainable production and consumption, resource efficiency, circularity increases or circular business models. In the absence of standardised disclosures on investment strategies related to CE finance, the SDG targets underlying SDGs 8.4 and 12.2 through 12.6 (see page 65), can be used to structure disclosure towards investors. These disclosures can be further enhanced with concrete CE metrics related to resource efficiency, avoided polluting outputs to soil, water and air; avoided material usage and avoided GHG emissions.

Principles for Sustainable Insurance (PSI)

Over 80 insurers, reinsurers and service providers worldwide have adopted the four Principles for Sustainable Insurance (PSI),[153] launched by UNEP FI in 2012. Signatories represent more than 25 per cent of worldwide insurance premium volume and USD 14 trillion in assets under management. The Principles are also part of the insurance industry questions leading to their scores and position within the industry ranking of the Dow Jones Sustainability Indices and FTSE4Good rating.

The four principles of the PSI can contribute to the expansion of the circular economy through investment and insurance. PSI signatories can contribute to the transition to circularity by implementing the principles in their strategy execution in three main ways:

- **Investment strategies and policies that reduce pollution, promote alternatives and waste prevention techniques.** For insurers, ESG risk ratings have become an important concept underlying investment activities. For example, for investments in the food and retail sector, companies can be vetted on their ability to

tackle pollution, caused by their plastic packaging. This ESG focus by investors can push investees to implement circular models and improve recycling and waste prevention infrastructure. The potential CE focus for insurers is well explained in the PSI report on plastic pollution[154] called "*Unwrapping the risks of plastic pollution to the insurance industry*".

- **Insurance strategy and policies that address the risks associated with pollution in the long run will stimulate pollution and waste avoidance.** Risk assessment of the pollution effects of linear economy practices is the first step towards a circular economy. Assuming that the height of the insurance premium is material, types of insurance that factor in potential liabilities will push companies to be more transparent about pollution risks. The insurance cover makes producers aware of pollution risks and pushes companies to operate more diligently in pollution-sensitive activities. Requiring the implementation of circularity principles can promote good practices that help avoid frequent claims and also avoid the resulting insurance premium hikes. Claims can result from improper disposal of hazardous and toxic wastes of which asbestos is a very well-known example of an extended list of harmful substances. Some manufacturers handle chemicals that potentially damage the environment if not appropriately stored or disposed of. Underwriting will need to consider toxic spills caused by accidents or abandonment of production assets, as well as proper maintenance and controls as part of the terms and conditions of insurance. While pollution liability insurance keeps companies protected on top of general liability, it also adds to the cost base of operations and will promote sustainable behaviour. Population groups with low incomes are more likely to face environmental exposure, while the division of labour tends to increase risks to men.[155] However, women and the most vulnerable workers are most affected by environmental degradation.[156] Including circularity principles in insurance could help counterbalance the tendency of credit markets to finance 'dirty' industries relative to equity markets.[157]
- There is the role of insurers in adopting risk management, underwriting and claims management to stimulate a shift to sustainable consumption and production and circularity in line with their societal role related to disaster recovery (build-back-better). The insurance of reused production materials, especially in construction, is one such aspect. The insurance sector can provide insights on prevention and life-time-extension measures to insure those materials with an acceptable risk premium without blocking innovation. When assets are shared between a pool of users the material footprint is lower. A company offering car sharing via an app instead of individual car lease or car ownership will need fewer cars to facilitate the same amount of mobility for the same amount of car users. Surely this can have an adverse effect on the volumes of private car insurance sold by insurers. Although the insurance sector can see this as a threat to existing business, this trend is not driven by the actions of insurers themselves, but by the benefits to society and consumers. This lower material footprint contributes to the underlying principles of circularity. One of the conditions that needs to be met for sharing to have a positive impact, is that appropriate insurance is in place. A 2018 Lloyd's of London report[158] identified the sharing economy as a significant growth opportunity for insurers. The report cites a PwC survey[159] on the sharing economy that found that 89 per cent of consumer panellists agreed the sharing economy marketplace is based on trust between providers and users. Insurers can grow their business by stimulating innovative product and service development, altered underwriting procedures fit for sharing services, which in turn also alters the process of claims management to facilitate the user's sharing experience.

Sustainable Financial instruments integrate circularity

This section explores debt and equity instruments that can be used to finance the transition to circularity.

Environmental, social and governance (ESG) criteria in sustainable financial services are a reflection of how the money is put to work in the economy. ESG criteria and scores integrated into decision-making for sustainable finance products and services are a reflection of how equity and debt instruments are allocated, from bonds, green loans, and sustainability-linked loans to ESG investments. Often these instruments are issued and traded by financial markets in the same way as conventional, unconstrained financial instruments. The difference is that the money goes to the underlying green or circular economy assets in the real world. This puts more focus on measurable outcomes and requires the use of circularity indicators and metrics as illustrated below. ESG issues can include resource efficiency, gender diversity and pay equity, although women are still seven per cent less likely than men to access financial services globally. Outcomes-based financing is critical to genuine progress towards a circular economy.

Green bonds and green loans use of proceeds clauses

The Climate Bond Initiative (CBI) green loans market summary for 2019 shows that global green bond and green loan issuance reached over USD 250 bn in 2019. This amount was a new global record, up 51 per cent compared to USD170.6 bn in 2018.[160] The majority were green bonds, with green loans accounting for around 4 per cent of issuance.

The International Capital Market Association (ICMA) voluntary Green Bond Principles (GBP), Social Bond Principles (SBP) and the Sustainability Bond Guidelines (SBG) provide globally-recognized frameworks for the issuance of green, social and sustainability bonds.[161] The expansion of criteria for issuing green bonds has made the underlying metrics more diverse. Industry criticism is that this diversity of metrics has not always contributed to clarifying the environmental value add. Growth in the volume of green bonds has increased the need for transparency.[162] Green bonds can be used to finance the transition to circularity.

What's also important about these bond-related principles is that they drive a similar change for commercial loans. Besides bond issuance, the commercial loans market forms an equally important activity in mainstream finance and business. ICMA has also issued the Green Loan Principles.[163] The addition of non-financial criteria to the disclosures of both bonds and loans is a growing trend and expands the CFO's role.[164] Any of these principles have four core components:

1. Use of Proceeds.
2. Process for Project Evaluation and Selection.
3. Management of Proceeds.
4. Reporting.

For both bonds and loans the circular economy is addressed through the topics of energy efficiency, the management of wastes and the efficient use of natural resources (forestry, land, soil, water), logistics and technology. Therefore the link can be primarily found in the metrics used to underpin the use of proceeds and the reporting to investors on the management of proceeds. ICMA indicates that related to SDG 12, green bonds can organise their use of proceeds and measure their contribution to sustainable consumption and production and circularity by reporting on various metrics:

- Avoided resource usage and avoided waste;
- Avoided emissions to air (other than greenhouse gases);
- Avoided emissions to water and soil;
- Secondary materials used;
- Materials recycled;
- Absolute or percentage reduction in local pollutants and reduction of hazardous materials used.[165]

An important aspect of these metrics is to monitor the final state of the contribution to a transition. Metrics that indicate that goods or materials are potentially recyclable or compostable do not necessarily mean that they are. To secure positive impacts, these indicators can best be supplemented by concrete measurements of materials recycled and composted.

Box 11: Sustainability Bond with use of proceeds dedicated to Circular Economy

In the public space the European Investment Bank (EIB) is one of the largest, if not the largest Green Bond issuer. EIB has recently launched Sustainability Awareness Bonds, where part of the proceeds are eligible to finance the transition to a more circular economy.

In the private sector, an exemplary sustainability bond has been issued by the Italian bank Intesa Sanpaolo to fund projects and businesses under a €5 billion credit facility to support the circular economy transition.

In collaboration with the Ellen MacArthur Foundation, Intesa Sanpaolo has included in its sustainability bond framework the following circular economy categories for the use of proceeds of the bond:

- Solutions for lifetime extension of goods and materials
- Regeneration of natural capital (e.g. restoration of degraded soils)
- Circular design focused on waste and pollution reduction
- Production processes producing or dependant on recycled resources
- Resource efficiency in the supply chain
- Reverse logistics, collection, separation and recycling of used materials
- Innovative technologies to enable circular business models (eg. IT, market places)

Examples of associated metrics are:

- Amount of waste reprocessed and used as circular input (tons)
- Amount or percentage increase of biobased/recycled materials utilization (tons)
- Prevented food waste (tons)
- Amount of recyclable/compostable goods produced (tons)

Orders reached over €3.5 billion ($3.9 billion). Intesa Sanpaolo placed €750 million of bonds at a fixed rate of 0.75%, with a five-year maturity.

Source: eib.org/en/investor_relations/sab/index.htm# group.intesasanpaolo.com/en/newsroom/press-releases/2019/11/sustainability-bond-en

Transition Bonds

Many companies have targets related to the environment[166] and some are working towards setting and implementing science-based targets.[167] Target achievement dates range widely between 2020 and 2050. The strategic decision-making process of executive boards and senior management need to align with these targets. Redirecting allocations of financial capital requires altered policies, programmes and projects targeted to circularity. Transition bonds are too informal a market to accurately measure financial capital that has been reallocated in this way, and environmental effects will need close monitoring.

For the transition to accelerate towards circularity, companies in resource-intensive industries such as manufacturing, extractive industries and chemicals are key players. These companies do not always have sufficiently recognised CE related assets to raise the needed capital for transition under the Green Bond and Green Loan Principles. Their production processes or products and services often do not qualify as

green. Mines can use funds to change over to renewable sources for their energy supply. They can invest in more sophisticated pollution prevention, reduction, reuse and recycling of water on the mining site or reprocessing and clean-up of tailings. All of these are usually regulated, for example under pollution control permits at an operating site, but governance may not be at the appropriate level. Companies need to address risks beyond compliance.

The Transition Bond principles[168] aim to steer companies in high-impact sectors along transition pathways,[169] through access to a separate asset class of financial instruments based on the same four components of the Green Bond Principles, from use of proceeds to reporting. While transition bonds are primarily presented as a climate finance solution, aimed at GHG emission reductions, they are also linked into the circular economy discussion and can potentially be used to finance the transition to circularity.

Sustainability ESG Linked Loans (SLL)

A sustainability-linked loan is a general corporate loan that aims at raising capital for specific sustainability programmes of the borrower. The SLL market is projected to grow rapidly. The volume of publicly announced sustainability linked loans rose from USD 10 bn in 2017 to USD 80bn in 2019.[170] ICMA issued the Sustainability Linked Loans principles (SLLP)[171,172] which have the following four core components:

1. Relationship to Borrower's Overall Corporate Social Responsibility (CSR) Strategy
2. Target Setting – Measuring the Sustainability of the Borrower based on target progress
3. Reporting
4. Review.

These loans can be used to finance more general sustainability improvement initiatives than green bond, green loans, social bonds, sustainability bond and transition bond instruments that identify the assets involved in a financial transaction. However, terms and conditions need to describe the practical environmental benefits delivered by the SLL. Metrics for circularity (see section 7) can help to transparently quantify environmental targets and impacts to ensure support for the transition to circularity. SLLs can be made fit for supporting this transition by targets linked to improving resource efficiency, (hazardous) material use, growth of CE business models, emissions control to land, water and air.

ESG investment strategies

Some ESG investment strategies[173] have embraced the transition to circularity theme. CE themed investment funds were launched by financial institutions including BNP Paribas,[174] BlackRock[175] and RobecoSAM.[176] The size of these funds, all of which are in their start-up phase, are a tiny part of the activities of these large groups. CE transactions are helping to deliver on objectives linked to mainstream ESG finance; circularity is also a powerful value driver in the context of pure play circular impact investing.[177] In a survey by the Global Impact Investor Network (GIIN) more than 40 per cent of investor mentioned sustainable production and consumption as a key theme for their investments. Both pure play investment and mainstreaming of metrics and scores related to circularity into broader ESG investment funds need to happen to develop the CE finance market.

For greater uptake within the financial industry, there needs to be more evidence of cross-pollination between the fund management style of smaller CE funds and the mainstream investment funds. That would mean a move from the millions to the billions and potentially trillions, if true mainstreaming of finance for circularity into ESG investment strategies is to be realised in the long run.

Box 12: BCF Circular Economy Fund in cooperation with EMF

How did the BCF Circular Economy Fund come about?

BlackRock launched a BGF Circular Economy fund in 2019, in collaboration with the Ellen MacArthur Foundation on the expectation that the transition is still nascent for a structural shift with the potential to provide longer-term investment opportunities.

What is Blackrock's motive /purpose behind the promotion of circularity / CE?

"As it becomes increasingly clear that we are reaching a point where it is necessary to re-think how we are producing and consuming products, the negative impact from the current take-make-waste model can no longer be ignored. We see a reallocation of resources and capital towards more sustainable investing as a key tenet of a transition to a more circular world. Given the rising consumer, corporate and regulatory focus on the circular economy, we have identified it as an emerging opportunity – not just to provide our clients access to a growing theme, but also play our part in accelerating that shift towards a circular economy."

How could the capital transition from a linear to a circular best be accelerated through the Fund?

"There is widespread consensus about the need to move from a linear to a circular economy. This view is supported by business leaders and policymakers. This shift is very important to help deliver the goals on GHG emissions targets, reduction in pollution, and sustainable economic growth. The main challenge now is to scale up targeted solutions and best practices. This involves investing in innovative companies or allocating capital to companies that embrace circular product design and operations. When we look at adoption curves for new technologies, we find that there are typically three forces that support the transition: regulatory incentives, change in consumer preferences and economics becoming more favourable. With the transition to a circular economy we see a convergence of these three forces, which is creating a powerful drive to effect change. Together, these forces shift competitive advantages towards well positioned companies that are earlier in the transition towards circularity."

Source: Interview with Sumana Manohar, Head of Thematic Research at BlackRock and co-manager of the BGF Circular Economy fund

New metrics for financing circularity

This section looks at frameworks for disclosure, indicators and metrics that can be integrated into financial products and services to allocate financing to the transition to circularity.

Box 13: UNEP FI Survey results: Data needs

Findings from UNEP FI's survey show that financial institutions responding prioritised the following non-financial data needed for for the integration of circularity:

- A circularity metric at product level;
- A circularity metric at company level;
- Data on product passport (what is in the product?);
- Data on resource toxicity.

Lack of uniform metrics for circularity was seen as the number 1 barrier identified by survey respondents for the question: What are the barriers that prevent circularity to grow for your financial company?

Circularity and non-financial metrics

Circularity can be embedded in ESG strategies and commercial activities. In order to fully integrate the environmental and social aspects of the shift to a circular economy into the financial industry, comparable and standardized metrics are key, as is alignment of policies and processes related to ESG performance and non-financial reporting. For clients active in industries that are known for their environmental pressures these non-financial ESG metrics have already become increasingly important to position themselves amongst peers.

Standardisation does not necessarily imply uniformity. Uniformity of circularity-related ESG metrics is less valuable as each industry has unique business models and materiality to report on. Setting up specific metrics and disclosure frameworks for specific industries could be more useful.

A commitment from CDP, the Climate Disclosure Standards Board (CDSB), the Global Reporting Initiative (GRI), the International Integrated Reporting Council (IIRC) and the Sustainability Accounting Standards Board (SASB) announced in September to work towards a shared vision of what is needed for progress towards comprehensive corporate reporting may contribute to alignment among leading frameworks, standards and platforms which guide the majority of sustainability and integrated reporting.[178]

In addition, the IFRS Foundation, which developed globally accepted accounting standards, may play an important a role in global ESG standard-setting, if it contributes to developing global sustainability standards as was proposed in a consultation launched in September 2020.[179]

Box 14: Non-financial, resource-related metrics for construction and real estate finance

Metrics can focus on improving materials efficiency and reducing carbon emissions. Sector-specific metrics for circularity are most relevant to high-impact sectors such as construction, one of the largest sectors in the world economy. The construction sector spends around USD 10 trillion on construction-related goods and services every year. Building activities of homes and real estate are capitalised and serviced by the financial industry on a global scale.

The circularity of these activities can only be compared by using non-financial metrics. As an example, the choice of building materials and building design have great potential to create value for society by reducing environmental pressures. For financial institutions, the environmental impacts of building materials are a key to understanding the evaluation of the circularity of buildings in their portfolio.

The table below outlines the difference in material use based of a unique example, where two completed designs were available for a building with the same square meters. For this particular building, a fully completed linear design was available, years before the actual construction of the building. Due to delay in the construction of the linear building a competing circular design was developed. The circular design was eventually executed. This allows for the comparison of the bill of materials of both plans. The biggest difference is in tonnage of the building's constructive materials: 6,569 tons compared to 4,174 tons through the substitution of concrete by constructive wood. The toxicity of building materials should also be considered.

	Traditional, linear economy design	Circular Buildings design
Square meters of plan	2,800 sqm	2,800 sqm (realised)
Total material usage	6,569 tons	4,174 tons
Concrete	5,500 tons	2,750 tons of which 100 tons reused
Wood	0 tons	330 tons of which 30 tons reused
Glass	935 tons	920 tons
Steel	110 tons	110 tons
Other materials	24 tons	34 tons of which 32 tons reused

Source: table adopted from KPMG True Value study of the CIRCL pavilion in Amsterdam, Netherlands

The Circular Building design shows a reduction in the use of concrete and an increase in the use of wood. Forestry activities are increasingly materials efficient, E.g. cascading wood use principles. Sustainable forest management practices can advance circular economy priorities. For this vision to materialize, forestry needs to be integrated into the global construction system to increase the use of long-lived wood products that store carbon and are sustainably sourced.

These types of studies are custom made and are too expensive for mainstreaming into the ESG research related to Circular Economy of the financial industry. Standardisation of non-financial metrics drives down cost.

Sources: wwf.eu/?263091/Cascading-use-of-wood-products-report
scholar.harvard.edu/files/stavins/files/milken_institute_review_on_carbon_sequestration.pdf

ISO/TC 323 Circular Economy ISO Standard Committee

An International Standards Organization (ISO) committee is working on internationally standardised and agreed principles for the terminology and definitions related to a circular economy. The goal is a working ISO management system standard, which is key for this transition and will ensure alignment with business models that support the move from linear to circular. An ISO standard that standardises the measurement and assessment of circularity will help financial institutions to better orient financial services towards companies and clients that adhere to these ISO standards.[180,181]

The Circular Economy standard ties into the following existing ISO standards:

ISO/TC 6	Paper, board and pulps
ISO/TC 20	Aircraft and space vehicles
ISO/TC 59/SC 17	Sustainability in buildings and civil engineering works
ISO/TC 71/SC 8	Environmental management for concrete and concrete structures
ISO/TC 207	Environmental management
ISO/TC 207/SC 5	Life cycle assessment
ISO/TC 251	Asset management
ISO/TC 268	Sustainable cities and communities
ISO/TC 307	Blockchain and distributed ledger technologies
ISO/TC 322	Sustainable finance
ISO/TC 324	Sharing economy

Global Reporting Initiative (GRI) guidance

The financial industry will be able to access information related to the waste aspects of a circular economy for companies reporting their non-financial disclosures according to GRI standards.[182] *GRI 306: Waste 2020* was published in June 2020 to strengthen the relationship between materials and waste by helping to identify waste-related practices and impacts through value chains, including circularity and waste prevention concepts.

The Reporting standard focuses on waste generation and how the impacts of the generated waste are managed by focusing on three performance indicators — waste generated, waste diverted from disposal, and waste directed to disposal.

Sustainable Accounting standards Board (SASB)

SASB has also included performance indicators related to the circular economy, primarily from the waste and recycling angle.[183] Company performance under the SASB standard can be analysed by the following performance metrics:

- Amount of waste incinerated, percentage hazardous, percentage used for energy recovery;
- Percentage of customers receiving recycling and composting services, by customer type;
- Amount of material recycled and composted;
- Amount of electronic waste collected, percentage recovered through recycling.

The barrier is the collection of data. The optimal way to get the data is to regulate it or pay for it. Even then, many businesses will be reluctant to share these data for competitive reasons. A first and crucial step is to arrange operational capacity to weigh materials being handled, as this will often not be present.

Circularity in non-financial accounting methods

The accounting profession is changing, particularly for CFO's departments at financial institutions as awareness grows about climate change and circular economy. Five trends that favour the transition towards more sustainable consumption and production and circularity in the financial sector should be catalysed and professionalised by accountants themselves:

1. The use of financial calculation models to determine the appropriate residual value and depreciation rates for secondary materials and reusable/reused assets (e.g. building materials in existing buildings);[184]
2. Tracking and solving contradictions in tax treatment of virgin versus secondary materials, for example double VAT taxation of secondary materials in certain jurisdictions;[185]
3. Integration of non-financial ESG related metrics by using full cost[186] / true value[187] / true cost / true price[188] accounting methods;[189]
4. Actively working with the audit discipline to improve the assurance and reliability of non-financial numbers;[190]
5. Contribution to transparency by including linear risks in their financial reporting, especially in light of stranded assets;[191]
6. The increase of the number of members of accounting or CFO led platforms that aim to make sustainable decision-making part of the mainstream.[192,193]

Credit Rating Agencies and linked Sustainability Data providers

The main credit rating agencies Moody's Investors Service (Moody's), Standard & Poor's (S&P) and Fitch Ratings (Fitch) that produce transparent and globally standardised credit ratings are increasingly supplementing these with ESG data. In comparison to the relatively new field of ESG data, the credit ratings themselves are produced by divisions of the ratings agencies with financial regulatory oversight. This oversight contributes to greater alignment of outcomes data, more consistently outlining financial risks and opportunities. To supplement their data services to the financial industry, credit rating agencies have acquired one or more ESG research data specialists:

- Moody's recently acquired the following ESG specialists: Four Twenty Seven,[194] Vigeo Eiris[195] and acquired a minority stake in Chinese ESG provider Syntao Green Finance;
- S&P acquired Trucost and the ESG rating services of RobecoSAM;[196]
- Fitch has launched the Fitch ESG Relevance Scores;[197]
- Morningstar has acquired the remaining shares of Sustainalytics.[198]

There is divergence and a variety in methods and outcomes in ESG data. Essentially, more than is the case with traditional credit ratings, there is a lack of standardisation in ESG scores across providers. This divergence is also evident in circularity metrics underlying ESG scores. The involvement of major rating agencies in the ESG market space can have a positive impact on convergence of methods and outcomes between the different ESG providers. Research conducted by MIT Sloan[199] shows that ESG ratings from different data providers are only aligned in over half of the cases, contrary to credit ratings that show greater alignment.

WBCSD Circular Transition Indicators (CTI)

The World Business Council on Sustainable Development (WBCSD)[200] has established the CTI to contribute to standardisation of circularity metrics for decision-makers in private companies. The CTI offers a common set of data that improve transparency on efforts towards more circular business models to stakeholders. These indicators measure the capability of a company to close the resource loop and to use circular inputs as resources for their production processes and generate circular outputs that can be reused, recycled, refurbished, etc. The CTI also includes the degree of renewable energy that is at play in the transformation process of companies. Indicators include percentages of:

- Circular inflow;
- Circular outflow;
- Water circularity;
- Renewable energy.

Further indicators focus on critical production materials and which type of recovery is applied to these critical materials, based on lists in the U.S.[201] and EU.[202] The focus is on materials that can be scarce in the future and are deemed critical to national security of production right now. Indicators include the percentage of critical materials and of recovery type. One indicator measures material productivity which connects the circular economy to financial management of the resource demand of any given company.

EMF's Circulytics Score Card

The Ellen MacArthur Foundation (EMF) has issued an ambitious circularity measurement tool called Circulytics.[203] What sets Circulytics apart is that it measure the strategy, target setting, transparency of disclosures to stakeholders and integration in decision-making of circular economy metrics rather than just focusing on material in- and outflows of the production processes. It is also one of the few methodologies that publishes an overall score for a company and its sub-units. The overall score can be broken down into two sub-scores:

- The Enabler score captures the ability of a company to grasp future circular business opportunities in the future. It reflects indicators that measure the capability of a company to transform towards a circular economy model, based on strategic choices and employee awareness and training programmes;
- The Outcome score displays the status of a company's circularity at the time of measurement.

Limits to Growth (LTG) & Planetary boundaries framework

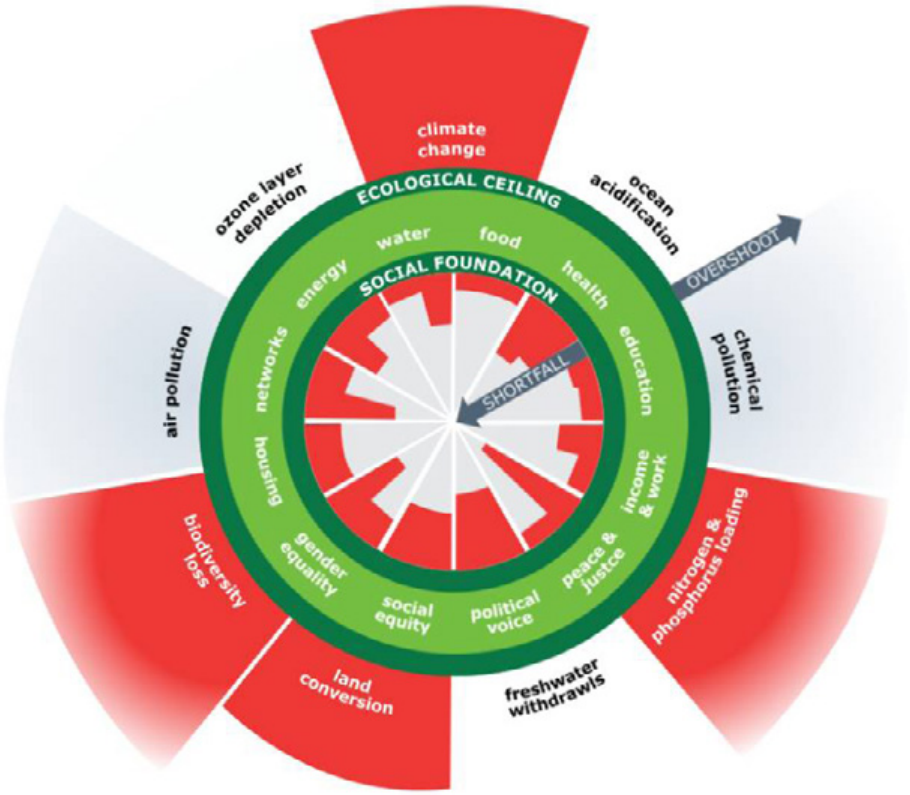
LTG, published in 1972, was revolutionary because with computer aided simulation, it outlined a scenario based on the interplay between exponential population and economic growth and finite resources on Earth.[204] It documented the pressures of continued growth on the sustainability and availability of the Earth's resources towards the year 2100.

The model studied and continues to track the boundary criteria below. The model has been criticised because the timelines of transgression of these boundaries as predicted in the original report have not all been met, although important boundaries like climate change and biodiversity loss have been crossed.

Climate change	Atmospheric carbon dioxide concentration (ppm by volume);
Biodiversity loss	Extinction rate (number of species per million per year);
Biogeochemical	Displacement of nitrogen and phosphorus (millions of tonnes per year);
Ocean acidification	Global acidification of surface seawater (Ph);[205]
Land use	Land surface converted to cropland (percent);
Freshwater	Global human consumption of water (km^3/year);
Ozone depletion	Stratospheric ozone concentration (Dobson units); [206]
Atmospheric aerosols	Overall particulate concentration in the atmosphere, on a regional basis
Chemical pollution	Concentration of toxic substances, plastics, heavy metals contamination

The model issued by Kate Raworth as the Doughnut Economy[207] can be seen as a simplified and more practical version of the planetary boundaries concept - defined by the Stockholm Resilience Centre to estimate the safe operating space for humanity. Recently the Doughnut model has been adopted for the city of Amsterdam's economy strategy and execution, it was renamed 'the City Doughnut'.

Figure 4: The Doughnut of social and planetary boundaries (2017)



Source: kateraworth.com/doughnut/

Box 15: City Doughnut for the City of Amsterdam

A new approach was taken to simply the Doughnut central to Doughnut Economics based on biomimicry insights of Janine Benyus and Kate Raworth, as part of the Doughnut Economics Action Lab in cooperation with Biomimicry 3.8, Circle Economy and C40 Cities, as part of the Thriving Cities Initiative.

	Social		Ecological
Local	What would it mean for the people of Amsterdam to thrive?	1 2	What would it mean for Amsterdam to thrive within its natural habitat?
Global	What would it mean for Amsterdam to respect the wellbeing of people worldwide?	4 3	What would it mean for Amsterdam to respect the health of the whole planet?

Although the quadrants themselves do not yet mention the metrics underlying the measurement, steering and reporting on progress by the City of Amsterdam, this type of custom made frameworks are promising for improving and road testing the standardisation of underlying circularity metrics.

Source: kateraworth.com/2020/04/08/amsterdam-city-doughnut/

Since the Circular Economy uses a resource-based system view, the transition to circularity needs to take into account the control variables that steer the Earth systems in a direction that is favourable to life and well-being. Circularity metrics should be tested and validated against physical limits and planetary boundaries.

The urgency of a transition to sustainable consumption and production and to circularity can be seen through the lens of the drivers of Earth system processes identified by the Stockholm Resilience Institute as nine planetary boundaries:[208]

1. Climate change (CO_2 concentration in atmosphere);
2. Ocean acidification;
3. Stratospheric ozone depletion (Ozone Depleting Substances);
4. Atmospheric aerosol loading (particulate matter);
5. Nitrogen and phosphorus inputs to the biosphere and oceans;
6. Global freshwater use;
7. Land system change;
8. Biodiversity loss;
9. Chemical pollution.

Drivers of the transition towards circularity in resource use

This section identifies the environmental pressures increasing the urgency of the transition to a resource-efficient economy and highlights targets under the Sustainable Development Goals that are expected to drive action on circularity.

A recent study on Financing a circular economy by the Ellen MacArthur Foundation highlighted megatrends such as shifting demographics, digitalisation, and resource scarcity reinforcing the transition to circularity.[209] Important drivers include population growth, climate change, increasing affluence, use of manufactured chemical substances, air pollution, and the unsustainable use of fertilisers. The planetary scale of these sizeable pressures make the transition from a linear to a circular economy urgent to stay within planetary boundaries.[210]

1. **Waste generation and environmental externalities.** Growing resource usage increases environmental degradation. Human population growth drives waste volumes from increased resource consumption and production patterns. Side-effects include pollution, climate change, biodiversity loss, deforestation, desertification and scarcity of natural resources. The environmental consequences can push ecosystems beyond tipping points and reduce access to water, land and air.[211] Our global economy often geographically displaces the environmental effects of production. Many linear economy wastes are literally put out of sight of consumers. Investments in urban areas that steer away from informal collection and backyard recycling towards organised circularity can change livelihoods and save lives, particularly in emerging economies.[212,213] One approach is to formalize the informal sector by providing equipment, training, financial support, cooperative organisation and integration into the waste processing value chain. This can have varying outcomes around the world, depending on factors including social equality.[214]
2. **Over-exploitation, inequality and weak governance**: Increase in affluence for a subset of our global society combined with the lack of strong institutional frameworks are drivers of resource-related conflicts in economies that depends on the extraction of natural resources for development.[215,216] Many of the untapped resources that are yet to be extracted to grow the global economy are found in fragile states. Their jurisdictions do not sufficiently protect citizens, workers and the environment. For a just transition to circularity, leaving no one behind is a key principle to achieve the 2030 Sustainable Development Agenda.[217]
3. **Increase in manufactured substances with negative impacts.** Economic activities such as extraction can release or transform heavy metals, with negative impacts on the environment and human health. Examples include per- and polyfluoroalkyl substances (PFAS), ozone-depleting substances (ODS), heavy metal compounds and radioactive materials. Despite terrific results achieved by the Montreal Protocol's ban of Ozone-Depleting Substances,[218] new harmful chemicals and materials that are insufficiently covered in any international agreement keep on being created.[219,220] Some of these new substances are potentially harmful chemicals or materials and require additional scrutiny. With millions of new chemicals appearing every year, scientific funding to research their effects on human health and biodiversity cannot keep up.[221]
4. **Climate change.** Resource extraction and production contributes to emissions of greenhouse gases (GHGs) that cause human-induced climate change. The transition to circularity can mitigate emissions by focusing on material and resource efficiency strategies for mobility, construction, manufacturing, food and agriculture. While renewables can address around 55 per cent of global GHG emissions, a more profound integration of circularity, resource and material efficiency into climate action is needed to tackle the remaining 45 per cent of emissions.[222] CE's focus on resource efficiency is key to transition to a low-carbon economy to achieve the goals of the 2015 Paris Agreement on Climate Change.[223, 224]

5. **Increases in air pollution linked to growing urbanisation**. The pollution impacts of production and consumption can be concentrated in urban areas. Material design, resource efficiency, urban design and spatial planning play a key role in limiting air pollution from sources such as fossil fuel combustion. The circular economy transition can contributed to well-managed construction and mobility in cities for healthy societies.[225]
6. **Unsustainable food production and consumption**. Unsustainable practices for food production are a direct driver of biodiversity loss and soil and water degradation. Excessive nitrogen and phosphorus for fertilizer use can contribute to pollution of land, water and air, putting pressure nature.[226] Food production methods can also damage human health, through the spread of diseases, air pollution and water contamination, pesticide use and increased resistance of microorganisms to antivirals, antifungals and antibiotics.[227,228]

Contribution to The Sustainable Development Goals SDGs

UN Photo/Cia Pak Ahead of the UN Sustainable Development Summit from 25-27 September, and to mark the 70th anniversary of the United Nations, a 10-minute film introducing the Sustainable Development Goals is projected onto UN Headquarters.

Decoupling economic growth from natural resource use and environmental degradation is critical. One of the key features of the UN Sustainable Development Goals (SDGs) agreed by 195 countries in 2015 is that the 17 goals and 169 underlying targets focus on the interconnectedness of economic activity of businesses, society at large and the interaction with the environment. For the financial sector, the SDGs provide a way to measure, report on and steer the outcomes of their activities. The SDG framework helps the financial sector to asses whether the activities represented on the balance sheet are contributing to positive or negative outcomes for the SDG targets. Whilst measurement, reporting and steering on SDGs is mostly done in the impact investing field[229] on a voluntary basis, the SDGs actually present the financial sector with a "convenient handbook for sustainability". Companies can use the specific SDG targets mentioned below to measure whether their commercial activities contribute or steer them away from the outcomes that promote the transition towards sustainable consumption and production and circularity.

Targets 8.4 and 12.2 through 12.6 all set targets for a shift towards sustainable consumption and production, including through circularity, tying directly into the economic growth and job creation agenda. This insight of making decoupling a priority for business and society is reflected in the SDG targets. The transition to sustainable consumption and production and circularity can help to decouple our economic growth from environmental degradation (target 8.4) through achieving sustainable management and efficient use of natural materials (target 12.2). How servitization is achieved matters and targets 12.3 through 12.6 offer guidance on what type of economic activities companies and government should strive for.

The link between circularlity and the achievements of the targets underlying SDG 8 and 12 is in the context of its contribution to the integrated and interconnected agenda across all 17 goals. SDG 14 (Life below water) and SDG 15 (Life on land) are intertwined with the regenerative and restorative dimensions of circularity. Since SDGs 14 and 15 refer to the effect of human activity on terrestial ecosystems (earth, soil, water, rivers, lakes and oceans) and biodiversity, they are often at the end of the chain of environmental effects and impacts caused by achieving or failing to achieve the targets under SDG 8 and 12. The recommended focus on SDG 8 and 12 is simply to keep target setting manageable for financial institutions and their clients.

Figure 5: SDG targets and links to decoupling of economic growth and use of natural resources

8 DECENT WORK AND ECONOMIC GROWTH	**Target 8.4:** Improve progressively, through 2030, global resource efficiency in consumption and production and endeavour **to decouple economic growth from environmental degradation**...
12 RESPONSIBLE CONSUMPTION AND PRODUCTION	**Target 12.2:** By 2030, achieve the sustainable management and efficient use of natural resources **Target 12.3:** By 2030, halve per capita global food waste at the retail and consumer level, and reduce food losses along production and supply chains including post-harvest losses **Target 12.4:** By 2020, achieve environmentally sound management of chemicals and all wastes throughout their life cycle in accordance with agreed international frameworks and significantly reduce their release to air, water and soil to minimize their adverse impacts on human health and the environment **Target 12.5:** By 2030, substantially reduce waste generation through prevention, reduction, recycling, and reuse **Target 12.6:** Encourage companies, especially large and transnational companies, to adopt sustainable practices and to integrate sustainability information into their reporting cycle

Other SDG targets directly related to the CE include:

2 ZERO HUNGER	**Target 2.4:** By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality.	
3 GOOD HEALTH AND WELL-BEING	**Target 3.9**: By 2030, substantially reduce the number of deaths and illnesses from hazardous chemicals and air, water and soil pollution and contamination.	
6 CLEAN WATER AND SANITATION	**Target 6.3:** By 2030, improve water quality by reducing pollution, eliminating dumping and minimizing release of hazardous chemicals and materials, halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse globally.	**Target 6.4:** By 2030, substantially increase water-use efficiency across all sectors and ensure sustainable withdrawals and supply of freshwater to address water scarcity and substantially reduce the number of people suffering from water scarcity.
7 AFFORDABLE AND CLEAN ENERGY	**Target 7.2:** By 2030, increase substantially the share of renewable energy in the global energy mix.	**Target 7.3:** By 2030, double the global rate of improvement in energy efficiency.
9 INDUSTRY, INNOVATION AND INFRASTRUCTURE	**Target 9.2:** Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries	**Target 9.4:** By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Source: sdgs.un.org/goals

Growth scenarios for financing circularity

This section highlights estimates of the economic value of decoupling economic growth from natural resource consumption and implications for job creation.

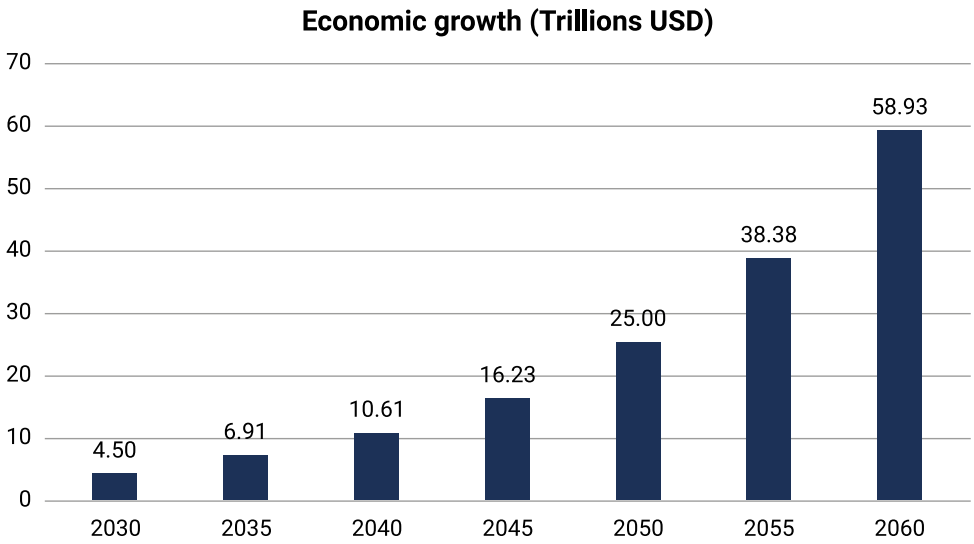
The tremendous system overhaul needed to transition towards circularity will generate innovations with financing opportunities of trillions of USD. Alongside environmental benefits, allocating capital to circular business models would generate significant macroeconomic value to society. For these benefits to emerge, many micro-economic business models need to mature and prosper. The macroeconomics of the CE are complex and uncertain. The micro-economic growth opportunity depends crucially on resource prices, which have fluctuated wildly in recent years. The presence of policy targeting sustainable consumption and production and circularity is key to stimulate circular micro-economic activity for business to generate macro-economic value. The milestone "Growth within" report from 2015 by the Ellen MacArthur Foundation & the McKinsey Centre for Business and Environment, estimates a potential of seven per cent additional GDP by 2030 provided the European Union (EU-27) adopt policies and targets for material/resource efficiency and system change from a linear to a circular economy.[230] This study projects growth of resource productivity by up to 3 per cent on an annual basis for Europe, equivalent to €600 billion (~USD 550 billion) per year savings on resources by 2030 and in addition €1.2 trillion (~USD 1.1 trillion) of system change benefits (avoided externalities) annually, totalling to €1.8 trillion (~USD 1.7 trillion) of benefits per year. This is based on the assumption of policy support and target setting for circularity and is therefore an optimistic scenario.

While the 'Growth Within' report is scoped to Europe, Accenture estimated the value to the global economy based on the transition to circularity. According to Accenture's "Waste to Wealth" research the circular economy could generate USD 4.5 trillion of additional economic output by 2030 on an annual basis. This is economic growth generated by circular business models that decouple economic growth from natural resource consumption. If this opportunity is not seized, it will contribute to a global gap of eight billion tons (Gt) between the supply and demand of natural resources by 2030, resulting in a USD 4.5 trillion of lost economic growth by 2030 and as much as USD 25 trillion by 2050. Based on the annual compounded growth rate of this could constitute an opportunity cost of almost USD 59 trillion by 2060.

The larger the scope of any macroeconomic study assessing the transition to circularity, the more uncertain the effects are on both economic activity and employment. There is however sufficient evidence indicating that the economic effects are positive, if brought about by enabling policies and cost-effective integration of circularity into existing financial services.

The CE market is still nascent. The first successful cases of finance for circularity are emerging, with financial institutions developing expertise, products and services set to be well placed to harness the tremendous opportunity identified.

Figure 6: The circular economy unlocks trillions of economic growth by 2060



Source: Accenture Strategy publication, *Waste to Wealth* (2015)

Jobs in the transition to circularity

The creation of new jobs and destruction of old jobs by the many new circular business models is highly relevant to financial institutions. The transition to circularity sensitizes financial sector specialists to recognize that jobs and spending in linear industries can go into decline. The timings of such declines and increases are difficult to predict, but the International Labour Organisation (ILO) has built a basic circular economy scenario that outlines job growth for the circular recovery and resale of secondary materials activities versus a scenario with job decline for linear manufacturing, mining and extraction activities. The ILO estimates that the circular economy model for sustainability in resource use and consumption[231] could result in a net total of around six million new jobs[232] by 2030, compared with a business-as-usual scenario. In the ILO's scenario towards circularity, nearly 78 million jobs will be created and almost 71 million will be destroyed. Growth in jobs can also accelerate new circular consumer preferences, while other linear consumption choices decline.

This ILO scenario is based on the following key assumptions:

1. It focuses on the effect on jobs of a sustained five per cent annual increase in recycling rates for plastics, glass, wood pulp, metals and minerals, replacing the direct extraction of the primary resources for these products.
2. It also models growth in the services economy, sharing economy, product-as-a-service, rental and repair services. Services shift ownership structures and according to the used model slow down the replacement of goods at an annual rate of one per cent.

Key considerations for the ILO scenarios include:

1. There are regional differences in job creation and destruction. A shift from plastic made from virgin fossil fuels towards the use and production of recycled plastics can shift jobs from the Middle East to the Americas for example. Jobs would shift from locations of extraction of resources via mining towards locations with urban mining and recycling activities. Reduced economic activity in remote and isolated locations with resource extraction, supported by small, rural communities, can lead to increased migration to cities because more secondary, recyclable materials are found in more densely built and populated areas.
2. The decency of the jobs created remains a key item to address, as it is in the business-as-usual scenario. Jobs in CE related services support a more equitable gender distribution for women across sectors and promote highly skilled jobs such as IT, reverse logistics, service quality management, hospitality. Based on the current gender distribution across sectors, the circular economy will raise both the female share of employment and the share of highly skilled jobs.[233] However, the scenario also accounts for a smaller increase in the numbers of workers in waste management for which policies related to health and safety need to complement policies to promote the circular economy. Waste disposal initiatives can contribute to gender equality through increased opportunities for employment of women.[234]
3. Job losses in the linear economy are inherent to the fact that many mining operations are being automated.[235] The remaining jobs in mining require higher skills and expertise levels and the pay of the remaining jobs will be relatively high. Recycling jobs related to waste picking or secondary material production will also be increasingly automated. Depending on the redistribution of employment across economic sub-sectors, the transition will result in a slightly lower female labour share in employment, unless sectors currently associated with green technology (such as electrical machinery) employ a higher share of women.[236] The level of skills required and the various types of jobs in the circular economy will increase with growing volumes of material recovery, increasingly referred to as urban mining.[237]
4. The increased use of low-carbon technologies such as wind, solar and energy storage will foster increased demand for mineral and metal products and hence can have knock-on job effects in mining.[238] With population growth, rising living standards, and growing clean tech use, a circular economy that is based on recycling alone will not satisfy the increasing demand for minerals and metals.[239] To meet demand, many higher skilled jobs are needed: urban mining, market making, digital market places, valuation, match making, material tracking, recovery and reverse logistics. These opportunities are mainly in the early stages of development and roll-out.

Policy considerations for financing circularity

This section outlines some of the key policy measures for governments to create an enabling environment for the transition, including Extended Producer Responsibility and fiscal instruments.

Resource and climate policy intertwined

For financial institutions the resource policy agenda (SDG 12) is interlinked with the climate policy agenda (SDG 13). The emissions of our global economy exceed the level required to meet the target of limiting a global temperature rise to 1.5°C above pre-industrial levels under the Paris Agreement on Climate Change. Transitioning from increasing use of resources under a linear economic model can contribute to mitigating emissions, but there is currently a misalignment between the resource policy agenda and the climate agenda. Our global economy is less than nine per cent circular.[240] To achieve the rapid, far-reaching and unprecedented changes needed, the remaining 91 per cent of the economy that is linear needs to be addressed. Policy, business and finance leaders need to tackle the direct relationship between the resource and climate agendas. FI's should strengthen the link between resource efficiency and climate change, as promoting circularity can help private finance sector deliver on climate commitments and improve risk management.[241] Climate-related measures need to go beyond energy efficiency and power production. Waste prevention and material recycling, together with the integration of the 9-R concept, would reduce incineration and GHG emissions.

Box 16: Africa Circular Economy Alliance integrates Climate and Circular Economy

The African Development Bank (AfDB) turns Nationally Determined Contributions (NDCs) under the Paris Agreement into investment plans. AfDB monitors the execution of Africa's NDCs. By focusing on the sustainable use of natural resources in relation to climate change, AfDB is now exploring Circular Economy opportunities in Africa to contribute to addressing climate change, while at the same time improving livelihoods and ending poverty, under an African Circular Economy Support Programme.

The route taken integrates climate and circular economy policy and will involve the 51 NDCs setting targets in Africa. Waste management, energy efficiency and water resource conservation will be included under the climate umbrella, but not necessarily labelled as circular economy. This integration into the NDC programme of Africa is prepared in cooperation with the Africa Circular Economy Alliance along with UNEP and the World Economic Forum. The alliance is co-chaired by Rwanda / South Africa and Nigeria. They focus on programmes related to resource efficiency to integrate with the climate change agenda.

The reason for this integration is the AfDB's ten-year strategy (2013-2022), which aims to change African economies to inclusive green growth by incorporating circularity principles. The financial strategy is focused on offering financial instruments that de-risk public and private circular projects. Five priority areas, called high fives, are access to energy, agricultural transformation, industrial development, integrating African economies and improving the quality of life of Africans

Green growth is focused on water and soil quality, energy and food security through the promotion of the sustainable use of natural resources. Particularly water infrastructure has a direct relationship to resilience to the effects of climate change.

Source: afdb.org/en/about-us/mission-strategy/objectives
pacecircular.org/african-circular-economy-alliance

Enabling policy environment for circularity

The effects of the linear economy on increased environmental degradation has triggered policy responses to address public health concerns. The global policy picture in the waste trade and transportation has been changing rapidly over the last few years, catalysing exporters to deal with their own wastes in a more effective and efficient way. For example, the knock-on effects of Asia's waste export bans[242] and the introduction of waste hierarchies[243] are among policy changes driving the global push for a circular economy. In China, the concept of Circular Economy has been established in Chinese economic policy since 2009 through the enactment of the Circular Economy Promotion Law. Policy changes that lead to onshoring of recycling and waste treatment plants can also create policy driven opportunities for financial industry players.

Extended Produced Responsibility (EPR)

Many governments implement EPR policies to promote sound waste management and help institutionalise related aspects of the circular economy.[244] EPR holds the producers of a product responsible for the collection and disposal of that product once it has become waste, and can include these costs in the pricing of their products. EPR instruments aim to make producers responsible for the environmental impacts of their products throughout the products' lifecycles, from design to the waste phase. EPR policy seeks to shift the burden of managing certain wastes from municipalities and taxpayers to producers, in line with the polluter pays principle.[245]

EPR provides an incentive for producers to prevent waste, improve recycling and reuse and reduce landfilling and incineration of scarce resources. EPR policy can be used to enforce the return of packaging to be recycled and reused or reduced at the source, particularly in the packaged goods industry.[246]

More advanced EPR schemes focus on lifecycle management instead of just waste disposal at end-of-life. These EPR schemes promote value recovery options such as retrofitting, repurposing, remanufacturing, refurbishing and repair of products before recycling, incineration or safe disposal are considered. This can promote product design for the environment.

EPR policies vary around the world, with distinct qualifications that are regionally determined, often at a city level. More uniformity would enable financial institutions to better leverage these policies and optimally integrate it into their risk models. This is a policy risk issue to monitor. For example, a proposed Break Free from Plastic Pollution Act of 2020 in the U.S.,[247] which would require producers of goods such as packaging to be fiscally responsible for collecting, managing, and recycling or composting the products after consumer use and phase out some single-use plastics from 2022, could have implications for the credit risk of companies in the plastics supply chain.

Box 17: Latin America and Extended Producer Responsibility (EPR) regulations

Various countries in Latin America & the Caribbean are implementing Extended Producer Responsibility (EPR) regulations and recycling laws which can contribute to the transition to a circular economy.

Chilean and Argentinian EPR bills focus on the production of rubber tyres, mandating management systems for used tyres and circular design principles to facilitate recovery of rubber and other tyre components as a secondary material.

Columbia proposed an EPR bill for the collection and treatment of packaging waste by waste management systems; producers will be held responsible for collection and recovery targets.

Brazil has passed several EPR Bills to promote collection of plastic wastes and the use of biodegradable plastic and avoidance of hazardous materials in product design to make material recovery more effective.

Fiscal policy for circularity

Financial institutions often assess the taxes that their clients are subject to, to evaluate potential implications for the profitability of companies that they finance. Proposed fiscal policy interventions to promote the transition to circularity include:

- Tax on virgin plastics. To fight plastic waste and to promote a transition to a circular economy for plastics, various tax regimes are proposed European Union (EU) countries[248] (E.g., €450/ton in Italy) and recently in the UK (GBP 200/ton).[249] Plastic has been singled out as a resource because the widespread effects of plastic pollution appear difficult to contain on a voluntarily basis. Taxation on raw materials aims to the reduce the amount of plastic from virgin materials.[250] Over 90 per cent of the plastic volume used in consumption and discarded are not recycled;[251]
- Taxes on virgin materials such as sand, gravel and rock used in the construction industry have been introduced by various EU states.[252] A policy that taxes first-time-use, virgin resources stimulates the efficiency of resource use by industries;
- Tax exemptions and fiscal compensation are instruments seen across the world to stimulate sustainable behaviour. VAT reduction for recycled content and the use of secondary materials has been proposed to EU member states[253] and in the United Kingdom (UK).[254] The lowering of VAT for repair, refurbishing, and remanufacturing activities would also be a welcome tax shift in favour of the circular economy.[255] A 12 per cent reducing in tax has been implemented in Sweden where citizens are stimulated to repair goods.[256] Luxembourg has a VAT rate of eight per cent for common repair services.[257] A Norwegian tax exemption policy waves the cost of re-registration tax of used low-emission cars (E.g., battery or hydrogen powered) to stimulate resale.[258] Norway also provides fiscal compensation for scrapping combustion engine vans when converting to a zero-emission van;[259]

- Shifting the tax burden from labour to materials. The theory is that secondary materials are labour intensive and therefore incur more tax than virgin materials. Although this has been recommended as an EU policy change, the tax shift from labour to resource use has been affected partially by a limited set of EU countries. Revenues from labour taxation remain eight times higher than the revenues generated by environmental taxes in the EU.[260] The potential global shift of taxes from labour to resources is still largely unrealised;
- Fiscal incentives that support training and hiring in circular businesses could be considered by policymakers to address shortages in skilled labour for remanufacturing and refurbishing of products;
- Changes in depreciation methods for circular products is also relevant to taxation and financial models. A change in accounting methods can already be observed for buildings built from secondary materials, documented with material passports. As well as the building itself, components and building materials can also have a higher value retention. The change of accounting methods can increase the success of secondary material markets;[261]
- Tax breaks and social security exemptions can also be provided to companies that hire recent master students or PhD graduates on the circular economy theme. This constitutes financial support to create academic spin-offs and enables private companies to acquire inhouse R&D services from certified and skilled researchers from international universities.[262]

Right to repair policies

Other policy instruments used by governments stress the right to repair, which makes it mandatory for companies to provide spare parts and diagnostic tools that make repair possible.[263] For example, in the U.S., motor vehicle owners have the right to repair. Both the U.S. and the EU are pushing for legislation related to the right to repair for electronics.[264]

International movement of wastes

The Basel Convention[265] is a crucial legislation for the financial sector and clients. The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal aims to reduce international movements of hazardous wastes. Specifically it aims to prevent the transfer of hazardous waste from developed to developing countries.

This is particularly relevant for ship finance and ship insurance. Because of the hazardous materials on board of (older) ships, the export of decommissioned vessels is regulated by the Basel Convention. Ship recycling is on the one hand a way to recover the resources of a ship and bring them back into circulation (e.g. steel), on the other hand ship recycling is still often done without environmentally sound infrastructure and with insufficient health protection for ship breakers. A number of financial institutions have therefore launched the responsible ship breaking standard (RSRS) to improve the conditions for recycling of ships by agreeing to a set of common expectations on the sound and safe recycling of ships.[266]

From a risk management perspective the financial sector needs to be aware and keep up to date on how clients plan to recycle (part of) their fleet.

Policies for circularity and decent employment

For financial institutions it is important to focus on the social protection aspects of work offered within a circular economy and the related employment trends and conditions for decent work (SDG 8). Social due diligence will require additional attention during the economic recovery in 2021/22. Flexible and part-time employment might be increasingly associated with circular business volumes of financial institutions. Therefore social protection of workers in these industries should be on the watch list of financial institutions, particularly those working with an ESG or social impact approach. Some part-time, freelance or zero-hour contract workers might not be sufficiently protected due to lack of eligibility for social security, because they do not conform to the minimum demands of social security schemes. Many workers may be at risk of inadequate protections. Financial institutions should be aware that Article 6 of the International Labour Organization's Part-Time Work Convention[267] states that "statutory social security schemes….shall be adapted so that part-time workers enjoy conditions equivalent to those of comparable full-time workers." This implies that workers should receive adequate protection regardless of their employment contract forms.

Onshoring may also result in a redistribution of wealth across countries, with related adjustments in social inequalities. In developed and developing countries, both the level and quality of employment will require policy attention. For the internal job market in developing countries, a circular economy can create more income resilience and better sanitary conditions. Waste processing currently relies heavily on informal employment for collection services. For a just transition[268,269] to circularity to occur, formalising the status of informal waste picker jobs is key.

Geographical variations in policy measures for circularity

This section highlights national and regional policy-led initiatives in Africa & the Middle East, Asia Pacific, Europe, Latin America & the Caribbean and North America.

Regional and national policy drives global business opportunity for financial players. For the financial sector it is important to understand the variety of approaches taken around world to contribute to the transition to circularity. A major step forward was taken at the 4th UN Environmental Assembly (UNEA4) in 2019, where countries agreed that the issue of resource impact on the environment plays significant role. The Ministerial Declaration included a commitment to "advance sustainable consumption and production patterns, including […] through circular economy and other sustainable economic models."[270] At a regional level, women are more likely to have access to financial services in developed than in developing economies, and financial inclusion can be combined with policies on sustainable consumption and production and circularity to address social inequalities as part of a just transition.[271]

National or sub-national policy focusing on business opportunity and material or resource efficiency and in some cases system redesign can contribute to this transition. At a sub-national level, cities play a crucial role in financing circular initiatives and business models. Examples include material loops for 4,000 companies requiring copper in their production in Shanghai, China,[272] as an alternative to virgin copper directly sourced from mines; city-wide roll out of collection bins and food waste fees for businesses in Milan, Italy,[273] actively diverting waste from landfills in San Francisco, U.S.,[274] and in San Sebastian, Spain,[275] revolving funds in Amsterdam, The Netherlands, through the Amsterdam Climate and Energy Fund (ACEF),[276] funds totalling EUR 300 million for climate-related actions made available by the Dutch government[277] can be accessed by subnational government for CE projects; and a CE themed venture capital and growth capital fund is scaling up finance for circularity in Edinburgh, Scotland.[278]

The financial challenges for cities and regions to scale up efforts towards sustainable consumption and production and circularity are numerous. Access to funding is a common barrier to launch circular business models.[279] Due to the lack of financial resources for innovators, only small-scale low-risk projects tend to be realised with limited impacts in terms of job creation and a limited scale of positive environmental effects. Coordination across the different levels of government is needed, linking the climate change and resources or circular economy agendas, to address barriers.

Box 18: UNEP FI Survey Outcomes

The majority of respondents to UNEP FI's survey perceived Africa, Europe and Asia as the geographies offering the most opportunity for financing circularity.

Asia Pacific

Country specific examples of progress and challenges in the Asian region progress:

- Japan: The Government introduced a law that favours a circular economy in 2000: The Law for the Promotion of Effective Utilization of Resources. It aims to establish *"a sound material-cycle economic system based on the 3R reduce-re-use-recycle principle."* (Japan, 2000).
- South Korea: The Government put in place a new circular economy law in 2008, mainly focused on waste recycling (Legislative Council Secretariat, 2012). Despite a high recycling rate in South Korea, more system redesign and resource efficiency measures are needed based on circular economy insights.
- India: The Indian Ministry of Environment, Forest and Climate Change formed the Indian Resource Panel (InRP) on Resource Efficiency in 2015 to promote sustainable development by utilising secondary resources to meet developmental needs. While this does not explicitly mention circular economy, the InRP's activity forms the basis for further circular economy focused policy development in India.
- China: Since January 2018, the National Sword program of China bans imports of 24 categories of waste due to rising environmental and health concerns. (See box).
- Australia: The Australia Government has started promoting the circular economy through policy initiatives, with measures including a National Food Waste Strategy in 2017 and a National Waste Policy in 2018, based on circularity principles. The Strategy aims to halve Australia's food waste of seven million tonnes a year by 2030. As a concrete example, Sydney promotes car sharing amongst its inhabitants by designating parking spaces for shared cars.[280]

Box 19: China's Circular Economy Promotion Law and knock-on effects

The first step towards a CE in China was a focus on cleaner production for the industrial sector. In June 2002, China's National People's Congress approved the Cleaner Production Promotion Law. Its key features are outlined in Article 28: "Enterprises shall monitor resource consumption and generation of wastes during the course of production and provision of services, and conduct cleaner production audits with respect to production and service procedures according to need.

Enterprises that exceed the national or local discharging standards or exceed the total volume control targets for pollutants set by the relevant local people's governments shall conduct cleaner production audits.

Any enterprise using toxic and hazardous materials in production or discharging toxic and hazardous substances shall periodically conduct cleaner production audits, and report the audit results to the relevant administrative departments for environmental protection and the relevant departments for economic and trade under the local people's government at or above county level."

The Chinese Government's consecutive policies are shown in the table below.

- The problem for China was twofold: sheer volume and poor quality of imported wastes. Up until National Sword, the volume of imported wastes added more than 10 per cent to China's total waste volume. The poor quality of waste imports made the imported waste more difficult to recycle and consequently reduced the profits for the Chinese companies involved.
- Since January 2018, the National Sword program of China bans imports of 24 categories of waste due to rising environmental and health concerns.
- Since start of 2018 there have been many knock-on effects of China's import ban, including wastes being diverted to Malaysia, Vietnam, Turkey and India. Due to negative effects of the displacements of wastes, these countries are also coming up with policy response that benefit a more circular global economy. Exporting countries are increasingly facing the need to address their own waste volumes, which makes the shift towards circularity more cost effective and urgent than ever.

Area	Policy/Law	Year
Cleaner production	Cleaner production pomotion law	2002
	Methods of cleaner production audit and review	2004
Pollution and waste management	Law for environment pollution of solid waste	2004
	Amended law on pollution prevention and control of solid waste	2005
	Laws and regulations for reuse and recycling specific solid waste	ongoing
	Amended law to the prevention and control of environmental pollution by solid waste	2016
	Environment Protection Tax law	2018
Energy conservation	Law for energy conversation	1997
	Medium- and long-term plan for energy conservation	2005
	Law for renewable energy	2005
Circular economy	Circular economy promotion law	2009

Source: Adapted from Li, Bao, Ziu, Zhang and Xu [38] and Su *et al.* [11].
National Sword Policy Programme 2018
Source: fdi.gov.cn/1800000121_39_597_0_7.html
pacecircular.org/african-circular-economy-alliance

North America

Canada

Canada is the host of the World Circular Economy Forum in 2021,[281] which is the first time the event will take place in North America.

In 2018, the Canadian Council of Ministers of the Environment (CCME) approved the Canada-wide Strategy on Zero Plastic Waste.[282] This nationwide strategy is built around the building blocks of prevention, value recovery, collection and clean up. Canada has a number of challenges which may be tackled through circularity as the country recycles around 10 per cent of plastic waste with the other 90 per cent going to landfill and incinerators.[283]

The concepts of urban mining in the context of circularity have recently gained political attention in Canada, where recycling and recovery are already present in the mainstream and provide a significant supplementary source of industrial inputs. Going forwards, repurposing, remanufacturing, refurbishing and repair could become additional supplementary activities to Canada's traditional role in mining of raw materials. The Canadian Government will also increase its focus on the shift to producer responsibility and the need for circular redesign of manufacturing, consumer goods, food production and petrochemicals.

Furthermore, Canada has an initiative called Mining Value from Waste,[284] which focuses on old mine tailings with the aim of recovering metals with new and improved extraction technologies, reducing long-term environmental liabilities, and repurposing material for better use.[285]

United States

According to ING research[286] on U.S. policy, the U.S. government is not very involved in legislating the circular economy. Most relevant policies are at state or lower level and mostly concern recycling of wastes. Market mechanisms are called upon to advance towards material efficiency. U.S.-based circular businesses have emerged around the following themes:

- Plastics recycling for food grade use;
- Compostable and biodegradable plastics;
- R&D into technologies to capture CO_2 directly from the atmosphere, and to use that CO_2 in the synthesis of transportation fuels to replace the use of crude oil;
- Recapture and reuse of textile fibres;
- Food rescue and distribution, and education;
- Reusable consumer goods that replace single-use alternatives;
- Drop off locations for repair of broken products;
- Market places for second-hand goods, either physical or virtual;
- Market places for materials salvaged from demolition;
- B2B auction marketplaces for liquidation of customer returns and overstock.

Latin America & the Caribbean

In the region, the transition to circularity has the potential of reducing dependence on imports and exports of oil, metals and minerals in the region. The creation of market places for secondary materials mitigates the exposure to exchange rate fluctuations that make imports more expensive. For Latin America and the Caribbean these are key considerations. It is estimated that the transition to circularity could generate 4.8 million of new jobs by 2030 in the region, which has some 80 public initiatives to enable the transition.[287,288] A Latin-American and the Caribbean Regional Coalition on Circular Economy to be launched by the end of 2020 aims to provide a regional platform to enhance inter-ministerial, multi-sectoral and multi-stakeholder cooperation, increase knowledge and understanding on circularity, and provide capacity building and technical assistance for the development of public policies for circular economy and sustainable consumption and production. The Coalition will be led by Colombia, Costa Rica, Peru and Dominican Republic together with the eight strategic partners: Inter-American Development Bank, Ellen MacArthur Foundation, World Economic Forum, Konrad Adenauer Foundation, United Nations Industrial Development Organization, Climate Technology Centre & Network, Partnership for Action on Computing Equipment and UNEP. Some country specific examples of progress achieved and challenges faced in the region are outlined below.

- Brazil: Circular business models are in early development stages and have primarily focused on three key sectors:
  - Agriculture with regenerative farming practices and Restoration of degraded land;
  - Construction with circular design and innovation in the utilisation of buildings and urban planning;
  - Electrical and Electronic Equipment Manufacturing with logistical collaboration and circular redesign.
- Argentina: The country lacks a solid recycling system so waste are sent to landfills, which prevents recycling or reuse (Rademacher, 2018). It is estimated that most of the recycled materials are recovered by informal recyclers. There are approximately 10,000 cartoneros working to clean up about 13 per cent of Buenos Aires' trash (Netwall, 2014).
- Mexico: The country is in the early stages of its transition to circularity (Rodriguez, 2019). It has 650 open-air dumpsites and about 200 landfills, many of which are in poor condition and lack basic infrastructure to ensure a sound operation and monitoring of the waste streams (Rodriguez, 2019). In 2009, the Government developed financial support programmes designed to help modernise the country's waste infrastructure. Grants were issued to upgrade landfills, close open dumps and engage in technical landfill studies and municipal waste collection (Rodriguez, 2019).
- Colombia: The country launched a National Strategy on Circular Economy in 2019, prioritising industry, packaging, biomass, energy, water, building materials.[289]
- Chile: The Chilean Economic Development Agency (CORFO) is supporting the transition to circular models. The development of a National Circular Economy Roadmap, National Strategy on Organic Waste and circular economy indicators and metrics are included in new nationally determined contributions (NDCs) under the Paris Agreement for the first time.
- Ecuador: The Ministry of Production launched a White Book on Circular Economy and signed a National Pact for the Circular Economy in 2020.
- Peru has developed a Circular Platform and Costa Rica is in the process of developing a circular economy policy and implementing circular economy policy frameworks.

Africa & the Middle East

Africa

An Africa Circular Economy Alliance along with UNEP and the World Economic Forum is co-chaired by Rwanda, South Africa and Nigeria. The alliance is in an early stage and is focused on sharing best practices for the creation of legal and regulatory frameworks that promote the circular economy.

Country specific examples of progress achieved and challenges faced in the region include:

- Nigeria: In 2017 Nigeria generated 290,000 tonnes of electronic waste – a 170 per cent increase compared to 2009 (UNEP, 2019). The Nigerian Government, the Global Environment Facility and UNEP have announced a USD 15-million initiative to kick off a circular electronics system in Nigeria. Safe e-waste recycling has enormous economic potential, with 100 times more gold in a tonne of e-waste than in a tonne of gold ore (UNEP, 2019).
- Rwanda: The country has set up a National Circular Economy Forum where the public and private sectors exchange on opportunities and challenges (Government of Rwanda, 2019). Production of biogas from urban, domestic and industrial wastes has the current focus;
- South Africa: The EU's main strategic partner in Africa for circular economic promotion has carried out projects including (SEED, 2020):
  - Utilization a metallurgical waste product to treat acidic water to potable stage. The treated acid mine water is then sold to mines to save on drinking water costs and reduces the mines' dependency from the municipalities;
  - Utilization of recycled bricks;
  - Manufacturing of building materials from recycled plastic waste;
  - Breeding insects to produce protein rich feed for animals.
- Ghana: In 2019, 30,000 tonnes solid waste were generated daily in Ghana and three-quarters of this was discarded in public dumps or burned. 3,000 tonnes of plastic waste are generated daily, of which less than two per cent is recycled. More than 80 per cent of the generated waste is recoverable;
- Saudi Arabia: Saudi Arabia's Saudi Vision 2030 supports the transition to a circular economy to surmount growing volumes of waste (WFES, 2019). The Capital, Riyadh will become the testing ground for Saudi Arabia's waste management recycling efforts. Key initiatives include the creation of recycling facilities capable of handling all waste types; effective recycling of construction and demolition waste, currently mostly dumped; and upcycling of construction and demolition waste into secondary road and home building materials.

Europe

The European Union has a long-standing commitment to advance the resource efficiency and circular economy agenda, starting by the European Commission's work on a resource efficiency platform in 2011. In 2014 a manifesto and policy recommendation were published to change the macro-economic narrative of the "Resource efficiency platform" into a micro-economic narrative to be able to transition to a circular economy in cooperation with the private sector. The EU is working towards keeping its resource consumption within planetary boundaries.[290]

The European Investment Bank (EIB) is managing a Joint Initiative for Circular Economy,[291] a cooperation among National Promotion Banks aimed at jointly investing in CE. With a blended finance approach EIB has provided more than EUR 2bn in co-financing for circular projects over the last five years.

An EIB-EC joint programme called InnovFin Advisory[292] developed a first of its kind "access-to-finance study" around 2014, with recommendations that triggered the setup of the CE Finance Support Platform for the financial sector. The introduction of the finance perspective in relation to the CE transition had a strong impact on policy.

In 2015, the European Commission launched the CE finance support platform as a major step in engaging the financial community with other stakeholders towards the CE transition.[293] In 2020, the Commission linked this to the European Green Deal, which focuses on sustainable growth and a prosperous social and economic agenda for the EU.[294] CE highlights are:

- Enhanced product policy framework to inform consumers and to prevent waste at the product design stage;
- Increased support for services, product-as-service models and digital solutions that reduce or regulate waste;
- Improved functioning of the internal market for high quality secondary raw materials.

The Commission's ambition to accelerate the transition towards circularity is a priority. Through the circular economy and sustainable finance transition, the EU aims to improve the international competitiveness of its economy; ensure a socially compassionate and equitable society; and ensure environmentally sustainable production and consumption. The role of finance and investment is seen as crucial to mainstreaming the circular economy. The Commission's proposed Renewed Sustainable Finance Strategy in 2020 contains the goal of mainstreaming finance for a circular economy. It is developing policies and regulations to influence businesses to measure and report on circular economy activities.

Financial institutions active in the EU-27 economic space will be required to disclose on activities related to circular economy for financial year 2022 in 2023. An EU Taxonomy Regulation in force from 2020 provides a framework for sustainable finance, including new legal obligations for financial market participants, large companies, the EU and Member States. The EU calls it the world's first-ever green list. It has the potential to create a common language that the financial sector can use to measure their impacts on the climate and the environment.[295] A set of six environmental objectives will come into force in the EU by the end of 2022. To support these environmental objectives financial market participants in the EU economic space will have to disclose and report to what extent the assets on their balance sheet contribute to the transition to a circular economy.

The development of the EU Taxonomy - classification system setting performance thresholds for sustainable economic activities is one of the first steps under the EU Action Plan for financing sustainable growth[296] and could contribute to mobilizing financing for the EU Green Deal[297] which aims to make the EU's economy sustainable by boosting resource efficiency by moving to a clean, circular economy, and restoring biodiversity and cutting pollution.

The EU Taxonomy Regulation identifies six environmental objectives for the purposes of the taxonomy (Article 5):

- Climate change mitigation;
- Climate change adaptation;
- Sustainable use and protection of water and marine resources;
- Transition to a circular economy, waste prevention and recycling;
- Pollution prevention and control;
- Protection of healthy ecosystems.

The EU Taxonomy will be expanded over the coming years to help investors, companies, issuers and project promoters in the transition to a low-carbon, resilient and resource-efficient economy by providing technical screening criteria. The EU taxonomy for banking and finance asks financial institutions to establish objectively the "do no significant harm"[298] principle for the circular economy. They will need to report on significantly positive contributions to all six environmental objectives, of which circular economy is one and tied into all five others. Companies subject to disclosure requirements under the revised EU Non-Financial Reporting Directive (NFRD) will need to make disclosures with reference to the Taxonomy, including large banks and insurers.

Current EU policies are described in the second Circular Economy Action Plan[299] (March 2020) in support of the Green Deal.[300] The action plan defines categories of activities substantially contributing to a circular economy; sets minimum criteria to be met by activities under each category; and provides methodological guidance including a list of typical investments/projects for each circular economy category. This can provide generic guidance and inspiration to the financial sector for the categorisation of CE business models.[301]

EU policy on resources has refocused from securing access to virgin raw materials, towards the generation and availability of secondary materials. The EU aims to relieve environmental pressures and sees the circular economy transition as a catalyst. The EU focus is mostly on abiotic resources, which are mostly non-regenerative within a reasonable timeframe of a year or a couple of years. Biotic resources are mostly considered in the context of biomass for biofuels.

These policy initiatives engage with key product value chains and blend into:

- The EU Industrial Strategy;[302]
- EU Biodiversity Strategy for 2030;[303]
- Farm to Fork Strategy;[304]
- Forest Strategy;[305]
- Consultations for Zero Pollution Action Plan.[306]

A broader initiative like the European Plastics Pact[307] has voluntarily assembled with 19 countries across Europe and more than 100 private companies worldwide to work towards a circular economy for plastics. The pact focuses on redesign of products and plastic itself, responsible use of plastics, the increase of recycling capacity and the use of recycled content in production.

Some EU member countries are accelerating their own national transitions to a circular economy. One such example is the Government of Netherlands with an objective to have a circular economy by 2050.[308] Another example is France, where a law "Fight against waste for the circular economy (lutte contre le gaspillage et à l'économie circulaire) was passed in early 2020 to align environmental law with principles of the circular economy.[309] Its overall purpose is to achieve a neutral ecological footprint within the framework of respecting planetary boundaries. By doing so, France has pre-emptively taken up a legal position within the EU-27 regarding laws mandating circular economy practices.[310] The 130 articles contain many details on the boundaries and strategic targets to manage and prevent waste production.

The law remains complex with many different timelines and boundaries between sectors and subsectors, with France aiming to:

- Use 100 per cent of recycled plastics by 2025 and wants to phase out the use of single use plastics by 2040;
- Reduce food waste, by 2025, by 50 per cent compared to its 2015 level in the areas of food distribution and collective catering and, by 2030, 50 per cent compared to its 2015 level in the areas of private consumption, production, processing and restaurants.

France is also implementing extended producer responsibility (principe de responsabilité élargie du producteur) regarding obligatory reuse and prevention of waste from commercial goods that run the risk of remaining unsold due to fashion or overstocking.

The Nordics—Denmark, Finland, Iceland, Norway and Sweden—are also taking concrete action to establish a circular economy. The Nordic Prime Ministers have agreed on a joint vision of the Nordic region to become the most sustainable and integrated region in the world by 2030.[311] The priorities in achieving this vision are the transition towards carbon neutrality and a circular and bio-based economy. Furthermore at the cross-Nordic level, the Nordic Council of Ministers has included circularity in recommendations for a common Nordic public procurement policy.[312] The Nordic Working Group for Circular Economy (NCE)[313] focuses on plastics, construction and buildings, mobility, food waste, waste management and prevention, transport across borders, and Nordic indicators for circular economy.[314] Nordic Innovation has a programme on Nordic Sustainable Business Transformation, where the emphasis is on challenging Nordic industries for a circular future, circular business models and innovative solutions.

Within the Nordics, Finland started implementing a circular economy roadmap for 2025 in 2016. This was created by Finnish Innovation Fund Sitra.[315] Finland was also the first to host the World Circular Economy Forum (WCEF) in 2017. The second version of the national roadmap, the Critical Move: Finland's Roadmap to the Circular Economy 2.0 was published in 2019.[316] Denmark was the second country to release their strategy for the circular economy transition in 2018.[317,318] Later that year, the Danish government launched the financing of several special initiatives leading towards more circular businesses. Sweden and Norway are currently developing their national circular economy strategies.

Appendices

Appendix 1: Principles for Responsible Banking

More than 180 banks have signed up to six principles:

1. **Alignment** We will align our business strategy to be consistent with and contribute to individuals' needs and society's goals, as expressed in the Sustainable Development Goals, the Paris Climate Agreement and **relevant national and regional frameworks.**
2. **Impact & Target Setting** We will continuously increase our positive impacts while reducing the negative impacts on, and managing the risks to, people and environment resulting from our activities, products and services. To this end, we will set and publish targets where we can have the most significant impacts.
3. **Clients & Customers** We will work responsibly with our clients and our customers to encourage sustainable practices and enable economic activities that create shared prosperity for current and future **generations.**
4. **Stakeholders** We will proactively and responsibly consult, engage and partner with relevant stakeholders to achieve society's goals.
5. Governance & Culture We will implement our commitment to these Principles through effective **governance and a culture of responsible banking.**
6. **Transparency & Accountability** We will periodically review our individual and collective implementation of these Principles and be transparent about and accountable for our positive and negative impacts and our contribution to society's goals.

Source: unepfi.org/wordpress/wp-content/uploads/2019/07/FINAL-PRB-Signature-Document-2-Interactive-22-07-19.pdf

Appendix 2: Principles for Responsible Investment

1. We will incorporate ESG issues into investment analysis and decision-making processes.
2. We will be active owners and incorporate ESG issues into our ownership policies and practices.
3. We will seek appropriate disclosure on ESG issues by the entities in which we invest.
4. We will promote acceptance and implementation of the Principles within the investment industry.
5. We will work together to enhance our effectiveness in implementing the Principles.
6. We will each report on our activities and progress towards implementing the Principles.

Source: unpri.org/pri/about-the-pri

Appendix 3: Principles for Sustainable Insurance

1. We will embed in our decision-making environmental, social and governance issues relevant to our insurance business.
2. We will work together with our clients and business partners to raise awareness of environmental, social and governance issues, manage risk and develop solutions.
3. We will work together with governments, regulators and other key stakeholders to promote widespread action across society on environmental, social and governance issues.
4. We will demonstrate accountability and transparency in regularly disclosing publicly our progress in implementing the Principles.

Source: unepfi.org/psi/the-principles/

Appendix 4: Useful resources

Key initiatives for the private sector transition and areas of intervention to boost circularity include:

- UNEP Circularity Platform
- International Resource Panel
- One Planet Network
- World Bank Group
- WBCSD circular economy programme
- Organisation for Economic Co-operation and Development (OECD)
- World Resources Institute
- Platform for Accelerating Circular Economy
- Ellen MacArthur Foundation
- World Economic Forum

Appendix 5: Acronyms

ADB	Asian Development Bank
AfDB	African Development Bank
BREEAM	Building Research Establishment Environmental Assessment Method
CBD	Convention on Biological Diversity
CE	Circular Economy
COP	Conference of the Parties
CTI	Circular Transition Indicators
DG FISMA	European Commission Directorate-General for Financial Stability, Financial Services and Capital Markets Union
DNA	Deoxyribonucleic acid, (nucleic acid that contains the genetic code)
EBRD	European Bank for Reconstruction and Development
EIB	European Investment Bank
EMF	Ellen MacArthur Foundation
EPR	Extended Producer Responsibility
ESG	Environmental, Social & Governance
EU	European Union
FAO	Food and Agriculture Organization
FTSE	Financial Times Stock Exchange
GBP	Green Bond Principles
GRESB	Global Real Estate Sustainability Benchmark
GRI	Global Reporting Initiative
GSSB	Global Sustainability Standards Board
GT	Gigatonnes
ICMA	International Capital Markets Association
ILO	International Labour Organisation
INRP	Indian Resource Panel
IRP	International Resource Panel
ISO	International Standards Organisation
LEED	Leadership in Energy and Environmental Design
LTG	Limits to Growth
MOOC	Massive Open Online Course
NDC	Nationally Determined Contribution (to climate mitigation and adaptation)
OECD	Organisation for Economic Co-operation and Development
PRB	Principles for Responsible Banking
PRI	Principles for Responsible Investment
PSI	Principles for Sustainable Insurance
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals
RFID	Radio Frequency Identification
SASB	Sustainability Accounting Standards Board
SBG	Sustainable Bond Guidelines
SBP	Social Bond Principles
SDG	Sustainable Development Goals
SEED	Supporting Entrepreneurs for Environment and Development
UCL	University College London
UNEA 4	Fourth session of the UN Environment Assembly
UNEP	United Nations Environmental Program
VAT	Value Added Tax
WBCSD	World Business Council Sustainable Development
WELL	Building standard with focus on human health and well-being
WFES	World Future Energy Summit

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