

## Sustainability and Circular Economy

### Glossary of Terms and Concepts

#### **Biomimicry**

A design strategy that takes inspiration from the natural world and its systems to produce more environmentally benign, circular solutions to meet our ongoing needs.

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

**Further reading:** <https://biomimicry.org/what-is-biomimicry/>

#### **Biosphere Rules**

A framework for implementing closed-loop production in business. The Rules emerged from a 2005 research project at IE Business School that identified the principles that facilitate circular processes in nature but reframed for industrial production systems. The five principles that constitute the Biosphere Rules are:

1. Materials parsimony. Minimize the types of materials used in products with a focus on materials that are life-friendly and economically recyclable.
2. Value cycle. Recover and reuse materials from end-of-use goods into new value-added products.
3. Power autonomy. Maximize the power autonomy of products and processes so they can function on renewable energy.
4. Sustainable product platforms. Leverage value cycles as product platforms for profitable scale, scope, and knowledge economies.
5. Function over form. Fulfil customers' functional needs in ways that sustain the value cycle.

**Sources of definition:** [https://en.wikipedia.org/wiki/The\\_Biosphere\\_Rules](https://en.wikipedia.org/wiki/The_Biosphere_Rules)

#### **Boundary conditions**

Boundary conditions are used to define what is included in a life-cycle assessment study. The common boundary conditions are cradle-to-gate, cradle-to-site and cradle-to-grave. However full boundaries should also define what was excluded (i.e. due to a lack of data, or inputs that were assumed negligible). (See also cradle-to-gate, cradle-to-site, cradle-to-grave, cradle-to-cradle, well-to-wheel.)

**Sources of definition:** <http://www.circularecology.com/glossary-of-terms-and-definitions.html>

## Carbon budgets

Carbon budgets are a simplified way to monitor the release of carbon emissions in a bid to meet agreed targets. For example, the UK government has set five-yearly carbon budgets to help them to meet their Climate Change Act targets of reducing emissions by at least 100% of 1990 levels (net zero) by 2050, and contributing to limiting global temperature rise to as little as possible above 2°C.

According to the Committee on Climate Change (CCC), UK emissions were 44% below 1990 levels in 2018. However, it is not on track to meet its next budget (2023 to 2027). To meet future carbon budgets and the 100% target for 2050 will require the government to apply challenging measures.

The simple idea of carbon budgets hides considerable complexity. Some of the indicators CCC tracks include the:

- emissions in an average unit of electricity and how low this could go if we changed our energy infrastructure;
- emissions from new cars, and the rate of development and investment in electric vehicles;
- size of onshore and offshore wind farms at various stages of their project cycles;
- number of lofts and walls being insulated and boilers upgraded, including moves to low
- carbon heat such as ultra-efficient heat pumps;
- progress of electricity market reform.

**Sources of definition:** <https://www.theccc.org.uk/tackling-climate-change/reducing-carbon-emissions/carbon-budgets-and-targets/>

## Carbon capture and storage (CCS)

Carbon Capture and Storage (CCS) is a technology that captures most of the carbon dioxide (CO<sub>2</sub>) emissions produced from the use of fossil fuels in electricity generation and industrial processes such as a cement factory or biomass power plant, preventing the carbon dioxide from entering the atmosphere. It is a potential means of mitigating the contribution to global warming and ocean acidification of carbon dioxide emissions from industry and heating.

Using CCS with renewable biomass can actually take carbon dioxide out of the atmosphere. The CCS chain consists of capturing the carbon dioxide, transporting it, and finally storing it, usually underground in depleted oil and gas fields or other geological formations. According to the Intergovernmental Panel on Climate Change (IPCC), while CCS drastically reduces CO<sub>2</sub>, emissions of air pollutants increase significantly, entailing a reduction in air quality.

**Sources of definition:** <http://www.ccsassociation.org/what-is-ccs/>

[https://en.wikipedia.org/wiki/Carbon\\_capture\\_and\\_storage](https://en.wikipedia.org/wiki/Carbon_capture_and_storage)

### **Carbon Disclosure Project (CDP)**

CDP, an international non-profit organization owned by DP Global, runs the global environmental disclosure system to drive insight and action towards a more sustainable economy. Each year CDP helps companies, cities, states and regions (at the request of their investors, purchasers and stakeholders) to measure and manage their risks and opportunities on climate change, water security and deforestation. CDP scores their performance, providing a benchmark against which to measure corporate and city progress.

**Sources of definition:** <https://www.cdp.net/en>

### **Carbon footprint**

The total emissions caused by an organization, project or product, expressed as carbon dioxide equivalent. Greenhouse gases (GHGs), including carbon dioxide, can be emitted through land clearance and the production and consumption of food, fuels, manufactured goods, materials, wood, roads, buildings, transportation and other services.

The Infrastructure Carbon Review in 2013 showed that the infrastructure industry controls 16% of the UK's total carbon emissions and has influence over a further 37%. This total impact figure of 53% is set to grow to 90% by 2050, due to decarbonisation in other sectors.

**Sources of definition:** [https://en.wikipedia.org/wiki/Carbon\\_footprint](https://en.wikipedia.org/wiki/Carbon_footprint)

<https://www.ukgbc.org/wp-content/uploads/2017/09/Delivering-Low-Carbon-Infrastructure.pdf>

### **Carbon offsetting**

Carbon offsetting is a way to compensate for the effect of a carbon footprint by investing in environmental projects designed to reduce future greenhouse gas emissions. These offsets are measured in tonnes of carbon dioxide-equivalent (CO<sub>2</sub>e). One tonne of carbon offset represents the reduction of one tonne of carbon dioxide or its equivalent in other greenhouse gases. The main market for carbon offsets is driven by compliance obligations that force organisations, companies, governments or other legal entities to buy carbon offsets in order to comply with caps on the total amount of carbon dioxide they are allowed to emit (for example, under the EU Emission Trading Scheme).

**Sources of definition:** [https://en.wikipedia.org/wiki/Carbon\\_offset](https://en.wikipedia.org/wiki/Carbon_offset)

### **Cascading**, also known as down-cycling

Cascading, or down-cycling, is the recycling of waste where the recycled material is of lower quality and functionality than the original material. It can help to keep materials in use, reduce consumption of raw materials, and avoid the energy usage, greenhouse gas emissions, air pollution, and water pollution of primary production and resource extraction.

Steel scrap from vehicles at the end of their lives, for example, is often contaminated to the point where it no longer meets the needs of the automotive sector but nonetheless finds a secondary, lower-value life in the construction sector.

A better route is upcycling, where the used of **secondary materials** adds value.

Within a biological cycle, cascading refers to the process of putting used materials and components into different uses and extracting, over time, stored energy and material order. Along the cascade, this material order declines until the material ultimately needs to be returned to the natural environment as nutrients. A cascade, for example, might be a pair of cotton jeans being turned into furniture stuffing and then into insulation material before being anaerobically digested so that it may be returned to the soil as nutrients.

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

<https://en.wikipedia.org/wiki/Downcycling>

**Circular economy**, also known as circularity or closed-loop production

A circular economy accounts for and values the social and environmental costs of economic activity as well as the financial ones. The Ellen MacArthur Foundation (EMF), one of the world's leading circular economy think-tanks, defines it as "restorative and regenerative by design, and which aims to keep products, components and materials at their highest utility and value at all times, distinguishing between technical and biological cycles."

With life-cycle thinking, material and labour waste is eliminated or minimised, carbon footprints are reduced, pollution is avoided, and all materials are reused, re-manufactured or, as a last resort, recycled back into a raw material or used as a source of energy. This is done by closing, narrowing, slowing, intensifying, and dematerializing loops, to minimize the resource inputs into and the waste and emission leakage out of the organizational system.

The objectives are to restore or regenerate natural systems (**natural capital**) and improve human wellbeing (**human capital**) without compromising economic stability, in alignment with the objectives of the UN **SDGs**.

A circular economy contrasts with the current dominant linear economic model, summed up as '**take, make, waste**'. According to the 2019 Circularity Gap Report, just 9% of the 92.8 billion tonnes of minerals, fossil fuels, metals and biomass that enter the global economy are re-used annually. The European Commission's Level(s) report reports that "in Europe, if we look beyond the use phase of buildings towards their full life cycle (including extraction, manufacture, transport, construction and end of life) they are responsible for half of all energy use, 40% of all greenhouse gas emissions, half of all raw material extraction, and a third of all water use."

A number of well-known studies identify profitable opportunities for businesses pursuing circular economy principles. For example, the EMF's 2015 "Growth Within" report identified

commercial opportunities for the construction sector in cutting out material waste through offsite techniques, better energy efficiency with passive design and distributed energy production, smarter management of assets through the IoT, more intensive use of assets with built assets as a service business models, better material recovery with material banks, and so on. The MPA's 2019 annual conference summarised circularity as embracing 'a range of principles including designing out waste, design for disassembly or adaptability, materials selection and waste as a resource.'

**Sources of definition:** <https://www.unido.org/our-focus-cross-cutting-services/circular-economy>

**Further reading:**

[https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation\\_Growth-Within\\_July15.pdf](https://www.ellenmacarthurfoundation.org/assets/downloads/publications/EllenMacArthurFoundation_Growth-Within_July15.pdf)

<https://circulareconomy.europa.eu/platform/en/news-and-events/all-news/2019-circularity-gap-report-reveals-world-only-9-circular-and-trend-negative>

[https://ec.europa.eu/environment/eussd/pdf/LEVELS\\_REPORT\\_en.pdf](https://ec.europa.eu/environment/eussd/pdf/LEVELS_REPORT_en.pdf)

### **Circularity**

See 'circular economy'.

### **Closed-loop production**

See 'circular economy'.

### **Corporate social responsibility**

An ongoing aspect of a business model that helps organisations to be socially accountable to themselves, their stakeholders, and the public. It helps companies to be conscious of the impact they are having on all aspects of society, including economic, social, and environmental. The idea is that it is self-regulating, nudging a company to gradually improve and hopefully positively contribute to the society that sustains them. It is monitored through ESG criteria.

**Sources of definition:** <https://www.investopedia.com/terms/c/corp-social-responsibility.asp>

### **Cradle-to-cradle**

Cradle-to-cradle is a specific kind of life-cycle assessment used to calculate circular or closed-loop production down technical and biological paths, where the last-resort resource recovery strategy is recycling. It takes inspiration from natural systems that leave no waste and use only clean, renewable energy.

The concept was developed by German chemist Michael Braungart and American architect Bill McDonough, who trademarked the Cradle to Cradle™ name and certification process.

One of the less obvious principles is that cradle-to-cradle production should celebrate diversity on the grounds that it builds resilience suited to different geographies.

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Cradle-to-gate**

A recognised boundary condition for a life-cycle assessment, useful for OEMs and their clients.

### **Cradle-to-grave**

A recognised boundary condition for a full life-cycle assessment, useful for seeking formal performance certifications such as BREEAM, LEED, or CEEQUAL.

### **Critical raw materials**

Under the EU Raw Materials Initiative, the EU has identified 27 critical raw materials, the continued unhindered supply of which is vitally important to European industry and its value chains. One of the stated objectives of the list is to draw attention to their importance for the transition to a low-carbon, resource-efficient, and more circular economy. As such, the list should help to improve the security and diversity of supply of raw materials through, amongst other strategies, recycling and substitution.

**Sources of definition:** <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52017DC0490>

### **Decarbonisation**

Decarbonization refers to policies that will result in a reduction of greenhouse gas emissions by substituting lower-carbon sources of energy or taking equivalent actions such as reducing the consumption of goods and energy. In both the near and medium term, decarbonization will affect every economy in the world and most aspects of economic activity. It will lead to a transformation in how goods and services are produced and consumed. It is part of the routemap to a circular economy.

**Sources of definition:**

[https://www.actuaries.org/IAA/Documents/Publications/Papers/Decarbonization-A\\_Briefing\\_for\\_Actuaries\\_FINAL.pdf](https://www.actuaries.org/IAA/Documents/Publications/Papers/Decarbonization-A_Briefing_for_Actuaries_FINAL.pdf)

### **Down-cycling**

See **Cascading**.

### **Ecosystem services (see also natural capital)**

The UN's Millennium Ecosystem Assessment (MA) 2005 report defines 'ecosystem services' as benefits people obtain from ecosystems and distinguishes four categories of ecosystem services: supporting, such as nutrient cycles and oxygen production; provisioning, such as the production of food and water; regulating, such as the control of climate and disease; and cultural, such as spiritual and recreational benefits. Supporting services are regarded as the basis for the services of the other three categories. Along with 'natural capital', the concept helps in accounting for the benefits gained from the natural world, especially when assigned an economic value.

**Sources of definition:** [https://en.wikipedia.org/wiki/Ecosystem\\_services](https://en.wikipedia.org/wiki/Ecosystem_services)

### **Energy recovery**

A resource recovery strategy that avoids landfill, usually involving incinerating material to produce electricity. Although a low-impact energy source compared to burning coal or gas, it produces more greenhouse gases than landfill, a risk that is partially mitigated with various filters.

### **Environmental, social and governance (ESG) criteria**

These are a set of tailored standards for an organisation's operations that socially conscious investors use to screen potential investments. Environmental criteria consider how a company performs as a steward of natural capital. Social criteria examine how it manages relationships with employees, suppliers, customers, and the communities where it operates. Governance deals with a company's leadership, executive pay, audits, internal controls, and shareholder rights.

**Sources of definition:** <https://www.investopedia.com/terms/e/environmental-social-and-governance-esg-criteria.asp>

### **Equator Principles**

A risk management framework adopted by financial institutions for determining, assessing and managing environmental and social risk in projects. They are primarily intended to provide a minimum standard for due diligence and monitoring to support responsible decision-making. They apply globally to all industry sectors and to four financial products 1) project finance advisory services 2) project finance 3) project-related corporate loans and 4) bridge loans.

**Sources of definition:** <https://equator-principles.com/>

### **Extended producer responsibility**

A policy in which financial or physical liability for end-of-life handling is placed on the producer, incentivising whole life value engineering and thus circularity.

For example, firms such as Philips have offered 'Light-as-a-Service' for several years. A more ambitious variant of the same model is to offer the whole of a building's exterior façade on this service basis. The supplier retains ownership of materials and responsibility for their performance, maintenance and renewal. This allows the client to spread costs over the life of the building and incentivises the supplier to work hard to maintain the quality of the materials to ensure they can be reused.

**Sources of definition:** <https://www.ceguide.org/Glossary>

### **Feedstock**

A material or substance that is used as an input to a product or process.

**Sources of definition:** <https://www.ceguide.org/Glossary>

### **FTSE 4Good**

The FTSE4Good Index is a series of ethical investment stock market indices listing companies demonstrating strong Environmental, Social and Governance (ESG) practices. They are used in four main ways:

- Financial products - as tools in the creation of index-tracking investments, financial instruments or fund products focused on sustainable investment.
- Research - to identify environmentally and socially sustainable companies.
- Reference - as a transparent and evolving global ESG standard against which companies can assess their progress and achievement.
- Benchmarking - as a benchmark index to track the performance of sustainable investment portfolios.

**Sources of definition:** <https://www.ftserussell.com/products/indices/ftse4good>

### **Gate-to-gate**

A recognised boundary condition for a partial life-cycle assessment. (See LCA.)

The Global Reporting Initiative (GRI) is an independent standards organisation that helps businesses and governments worldwide understand and communicate their impact on critical sustainability issues such as climate change, human rights, governance and social well-being. This enables real action to create social, environmental and economic benefits for everyone.

### **Global Reporting Initiative (GRI)**

Their GRI Sustainability Reporting Standards provide a transparent framework for stakeholders, including many of the world's largest corporations, to validate and communicate the results of their corporate social responsibility and environmental, social and governance activities.

**Sources of definition:** <https://www.globalreporting.org/Information/about-gri/Pages/default.aspx>

### **Green bond**

A bond specifically earmarked to be used for climate and environmental projects. Growing in popularity, these bonds are typically asset-linked and backed by the issuer's balance sheet. They are sometimes called 'climate bonds'.

They are intended to encourage sustainability, financing projects focused on energy efficiency, pollution prevention, sustainable agriculture, fishery and forestry, the protection of aquatic and terrestrial ecosystems, clean transportation, sustainable water management, and the cultivation of environmentally friendly technologies.

Green bonds come with tax incentives such as tax exemption and tax credits, providing a financial incentive to tackle prominent social issues such as the movement to a circular economy. To qualify for green bond status, they are often verified by a third party such as the Climate Bond Standard Board, which certifies that the bond will fund projects that include benefits to the environment.

**Sources of definition:** <https://www.investopedia.com/terms/g/green-bond.asp>

### **Green finance**

A broad term that can refer to financial investments flowing into sustainable development projects and initiatives, environmental products, and policies that encourage the development of a more sustainable economy. Green finance includes climate finance but is not limited to it. It also refers to a wider range of other environmental objectives.

### **Human capital**, also known as Social capital

One of the three bottom lines (see Triple bottom line), human capital is the economic value of people to businesses. It arises through education, training, experience, skills, knowledge, judgement and personality. In a circular economy, the concept extends beyond the bounds of an organisation to society more generally, recognising the systemic interconnectedness of their activities and the enlightened self-interest of social equity, i.e. in behaving with justice and fairness. As part of their environmental, social and governance (ESG) policies, circular organisations ideally attempt at least to do no harm and ideally to promote the wellbeing of people.

### **Industrial ecology**

The study of material and energy flows through industrial systems. Waste is seen as an input (resource recovery) to be exploited with the ultimate objective of closing the loop or attaining full circularity.

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Landfill diversion**

A generic term for resource recovery strategies ensuring that waste does not simply end up as landfill.

### **Life-cycle assessment (LCA)**

A quantitative method to assess environmental impacts associated with all the stages of the life-cycle of a commercial product, activity, process, or service. An LCA usually comprises three stages: an **inventory analysis** (materials, labour, energy), and impact analysis (social, environmental and economic), and an improvement analysis (mitigating so-called ‘hotspots’ by optioneering trade-offs and/or alternatives). The resultant score or profile helps organisations to identify material and management changes that are most likely to improve outcomes.

Depending on the **boundary conditions** selected, the analysis can go from raw material extraction and processing (cradle), through the product's manufacture, distribution and use (**cradle-to-gate**), to the recycling or final disposal of the materials composing it (**cradle-to-grave**). In a truly circular life-cycle, there is no grave, giving rise to the term ‘**cradle-to-cradle**’.

A good way to evidence compliance documents such as Environmental Impact Assessments or Environmental Product Declarations, there are a number of online tools and, indeed, consultants to help you. It should be noted that it is a maturing process. The large number of inputs and complexity of contemporary projects makes the process relatively involved and demanding, with gaps in information and assumptions that may not have been fully validated.

The value of the an LCA in calculating **circularity** is critically dependent on which indicators are selected. For example, an ecologically based LCA is a recognised variant of a standard LCA, distinguished from the latter by measuring many more impacts on ecological resources and surrounding ecosystems. Similarly, a life-cycle energy analysis variant tots up all the energy inputs, including those that are embodied, added in use and at the end of life. The most comprehensive version of an LCA is sometimes referred to as a **triple bottom line** cost-benefit analysis, which quantifies sustainability impacts in the context of total net present value, return on investment and project payback.

**Sources of definition:** [https://en.wikipedia.org/wiki/Life-cycle\\_assessment](https://en.wikipedia.org/wiki/Life-cycle_assessment)

### **Life-cycle cost analysis (LCC)**

A quantitative method for documenting and assessing all costs that occur over the lifetime of an asset, including construction costs, maintaining, replacement, operating, residual value, and end-of-life costs. It is an important part of a **triple bottom line** life-cycle assessment. Financial costs are discounted into net present value to account for the different timing of costs. (See **Life-cycle assessment**.)

### **Life-cycle inventory (LCI)**

An important first step during a life-cycle assessment. It involves collecting together information about the resources and energy (and sometimes, the labour) expended during the life-time of a product, project, process, or activity so its impact may be assessed. There are several well-known, mature sources of this information, including Ecoinvent and the ICE.

### **Maintain/prolong**

The most desirable resource recovery strategy for a product, asset or activity in the technical material flow cycle. It implies that design has prioritised durability and easy maintenance, promoting efficiency and minimising waste. (See also Resource recovery.)

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Material flow**

The quantity and rate at which materials move through systems such as cities, infrastructure networks, companies, and so on. There are two fundamentally distinct flows of material: biological and technical.

Biological materials are those that can safely re-enter the natural environment after going through one or more use cycles, where they will biodegrade over time, returning the embedded nutrients to the environment.

Technical materials cannot re-enter the natural environment. These materials - metals, plastics, and synthetic chemicals, for example - must continuously cycle through the system so that their value can be captured and recaptured.

Whereas biological materials are consumed, technical ones are only used, an important distinction that raises the question of whether we need to own technical materials as we currently do. Owning is less important than having access to it, a shift in mindset that lays the groundwork for many of the practicalities of switching to a circular economy. (See also Extended producer responsibility.)

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

<https://www.ceguide.org/Glossary>

### **Natural capital**

One of the three bottom lines (see **Triple bottom line**), natural capital collective term for the world's stock of renewable and non-renewable natural resources, including its minerals, metals, air, water, and all living things that combine to yield benefits to people. Many of these services – clean air and water, fertile soil, or climate regulation, for example - are externalities never properly valued in linear economy accounting. It is an important concept in circularity because it aligns natural resources with the more familiar 'financial capital', allowing us to draw parallels about managing debts judiciously in order to reap profits - regeneration and restoration. Natural capital is part of a complex system, meaning that spending beyond our means risks not just ecological impacts but social and economic ones, too. See also '**Ecosystem services**'.

**Sources of definition:** <https://www.ceguide.org/Glossary>

### **Net zero carbon**

A target whereby the sum of carbon emissions and carbon saving over the life of a product, built asset, project, activity, or process is zero. The World Green Building Council defines a net zero carbon building as one that 'is highly energy efficient and fully powered from on-site and/or off-site renewable energy sources.' The key strategies are to reduce energy demand by prioritising energy efficiency and to use renewable energy sources either directly or in offsets.

The UK Government was one of the first G7 nations to legally commit the UK to net zero carbon emissions by 2050. (See also **Energy recovery**.)

**Sources of definition:** <https://www.worldgbc.org/advancing-net-zero/what-net-zero>

### **Principles of Responsible Investment (PRI)**

A voluntary and aspirational set of investment principles that offer a menu of possible actions for incorporating ESG issues into investment practice. Convened by the United Nations Secretary-General, they were developed by investors, for investors, to enable a more sustainable global financial system, regarded as an important corollary to achieving a circular economy.

**Sources of definition:** <https://www.unpri.org/pri/an-introduction-to-responsible-investment/what-are-the-principles-for-responsible-investment>

### **Product recovery management**

A term describing the specific process of managing all used and discarded products, components, and materials to recover as much of the economic and ecological value as possible, thereby reducing the quantity of discarded waste. The EU-funded research project Buildings As Material Banks is

developing the thinking, tools (Materials Passports and Reversible Building Design), and enabling conditions to fulfil this potential. (See also **Resource recovery**.)

**Further reading:** <https://www.bamb2020.eu/about-bamb/>

### **Recondition**

A resource recovery strategy that returns the quality of a product or element to a satisfactory condition (typically less good than new), giving the resultant product a lesser warranty than of a newly manufactured equivalent. (See also Resource recovery.)

### **Recycle**

Recycling is the least favoured resource recovery strategy for products. It is the process of reducing a product all the way back to its basic material level, thereby allowing some or all of them to be remade into new products. Undoubtedly an important process in a circular economy, the loss of embedded labour and energy, the necessary costs to remake products entirely, and the inevitable material losses mean that it is a lower value process than repairing, reusing, reconditioning, or remanufacturing. (See also Resource recovery.)

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Refurbish**

A resource recovery strategy that returns products or elements to a satisfactory quality level, i.e. restores value, through repair, usually without disassembly or replacement of components. The resulting quality is usually less than that of a new, remanufactured or reconditioned equivalent. (See also Resource recovery.)

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Regenerative design**

A process-oriented whole-systems approach to design. It optimises the restoration, renewal or revitalisation of natural systems to create resilient, equitable systems that help humans to achieve sustainable development.

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Remanufacture**

A resource recovery strategy whereby used products are restored to the original equipment manufacturer standard and receive a fresh warranty at least equal to a newly manufactured product. (See also Resource recovery.)

### **Repair**

A resource recovery strategy whereby broken products, equipment or systems are fixed rather than replaced. In a circular economy, calculations about whether this is worthwhile will account the environmental and social costs as well as the financial ones. (See also Resource recovery.)

### **Resource recovery**

A strategy to keep waste material out of landfill and instead use it to make new outputs that maximize value and utility. The Biosphere Rules set out some principles for how to design this into your products, projects and services under five headings: materials parsimony; value cycling; power autonomy; sustainable product platforms; function over form.

The EU-funded research project Buildings As Material Banks is developing the thinking, tools (Materials Passports and Reversible Building Design), and enabling conditions to fulfil this potential.

The Major Infrastructure Resource Optimisation Group (MI-ROG), made up of many of the UK's largest infrastructure clients, is hoping to create a national materials exchange that can leverage advances in platform technology to make this process work in real time.

(See also **Product recovery management, Energy recovery, Reuse/redistribute, Maintain/prolong, Recondition, Refurbish, Repair, Remanufacture, Recycle.**)

**Further reading:** <https://www.bamb2020.eu/about-bamb/>

### **Responsible investment**

A strategy and practice to incorporate **environmental, social and governance** (ESG) factors in investment decisions and active ownership.

**Sources of definition:** <https://www.unpri.org/>

### **Reuse/redistribute**

A beneficial and proven resource recovery strategy that allows products, projects, and assets in the technical material flow to find new users without first having to undergo any alteration or change. This kind of transaction is facilitated by second-hand marketplaces like Ebay. (See also **Resource recovery**.)

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

### **Reverse logistics**

The process of collecting and aggregating products, components or materials at the end of their lives for reuse, reconditioning, remanufacture, or recycling.

**Sources of definition:** <https://www.ceguide.org/Glossary>

### **Reversible design**

Designing for resource-efficient repair, reuse and recovery of materials, products and components. In buildings, for example, this would mean making it possible to access different systems such as floors, walls, ceilings, and building services without damaging other parts of the building so that components can easily be repaired, removed or replaced.

### **Secondary raw materials**

Waste materials that are recovered, recycled and reprocessed for use as raw materials.

**Sources of definition:** <https://www.ceguide.org/Glossary>

### **Social capital**

See **Human capital**.

### **Sustainable Development**

Sustainable development was famously defined in the 1987 Brundtland Report: 'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.' It is the fundamental purpose of a circular economy, framed in the context of the UN Sustainable Development Goals.

**Sources of definition:** [https://en.wikipedia.org/wiki/Brundtland\\_Commission](https://en.wikipedia.org/wiki/Brundtland_Commission)

### **Sustainable Development Goals (SDGs)**

The Sustainable Development Goals (SDGs) are targets set in the United Nation's (UN) 2030 Agenda for Sustainable Development, adopted by UN Member States in 2015. They recognize that ending poverty and other deprivations must go hand-in-hand with strategies

that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests. They are integrated and indivisible, and balance the three dimensions of sustainable development: the economic, social and environmental. Shifting to a circular economy is considered an important means of achieving these goals.

All the SDGs are relevant, but the following are especially so:

- Goal 6: Ensure availability and sustainable management of water and sanitation for all
- Goal 7: Ensure access to affordable, reliable, sustainable and modern energy for all
- Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation
- Goal 11: Make cities and human settlements inclusive, safe, resilient and sustainable
- Goal 13: Take urgent action to combat climate change and its impacts

The UN aims to achieve all 17 goals by 2030.

**Sources of definition:**

<https://sustainabledevelopment.un.org/post2015/transformingourworld>

**Systems thinking**

An approach that accounts for the interdependence and co-evolution of elements by analysing the likely knock-on effects that changes in one part of a system could have elsewhere in the same system. Failures to account properly for these effects become unintended consequences, and can negate any benefits arising from the change. In a linear economy, for example, realising a financial profit might engender negative environmental or social consequences that render the profit unsustainable over time. Thinking about production, the environment and society as one unified system in this way is an essential foundation for a circular economy.

**Sources of definition:** <https://www.ellenmacarthurfoundation.org/explore/the-circular-economy-in-detail>

<https://www.ceguide.org/Glossary>

**Take-make-waste**

A shorthand term describing the traditional linear economy model, also described as an ‘open-loop model.’

**Triple bottom line**

A framework for accounting for social and environmental concerns as well as financial costs, synonymous to environmental, social and governance (ESG) criteria. The term was coined in

1994 by British management consultant John Elkington as a way of recognising the hidden costs and value in exploiting natural and human capital, and in promoting the enlightened self-interest businesses might have in accounting for them fully and properly. It is sometimes summed up as 'people, planet, and profit'.

In the context of infrastructure projects, for example, a flood defence scheme will have the primary goal of protecting land and property, but can deliver many other social, economic and environmental goods. Project appraisal methodologies need to evolve so that they can capture and assess all of these benefits.

Some organisations demonstrate their commitment to the triple bottom line by voluntarily reporting their ongoing performance on all three measures to the Global Reporting Initiative. Even so, companies are often accused of letting financial profit dominate their considerations at the expense of people and planet.

**Sources of definition:** <https://www.investopedia.com/terms/t/triple-bottom-line.asp>

### **Urban mining**

Urban mining is a metaphor for recovering secondary materials from the products, buildings and other assets in our towns and cities at the end of their lives to extract new value from them. The range extends from rare metals (found in electronics), steel, copper, aluminium, concrete, bricks, ceramics, plastics, gypsum, asphalt, and timber. Apart from the inherent environmental value, another potential benefit from urban mining is the fact that the material is already where it is most likely to be needed in its new incarnation, avoiding further transportation costs. (See also **Resource recovery**.)

**Sources of definition:** <https://www.dw.com/en/urban-mining-hidden-riches-in-our-cities/a-42913985>

### **Waste hierarchy**

The priority order available for managing wastes, from most to least preferred, based on the best environmental outcome across the lifecycle of the material: prevent, reduce, reuse, recycle, incinerate, send to landfill.

**Sources of definition:** <https://www.ceguide.org/Glossary>

**Waste recovery**

A strategy to replace non-waste materials in your operations with waste materials that satisfactorily perform the same function, thereby using less **natural capital**. For example, using crushed concrete and bricks to create a development platform for a building instead of primary aggregates.

**Sources of definition:** <https://www.gov.uk/guidance/waste-recovery-plans-and-permits>

**Well-to-wheel**

A boundary condition used in partial life-cycle assessments for transport fuels and vehicles. Other smaller boundary conditions in the sector include 'well-to-station', or 'well-to-tank', 'station-to-wheel', 'tank-to-wheel', and 'plug-to-wheel'.

**Zero waste**

A conceptual target to divert all (usually interpreted as at least 95%) waste from landfill. The scope of zero waste may or may not include incineration depending on the case.

**Sources of definition:** <https://www.ceguide.org/Glossary>