Sustainable Business Network | CONSTRUCTION SECTOR ACCORD

Getting on the same page:
A shared language for a circular construction sector

JUNE 2024

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1 Introduction

A shared language is essential to foster collaboration and streamline operations. To facilitate this, we have developed a standardised set of terms and definitions relating to eliminating waste in the construction sector.

This will help ensure consistent and efficient communication and documentation across the industry. It is also crucial for interoperability across the value chain (see Figure 1). Standardised language also helps with education and training, providing a uniform framework across the sector.

The glossary does not contain general building terms. Instead, we have focused on terms that specifically relate to circular construction and may be new to some in the industry. Where appropriate, we have used existing definitions (refer to the list of sources). Where this was not possible, we have written definitions or fine-tuned definitions from multiple sources. This glossary will be updated as circularity in the sector evolves.

The circular economy

The circular economy is an economy where waste and pollution are designed out, products and materials are kept in use and natural systems are regenerated. The circular economy is based on three main principles:

- Design out waste and pollution
- Keep products and materials in use
- Regenerate natural systems

Circular Economy Framework

This construction specific framework* is a good foundation to overlay with circular economy principles.

Build Nothing by refusing unnecessary new construction.

Build for Long Term Value increasing building utilisation and designing for longevity, adaptability, disassembly and re-use of materials at the outset.

Build Efficiently by refusing unnecessary components and increasing material efficiency.

Build with the Right Materials by reducing the use of virgin material, use of carbon intensive materials and designing out hazardous/ pollutant materials.

* From ARUP and Ellen MacArthur Foundation

Circular construction

To eliminate waste throughout the construction process, we need to transition from a ‘take-make-waste’ linear economy to a circular one. We need to design out waste from the start and recognise ‘waste’ as a resource, rather than rubbish.

Circular construction means designing, building, using and reusing buildings, areas and infrastructure according to circular economy principles.

Designing for circular construction requires that the following strategies be considered.

Design for adaptability

A strategy for creating products and systems that can evolve and adjust to changing needs and circumstances. It involves proactively anticipating future uncertainties through design choices. Key principles include modularity, scalability, flexibility, user-centric design, open-ended design and resource efficiency. The benefits include increased resilience, extended lifespan and reduced costs over the long-term.

Examples include modular furniture and multi-purpose buildings.

Design for disassembly

A strategy for designing products and systems that can be easily taken apart at the end of their useful life. It prioritises recovery and reuse of materials, minimising waste. Key principles include modularity, standardised connections, clear labelling, recyclable materials, and minimisation of adhesives and permanent fasteners. Benefits include reduced waste, product longevity and cost savings.

Examples include modular furniture and building materials that can be disassembled and reused.

Design for longevity

A strategy that focuses on durability. It aims to maximise the value of a building and its components over time, optimising value retention and value recovery potential. It aims to preserve buildings by designing and selecting durable products that can stand the test of time.

Key principles include durable materials, robust construction, modularity, timeless design and adaptability.

Design for repairability

A strategy for designing products and systems that can be repaired and maintained easily and cost effectively, usually by the end consumer.

The design considers materials, assembly, available parts and the skills needed to carry out repairs.

Sharing and trading

Sharing and trading existing resources via online platforms, second-hand markets and ‘product as a service’ models can reduce the need for new products and materials.

Where ‘waste’ cannot be designed out, products and materials must be kept in circulation. Excess or damaged products or materials, as well as those at their end of life, are cycled back into the value chain. This means reusing, remanufacturing and recycling products and materials, rather than sending them to landfill.

Figure 1 shows a circular value chain for the construction sector. The desired circular materials flow is outlined in red.

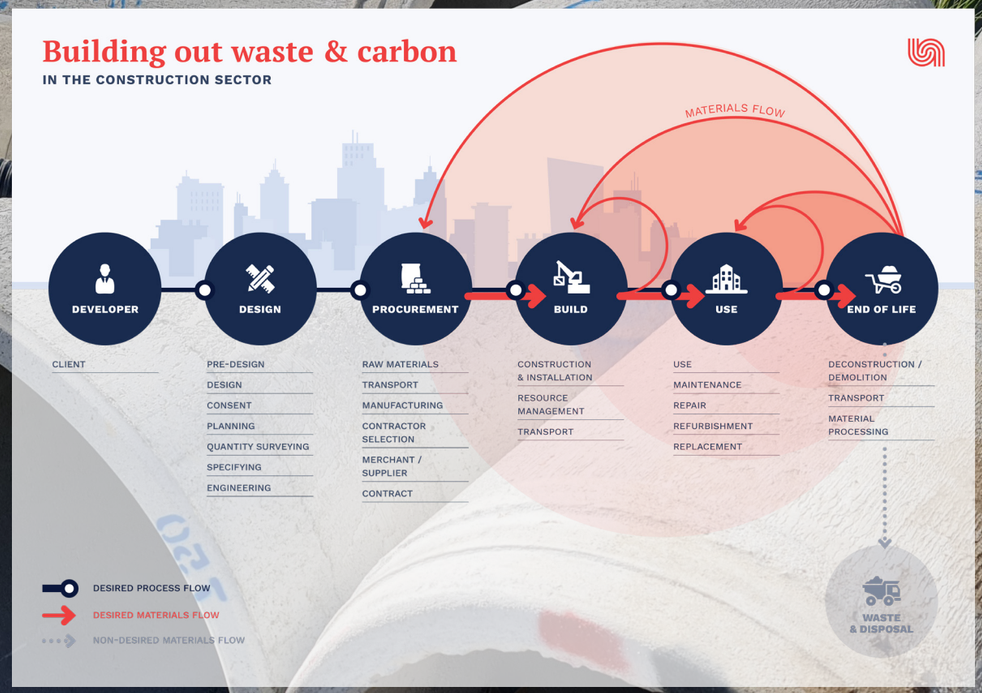

Figure 1: Circular construction value chain. Source: Sustainable Business Network, 2023.

2 Terms and definitions

Biobased materials (products)

Materials (products) wholly or partly derived from renewable organic materials.

For example, timber, cork, clay, earth and hemp are all biobased materials.

Biodegradable

Able to break down and blend back in with the earth, given the right conditions and presence of microorganisms, fungi or bacteria. No toxins are left behind.

Biodiversity

Short for 'biological diversity'. The variety of life on Earth, at all levels, from genes to ecosystems.

Biological cycle

Cycle through which biological nutrients are returned to the natural environment to regenerate plant and animal life.

Biophilic design

An approach to architecture and interior design that connects people with nature. It is based on the premise that incorporating natural elements into the built environment can have positive impacts on health, wellbeing and productivity.

By-products

A secondary product resulting from a manufacturing process. It arises as a result of the main production and is not the primary focus of the process.

For example, sawdust is a by-product of timber production, and fly ash is a by-product of coal combustion.

Carbon footprint

Total emissions of greenhouse gases (in carbon equivalent) for an activity or organisation over a given period of time.

Carbon intensive materials

Materials that have high levels of embodied carbon.

Cascading

The repeated use of products or materials that are already in the economy i.e. the side stream from one process is used as feedstock for the next.

For example, using food by-products to make other materials, such as textiles made from orange peel. Another example is designing new food products using ingredients usually considered waste, like ketchup made from banana peel.

Circular business model

The underlying structure used by an organisation to create, deliver and capture value as part of the circular economy.

Cradle-to-cradle (C2C) (philosophy)

An approach to product and system design that involves potentially infinite circulation of materials and nutrients. It eliminates the concept of 'waste'. Instead, everything is designed to be either nutrients for nature or technical nutrients for industry. The concept was introduced by William McDonough and Michael Braungart.

Cradle-to-cradle (C2C) (label)

A labelling system that assesses the extent to which products comply with cradle-to-cradle design principles.

Cradle-to-grave

The standard lifecycle model in our current 'take-make-waste' linear economy.

Critical raw material

Raw materials of major economic value for which there are no viable substitutes.

For example, cobalt, tungsten and nickel are all critical raw materials.

Deconstruction

A method of dismantling buildings to ensure that materials can be reused, repurposed or recycled.

Downcycling

Recycling a material in a way that decreases its quality or value. Downcycling does not eliminate the need for virgin material in the original product. It often involves breaking down materials into smaller pieces or changing the structure of a material to a lower-quality product.

For example, crushing concrete to produce hardcore. Crushing and downcycling concrete avoids landfill but does not substitute new concrete production.

Durability

The ability of a product or material to withstand wear, tear, pressure or damage over time. It relates to the product's functionality, performance and appearance under expected conditions.

Embodied carbon

The carbon dioxide (CO_2) emissions associated with materials and construction processes throughout the whole lifecycle of a building or infrastructure. It includes any CO_2 created during the manufacturing of building materials, the transport of those materials and the construction practices used.

End user
The intended or actual user of a product or service.

End-of-life
Point in time during the life cycle at which a product or material is taken out of use and disposed of.

End-of-life cost
Net cost or fee for disposing of a structure, material or product at the end of its life.

Energy efficiency
The use of less energy to perform the same task or produce the same result.

For example, energy efficient homes and buildings use less energy to heat, cool and run appliances and electronics. Energy efficient manufacturing facilities use less energy to produce goods.

Environmental Product Declaration (EDP)
An independently verified and registered document providing comparable data on the environmental impact of a product throughout its life cycle.

Extended producer responsibility (EPR)
The extension of producer responsibility for products and materials beyond the point of sale. It includes the entire life cycle of products, including selection of materials, resource extraction, manufacturing, use, repair and disposal. This is also referred to as product stewardship.

Greenhouse gases
Gases that trap heat in the atmosphere including carbon dioxide, methane, nitrous oxide and water vapour.

Integrated Design Process (IDP)
A range of intentional, interdisciplinary and collaborative approaches to design and construction. It is iterative and connects various disciplines with ongoing collaboration between stakeholders.

Life cycle analysis (LCA)
A systematic and quantitative evaluation of the environmental impacts of a product or service through all stages of its life.

Life cycle cost (LCC)
All the costs incurred during the lifetime of a product or service including maintenance, repair and disposal.

Linear economy
An economy in which finite resources are extracted to make products that are used - generally not to their full potential - and then thrown away.

Material efficiency
A concept that aims to meet a project's requirements with minimal material consumption. It aims for an efficient use of materials at a maximum level of performance. It avoids inefficient building material volumes (high-rise, transfer, long-span, cantilevers or deep underground structures). It uses high-performance products and materials and advanced engineering methodologies.

Material passport
Sets of data that list all the materials that are included in a product or construction.

Modularity
The design and production of products or buildings with easily interchangeable components to facilitate repair, deconstruction or modification. Modularity lowers costs and makes it easier to customise products and adapt them to changing needs. This helps prevent products from becoming obsolete and ensures they are kept in use for longer.

Non-renewable resource
Raw material that cannot be readily replaced by natural means on a human time scale.

For example, limestone is a non-renewable resource as there is a finite amount and it takes millions of years to form.

Operational carbon
Greenhouse gas emissions created by the day-to-day use of a building.

Operational efficiency
The ability to run a building to a desired standard, through minimal waste and resource use.

Operational emissions
Emissions both directly and indirectly attributable to the use of a building.

Prefab or prefabricated
Parts that have been manufactured offsite.

Product Stewardship
A concept where businesses take responsibility for the environmental impact of the products they make, sell or buy. This involves all stages of the product's life cycle, including end-of-life management. Also referred to as Extended Producer Responsibility (EPR).

Product-as-a-service (PaaS)
The concept of selling the services and outcomes a product can provide rather than the product itself.

For example, lighting as a service is a service-based model in which lighting service is paid via subscription. The provider maintains ownership of the product, encouraging design for longevity and allowing an extended product life with several subscription cycles.

Recover value

Recapture any remaining value from a product or resource, without increasing emissions.

For example, chemical recycling or renewable energy.

Recycle

Process materials that would otherwise be thrown away and turn them into reusable materials.

In closed loop recycling, materials from a product are recycled to make the same, or similar, product without significant degradation or waste. This can be done repeatedly. In open loop recycling, materials from a product are used to make a different type of product.

Some materials are infinitely recyclable. Others can be can recycled a limited number of times before they are too degraded and need to be permanently disposed of.

Red List material

Materials, chemicals and elements that pose serious risks to human health and the environment, according to the Living Building Challenge®. The International Living Future Institute believes they should be phased out of production.

Redesign

Change the design of an existing product or service using the principles of the circular economy.

Reduce

Decrease the use and quantity of raw materials without adversely impacting functionality and quality.

Refurbish

Extend a product or part's lifetime through repair, potentially with replacement of parts, without changes made to the product's functionality.

Refuse

Prevent the use of products, elements or materials.

Regeneration

Improve ecological health and biodiversity by enabling, supporting and enhancing natural processes.

Regenerative design

Design approach intended to produce positive environmental effects, rather than negative or even neutral outcomes. It is a holistic approach to design that encompasses the economy, environment and community.

Remanufacture

Rebuild a product to its original specifications using a combination of reused, repaired and new parts.

Renewable resource

A resource that can be naturally or artificially grown or regenerated using processes found in nature within a foreseeable time frame. A renewable resource is capable of being exhausted but can be regrown or regenerated indefinitely with proper stewardship.

Repair

Extend the use of a product or structure by applying preventive or corrective maintenance.

Repurpose

Adapt a product, or its component parts, for a different function than originally intended without making major modifications to its physical or chemical structure.

Restoration (ecosystem)

Assist an ecosystem to recover to a previous, more biodiverse condition.

Restoration (building, product or components)

Preserve assets, returning them to their former position or an improved condition. It can involve replacing outdated utilities or installing climate controls.

Restoration (sites)

Return areas on or adjacent to a work site that were disturbed during construction to at least the same condition as before works commenced.

Rethink

Intensify product use by enabling the same object or sub-object to deliver higher 'numbers of functions'.

Reuse

Extend the lifetime of a product, component or element beyond its intentional designed life span.

Reverse logistics

An integrated transport system that enables excess, damaged and end-of-life construction materials to be economically and efficiently collected and transported back to a suitable reprocessing facility for reuse, repurposing or recycling.

Secondary materials

Materials that have already served their intended purpose. They can include excess and damaged materials, materials produced unintentionally as part of the manufacturing process, and materials that have been recovered at the end of their useful life.

For example, steel slag is a secondary material from the process of steel making. It has little commercial value but is used as a raw material in a number of industrial processes.

Technical cycle	Keep products, components and materials in use for as long as possible through reuse, repair, remanufacturing and recycling.
Total cost of ownership (TCO)	Costs and benefits over the entire lifespan or useful life of a product or material.
Value chain	The progression of activities needed to create a product or service across its full lifecycle.
Waste hierarchy	A tool used to prioritise different waste management strategies. It illustrates the best and least favoured options to reduce and manage waste (see Figure 2).
Water efficiency	Optimise water use to achieve the desired outcome with minimal wastage.
Zero carbon	A term sometimes used to describe a product or service that creates no greenhouse gas emissions during production and/or operation.
Zero waste	A target of sending no waste for disposal via landfill or burning.

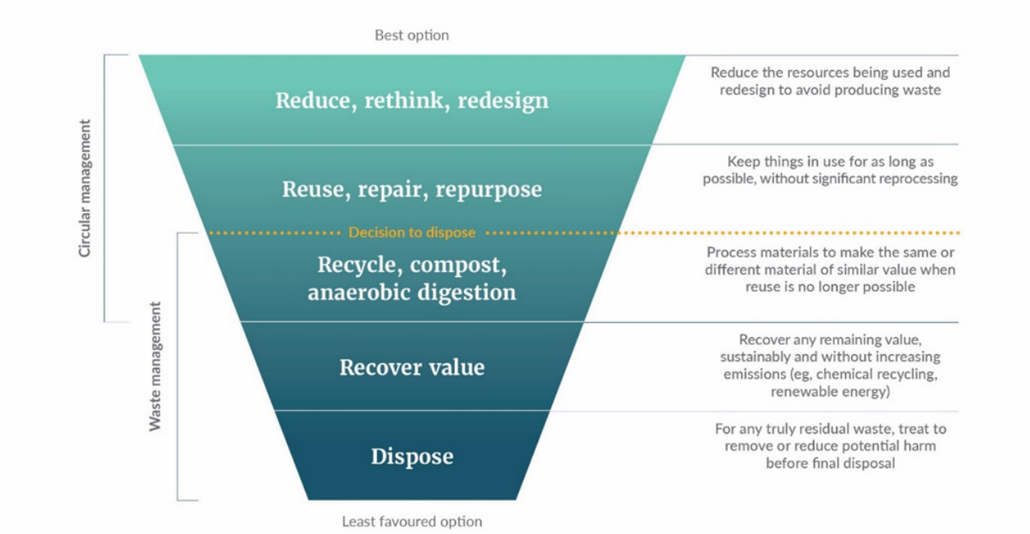

Figure 2: The waste hierarchy. **Source:** Ministry for the Environment, 2023.

3 Scope 1, 2 & 3 emissions

Scope 1 emissions	Greenhouse gas emissions from sources an organisation owns or controls directly. For example, emissions from burning fuel in the company's vehicle fleet (if they are not electric).
Scope 2 emissions	Greenhouse gas emissions a company causes indirectly through the purchase of goods and services for its own activities. For example, the emissions caused by the generation of electricity used in a company's building.
Scope 3 emissions	Indirect emissions a company is responsible for, but does not produce or directly control through its own operations. The emissions are generated from activities the company influences, but doesn't directly manage. For example, emissions from products from suppliers.

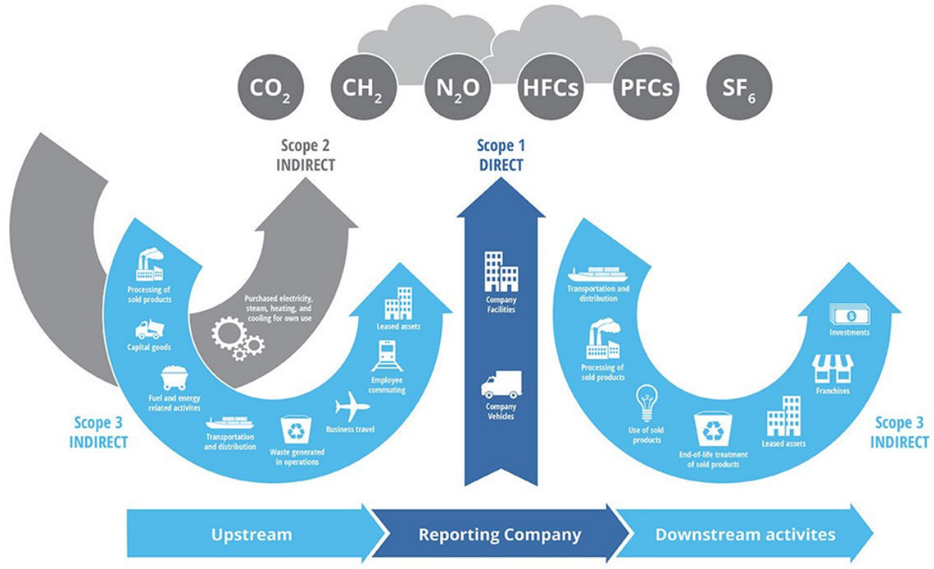

Figure 3: Carbon Accounting Scopes. **Source:** Waste Management New Zealand, n.d.

4 Certifications and standards

Greenstar

Created by Green Building Council Australia in 2003, and adapted for Aotearoa New Zealand, Green Star provides six-star rating based on a building's key sustainability credentials. Green Star certification is available for all types of commercial buildings and large-scale community developments.

Homestar

An independent rating tool for assessing the health, efficiency and sustainability of homes in Aotearoa New Zealand.

To receive a Homestar rating, a house must meet additional performance and sustainability requirements above and beyond the New Zealand Building Code. Homestar provides a clear framework to design and build more efficient homes.

Living Building Challenge

A building certification programme that encourages the creation of self-sufficient, regenerative buildings. It was created by the International Living Future Institute in 2006.

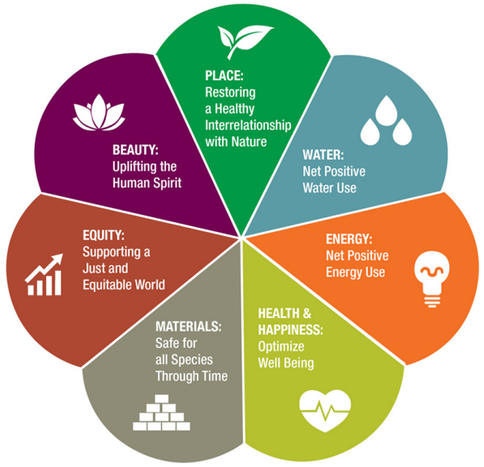

Figure 4: Challenge "Petals". **Source:** The Living Village.

Passive House

A standard for buildings that optimises the health and wellbeing of its occupants while consuming minimal energy.

Typically, a Passive House uses up to 95% less energy per year to heat than a standard house or building.

5 R principles

Refuse	Prevent the use of products, elements or materials.
Rethink	Intensify product use by enabling the same object or sub-object to deliver higher 'numbers of functions'.
Redesign	Change the design of an existing product or service using the principles of the circular economy.
Reduce	Decrease the use and quantity of raw materials without adversely impacting functionality and quality.
Reuse	Extend the lifetime of a product, component or element beyond its intentional designed life span.
Repair	Extend the use of a product or structure by applying preventive or corrective maintenance.
Refurbish	Extend a product or part's lifetime through repair, potentially with replacement of parts, without changes made to the product's functionality.
Remanufacture	Rebuild a product to its original specifications using a combination of reused, repaired and new parts.
Recycle	Process materials that would otherwise be thrown away and turn them into reusable materials. In closed loop recycling, materials from a product are recycled to make the same, or similar, product without significant degradation or waste. This can be done repeatedly. In open loop recycling, materials from a product are used to make a different type of product. Some materials are infinitely recyclable. Others can be can recycled a limited number of times before they are too degraded and need to be permanently disposed of.
Recover value	Recapture any remaining value from a product or service, without increasing emissions. For example, chemical recycling or renewable energy.

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