

Lexicon

Circular Construction

Unambiguous terms and definitions

Version 2.0 – 02 July 2020

Platform CB'23



© Platform CB'23

Although utmost care has been taken in preparing this Lexicon, errors and omissions cannot be entirely ruled out. Platform CB'23, the organisations involved and/or the members of action teams therefore do not accept any liability relating to this document, including for any direct or indirect damage or loss, caused by or related to the use of this document.

The Lexicon may be shared and its content may be used, provided the source is acknowledged.



Introduction

Working effectively on circular construction calls for unambiguous use of terminology: we must all 'speak the same language'. This lexicon provides clarity about the meanings of various terms. The first version of the lexicon was published in July 2019, based on the efforts of the action teams in 2018-2019. Since the topics that the action teams focussed on in that year were 'circular construction framework', 'measuring circularity' and 'passports for the construction sector', the terms and definitions in the lexicon have a bearing on these topics. This second version of the lexicon was supplemented by terms based on the efforts of the action teams in 2019-2020. The lexicon does not contain an exhaustive list of terms and definitions for circular construction and will be supplemented and updated at regular intervals.

Structure

The Circular Construction Lexicon is structured as follows:

- **Terms and definitions:** frequently used terms about circular construction and their definitions.
- **Sources:** reference to the sources of the definitions.
- **R principles:** summary of frequently used R principles concerning circularity.



Terms and definitions

Principles

This section contains a list of terms and definitions used in connection with circular construction.

The following principles were applied when preparing this list:

- **No general terms:** Terms that do not specifically apply to circular construction and which are already used uniformly in the sector have not been included.
- **Consistency with existing definitions:** Wherever possible, existing definitions and sources have been used, some of which have been taken from standards and other commonly used and accepted documents. Where this was not possible, the Platform CB'23 action teams drew up their own definitions based on descriptions from literature and practical experience. Some existing definitions were fine-tuned for circularity purposes.
- **Sector neutral:** The definitions have been drawn up to be sector-neutral as far as possible so that they will apply to both buildings and the civil engineering sector. Some existing definitions relating to a sub-sector have been slightly modified.
- **Source reference:** The source is indicated in the last column of the list. The various sources can be found in the Sources section.

Main definitions

The two most important terms in the list are explained here.

circular construction [14]

developing, using and reusing buildings, areas and infrastructure without unnecessarily depleting natural resources, polluting the living environment and affecting ecosystems. Carrying out construction such that it is economically justifiable and contributes to the welfare of people and animals. Here and there, now and later.

circular structure

structure designed and constructed according to circular design principles and/or constructed using circular products, elements and materials



Term	Definition	Source
abiotic resource	raw material generated from non-living resources	[2]
abundant	amply available, based on the size of the stock of a resource, raw material or material, its extractability and security of supply if any geopolitical or social changes occur ⇒ See 'scarce'.	[5]
adaptive capacity	all characteristics that enable a structure to retain its functionality in a sustainable and economically viable manner throughout its technical life and if any changes in function, needs and circumstances occur	[3]
bill of materials (BOM)	list of the component parts and materials used to make the object or sub-object, including some or all of the following details: <ul style="list-style-type: none"> - product description; - unique parts and materials, including their quantities and mass; - materials and substances (including substance names, weight and concentrations thereof) for each unique part and component; - weight of each unique part and component; - total weight of product 	[7]
biobased construction	construction using biobased construction materials and/or application of biobased products ⇒ See 'biobased materials (products)'.	[8]
biobased materials (products)	materials (products) wholly or partly derived from biomass ⇒ See 'biomass'.	[5]
biodegradable	⇒ See 'biodegradable'.	
biodegradable	capable of fully decomposing and being re-absorbed into the biological cycle under certain conditions within a certain period of time ⇒ See 'biological cycle'.	[10]
biodiversity	range of natural species (animals, plants, habitats and genes), both in terms of diversity (number) and functionality (function)	[9]
biological cycle	⇒ See biological cycle.	
biological cycle	cycle through which biological nutrients are returned to the biosphere in a way that rebuilds natural capital and enables the regeneration of biotic resources	[7]
biomass	⇒ See 'biomass'.	
biomass	material of biological origin, excluding material embedded in geological formations and material transformed to fossilized material	[11]



biotic resources	raw materials that are derived from living resources, i.e. of plant or animal origin (including algae and bacteria), and are therefore (potentially) renewable resources ⇒ See also 'renewable resource'.	[2]
BOM	⇒ See 'bill of materials (BOM)'.	
building passport	⇒ See 'passport for the construction sector'.	[21]
business model	⇒ See 'circular business model'.	
cascading	using a product or part of a product for another application if it is no longer capable of fulfilling its initial function Cascading takes place in the technical cycle. ⇒ See 'technical cycle'.	[12]
circular business model	manner in which the organisation adds value or multiple value as part of the circular economy ⇒ See also 'circular revenue model'.	[13]
circular construction	developing, using and reusing buildings, areas and infrastructure without unnecessarily depleting natural resources, polluting the living environment and affecting ecosystems. Carrying out construction such that it is economically justifiable and contributes to the welfare of people and animals. Here and there, now and later.	[14]
circular economy	an economic system that optimises the use and value of resource flows without hampering the functioning of the biosphere and the integrity of society This means endeavouring to protect biological and technical stocks of materials, avoiding environmental impact and preserving existing value.	[10]
circular procurement	procuring a product, service or work where the circular impact is a criterion This can be done by, e.g.: - basing decisions on technical/content matter-specific circular aspects; - taking a longer lifespan into account; - specifying maintenance and return at the end of the lifespan; - integrating financial incentives to ensure circular use.	[13]
circular revenue model	manner in which an organisation earns money and circular ambitions have been financially secured ⇒ See also 'circular business model'.	[13]



circular risk	<p>technical risk that an object or sub-object behaves differently than desired when used in a new life cycle</p> <p>Examples:</p> <ul style="list-style-type: none"> - An object cannot be adapted to new functions. - An object no longer meets the structural requirements. - An object is found to be toxic. 	[10]
circular strategy	<p>activity carried out with the intention of contributing to a circular economy</p> <p>Examples of circular strategies are:</p> <ul style="list-style-type: none"> - lifetime extension; - increasing adaptive capacity; - R principles. <p>⇒ See also 'Summary of R principles'.</p>	[10]
circular structure	<p>structure designed and constructed according to circular design principles and/or constructed using circular products, elements and materials</p>	[10]
circular tendering	<p>tendering where the circular impact is a criterion</p> <p>⇒ See also 'circular procurement'.</p>	[13]
climate-neutral	<p>not contributing to climate change</p>	[10]
construction costs	<p>costs resulting from commitments entered into for the physical construction of structures</p> <p>⇒ See 'direct construction costs'.</p> <p>⇒ See 'indirect construction costs'.</p>	[6]
construction product	<p>⇒ See 'level of scale'.</p>	
cradle-to-cradle (C2C) (1 - design philosophy)	<p>design philosophy according to which all waste is food for something new, clean energy is used and no toxic materials are used</p> <p>An important underlying principle is that C2C not only seeks to limit the negative footprint, but also to achieve a positive effect.</p>	[15]
cradle-to-cradle (C2C) (2 - label)	<p>labelling system that assesses the extent to which products comply with cradle-to-cradle design principles</p>	[10]
cradle-to-cradle banned list	<p>list of substances which, because of their toxic properties, are not permitted to be part of products with a C2C label</p>	[10]
critical material	<p>⇒ See 'critical raw material'.</p>	
critical raw material	<p>⇒ See 'critical raw material'.</p>	
critical raw material	<p>material of major economic importance and low security of supply</p>	[5]
degradable	<p>⇒ See 'biodegradable'.</p>	
degradable	<p>⇒ See 'biodegradable'.</p>	



design for deconstruction	⇒ See 'design for disassembly'	
design for disassembly	designed for disassembly ⇒ See 'disassembly';	[10]
detachable/detachability	⇒ See 'design for disassembly'	
direct construction costs	costs that can be directly attributed to a product or service when calculating the cost price ⇒ See 'construction costs'. ⇒ See 'indirect construction costs'.	[6]
disassembly;	the non-destructive, and preferably simple, dismantling of a composite construction product or element	[10]
downcycle	⇒ See 'downcycling'.	
downcycling	⇒ See 'downcycling'.	
downcycling	process of converting secondary raw materials, components or products (from reuse or recycling) into new materials, components or products, typically of lesser quality, reduced functionality and/or lower value compared to their original intended purpose (e.g. due to contamination and mixing of materials) ⇒ See also 'upcycling'.	[7][10]
durable	capable of withstanding chemical, physical and mechanical actions which occur in specific applications to such an extent that functionality is guaranteed for a long period of time	[16]
ECI	⇒ See 'environmental cost indicator (ECI)'.	
eco procurement / environmentally responsible procurement	procurement of products or services such that any negative impacts on the environment are prevented or minimised or that a positive contribution to the environment is made, for example by creating natural values Examples of focus areas in eco procurement are: energy and climate, materials and resources, water and soil, living environment, nature, biodiversity and space, health and well-being.	[13]
Ecodesign Directive	European Directive which lays down requirements for environmental aspects of product design and development with the aim of reducing the adverse environmental impacts throughout a product's life cycle	[7]
economic life	period of time during which the object or sub-object is depreciated after having been constructed	[10]
end user	person who or organisation which uses a product before this product or its residue becomes waste in a linear economy	[10]



end-of-life cost	net cost or fee for disposing of a structure at the end of its service life or interest period	[18]
environmental cost	financial interpretation of any negative environmental impact resulting from the design, construction and use of a structure	[26]
environmental cost indicator (ECI)	unit used to express environmental costs, developed for the civil engineering sector and specified in SBK's <i>Bepalingsmethode milieuprestatie gebouwen en gww-werken</i> (SBK determination method for the environmental performance of buildings and civil engineering works)	[10]
environmental impact	unfavourable or favourable change in the environment fully or partly resulting from an organisation's activities or products	[1] [25]
environmental performance	performance related to environmental impacts and environmental aspects In the Netherlands, environmental performance is expressed as a 1-point score for the Environmental Performance of Buildings (MPG) or Environmental Cost Indicator for the civil engineering sector (ECI). ⇒ See 'product system impact category'.	[20]
environmental performance of buildings (MPG)	summary of the environmental costs per gross floor area and measure of the sustainability of a building in terms of net energy consumption and environmental burden due to the use of materials The MPG is calculated according to the SBK determination method. An MPG score is required when applying for an environmental permit for new-built homes and office buildings of more than 100 m ² .	[2]
Environmental Product Declaration (EPD)	independently verified and recorded statement providing comparable information on the environmental impact of products throughout their life cycle	[20]
EoL treatment / end-of-life treatment	treatment of an object or sub-object that has reached the end of its functional life and has become waste, such that it can either be reused as a product or material, or processed as waste ⇒ See 'functional lifespan'.	[19]
EPD	⇒ See Environmental Product Declaration (EPD).	[20]
external costs	⇒ See 'environmental costs'.	
functional lifespan	lifespan of an object or sub-object during which it remains suitable for its current function and is used at its current location	[5]
future value	the extent to which a structure has a positive long-term usage value and is therefore capable of meeting the needs	[30]



	of its users and social developments during several life cycles	
GC	⇒ See 'general costs (GC)'.	
general costs (GC)	costs incurred by the construction company which cannot be directly attributed to a construction project and are charged to direct costs by means of a surcharge	[6]
general implementation costs (GIC)	cost of equipment and/or labour required for the implementation of a construction project, to the extent that these costs are not related to resources, such as materials, that remain on the construction site upon completion	[6]
GIC	⇒ See 'general implementation costs (GIC)'.	
impact category	⇒ See 'product system impact category'.	
indirect construction costs	costs which cannot be directly attributed to a specific product or service but which must be incurred in order to achieve the preconditions for producing a product or providing a service ⇒ See 'construction costs'. ⇒ See 'direct construction costs'.	[6]
LCA	⇒ See 'life cycle analysis (LCA)'.	
LCC	⇒ See 'life cycle cost (LCC)'.	
LCI	⇒ See life cycle inventory analysis (LCI).	
level of scale	classification of a structure (and sometimes its surroundings) into logical units based on e.g. size and/or function Examples of levels: - area - complex - structure - element - construction product - material - raw material	[29]
life cycle	consecutive and interlinked stages of a product or service in its current function and location: design, acquisition of raw materials, production, distribution, use and end of life management The challenge of circular construction is to think about multiple life cycles.	[7]
life cycle analysis (LCA)	compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle	[20]



life cycle cost (LCC)	method for systematic economic assessment of life cycle costs during an analysis period ⇒ See also 'life cycle'.	[18]
life cycle inventory analysis (LCI)	phase of life cycle assessment involving the compilation and quantification of inputs and outputs for a product throughout its life cycle ⇒ See also 'life cycle'.	[20]
lifespan	span of the life cycle ⇒ See also 'life cycle'.	[5]
lifespan extension	circular strategy that focuses on the proper execution of maintenance and repairs, so that an object or sub-object lasts longer than its previously estimated technical lifespan	[5]
maintenance	⇒ See 'maintenance'.	
maintenance	action during the use phase of a product or structure to ensure that it remains in a condition which enables it to continue to perform its function as required ⇒ This is an R principle. See 'Summary of R principles'.	[10]
material circularity indicator (MCI)	measurement method to be able to determine the circularity of a production chain Measurement method developed by the Ellen MacArthur Foundation to determine the circularity of a production chain.	[23]
materials passport	⇒ See 'passport for the construction sector'.	
MCI	⇒ See material circularity indicator.	
modular (construction)	using factory-assembled elements on the construction site These elements often consist of several modules. These modules contain various industrially manufactured components.	[27]
MPG	⇒ See 'environmental performance of buildings (MPG)'.	
natural capital	stock of renewable and non-renewable natural resources (e.g. plants, animals, air, water, soils, minerals) that combine to yield a flow of benefits to people	[7]
non-renewable resource	raw material of abiotic or biotic origin which is not grown, naturally replenished or naturally cleansed, on a human time scale	[20]
object	physical or functional entity in the construction sector This term is used in the guides to refer to a physical entity with different levels of scale.	[5] [21]



object or sub-object	⇒ See 'object'.	
operating costs	costs arising from the possession or use of a structure These include insurance costs, energy costs, ground rents, maintenance and management costs, depreciation and rent.	[5]
passport for the construction sector	digital document recording an object in buildings or in the civil engineering sector It documents what an object consists of both in qualitative and quantitative terms, how it was built and where it is located. It documents the ownership of the entire object and/or its parts. ⇒ See 'object'.	[21]
pay-per-use	revenue model where a user pays for the use of a product	[28]
physical scarcity	scarcity in terms of existing stocks of raw materials and the risk of their being depleted ⇒ See 'scarce'.	[5]
primary material	construction or other material produced from primary raw materials ⇒ See 'primary raw material'.	[22]
primary raw material	raw material produced by the earth and used by humans for the production of products and materials	[21]
product system impact category	class representing environmental issues of concern to which life cycle inventory analysis results may be assigned Examples: depletion of raw materials, increased greenhouse effect, human toxicity. An extensive description can be found in Clause 4 of the <i>Measuring Circularity guide 2.0</i> . ⇒ See life cycle inventory analysis (LCI).	[24]
product-as-a-service	revenue model where the ability to use a product as a service is offered The service provider continues to be the owner of the product.	[28]
profit & risk (P&R)	reservation to cover unforeseen events relating to the structure which cannot be charged to the client as contract variations	[6]
R principle	⇒ See 'circular strategy'. ⇒ See 'Summary of R principles'.	
raw material	basic material used in a process for making goods, energy, products or semi-manufactures	[13]



reclaim / reclamation (raw materials)	recovering raw materials from materials which would otherwise have been waste or would have been incinerated ⇒ This is an R principle. See 'Summary of R principles'.	[7]
reclamation	⇒ See 'reclaim / reclamation (raw materials)'. ⇒ This is an R principle. See 'Summary of R principles'.	
recondition	return of a used product to a satisfactory condition by rebuilding or repairing major components that are due to be replaced, even where there are no reported or apparent faults in those components ⇒ This is an R principle. See 'Summary of R principles'.	[7]
recondition	⇒ See 'recondition'. ⇒ This is an R principle. See 'Summary of R principles'.	
recover	⇒ See 'recover / recovery (energy)'. ⇒ This is an R principle. See 'Summary of R principles'.	
recover / recovery (energy)	recovering energy from raw materials which would otherwise have become waste ⇒ This is an R principle. See 'Summary of R principles'.	[19]
recycle	recovering materials and raw materials from discarded products and reusing them to make products ⇒ See 'upcycling'. ⇒ See 'downcycling'. ⇒ This is an R principle. See 'Summary of R principles'.	[2]
recycled content	proportion, by mass, of reused or recycled material in an object or sub-object ⇒ See also 'secondary material'.	[1]
recycling	⇒ See 'recycle'. ⇒ This is an R principle. See 'Summary of R principles'.	
redesign	⇒ See 'redesign/renew'. ⇒ This is an R principle. See 'Summary of R principles'.	
redesign/renew	redesigning a product, based on circular design principles ⇒ This is an R principle. See 'Summary of R principles'.	[2]
reduce	reducing the use of new raw materials and the quantity of raw materials while ensuring the same functionality and quality ⇒ This is an R principle. See 'Summary of R principles'.	[2]
reference lifespan	known lifespan of a construction product under certain circumstances or conditions of use	[22]



	This reference can serve as a basis for estimating the lifespan under other conditions of use.	
refurbish (products or parts)	refurbishing or improving the technical and/or functional quality of an existing construction product or other product by using product components from a discarded product with a comparable function ⇒ This is an R principle. See 'Summary of R principles'.	[10]
refuse	⇒ See 'refuse'. ⇒ This is an R principle. See 'Summary of R principles'.	
refuse	preventing the use of products, elements or materials ⇒ This is an R principle. See 'Summary of R principles'.	[10]
remanufacture	reusing an object or a sub-object from a discarded object or sub-object to create a 'new' object with a similar function ⇒ See 'object'. ⇒ This is an R principle. See 'Summary of R principles'.	[2]
remanufacture	⇒ See 'remanufacture'. ⇒ This is an R principle. See 'Summary of R principles'.	
renew	⇒ See 'redesign/renew'. ⇒ This is an R principle. See 'Summary of R principles'.	
renewable material	material produced from renewable resources	[2]
renewable resource	resource that is grown, naturally replenished or naturally cleansed, on a human time scale A renewable resource is capable of being depleted, but may last indefinitely with proper stewardship. Examples include: trees in forests, grasses in grassland, fertile soil. A renewable resource can be of abiotic or biotic origin.	[20]
renovate (structures)	restoring and/or improving the technical and/or functional quality of a structure that still functions well in its own right by carrying out large-scale refurbishment, thus restoring or improving its functionality and technical quality ⇒ This is an R principle. See 'Summary of R principles'.	[10]
repair	extending the use of a product or structure by applying preventive or corrective maintenance during its use phase ⇒ This is an R principle. See Annex 'Summary of R principles'.	[10]
repurpose	re-using an object or sub-object that has been discarded for another function ⇒ This is an R principle. See 'Summary of R principles'.	[2]



residual value	value assigned to a structure at the end of the analysis period	[18]
rethink	<p>intensifying product use by enabling the same object or sub-object to deliver higher 'numbers of functions'</p> <p>Examples include:</p> <ul style="list-style-type: none"> - shared use of products (such as car sharing or apartments with shared facilities); - making products and structures multifunctional (such as smartphones or multifunctional printers). <p>⇒ See 'object'.</p> <p>⇒ This is an R principle. See 'Summary of R principles'.</p>	[2]
return value	financial value agreed as an incentive to assure circular use of a product: a kind of 'deposit'	[2]
reuse	<p>reuse of construction products, components or elements in the same function, possibly after they have undergone treatment</p> <p>Examples are the reuse of an insulating material as insulating material, a door as a door or a roof as a roof.</p> <p>⇒ This is an R principle. See 'Summary of R principles'.</p>	[22]
scarce	<p>available to a limited extent, based on the size of the stock of a resource, raw material or material, its extractability and security of supply if any geopolitical or social changes occur</p> <p>⇒ See 'abundant'.</p>	[5]
secondary material	material recovered from previous use or from residual flows from another product system which substitutes primary materials or other secondary materials.	[20]
socio-economic scarcity	<p>scarcity based on economic importance and security of supply</p> <p>⇒ See 'scarce'.</p>	[5]
sustainable	<p>produced in line with sustainable development principles</p> <p>⇒ See 'sustainable development'.</p>	[17]
sustainable	⇒ See 'sustainable'.	
sustainable development	development that meets the needs of the present without compromising the ability of future generations to meet their own needs	[17]
sustainable development	⇒ See 'sustainable development'.	



sustainable product	product made in line with sustainable development principles See 'sustainable development'.	[17]
TCO	⇒ See 'total cost of ownership'.	
technical cycle	cycle through which products, components and materials are restored to the economy as parts of new products, components and materials or used more intensively	[7]
technical life	period during which an object can continue to perform the functions desired sufficiently reliably ⇒ See 'object'.	[10]
total cost of ownership (TCO)	costs and benefits during the entire lifespan or useful life of an object or sub-object	[26]
upcycling	process of converting secondary raw materials (from reuse or recycling) into new materials, components or products of better quality, improved functionality and/or a higher value ⇒ See also 'downcycling'.	[7] [10]
upgradeable	characteristic of a product that enables its physical or virtual components or parts to be separately enhanced or replaced without having to replace the entire product	[7]
value retention	retaining the technical qualities required to perform a particular function and preserve the associated economic value	[5]
waste (waste substances)	any substance or object which the holder discards, intends to or is required to discard	[4]
whole-life costing (WLC)	methodology for systematic economic consideration of all whole-life costs and benefits over a period of analysis	[18]



Sources

- [1] ISO 14021:2016 and, *Environmental labels and declarations – Self-declared environmental claims (Type II environmental labelling)*. Available via: <https://www.nen.nl/NENShop/Norm/NENENISO-140212016-en.htm>.
- [2] Potting, J., Hanemaaijer, A., Delahaye, R., Ganzevles, J., Hoekstra, R., & Lijzen, J. (2018). *Circulaire economie: Wat we willen weten en kunnen meten. Systeem en nulmeting voor monitoring van de voortgang van de circulaire economie in Nederland*. The Hague. Consulted on: <https://www.pbl.nl/sites/default/files/cms/publicaties/pbl-2018-circulaire-economie-wat-we-willen-weten-en-kunnen-meten-2970.pdf>.
- [3] Hermans, M. H., Geraedts, R. P., Van Rijn, E., & Remøy, H. T. (2014). *Gebouwen met toekomstwaarde! Het bepalen van de toekomstwaarde van gebouwen vanuit het perspectief van adaptief vermogen, financieel rendement en duurzaamheid*. Consulted on: <https://repository.tudelft.nl/islandora/object/uuid:f0555f9d-f2a1-45ad-9fc3-99536caa4fba>.
- [4] European Parliament & Council of the European Union. (2008). *Directive 2008/98/EC on waste*. Consulted on: <https://eur-lex.europa.eu/legal-content/NL/TXT/PDF/?uri=CELEX:32008L0098&from=EN>
- [5] Compiled by the Measuring Circularity action team.
- [6] NEN 2699:2017, *Investment and operating costs of property - Terminology and classification*. Available via: <https://www.nen.nl/NEN-Shop/Norm/NEN-26992017-nl.htm>.
- [7] BS 8001:2017, *Framework for implementing the principles of the circular economy in organizations – Guide*. Consulted on: <https://www.bsigroup.com/en-GB/standards/benefits-of-using-standards/becoming-more-sustainable-with-standards/BS8001-Circular-Economy/>.
- [8] *C-154 Green Deal Biobased Bouwen*, (2018). Consulted on: <https://www.greendeals.nl/greendeals/biobased-bouwen>.
- [9] Rockström, J., Steffen, W. L., Noone, K., Persson, Å., Chapin III, F. S., Lambin, E., Schellnhuber, H. J. (2009). Planetary boundaries: exploring the safe operating space for humanity. *Ecology and society*. Available via: https://pdxscholar.library.pdx.edu/cgi/viewcontent.cgi?article=1063&context=iss_pub.
- [10] Compiled by the Framework action team.
- [11] NEN-EN-ISO 14067:2018 en, *Greenhouse gases – Carbon footprint of products – Requirements and guidelines for quantification*. Available via: <https://www.nen.nl/NEN-Shop/Norm/NENENISO-140672018-en.htm>.
- [12] Ellen McArthur Foundation, et. al. (2015). *Towards a circular economy: Business rationale for an accelerated transition*. Consulted on: https://www.ellenmacarthurfoundation.org/assets/downloads/TCE_Ellen-MacArthur-Foundation_9-Dec-2015.pdf.
- [13] Van Oppen, C., Croon, G., & Bijl de Vroe, D. (2018). *Circulair Inkopen in 8 Stappen Een betere wereld begint bij het stellen van een betere vraag: Copper8*. Consulted on: <https://www.copper8.com/wp-content/uploads/2019/02/E-book-Circulair-Inkopen-in-8-stappen-Copper8.pdf>.
- [14] Circular Construction Economy transition team (2018). *Transitieagenda Circulaire Bouweconomie – Samen bouwen aan de circulaire economie voor Nederland in 2050. (Transition Agenda for the Circular Construction Economy – Jointly building on the circular economy for the Netherlands in 2050)*. Consulted on: <https://www.rijksoverheid.nl/documenten/rapporten/2018/01/15/bijlage-4-transitieagenda-bouw>.



- [15] McDonough, W., & Braungart, M. (2002). *Cradle to cradle: remaking the way we make things*. New York: North Point Press.
- [16] Hendriks, C. F., & Kaiser, M. A. (2000). *De ecologische stad: DIOC*.
- [17] World Commission on Environment & Development. (1987). *Our common future*. Oxford; New York: Oxford University Press.
- [18] NEN-ISO 15686-5:2017 en, *Buildings and constructed assets – Service life planning - Part 5: Life cycle costing*. Available via: <https://www.nen.nl/NEN-Shop/Norm/NENISO-1568652017-en.htm>.
- [19] NEN-EN 45555:2019 en, *General methods for assessing the recyclability and recoverability of energy-related products*. Available via: <https://www.nen.nl/NEN-Shop/Norm/NENEN-455552019-en.htm>.
- [20] NEN-EN 15804:2012+A1:2013 en, *Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products*. Available via: <https://www.nen.nl/NEN-Shop/Norm/NENEN-158042012A12013-en.htm>.
- [21] Compiled by the Passports for the Construction Sector action team.
- [22] Stichting Bouwkwiteit (SBK). (2019). *Bepalingsmethode Milieuprestatie Gebouwen en GWW-werken. (Determination method for the environmental performance of buildings and civil engineering works.)* Available via: <https://www.milieudatabase.nl/imgcms//SBK%20Bepalingsmethode%20versie%203.0,%201%20januari%202019.pdf>.
- [23] Ellen McArthur Foundation & Granta Design. (2015). *Circularity indicators - an approach to measuring circularity*. Available via: https://www.ellenmacarthurfoundation.org/assets/downloads/insight/Circularity-Indicators_Project-Overview_May2015.pdf.
- [24] NEN-EN-ISO 14044:2006 en, *Environmental management – Life cycle assessment – Requirements and guidelines*. Available at: <https://www.nen.nl/NEN-Shop/Norm/NENENISO-140442006-en.htm>.
- [25] Van Leeuwen, M. (2018). *Meten aan circulariteit – Het berekenen van circulaire producten met LCA-methodiek of circulariteitsindicator*. Consulted on: <https://www.cementonline.nl/meten-aan-circulariteit>.
- [26] PIANOo. (2016). *Levenscycluskosten als gunningscriterium: een praktische aanzet tot gebruik*. Consulted on: <https://www.pianoo.nl/sites/default/files/documents/documents/levenscycluskostenalsgunningscriteriumjuni2016.pdf>.
- [27] BAM Bouw en Techniek. (z.d.). *Hoe werkt Modulair Ontwikkelen en Bouwen*. Consulted on: <https://www.bambouwentechniek.nl/specialismen/modulair-ontwikkelen-bouwen/hoe-werkt-modulair-ontwikkelen-en-bouwen>.
- [28] Jonker, J., e.a. (2014). *Nieuwe Business Modellen – Samen werken aan waardecreatie*: Academic Service.
- [29] NEN 2660: 2660 nl, *Information system for the building field – Terminology, definitions and general rules*. Available at: <https://www.nen.nl/NEN-Shop/Norm/NEN-26601996-nl.htm>.
- [30] Hermans, M. H., Geraedts, R. P., Van Rijn, E., & Remøy, H. T. (2014). *Gebouwen met toekomstwaarde! Het bepalen van de toekomstwaarde van gebouwen vanuit het perspectief van adaptief vermogen, financieel rendement en duurzaamheid*. Consulted on: <https://repository.tudelft.nl/islandora/object/uuid%3Af0555f9d-f2a1-45ad-9fc3-99536caa4fba>.

Summary of R principles

English term	Platform CB'23's definition	Definition in standard
reclamation	recovering raw materials from materials which would otherwise have become waste or would have been incinerated	<p>recovery operation of any kind, the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy [SOURCE: Directive 2008/98/EC, modified: addition of Note 1 to entry]</p> <p>material recovery recovery operation of any kind, excluding energy recovery and the reprocessing into materials which are to be used as fuel [SOURCE: EN 50625-1:2014, 3.23, modified formatting and sentence structure]</p> <p>reclamation/reclaiming collection of products, components or materials with the intention of avoiding waste and with the purpose of reuse or recycling (BS8001:2017)</p>
recondition	return of a used product to a satisfactory condition by rebuilding or repairing major components that are due to be replaced, even where there are no reported or apparent faults in those components	<p>recondition return of a used product to a satisfactory working condition by rebuilding or repairing major components that are close to failure, even where there are no reported or apparent faults in those components [SOURCE: BS 8887-2:2009, 3.30] (BS8001:2017)</p>
recover	recovering energy from raw materials which would otherwise have become waste	<p>recovery operation of any kind, the principal result of which is waste serving a useful purpose by replacing other materials which would otherwise have been used to fulfil a particular function, or waste being prepared to fulfil that function, in the plant or in the wider economy [SOURCE: Directive 2008/98/EC, modified: addition of Note 1 to entry]</p> <p>energy recovery production of useful energy through direct and controlled combustion or other processing of waste [SOURCE: IEC 62635:2012, modified Note 1 to entry deleted]</p>
recycle	recovering materials and raw materials from discarded products and reusing them to make products	<p>Recovery recovery operation of any kind, by which waste materials are reprocessed into products, materials or substances whether for the original or other purposes It includes organic recycling but does not include energy recovery and the reprocessing into materials that are to be used as fuels or for backfilling operations [SOURCE: Directive 2008/98/EC, modified: moved second sentence of definition to Note 1 to entry] (prEN 45555:2018)</p> <p>recycle/recycling action of processing a discarded or used product, component or material for use in a future product, component or material (BS 8001:2017)</p>



redesign/renew	redesigning a product based on circular design principles	-
reduce	reducing the use of new raw materials and the quantity of raw materials while assuring the same functionality and quality	-
refurbish	refurbishing or improving an existing construction product or other product by using product components from a discarded product with a comparable function	<p>refurbishment industrial process of returning a used product to a satisfactory working condition without making any important changes to the product (NEN-EN 45553:2018)</p> <p>refurbish aesthetic improvement of a product, component or material, which might involve making it look like new, with no or limited functionality improvements [SOURCE: <i>Remanufacturing: towards a resource efficient economy</i> [15], modified] (BS 8001:2017)</p>
refuse	preventing the use of products, elements or materials	-
remanufacture	reusing an object or a sub-object from a discarded object or sub-object to create a 'new' object with a similar function	<p>production process that creates products using parts taken from previously used products</p> <p>remanufacturing: industrial process which creates a product from used products or used parts where at least one important change is made to the product (NEN-EN 45553:2018)</p> <p>remanufacture return a used product to at least its original performance with a warranty that is equivalent to or better than that of the newly manufactured product <i>NOTE 1 From a customer viewpoint, the remanufactured product can be considered the same as a new product.</i> <i>NOTE 2 With respect to remanufacture:</i> - manufacturing effort involves dismantling the product, the restoration and replacement of components and testing of the individual parts and whole product to ensure that it is within its original design specifications; - performance after remanufacture is expected to be at least comparable with the original performance specification; and - any subsequent warranty is generally at least equal to that of new product. <i>NOTE 3 This assumes that remanufacture applies to like-for-like products.</i> [SOURCE: BS 8887-2:2009, 3.34] (BS 8001:2017)</p>
renovate	restoring and/or improving the technical and/or functional quality of a structure that still functions well in its own right by restoring or improving its functionality and technical quality on a large scale	-



repair	<p>extending the use of a product or structure by applying preventive or corrective maintenance during its use phase</p>	<p>repair process of returning a faulty product to a condition where it can fulfil its intended use (prEN 45554:2018)</p> <p>repair returning a faulty or broken product, component or material back to a usable state <i>NOTE 1 A repair may use remanufactured or reconditioned parts.</i> <i>NOTE 2 With respect to repair:</i> - the effort is the minimum required to address the specified fault; - after repair, the product is expected to be in a useable state, but assurances of performance are generally limited to the repaired part; and - any subsequent warranty is generally less than that of newly manufactured, remanufactured or reconditioned equivalents and might apply only to the component that has been replaced or repaired. [SOURCE: BS 8887-2:2009, 3.36, modified] (BS 8001:2017)</p>
repurpose	<p>re-using an object or sub-object that has been discarded for another function</p>	<p>repurpose using a product, its components or materials in a role that they were not originally designed to perform <i>NOTE 1 This action deals with instances where products, components or materials can be used again for a different purpose for which they were conceived without the need for any reprocessing or treatment, which falls under recycling.</i> <i>NOTE 2 Augmentation of the product might be required to fulfil its new role.</i> [SOURCE: BS 8887-2:2009, 3.37, modified] (BS 8001:2017)</p>
rethink	<p>intensify product use enabling the same object or sub-object to deliver more numbers of functions'</p> <p>Examples include: - shared use of products (such as car sharing or apartments with shared facilities); - making products and buildings multifunctional (such as smartphones or multifunction printers).</p>	
reuse	<p>reuse construction products, components or elements in the same function, possibly after they have undergone treatment</p> <p>Examples are the reuse of an insulating material as insulating material, of a door as a door, of a roof as a roof.</p>	<p>re-use operation by which products or parts that are not waste are used for the same purpose for which they were conceived by another user Note 1 to Entry: The transfer of ownership is essential part of the concept of re-use. (prEN 45554:2018)</p> <p>reuse/reused operation by which a product, component or material can be used again without requiring any reprocessing or treatment <i>NOTE 1 This action deals with instances where products, components or materials can be used again for the same purpose for which they were conceived without the need for any modifications, reprocessing or treatment.</i></p>

		<p><i>NOTE Items might need to be “prepared for reuse”, which involves checking, cleaning or repairing recovery activities so that they can be reused without any other processing.</i></p> <p>(BS 8001:2017)</p>
<p>maintenance</p>	<p>action during the use phase of a product or structure to ensure that it remains in a condition in which it is able to continue to function as required</p>	<p>-</p>