

Steel Re-use in the Circular Economy

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What help can you get from prEN 17662

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Convener TC135/WG17

prEN 17662, c-PCR under EN 15804

Execution of steel structures and aluminium structures - Environmental Product Declarations - Product category rules complementary to EN 15804 for steel, iron and aluminium products for use in construction works

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Steel – a sustainable material



BUILDING ASSESSMENT INFORMATION														
BUILDING LIFE CYCLE INFORMATION												SUPPLEMENTARY INFORMATION BEYOND BUILDING LIFE CYCLE		
A1 - A3			A4 - A5		B1 - B7					C1 - C4				D
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE					END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARY
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	D
Raw material supply	Transport	Manufacturing	Transport	Construction - Installation process	Use	Maintenance	Repair	Replacement ^a	Refurbishment	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery, recycling, potential
scenario	scenario	scenario	scenario	scenario	B6 Operational energy use	scenario	scenario	scenario	scenario	scenario	scenario	scenario	scenario	
Mand.	Mand.	Mand.								Mand. ^b	Mand. ^b	Mand. ^b	Mand. ^b	Mandatory ^b
Mand.	Mand.	Mand.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Opt.	Mand.	Mand.	Mand.	Mand.	Mandatory
Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mand.	Mandatory



Eiffel Tower 1889: Benh LIEU SONG - Eget arbete, CC BY-SA 3.0,
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Sydney Harbour Bridge 1931: Dietmar Rabich, CC BY-SA 4.0,
<https://commons.wikimedia.org/w/index.php?curid=85074409>

Reference service life




Skurubron1915/1957: Holger.Ellgaard - Eget arbete, CC BY-SA 3.0,
<https://commons.wikimedia.org/w/index.php?curid=4978039>



Nya Skurobron 2023: Rutger Gyllenram

Build new
and keep the old
with new function

A wide-angle photograph of an indoor padel court. The court is enclosed by a black metal frame and black safety netting. The playing surface is covered in bright green artificial turf. The court is situated within a large, modern building with a high ceiling and a complex steel truss structure. Numerous recessed ceiling lights illuminate the space. In the background, other parts of the facility are visible, including a concrete walkway and additional court structures.

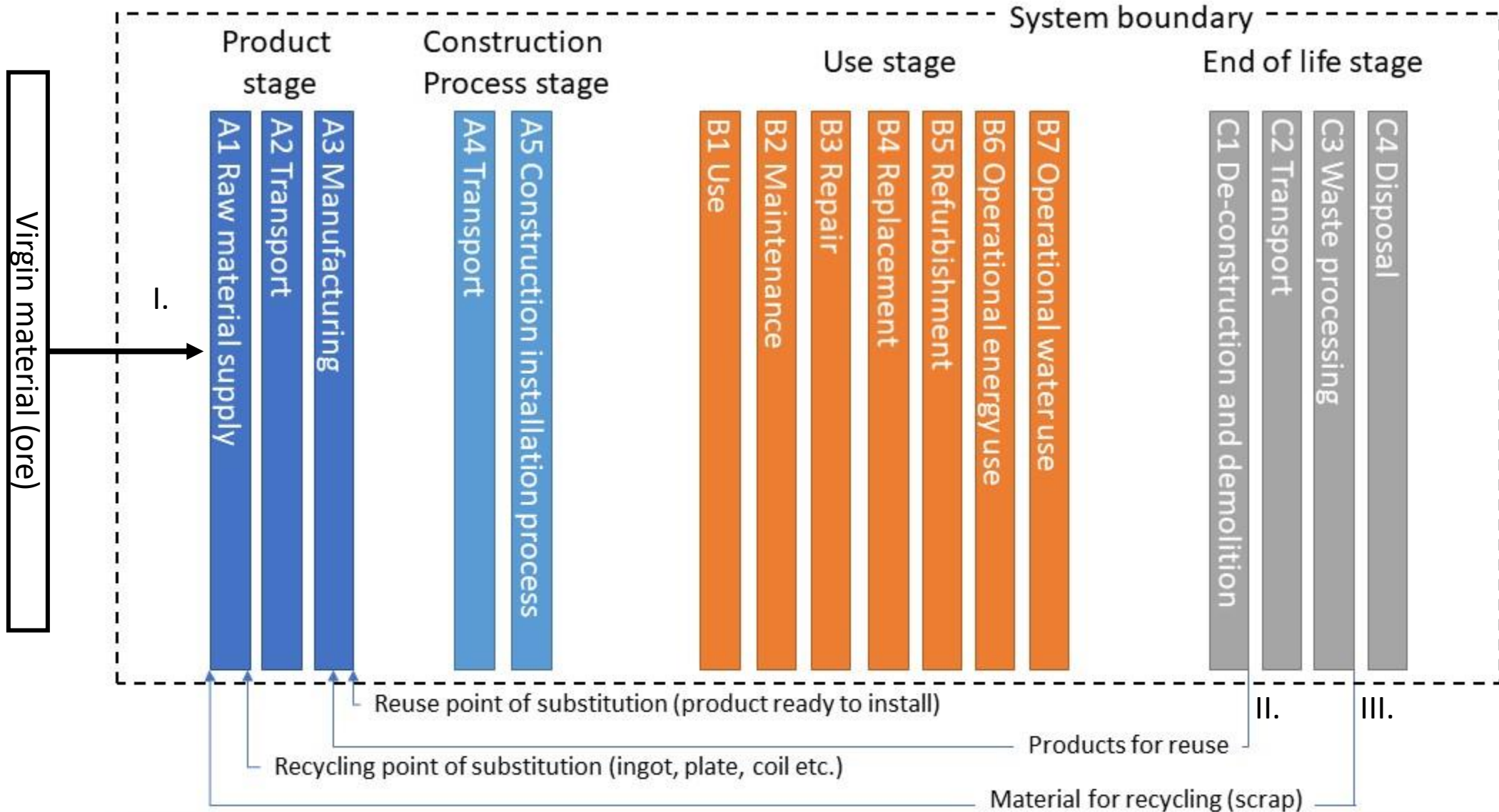
Reuse building or Reuse components

Padelhall 2022: www.unisport.com



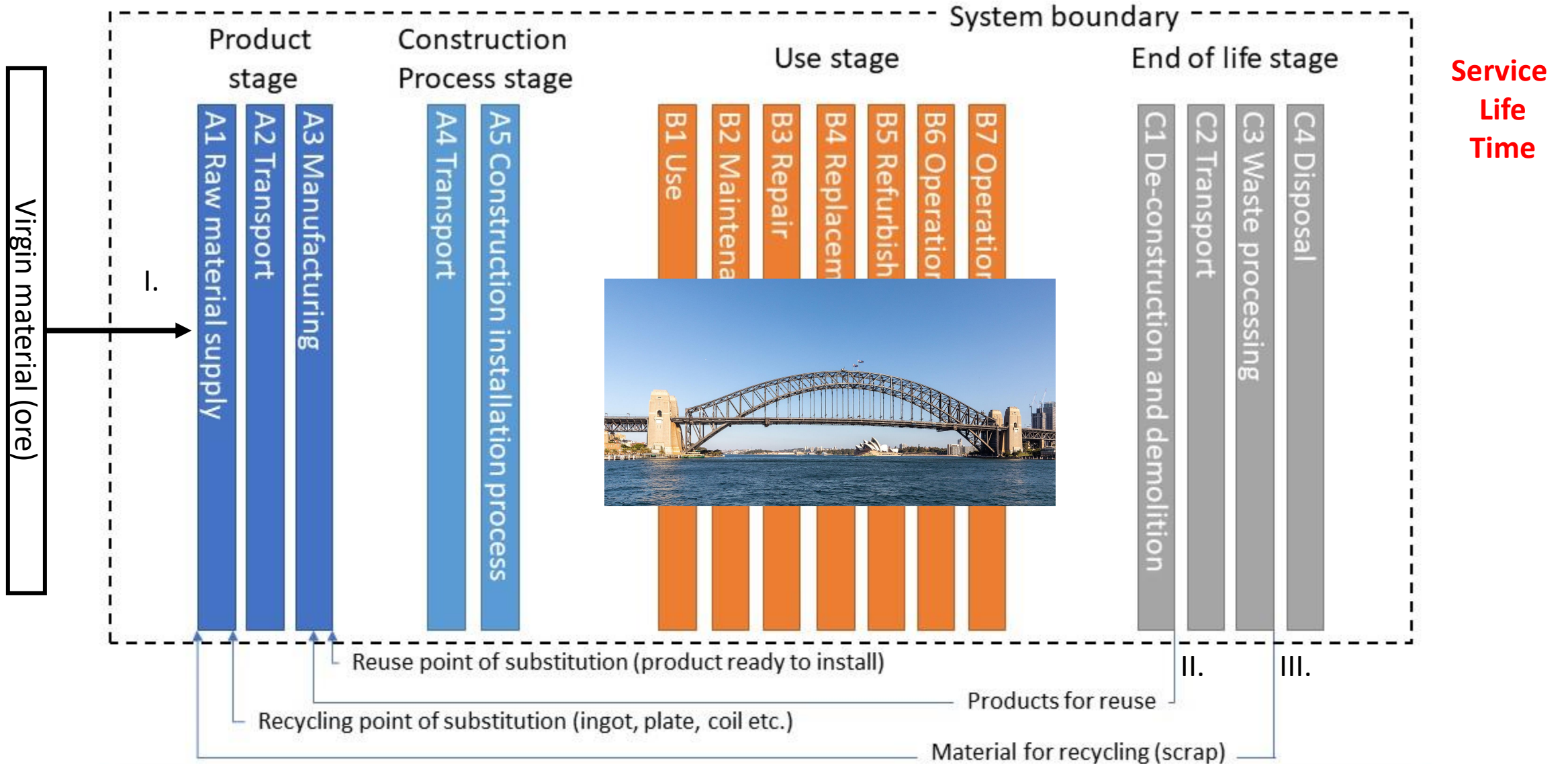
Recycle collected material

Extracting rebar from demolition rubble: By Anna Frodesiak - Own work, CC0,
<https://commons.wikimedia.org/w/index.php?curid=19241105>



D Benefits and loads beyond the system boundary (according to EN 15804 and prEN 17662)

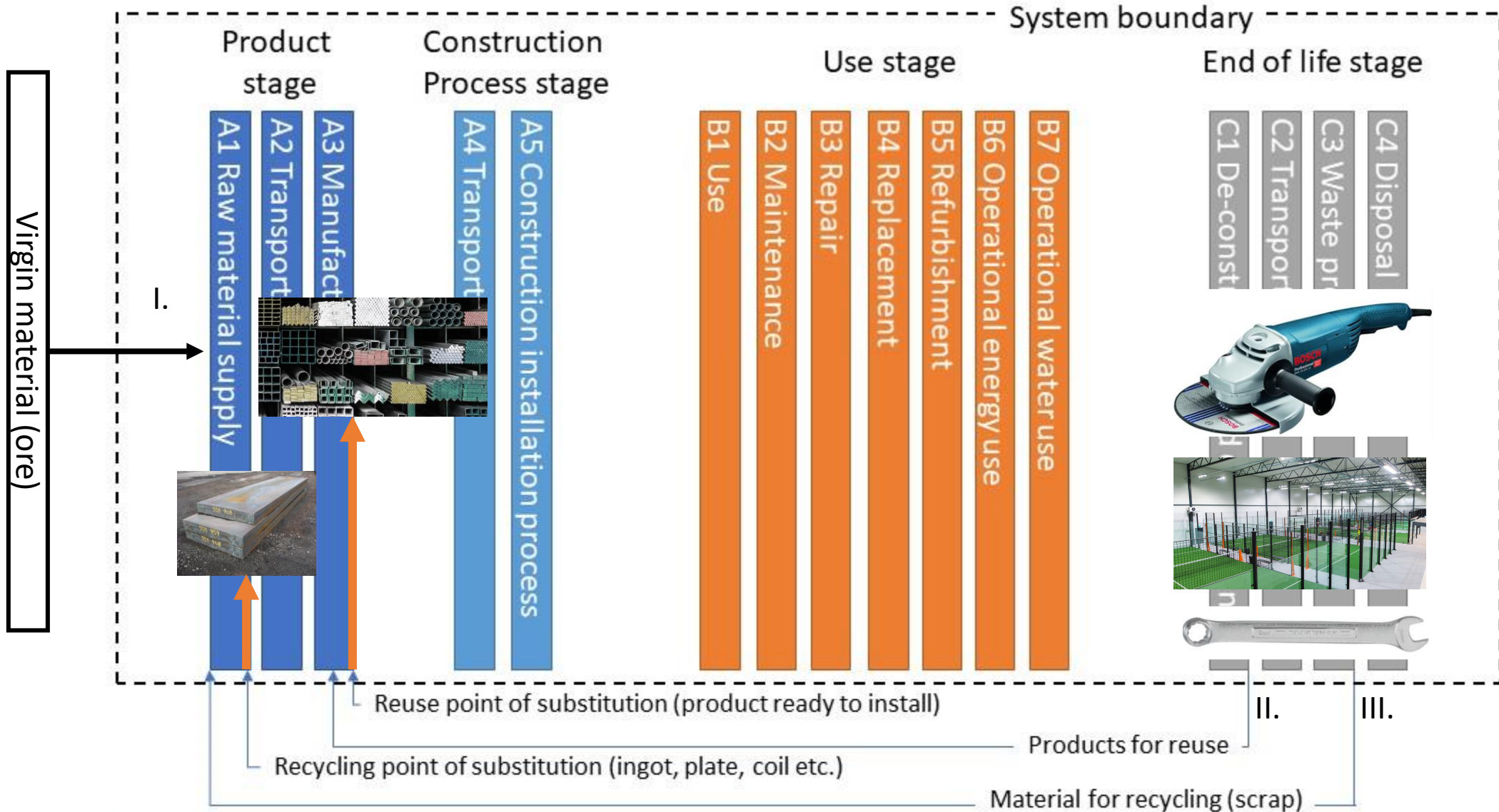
Module D shows the net benefit as avoided emissions of reusing a product or recycling material up to the point of substitution, taking into account resource use, the deterioration in quality and fraction of recycled material. See prEN17662 annex F.



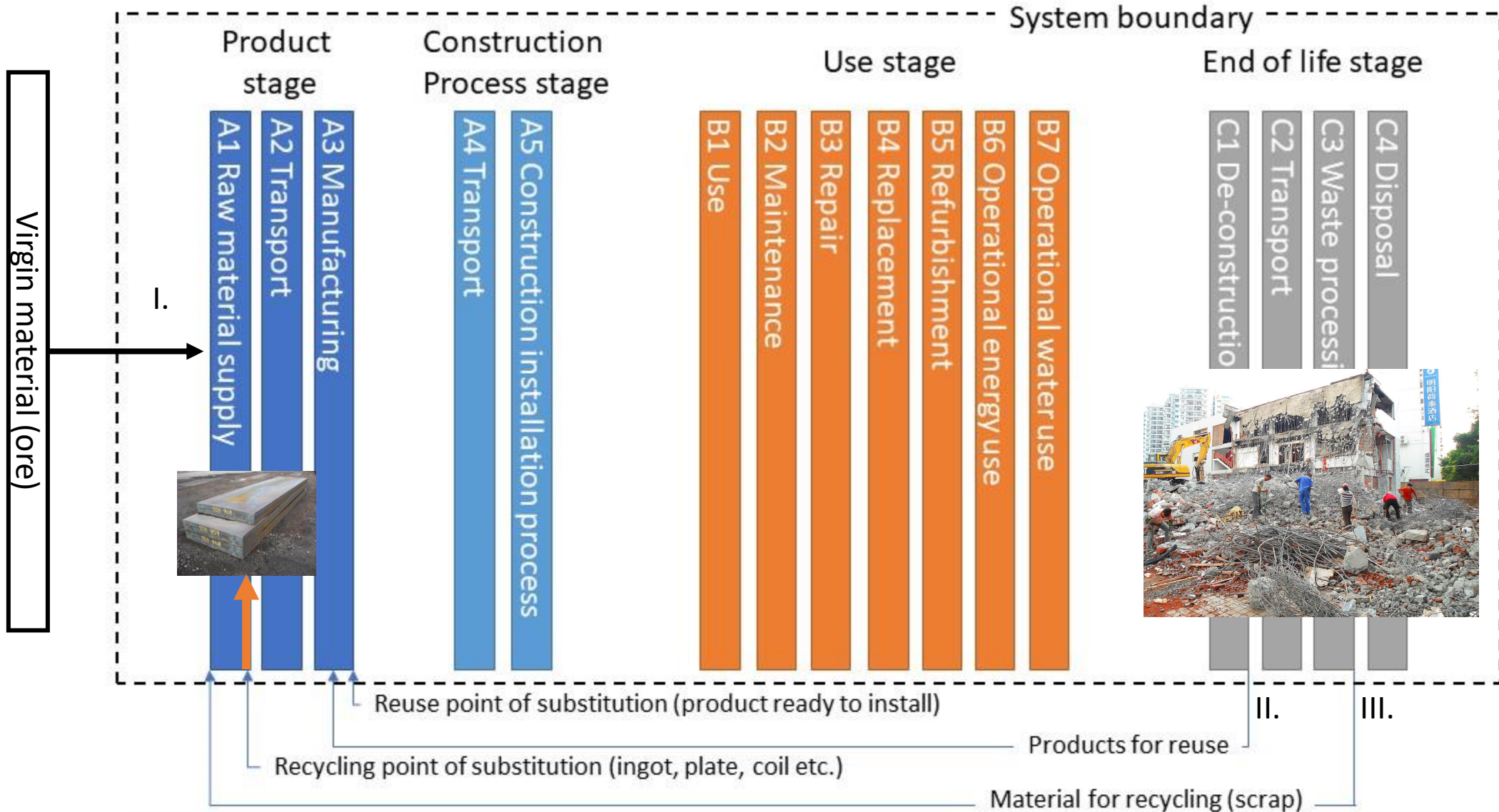
D Benefits and loads beyond the system boundary (according to EN 15804 and prEN 17662)

Module D shows the net benefit as avoided emissions of reusing a product or recycling material up to the point of substitution, taking into account resource use, the deterioration in quality and fraction of recycled material. See prEN17662 annex F.

Reuse



D Benefits and loads beyond the system boundary (according to EN 15804 and prEN 17662)
Module D shows the net benefit as avoided emissions of reusing a product or recycling material up to the point of substitution, taking into account resource use, the deterioration in quality and fraction of recycled material. See prEN17662 annex F.



Recycling

D Benefits and loads beyond the system boundary (according to EN 15804 and prEN 17662)

Module D shows the net benefit as avoided emissions of reusing a product or recycling material up to the point of substitution, taking into account resource use, the deterioration in quality and fraction of recycled material. See prEN17662 annex F.

Reuse and recycling C and D

Table 2 Reuse and recycling scenarios for modules C1, C2, C3 and D

	Processes taking place in each module			
	C1 Disassembly or demolition	C2 Transport	C3 Waste processing in preparation for reuse and recycling	D Benefits and loads from reuse/recycling
Reuse scenario	Disassembly, initial sorting	Transport to stockholder /fabricator	No further processing needed to reach end of waste state	Cutting to size/ refurbishment/ finishing to the point of substitution. Benefits of substitution of a primary product of equivalent function
Recycling scenario	Demolition/disassembly, initial sorting	Transport to treatment facility	Further separation/sorting of scrap types, cutting to size or shredding and/or baling	Transport to metal re-processor, re- melting and casting. Benefit of substituted primary cast metal ingot/slab

Reuse and Recycling A1-A3

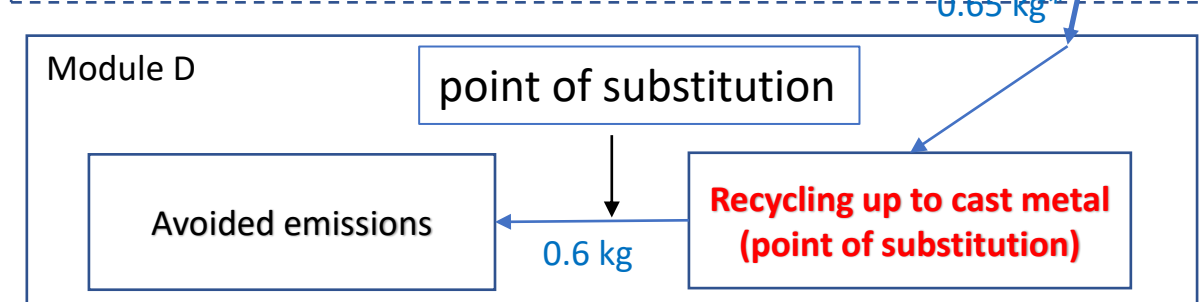
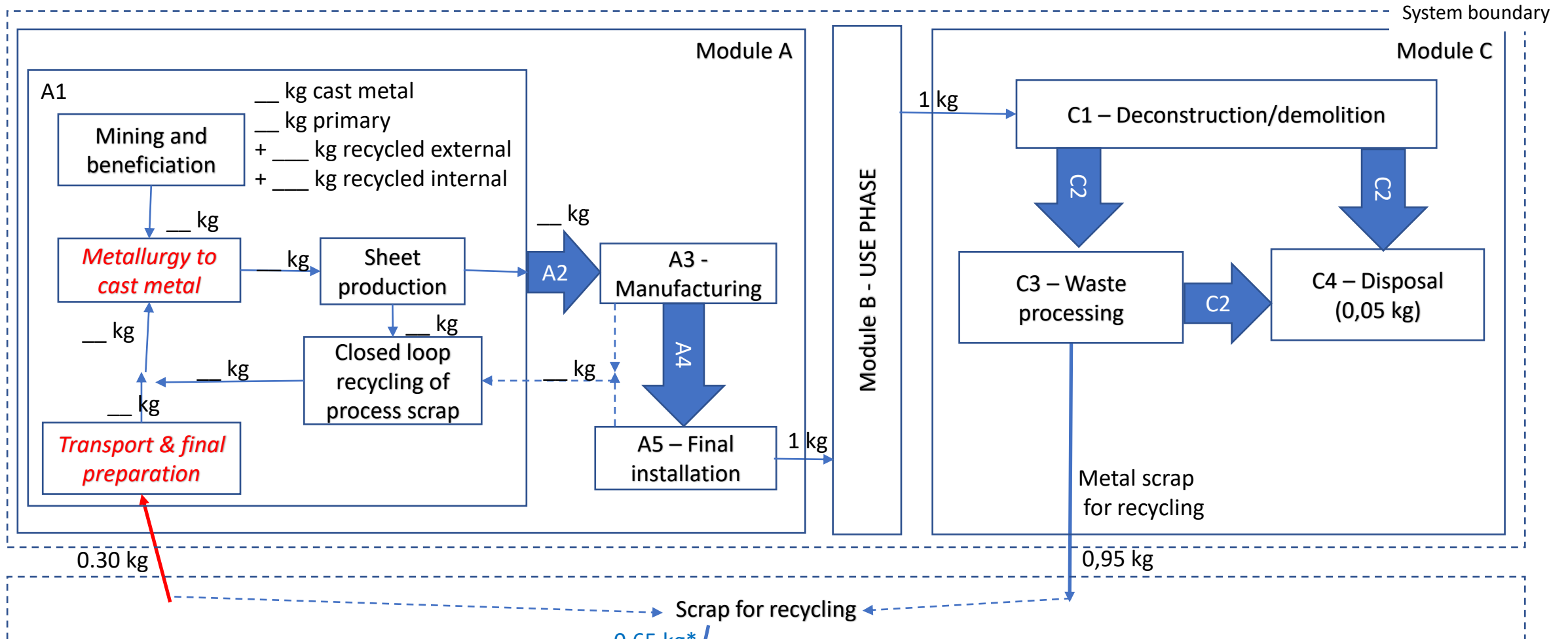
Table 3 Processes for reuse of products and recycling of secondary materials in modules A1-A3

	Processes taking place in each module		
	Module A1 Raw material extraction and material processing	Module A2 Transport to manufacturing	Module A3 Product manufacture
Secondary product input for reuse	None	Additional transport to manufacturer	Cutting to size, fabrication /finishing for final application
Secondary material input for recycling	Transport to metal reprocessor, re-melting and casting, material processing (semi- finished)	Transport to manufacturer	Product manufacturing /fabrication

Default values for reuse, recycling and landfill for the End of life scenarios for various structural metal products

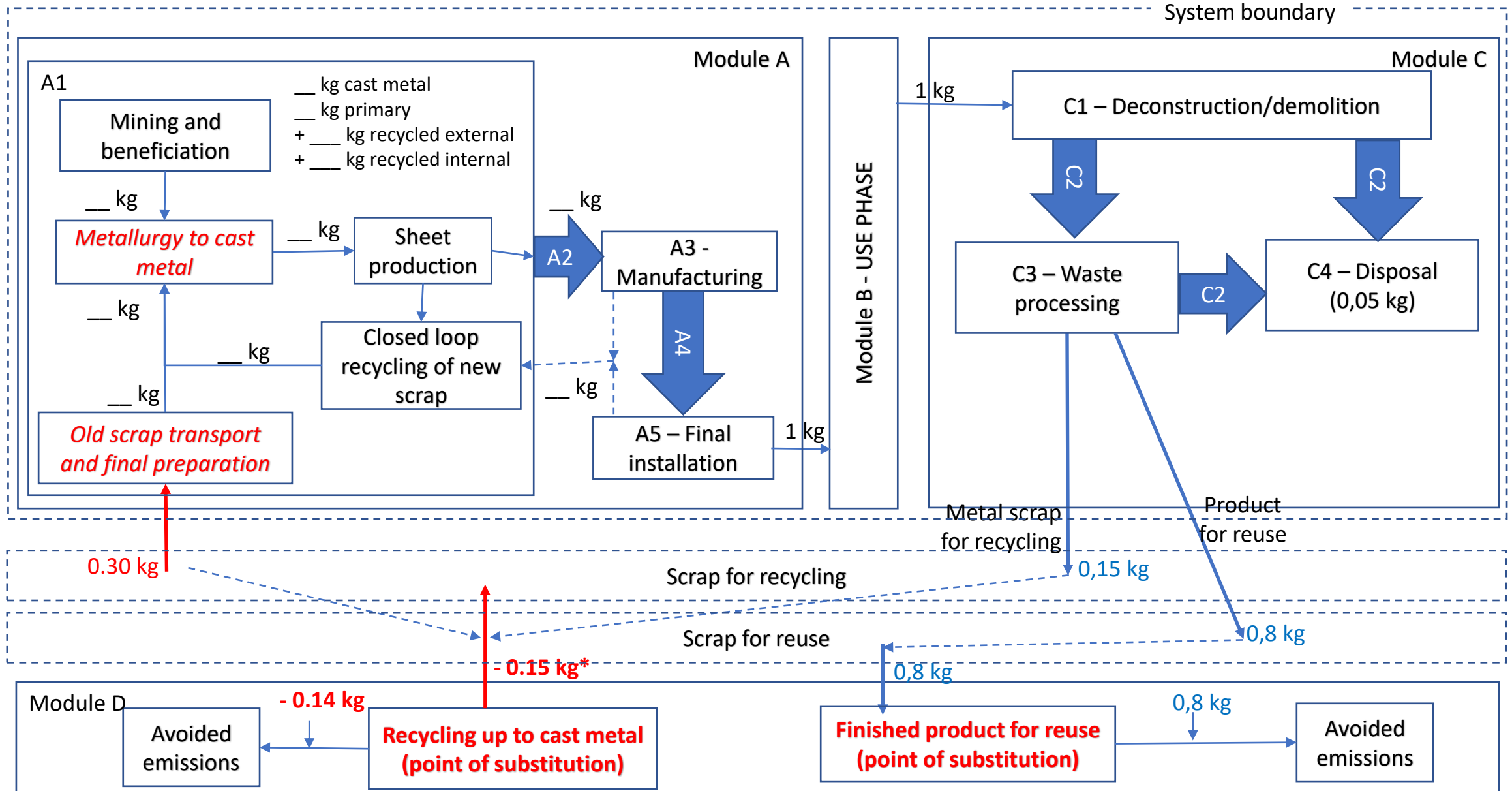
Metal	Product	%Collected for reuse	%Collected for recycling	%Landfilled
Steel [13, 14, 15, 16]	Structural sections/tubes (hot rolled, welded)	11%	89%	0%
	Light structural steel (cold formed)	5%	93%	2%
	Internal light steel (e.g. plaster profiles, door frames)	10%	89%	1%
	Composite floor decking	10%	89%	1%
	Profile steel cladding (roof/facade)	15%	81%	4%
	Steel piles (sheet and bearing)	15%	71%	14%
	Other (e.g. stainless steel)	4%	95%	1%
	Rebar	0%	90%	10%
Aluminium [17]	Aluminium elements ¹⁾	0%	96%	4%
¹⁾ For the aluminium structural elements, no specific data have been collected to assess the fraction of product which is reused. Hence, as taking a conservative approach, the default scenario assumes that all collected aluminium products are directed to recycling. For big aluminium pieces heavier than 0.5 kg, a collection rate of 99% has been reported.				

Recycling only (Steel) - 1 kg of metal sheet produced from a cast metal made of _% primary & _% recycled



*0.65 kg corresponds to the net flow of scrap, i.e. 0,95 kg generated at EoL minus 0,30 kg used at production stage

Recycling & Reuse - 1 kg of metal sheet from a cast metal of ___% primary & ___% recycling, EoL: 80% sent for reuse and 15% for recycling



*- 0,15 kg corresponds to the net consumption of scrap , i.e. 0,15 kg generated at EoL minus 0,3 kg used at production stage

Guidance to processes in A1 and A3

Table 1 Processes reported in modules A1 and A3

Processes	A1	A3
Ingot, slab, bloom, billet and powder production including upstream processes	x	
Coil, plate, bar, wire and profile production including upstream processes	x	
Coating and surface treatment of coil, plate, bar and wire	x	
Foundry casting including rinsing but excluding machining including upstream processes	x	
Forging		x
Additive manufacturing		x
Profiling and forming		x
Cutting, piercing, blanking and machining		x
Welding, soldering, gluing etc		x
Coating and surface treatment of material other than coil, plate, bar and wire		x
Other processes taking place before transport to the building site		x

Note: all transport steps between processes within and between A1 and A3 must be included and reported in A2

Default data for A5 and C1

Table I.1 Default data for modules A5 and C1 of single-story buildings

<i>Consumption per ton of structural steel</i>	<i>Module A5 Erection</i>	<i>Module C1 Dismantling (reuse and recycling)</i>	<i>Module C1 Demolition (recycling)</i>	<i>Module C1 European mix of Dismantling /Demolition</i>
Electricity	1,89 kWh/t	0,63 kWh/t	-	0,07 kWh/t
Diesel	3,73 l/t	4,96 l/t	4,10 l/t	4,19 l/t
Oxygen	-	-	2,54 kg/t	2,26 kg/t
Propane	-	-	0,15 kg/t	0,13 kg/t

Table I.2 Default data for modules A5 and C1 of multi-story buildings

<i>Consumption per tonne of structural steel</i>	<i>Module A5 Erection</i>	<i>Module C1 Demolition (recycling)</i>
Electricity	13,86 kWh/t	-
Diesel	3,77 l/t	13,83 l/t
Oxygen	-	6,75 kg/t
Propane	-	0,40 kg/t

Table 4 Declaration of data sources in EPD

Data Description	Data Source and type used (example shown)								
	A1		A2	A3	A4	A5	B	C	D
	A1.1 Crude metal supply (from slab, ingot)	A1.2 Semi finished metal supply (semi-finished coil, section, bar)							
Process Data Source (Trade association, specified database, or company specific)	e.g. worldsteel	e.g. worldsteel	e.g. GaBi	e.g. Company X	e.g. GaBi	e.g. GaBi	e.g. GaBi	e.g. GaBi	e.g. worldsteel
Process Data Type (Generic, Regional Average (specify), or Supply Chain Specific* [*single company or a group of named companies in a collective])	e.g. European Average	e.g. European Average	e.g. European Average	e.g. Supply Chain Specific	e.g. European Average	e.g. Germany Average		e.g. European Average	e.g. European Average
Scenario Data source (e.g. distance/recycling rate)	N/A	N/A	e.g. distance Company X specific	N/A	e.g. distance Company X specific	e.g. Industry data	e.g. Maintenance for coatings	e.g. European Recycling rates	N/A

Data quality



Gardermoen, Oslo
Foto: Wikimedia Hiroto T

The key to sustainable construction is to build beautiful houses that people want to live and work in, houses that can change with changing requirements, that do stay healthy, economical and worthwhile to own and also make you happy when you look at them.

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