

# Attachment 1. Technical, industrial and business model parameter-option matrices

	Parameter	Sub-parameter	Design options per parameter	
Technical model	TP1 Materials / resources 1-36	TP1.1 Biological materials 2,3,5-7,9,11,13,16-21,23-25,29,30,33-36	TP1.1-1 Renewable material 1,2,5-7,9,11-13,15,16,18-21,23-25,28,30,34	
			TP1.1-2 Bio-based material 1,3,5,6,13,16,20,23-25,27,30	
			TP1.1-3 Non-toxic (healthy) material 5-7,9,11,13,15,18-20,22,23,25,26,29,30,34	
			TP1.1-4 Safe material 2,3,5,6,11,23-25	
			TP1.1-5 Low-impact material 6,9,16,20,23,24,27,33	
		TP1.2 Technological materials 2,3,5-7,9,11,13,16-25,29,30,33-36	TP1.1-6 Biodegradable material 1,3,5,6,9,11-13,16,18-23,25,34,36	
			TP1.2-1 Durable or high-quality material 3,6,7,13,16,18,20,23,25,26,29,30,34	
			TP1.2-2 Virgin material 1,3,6,7,12,16,19-22,26,27,32-34	
			TP1.2-3 Recyclable material 1,4,6-9,11-13,15,16,18-21,23-26,28,29,33,34	
			TP1.2-4 Non-virgin (i.e., re-used, recycled) material 1-3,5-9,12,13,16,18-21,23-27,29,33,34	
	TP2 Energy 1-7,9-13,15-33,35,36	TP2.1 Type of energy (in use phase) 1-7,9-11,18,19,21,23,27,30,33,35,36	TP2.1-1 Natural gas	
			TP2.1-2 Grey power (i.e., electricity from fossil resources) 18,30	
			TP2.1-3 Diesel / petrol 18,21,30	
			TP2.1-4 Bio gas / biofuel 9,21	
			TP2.1-5 Hydrogen power	
			TP2.1-6 Green alternating current (e.g., transformed electricity from PV-cells) 30	
			TP2.1-7 Green direct current (e.g., electricity from PV-cells) 18	
			TP2.1-8 Heat from thermal storage 18	
			TP2.1-9 On-site pre-heating (e.g., horizontal ground loop)	
			TP2.1-10 City heating	
			TP2.1-11 Block heating	
			TP2.1-12 Off-site power (i.e., grid energy) 18,30	
			TP2.1-13 On-site power (i.e., independent generated power) 18,36	
	TP3 System Architecture 1,3,4,6,12-14,18,19,22,25,29,30,32,33,35	TP3.1 System elements 1-4,6,8,12-14,16,18,19,22,25,29,30,33,35	TP3.1-1 Built environment 7,13,19	
			TP3.1-2 Building 3,7,13,19,20,32	
			TP3.1-3 Building component 7,13,19,20,32	
			TP3.1-4 Product 1-7,9-36	
			TP3.1-5 (Sub-)component 1-3,7-9,12,15,18-26,29,32,35	
			TP3.1-6 Part 1,3-7,9,12-15,18,20-22,24,26,27,29,33-35	
			TP3.1-7 Material 1-36	
			TP3.1-8 Resource 1,5,7-11,13,15-34,36	
	TP4 Amount 1,4-10,12,13,16-19,21,24,25,29-34	TP4.1 Amount of elements or resources 1,4-10,12,16,18,19,21,24,25,29-32,34	TP4.1-1 Number of system elements (i.e., number of products, parts) 16,17,30,34	
			TP4.1-2 Amount of resources (e.g., in [kg], [m <sup>3</sup> ], [kwh]) 4,7-9,12,16,21,25,29,32	
	TP5 Time(s) 1-23,25-30,32-35	TP5.1 Amount of lifecycles 1-7,9-13,15-30,32,35	TP5.1-1 Single lifecycle 4,19,21,23,25-28,34	
			TP5.1-2 Multiple lifecycles 1,3,4,6,10,16-18,20-23,25-27,33,34	
		TP5.2 Expected lifespan 1-7,9-16,18-27,29-35	TP5.2-1 Very short 16	
			TP5.2-2 Short 1,3,7,11,13,16,18-20,22,23,25,32	
			TP5.2-3 Medium	
	TP6 Lifecycle stage 3,18,24,33	TP6.1 Lifecycle stage of building component, part, material 3,18,24,33	TP5.2-4 Long 1-5,7,9-11,13,15,16,18-22,25-27,30-32,34,35	
			TP5.2-5 Very long 29	
			TP6.1-1 Introduction 3,18	
			TP6.1-2 Growth 3,18	
			TP6.1-3 Maturity 3,18,33	
			TP6.1-4 Decline 3,18	
			Narrowing loops	TP7.1 Design for material reduction 3-5,7-10,12,13,15,16,19,21,23-27,29,31,33
TP7.1-2 Apply re-used, recycled, or low-impact materials 6,9,13,15,16,23,24,33				
TP7.1-3 Find local industrial symbiosis for needed resources 5,8,9,18,21,23				
TP7.1-4 Reducing material in (re)production (e.g., less cutting losses) 7,9,13,16,19,23-25,29				
TP7.1-5 Reducing packaging material (i.e., light weighting or minimisation) 9,15,23,25				
TP7.2 Design for energy reduction 3,4,7,9,13,16,19,20,23,25,27,31,33				TP7.1-6 Reduce material in building component (i.e., light weighting, remove redundant parts, minimise the building component) 3,5,7,9,13,16,19,21,23-25,29,32,33
				TP7.1-7 Reduce use-phase material (i.e. water, consumables) 7,9,25
				TP7.1-8 Use bio-inspired (biomimetic) design for biological loop designs 6,18,19,23-25
	TP7.1-9 Reduction or smart-use of critical and scarce materials (e.g., critical materials only for short-cycled use) 9,17			
	TP7.2-1 Design for a lean, clean, green production process 3,7,9,16,20,21,23-25,27			
TP7.3 Design for attachment 3-5,9,11,12,14,16,20-25,32,34,35	TP7.2-2 Balance component lifespan with energy performance prospects 9	TP7.2-3 Minimise energy in use-phase (e.g., passive design) 3,7,9,13,23,27		
		TP7.2-4 Optimise energy efficiency in use-phase (e.g., insulate) 5,7,23,24,33		
		TP7.2-5 Recover and exchange energy 13		
		TP7.2-6 Use renewable energy sources in (re)production and use 6,7,11,15,18-21,23,24,28,30,33		
		TP7.3-1 Design for easy use 14		
		TP7.3-2 Design for high safety standards 4,9,14,19,29,33		
		TP7.3-3 Add surplus quality 3,4,7,14		
		TP7.3-4 Design for user trust (e.g., ensure reliability of design) 3,4,7,14,22,32		
		TP7.3-5 Design for comfortable use 14		
		TP7.3-6 Facilitate democratic or open-source design and use 3,6,13,16,20,23		
		TP7.3-7 Design for emotional desirability (e.g., provide emotional relevant narrative, service, information, meaning) 3,11,12,14,16,22,23,25,32,34,35		
		TP7.3-8 Design for strong social value (e.g., provide services and information relevant to the users social environment) 14		
		TP7.3-9 Make a timeless base design 3,4,23,25,35		
		TP7.3-10 Facilitate customisation and adjustment options to reflect user's emotional, social values, and user preferences 3,4,12,14		
		TP7.3-11 Balance quality with user expectations 3,14		
TP7.3-12 Make a design which ages well and builds a personal patina 14				
TP7.4 Design for reliability and durability 1,3-7,9-11,13,14,16,18,20-27,29,31-35	TP7.3-13 Make an innovative (i.e., novel, sufficiently complex) design 14	TP7.3-14 Offer upgrades to keep user interest 4,14,35		
		TP7.3-15 Design to facilitate interaction with user (to enhance curiosity, understanding, attractiveness, attachment) 3,14,25		
		TP7.4-1 Consider obsolescence, growth and future scenarios 3,4,6,8,11,13,18,33,35		
		TP7.4-2 Select an appropriate lifespan for the component / part / material 3,13,16,25,29		
		TP7.4-3 Make a highly functional design 13,15,16,24,32		
		TP7.4-4 Anticipate on new regulations 4,13,18,29,35		
		TP7.4-5 Dimension for unintended / stressed use 14,23,29,35		
		TP7.4-6 Over-dimension or duplicate critical parts 9,13,14,35		
		TP7.4-7 Design out moving parts 14,35		
		TP7.4-8 Only include electronic parts consciously 9,18		
		TP7.4-9 Evaluate, and optimise the component, (sub)components and parts on quality, and design-out component failures (i.e., iterative design) 3,5,6,14,23,25		
		TP7.4-10 Design for resistance to wear 22,35		
		TP7.4-11 Use durable materials 9,13,14,16,34		
		TP7.4-12 Design so (sub)components and parts can withstand repetitive assembly and disassembly 3,29		
		TP7.4-13 Design robust interfaces (i.e., joints or touch surfaces) between components and parts 14,29		
TP7.4-14 Select materials which can withstand shock and vibration impacts 13,14				
TP7.4-15 Reduce coated, painted or plated materials 14,35				

Technical model

TP7 Circular design strategies  
1.3-7.9-16.18-21.23-27.29.30.32-35

Slowing loops

Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.4-16 Prevent discolouration of materials	14,35
		TP7.4-17 Avoid corrosive, toxic and aging materials	11,34,35
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.4-18 Use (a limited variety of) compatible base materials	14
		TP7.4-19 Use compatible fastener to base materials (to prevent corrosion)	35
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.4-20 Design for simple use of the designed building component	14
		TP7.4-21 Limit number of components, parts, and materials	3,14
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.4-22 Design so dirt has no chance to build up (no edges, ridges or holes)	29
		TP7.4-23 Decomplexify the design of (sub)components and parts	3,14,24
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.5-1 Company standardisation	3,14,15,18
		TP7.5-2 Industry standardisation	3,14,29
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.5-3 Part standardisation	3.4.9.14.18.22.24.33-35
		TP7.5-4 (Sub)component standardisation	3.4.14.15.18.24.29.33.34
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.5-5 Product / building component standardisation	3.4.6.14.18.34
		TP7.5-6 Measurement standardisation	3.13.29.33
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.5-7 Joint standardisation	3.15.24.29.33
		TP7.5-8 Joint piece (i.e., adaptor) standardisation	3,14,29
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.5-9 Tool standardisation	14
		TP7.5-10 Interface standardisation	4,14,22,33,35
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.5-11 Performance test standardisation	35
		TP7.6-1 Make the design easy to open / accessible	3.4.9.14.18.29.32,33,35
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.6-2 Position maintenance points close together	9,14,18
		TP7.6-3 Indicate handling and lifting instructions on components and parts (e.g., lifting handles, eyes)	14
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.6-4 Large (sub)components and parts should be mounted on hinges, slides or runners to offer better access during maintenance and repair	14
		TP7.6-5 Design an opening plane	35
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.6-6 Design for safe maintenance (e.g., avoidance of toxic materials)	9,14,18
		TP7.6-7 Design maintenance points so personnel can keep a comfortable posture during maintenance.	14
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.6-8 Design so maintenance can be done by few, and unskilled personnel	6,14,23
		TP7.6-9 Design so it can only be maintained / repaired in the right way	4,14
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.6-10 Design so maintenance is fast	9,14,18,21,22
		TP7.6-11 Optimise sequence for maintenance and repair	14,33
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.6-12 Keep cleaning and repair intensive parts accessible	3.4.14.35
		TP7.6-13 Standardise design fit and assembly sequence	29
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.6-14 Design so the 'weakest link' is easy (and cheap) to replace	14,18
		TP7.6-15 Provide sufficient space around parts to prevent secondary damage	14,32
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.6-16 Design to allow on-site maintenance	3.4.23.35
		TP7.6-17 Enclosed maintenance and repair instructions	1.3.9.14.23.24.32.34
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.6-18 Make an uncomplicated design	12,14,18
		TP7.6-19 Make a modular design	1.3.4.6.7.9.12.14.17.18.20.21.23-25.29.33,35
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.6-20 Separate parts based on technical lifespan and function	3,18,29
		TP7.6-21 Align the maintenance, repair and replacement cycle of (sub)components and parts	33,35
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.6-22 Reduce variation in lifespans of (sub)components and parts to ease maintenance planning and prevent premature replacements	14
		TP7.6-23 Minimise number of components and parts to ease repairs	9,14,33
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.6-24 Use standardised, universally applicable components and parts	14,33,34
		TP7.6-25 Components, parts which are often replaced need to be easy to handle (i.e., standard size/weight, no sharp edges, easy to transport)	14,18
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.6-26 Design (and offer) spare parts	1.3.6.9.21.24.34
		TP7.6-27 Make products stackable (to ease transport for repairs)	35
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.6-28 Use fasteners which allow fast maintenance and repair (no wet-joints)	14,18,33
		TP7.6-29 Select fasteners with regard to maintenance frequency and availability of tools at replacement location	14
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.6-30 Minimise number of fasteners to make maintenance and repair easy	9,14,33
		TP7.6-31 Design joints which do not require tools for maintenance and repair	14
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.6-32 Use smooth surfaces to ease cleaning	29,33,35
		TP7.6-33 Use materials that can stand cleaning and maintenance	3,29,35
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.6-34 Use materials that can be easily repaired, replaced, touched-up	14
		TP7.6-35 Apply self-healing or self-cleaning materials	3,23
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.6-36 Include a component and part passport	12,13,20,24,32,33
		TP7.6-37 Make the product easily testable (e.g., include self-use diagnostic tools)	3.4.9.14.18.33,35
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.6-38 Integrate (live)monitoring of performance in design	4.6.7.12-14.18.20.24.30.31,33,35
		TP7.7-1 Separate the component in sub-components and parts based on functional lifespan (e.g., building 'support' and 'infill')	3,12,13,14,15,18,23,29
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.7-2 Separate building components into 'shearing layers': site, structure, skin, services, space-plan, stuff	13,19
		TP7.7-3 Make a modular design	1.3.4.6.7.9.10.12.14.15.17.18.20.21.23-25.29.33,35
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.7-4 Make to-be-updated functions independent of the base of the design	12-15,18
		TP7.7-5 Design excessive functionality and performance in the component base	14
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.7-6 Leave room in component / product for upgrades	13
		TP7.7-7 Allow for technical, functional and aesthetic customisation	3-6.7.13.14.18,22,33
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.7-8 Plan for scenario's of change	3.4.6.7.13.14.18,19
		TP7.7-9 Design (and offer) techn., funct. or aesth. upgrades & add-ons	1.3.5.9.13.14.18.23,33,34
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.7-10 Design versatile parts which could perform several functions	14,24
		TP7.7-11 Use standardised (sub-)components and parts to ease updates	3,14,15,18
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.7-12 Make products and component stackable to ease transport	3,15,35
		TP7.8-1 Easy (enclosed) dis-, and reassembly instructions	32,33
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.8-2 Provide easy access to joining, breaking, cutting points	9,14,29,33,35
		TP7.8-3 Design for automated disassembly	29
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.8-4 Use assembly methods that allow disassembly without damage to re-usable components	9,29,33,35
		TP7.8-5 Minimise number of components and parts	14,24,29,33,35
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.8-6 Use standardised and modularised components	14,15,29,33
		TP7.8-7 Keep drainage points accessible	9,14
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.8-8 Optimise and simplify sequence for dis-, and re-assembly	4,33,35
		TP7.8-9 Design so sequence independent dis-, and re-assembly is possible	33,35
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.8-10 Keep one surface for grasping	14,29,33,35
		TP7.8-11 Prevent the need for turning	14,35
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.8-12 Design for a linear and unified disassembly direction	14,33
		TP7.8-13 Simplify and standardise components, and the dis-, and re-assembly fit	29,33,35
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.8-14 Apply a loose fit for easy re-assembly	33,35
		TP7.8-15 Mark and label (important) disassembly joints	14,29,33,35
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.8-16 Limited number of different connections	4,14,24,29,33,35
		TP7.8-17 Limited number of connections	4.9.14.18.24,29,33,35
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.8-18 Apply (grasp fit) click connections	29,33,35
		TP7.8-19 Avoid or limit non-rigid parts	14,29
Design for TP7.5 standardisation and compatibility	3.5.9.11.13-15.18.21-24.29.33-35	TP7.8-20 Use standardised and simple joints	14,24,33
		TP7.8-21 Use easy and fast dis-, and remountable connections	3.4.9.13.15.18.23.24.29.33,35
Design for ease of TP7.6 maintenance and repair	1.3-7.9.14.16.18.21-25.27.29.32-35	TP7.8-22 Use easy to destroy joints	35
		TP7.8-23 Avoid wet joints (i.e., welded or poured)	4,14,29,35
Design for TP7.7 upgrades and adjustments	1.3-7.9.12-15.18.20-25.27.29.32,34,35	TP7.8-24 Avoid (non-soluble) adhesives	3.4.14.15.23.29.32,33,35
		TP7.8-25 Design so easy or no tools are needed for dis-, and re-assembly	4.9.18.23.24.29,33,35
Design for dis-, and re-assembly TP7.8	3-5.9.11.13-15.18.19.21-25.29.31-35	TP7.8-26 Avoid metal inserts in plastic parts	14,33,35
		TP7.8-27 Avoid materials which are likely to damage machinery	14

Technical model		Closing loops		TP7.9 biodegrading and recycling				
				TP7.9-1	Make disassembly easy, or not needed for recycling	4,18,22,29		
				TP7.9-2	Use highly recyclable / biodegradable materials	4,6,7,13,18-20,23-25,27,29,33,34		
				TP7.9-3	Anticipate material recycling / biodegradation routes	4,6,8,13,18,19,25,33		
				TP7.9-4	Use appropriate biological or technological materials	6,7,16,20,23,25,29,34,35		
				TP7.9-5	Separate parts at material boundaries (mono-materials)	3-6,9,13,15,16,18,20-22,24,29,32-35		
				TP7.9-6	Limit number of materials	4,9,14,24,29,33,35		
				TP7.9-7	Use recycling (process) compatible materials	4,13,14,18,24,29,32,33,35		
				TP7.9-8	Use common materials (to limit the number of recycling streams)	9,13,33,35		
				TP7.9-9	Use break lines (for destructive recycling)	4,33,35		
				TP7.9-10	Use recycle compatible materials for base and fasteners	24,29,33,35		
				TP7.9-11	Keep parts of the same material together	14,35		
				TP7.9-12	Provide easy access to toxic, valuable or re-usable parts / materials	14,29,33,34		
				TP7.9-13	Keep toxic materials grouped together, sealed and easy to remove	14,29,35		
				TP7.9-14	Keep critical, valuable, re-usable parts and materials grouped together	4,33,35		
				TP7.9-15	Prevent secondary (non-compliant) paint and coating	4,14,29,33,35		
				TP7.9-16	Make components, parts stackable to ease re-loops	14,25,35		
				TP7.9-17	Minimise product volume to ease relooping	9,14,23,25,35		
				TP7.9-18	Provide markings or different colours to indicate material types	4,9,14,16,18,24,26,29,33,35		
				TP7.9-19	Provide disposal or recycling instruction	24,32,33		
				TP7.9-20	Include material passport (e.g., in BIM)	6,12,13,16,19,20,26,32		
Industrial model		Partners in supply chain or value network		IP1.1				
IP1	Key partners	1-11,13,15,17-28,30,33,36	IP1.1	Partners in supply chain or value network	1-11,13,15,17-28,30,33,36	IP1.1-1	Government	2,3,8,9,12,17,18,20-22,24-26,29-32
						IP1.1-2	Building owner	13,19
						IP1.1-3	Expert (e.g., designers, consultants)	1-3,6,8,11,13,15-19,21,24-26,31-33
IP2	Key activities	1-10,13,15,17-22,25-36	IP2.1	Activities	1-11,15,17-22,25-33,38	IP2.1-1	Financing	3,4,9,10,13,18,31
						IP2.1-2	Manufacturing materials	1,3,4,7,9,13,18,21-23,26,27,35
						IP2.1-3	Manufacturing parts	3-5,7,13,18,21,22,26,33,35
IP3	Key resources	2,3,5,6,17-22,26-28,30-33,36	IP2.2	Re-loop activities	1-13,15-22,25-27,29-38	IP2.1-4	Manufacturing (e.g., product / building component)	1,3-9,11,13,15,16,18-27,29-35
						IP2.1-5	Transporting	1,3,4,8,9,14,15,18,21,23,24,30,33
						IP2.1-6	Selling	1-6,9-13,17-22,24-27,30-32,34,35
				IP2.1-7	Installation / assembly	3,6,9,10,14,18,24,26		
				IP2.2-1	After sales support	3,9,18,31,34		
				IP2.2-2	Maintenance	1-8,10,13-15,17-21,23-25,29-31,33-35		
				IP2.2-3	Refilling	6,12		
				IP2.2-4	De-, re-installation	3,6,13,18,33,35		
				IP2.2-5	Repairing	1-7,9-11,14,16,18-27,29-36		
				IP2.2-6	Refinancing	18		
				IP2.2-7	Recovering or collecting	1,3-10,12,13,15,16,18-27,29-35		
				IP2.2-8	Re-transporting	3,5,15,18,21,23,25,29,30,33		
				IP2.2-9	Sorting	4,9,12,15,18,19,21,22,29,32,34		
				IP2.2-10	Re-using	1-7,9-13,15-27,29,30,32-36		
				IP2.2-11	Refurbishing	1-7,9,10,12,13,15,17-23,25,29,32,35		
				IP2.2-12	Remanufacturing	1-7,9,10,13,15,17,18,20-27,29,31-35		
				IP2.2-13	Reselling	1-3,5,9,10,12,17,18,20-24,26,27,32,34,35		
				IP2.2-14	Dis-, reassembly (or demolition)	3-7,9,10,12,13,15,18,19,21,23-25,29-35		
				IP2.2-15	Re- or upcycling	1-13,15-27,29-36		
				IP2.2-16	Biodegrading (e.g., composting or anaerobic digestion)	3,5-7,9,12,13,16,18,20,21,23-25,34,35		
				IP2.2-17	Recovering (i.e., energy recovery through combustion)	1,3,4,6-9,11-13,18,20-23,25,26,29,32-35		
				IP2.2-18	Monitoring, testing or informational feedback provision	1,3,4,6,7,9,10,12-14,17,18,20-22,24,26,28,30,31,33-35		
				IP2.3	(Re-)production process per (re)activity	1-4,6,8-12,15,16,18,20-25,27,29,31-34,36		
				IP2.3-1	(Re-)casting / (re-)melting	3,5,6,33		
				IP2.3-2	Imaging and (re)coating			
				IP2.3-3	(Re)moulding	23,33		
				IP2.3-4	(Re)forming			
				IP2.3-5	Machining (e.g., milling, sawing, drilling)			
				IP2.3-6	Welding			
				IP2.3-7	De-, and re-fastening			
				IP2.3-8	Adhesive bonding			
				IP2.3-9	Crushing / shredding	3,4,9,18,22,32,34		
				IP2.3-10	Anaerobic digestion and biochemical extraction	7,18,21		
				IP2.3-11	Additive manufacturing - 3D printing	3,7,11,12,15,20,21,23,34		
IP3	Key resources	2,3,5,6,17-22,26-28,30-33,36	IP3.1	Facilities for activities	1,3-6,10-12,15,20,27,32,33	IP3.1-1	Mine	1
						IP3.1-2	Factory or production facility	1,4-6,9-11,15,31,32
						IP3.1-3	Warehouse	4
				IP3.1-4	(Re)distribution centre			
				IP3.1-5	Digital platform	1,3,5,6,9-12,18-22,26,27,31,32,34		
				IP3.1-6	Shop	3,5,9,10,12,16,18,21,22,24,31,35		
				IP3.1-7	(Re)makerspace	11		
				IP3.1-8	Home or site of user	1,3,6,9,11,21,23,30,32		
				IP3.1-9	(Re-)sorting centre			
				IP3.1-10	Second-hand shop	5,23		
				IP3.1-11	Repair café or repair shop	3,5,21,31		
				IP3.1-12	Return street			
				IP3.1-13	Re-factory	32		
				IP3.1-14	(Re-)print shop			
				IP3.1-15	Recycling facility	1-3,5,6,9,12,32		
				IP3.1-16	Urban mine			
				IP3.2	System elements	2,3,6,12,18,19,29,30,33		
				IP3.2-1	Built environment	7,13,19		
				IP3.2-2	Building	3,7,13,19,20,32		
				IP3.2-3	Building component	7,13,19,20,32		
				IP3.2-4	Product	1-7,9-36		
				IP3.2-5	(Sub-)component	1,3-7,9,12-15,18-26,29,32-35		
				IP3.2-6	Part	1,3-7,9,12-15,18,20-22,24,26,27,29,33-35		
				IP3.2-7	Material	1-36		
				IP3.2-8	Resource	1,5,7-11,13,15-34,36		
				IP4.1-1	Truck	3		
				IP4.1-2	Van			
				IP4.1-3	Car			

Industrial model	IP4 Transport / logistics	IP4.1 Mode of transport	3,6,7,15,21,23,30	IP4.1-4	Freight ship	3,21,32
				IP4.1-5	Freight train	
				IP4.1-6	Bike	
		IP4.1-7	Bulky transport			
		IP4.1-8	Dense transport	3		
		IP4.2 Distance	3-7,9,11-13,15,18-21,23,27,29,30,33,35	IP4.2-1	At home / on site (i.e., ± 0 km)	1,9,15,18,19,23,30
	IP4.2-2			Local (i.e., city ± 20 km)	1,4-7,9,11-13,15,18,19,21,25,30,35	
	IP4.2-3			Regional (i.e., ± 50 km)	23,30	
	IP4.2-4			National (i.e., ± 200-300 km)	12,18,33	
	IP4.2-5			Continental (i.e., ± 300-2000 km)	32	
	IP4.2-6			Global	4,11,17,23,30,32,33	
	IP5 Process energy	IP5.1 Type of energy	3,6,7,15,16,18-23,27,29,30,33,36	IP5.1-1	Natural gas	
IP5.1-2				Grey power (i.e., electricity from fossil resources)	18,30	
IP5.1-3				Diesel / petrol	18,21,30	
IP5.1-4				Bio gas / biofuel	9,21	
IP5.1-5				Hydrogen power		
IP5.1-6				Green alternating current (e.g., transformed electricity from PV-cells)	30	
IP5.1-7				Green direct current (e.g., electricity from PV-cells)	18	
IP5.1-8				Heat from thermal storage	18	
IP5.1-9				On-site pre-heating (e.g., horizontal ground loop)		
IP5.1-10				Industrial symbiosis	21	
IP5.1-11				Off-site power (i.e., grid energy)	18,30	
IP5.1-12				On-site power (i.e., independent generated power)	18,36	
Business model	BP1 Key partners	BP1.1 Partners in supply chain or value network	1-11,13,15,17-28,30-33,36	BP1.1-1	Government	2,3,8,9,12,17,18,20-22,24-26,29-32
				BP1.1-2	Building owner	13,19
				BP1.1-3	Expert (e.g., designers, consultants)	1,3,6,8,11,13,15-19,21,24-26,31-33
				BP1.1-4	Third-party financier	2,6,10,13,18,31,32
				BP1.1-5	Material supplier	1,3,6,17,22,26,28,32,33
				BP1.1-6	Part supplier	2,3,5,7,9,14,15,17-22,28,33
				BP1.1-7	Manufacturer (e.g., product or building component manufacturer)	1-7,9,10,12-16,20-22,24,26-28,30-34
				BP1.1-8	Transporter	2,4,5,8,18,21,26
				BP1.1-9	Specialised dealer	1-3,5,6,8-10,12,16,18,21,22,24,32
				BP1.1-10	Service provider	1-7,9,10,12,14,17-22,26,27,30,31,33
				BP1.1-11	Contractor	19
				BP1.1-12	User	1-7,9-14,16-25,27,29-36
				BP1.1-13	Maintenance specialist	3,6,14,18,21,30,33
				BP1.1-14	Collector	4,5,9,12,18,21,22,26,32
				BP1.1-15	Second-hand reseller	1-3,5,10,18,21,22,34
				BP1.1-16	Specialised refurbisher	1,3,10,18,21,22,33,34
				BP1.1-17	Specialised remanufacturer	1,3,21
				BP1.1-18	Specialised recovered material reseller	1,10,21,22,27
				BP1.1-19	Specialised recycler	1,3-5,10,12,16-22,26,29,30,32,33,35
	BP2 Customer segments	BP2.1 Owner	1-7,10,11,13,17-27,30	BP2.1-1	Building owner as owner	19
				BP2.1-2	Manufacturer as owner	1-4,6,10,18-20,24,25,31,32,34
				BP2.1-3	User as owner	1-5,9-11,17,18,20-22,24,30,32,34
				BP2.1-4	Specialised dealer as owner	18
				BP2.1-5	Service provider as owner	1,3,9,10,17,18,20,22,30
				BP2.1-6	Financier as owner	10
				BP2.1-7	Contractor as owner	
	BP2.2 Customer	2,3,6,9,10,12,17,18,20-22,24,26-	BP2.2-1	Building owner as customer (i.e., landlord, housing association, investor)		
			BP2.2-2	User as customer (i.e., home-owner or tenant)	2,10,31	
	BP3 Supply chain relations	BP3.1 Primary contact customer	18,28	BP3.1-1	Building owner as contact	
				BP3.1-2	User as contact	10,18
				BP3.1-3	Dedicated personal assistance	9,17,26,31
		BP3.2 Kind of customer relationship	1-3,6,9,11,17-22,26,28,31,34	BP3.2-1	Mixed human and auto. interaction (e.g., help-desk and online website)	31
				BP3.2-2	Self-service automated	1,3,9,17,21,26,31
				BP3.2-3	Contractor as primary supply chain partner / contact	
		BP3.3 Primary supply chain partner / contact	1,2,28	BP3.3-1	Building owner as primary supply chain partner / contact	1
				BP3.3-2	Manufacturer as primary supply chain partner / contact	1
BP3.3-3				Specialised dealer as primary supply chain partner / contact	1	
BP3.3-4				Contractor as primary supply chain partner / contact		
BP3.3-5				Buyer-supplier relationship	17,22,31	
BP3.3-6				Supply chain partner-, or customer consultation	3,18-22,24,25	
BP3.4 Kind of collaboration	1-3,5-8,10-12,15-25,27-29,31,32,34	BP3.4-1	Strategic alliance between (non-competing) partners	1,7,8,10,12,17,21,27,31,32		
		BP3.4-2	Industry association	8		
		BP3.4-3	Co-creation	2,3,6,10,11,16-22,28,31,32		
		BP3.4-4	Competition	31		
		BP3.4-5	Building team	19		
		BP3.4-6	Joint venture	6,10,18,31		
BP4 Cost structure	BP4.1 Cost proposition	3,18	BP4.1-1	Cost driven (i.e., low cost to manufacture and install)	3,4,18	
			BP4.1-2	Value driven (e.g., high residual value, high user value)	30	
			BP4.1-3	Low operational cost driven (e.g., low maintenance costs)	9	
			BP4.1-4	Product-service system (PSS)		
BP5 Revenue streams	BP5.1 Financial arrangement	1-4,7,10,11,15,17-21,28,30-32,34,36	BP5.1-1	Sale	1-6,9,12,17-22,24-27,30-32,34	
			BP5.1-2	Sale with warranty	1,3,5,9,12,16,21,24,32,34	
			BP5.1-3	Sale and take-back guarantee	1,6,9,21,23	
			BP5.1-4	Sale and buy-back guarantee	1,9,10,12,18-22,27	
			BP5.1-5	Sale with deposit	5,9,10,21,22,32	
			BP5.1-6	Product-service system (PSS)	1-7,9-12,14,17,18,20-22,24,25,27,28,30,31,36	
			BP5.1-7	For-free	21,30	
			BP5.1-8	Product lease	1-3,5,9,10,17-21,24,25,27,30-32,34	
			BP5.1-9	Pay-per-use	1-3,5,6,9,10,17,18,20,21,31,34	
			BP5.1-10	Use subscription	2,6,10-12,17,18,20,26,31	
			BP5.1-11	Rent/hire	1,3,5,9,11,12,17,18,20-22,24,25,30,31	
			BP5.1-12	Pooling / sharing	1-3,5-7,9-12,18-25,27,30-32	
			BP5.1-13	Trading (fee)	1-3,5,6,9,12,18,21,22,25	
			BP5.1-14	Performance lease	1,3,4,6,10,12,17-20,31	
			BP5.1-15	Pay-per-service	1,5,6,9,10,12,17,18,20-22,27,31	
			BP5.1-16	Reward system (e.g., bonus-malus points, discount on new purchase)	5,9,10,12,18,21,22,31	
			BP5.1-17	Service subscription	6,10,17-19,25,27	
BP5.2 Income division	10,19,20,28	BP5.2-1	Income division per company	19		
		BP5.2-2	Income division in 'mini' coalitions	5,10,14		
		BP5.2-3	Income division over the value chain	5,10,14,19,20,22		
BP6.1 Product / service proposition	1-3,5-7,9,10,12,17-28,30-32,34,36	BP6.1-1	Building	13,19		
		BP6.1-2	Building components	19,34		
		BP6.1-3	Products	1-7,9-13,17-28,30-34		
		BP6.1-4	(Sub-)components or parts (e.g., for repair or updates)	1,3,5,6,9,12,18,20-22,24-27,34		
		BP6.1-5	Materials	1,5,9,12,18-22,25-27		
		BP6.1-6	Resources	1,5,9,12,18-22,25-27		
		BP6.1-7	Service (e.g., maintenance, advice, connecting, brokering)	1-7,9-14,17-28,30-35		
		BP6.1-8	Consumables	1,3,4,6,9,12,20,22,25,27,34		
		BP6.1-9	Use	1-6,9,12,17,18,20-22,24,25,27,30-32,34		
		BP6.1-10	Performance	1-6,9,12,17,18,20-24,27,31		
		BP6.1-11	Component use energy	12,18,20,22,25		
BP6.2 Value creation and delivery	1-3,5-7,9,12,17-21,24,26-28,30,31,36	BP6.2-1	Value through high service / performance / customer experience	1,5-7,9,12,17,18,21,27,30		
		BP6.2-2	Value through reduction of costs by encouraging sufficiency	1,5		
		BP6.2-3	Value through less space needed (through dematerialisation)	12,26		
		BP6.2-4	Value through (green) prestige or status	12,17,18,20,30		
		BP6.2-5	Value through lower initial investment	3,5,9,12,17,21,22,26		
		BP6.2-6	Value through lower total cost of ownership (TCO)	3,5,7,9-12,17-20,26,27		
		BP6.2-7	Value through lower energy costs	4,18,30		
		BP6.2-8	Value through higher level of quality of maintenance	13,18		
		BP6.2-9	Value through (access to) better / high-quality components	1,3-7,9,12,17,18,20-22,27,30,32		
		BP6.2-10	Value through less 'hassle'	3,5,6,9-12,17-21,26,27,30,32		
		BP6.2-11	Value through less consumption of materials / energy	5-7,10,12,18,21,22,27,30		

Business model	Value propositions 2-10, 12, 17-28, 30-34, 36	BP6.3 Value capturing 1-10, 12, 17-22, 24-28, 30, 31, 34	BP6.2-12 Value through better life cycle analysis (LCA) / climate performance	5-7, 9, 10, 12, 18-22, 24, 26, 28, 30	
			BP6.2-13 Value for risk reduction	12, 17, 18	
			BP6.2-14 Value through customisation options	3-7, 9, 11-13, 17, 18, 20, 21, 26, 30	
			BP6.2-15 Value through upgrade opportunities	5, 12, 18, 20, 21	
			BP6.2-16 Value through off-balance investment		
			BP6.2-17 Value through lower waste-disposal costs	12, 26	
			BP6.2-18 Value through higher end-value of building component / product	6, 12, 18, 20, 22, 27	
			BP6.3-1 Value through stable revenue streams	10, 12, 19, 20	
			BP6.3-2 Value through supply chain interest alignment / collaboration	1, 5, 9, 10, 18, 20-22, 24, 27, 31, 33	
			BP6.3-3 Value through green reputation for company	9, 12, 18, 20, 21	
			BP6.3-4 Value through becoming market leader	1, 24	
			BP6.3-5 Value through lower risk	1, 5, 6, 9, 12, 13, 18, 31, 32	
			BP6.3-6 Value through efficiency by integration of systems (e.g., train-metro)	7, 10, 18, 22, 31	
			BP6.3-7 Lower overall costs	1, 5, 6, 9, 10, 18, 21, 33	
			BP6.3-8 Value through long-term client relations	3, 9, 10, 12, 19-21, 25, 27, 31, 32	
			BP6.3-9 Value through increased (process) efficiency	1, 8-10, 12, 18, 20, 21, 27	
			BP6.3-10 Value through additional / untapped market share and revenue streams	1-3, 5, 8, 9, 12, 18, 20, 21, 25-27, 30, 31, 34	
			BP6.3-11 Value through lower resource costs	1, 5, 9, 10, 12, 20, 21, 26	
			BP6.3-12 Value through consistent resource supply	1, 3, 6, 9, 12, 18, 20, 21, 25, 27, 31-33	
			BP6.3-13 Value through less consumption of materials	1, 2, 5, 6, 9, 10, 12, 13, 21-28, 30	
	BP6.3-14 Value through better life cycle analysis (LCA) / climate performance	5-7, 9, 10, 12, 18-22, 24, 26, 28, 30			
	BP6.3-15 Value through lower logistic costs	8, 10, 12			
	BP6.3-16 Value through 'premium' cost price or higher margins (for quality product)	1, 5, 9, 12, 18, 21, 25, 27			
	BP6.3-17 Additional revenues from long lifespan of component	1-5, 10, 12, 13, 18, 20, 21, 25, 26, 34			
	BP6.3-18 Increased profit from reparability of component / part	1-3, 5, 10, 12, 18, 20, 21, 26, 27			
	BP6.3-19 Long-term customer loyalty / lock-in (i.e., repeat sales of consumables)	3, 5, 6, 9, 10, 12, 20, 22, 25, 32			
	BP6.3-20 Increased profit from end-value product / part (i.e., reusability)	1-6, 9, 10, 12, 18-22, 25-27, 29, 32-34			
	BP6.3-21 Increased profit from end-value material (i.e., re-use and recyclability)	1-3, 8-10, 12, 18-22, 25-27, 29, 31, 33, 34			
	BP6.3-22 Increased profit from energy savings	5, 7, 9, 20			
	BP6.3-23 Increased profit by saving on recycle costs	1, 8, 9, 12, 20, 21, 27, 29			
	BP6.3-24 Value through job / company growth	2, 9, 12, 13, 20, 21			
	BP6.3-25 Higher profit margins through service proposition	1, 3, 5, 9, 10, 12, 18, 21, 25, 27, 32			
	BP7 Key resources 2, 3, 5, 6, 17-22, 26-28, 30-33, 36	BP7.1 Key resources per supply chain partner 33, 36	2, 3, 5, 6, 17-22, 26-28, 30-33, 36	BP7.1-1 Physical resources (i.e., system elements and facilities for activities)	3, 6, 17, 18, 21, 22, 24, 26, 28, 30, 31
	BP8 Channels 2, 3, 6, 8, 10, 17-22, 26-28, 31, 33, 34, 36	BP8.1 Sale and (re)loop channels 2, 3, 6, 8, 10, 17-22, 26-28, 31, 33, 34, 36	2, 3, 6, 8, 10, 17-22, 26-28, 31, 33, 34, 36	BP7.1-2 Intellectual resources (e.g., partnership / IP / brand)	3, 6, 17, 18, 21, 22, 26, 31
				BP7.1-3 Human resources (e.g., skilled / unskilled employees)	3, 6, 17, 18, 26, 31, 36
				BP7.1-4 Financial resources (e.g., cash / finance capacity)	3, 6, 17, 21, 26, 31
				BP8.1-1 Online (re)store	1, 2, 9, 10, 12, 18, 20, 21, 31
				BP8.1-2 Customer community	3, 31
				BP8.1-3 Post-purchase customer support	3, 31
				BP8.1-4 Online (second hand) marketplace or platform	1, 3, 5, 6, 9-12, 18-22, 26, 27, 31, 32, 34
BP8.1-5 (Re)store				3, 5, 9, 10, 12, 16, 18, 21, 22, 24, 31, 35	
BP8.1-6 On phone sale					
BP8.1-7 Online repair site				32	
BP8.1-8 (Social) media advertisement	20				
BP8.1-9 (Social media) sales team or influencers	20				
BP9 Take back systems 1, 2, 4-6, 9, 10, 12, 16, 18-21, 23-27, 32, 34, 36	BP9.1 Facilities for take-back 1, 2, 4-6, 9, 10, 12, 16, 18-21, 23-27, 32, 34, 36	1, 2, 4-6, 9, 10, 12, 16, 18-21, 23-27, 32, 34, 36	BP9.1-1 (Nation wide) collection points	5, 10, 12, 21, 32	
			BP9.1-2 At home pick-up	9, 12, 18, 32	
			BP9.1-3 In store drop-off	9, 12, 21	
			BP9.1-5 Postal return	9, 12	
			BP10 Adoption factors 2, 6-9, 12, 13, 18-22, 24, 25, 32, 34	BP Circular business model adoption factors 2, 6-9, 12, 13, 18-22, 24, 25, 32, 34	2, 6-9, 12, 13, 18-22, 24, 25, 32, 34
BP10.1-2 Work from circular ambitions for a project and process	19, 33				
BP10.1-3 Expertise for developing and implementing circular innovations	6, 7, 9, 18-21, 24, 25, 28, 31-33				
BP10.1-4 Need for change (in society and businesses)	2, 18, 20, 21, 25, 28, 30				
BP10.1-5 CE concept accepted by society	13, 17, 20, 21				
BP10.1-6 Consistency in / long-term commitment by the supply chain partners	19, 30				
BP10.1-7 Trust between supply chain partners	1, 9, 10, 18, 19, 22, 31				
BP10.1-8 Supply chain acceptance and motivation	4, 9, 10, 13, 17-20, 22-25, 28				
BP10.1-9 Certainty of benefit for supply chain partners	1, 2, 9, 17-20, 22, 24, 32				
BP10.1-10 Supply chain alignment or collaboration possible	4, 9, 10, 18-20, 22, 24, 25, 27, 28				
BP10.1-11 Customer is aware of circular offer	4, 18, 23, 26, 30, 31				
BP10.1-12 Customer acceptance and demand	2, 3, 9, 10, 11, 18, 20-26, 30, 31, 34				
BP10.1-13 Customer behaviour	4, 7, 9-11, 20, 21, 28, 30-33				
BP10.1-14 Political acceptance	6, 20				
BP10.1-15 Driving policy and legislation	2, 5, 6, 8-10, 12, 13, 15, 17, 18, 20, 21, 24-26, 28, 30, 32				
BP10.1-16 Resource availability	2, 9, 18, 20, 21, 24, 26, 28				
BP10.1-17 Geographical proximity	9, 20, 21				
BP10.1-18 Technical ability	1, 2, 4, 7, 11, 16-18, 20, 21, 23, 28, 34				

### Legend sources

1	(Achterberg et al., 2016)	19	(Leising et.al, 2018)
2	(Antikainen and Valkokari, 2016)	20	(Lewandowski, 2016)
3	(Bakker et al., 2014)	21	(Lüdeke-Freund et al., 2018)
4	(Balkenende and Bakker, 2015)	22	(Mentink, 2014)
5	(Bocken et al., 2016)	23	(Mestre and Cooper, 2017)
6	(Ellen MacArthur Foundation and IDEO, 2017)	24	(Mendoza et al., 2017) and (Heyes, et al., 2018)
7	(Ellen MacArthur Foundation, 2015)	25	(Moreno, et al., 2016)
8	(Ellen MacArthur Foundation, 2013)	26	(Nussholz, 2017)
9	(Evans and Bocken, 2014) and (Evans and Bocken, 2013)	27	(Nußholz, 2017)
10	(Fischer and Achterberg, 2016)	28	(De Pádua Pieroni et al., 2018)
11	(Forum for the Future and Novelis, n.d.)	29	(Poppelaars, 2014)
12	(Forum for the Future and Unilever, n.d.)	30	(Scheepens, et al., 2016)
13	(Geldermans, 2016)	31	(Sempels, 2014)
14	(Gerritsen, 2015)	32	(The Great Recovery and RSA, 2013)
15	(Gispén, n.d.)	33	(Toxopeus et al., 2018)
16	(Goldsworthy, 2017)	34	(van Dam et al., 2017)
17	(Hofmann et al., 2017)	35	(van den Berg and Bakker, 2015)
18	(Joustra et al., 2013)	36	(WIITHAA, n.d.)