

Table S1. Parameter used for calculating sustainability impact indicator values.

Parameters	Amount	Unit	References
Raw materials (A1)			
Roundwood	58.2	EUR/m ³	[45]
Labour cost (Harvesting)	23.08	EUR/hr	[46]
Harvesting productivity	17.2	m ³ /hr	[47]
Harvester fuel consumption	1.426	l/m ³	[48]
Forwarder fuel consumption	0.53	l/m ³	[47]
Diesel cost	1.48	EUR/l	[49]
Manufacture process (A2)			
Productivity of sawnwood	59	m ³ /hr	Expert opinion, 2020a
Productivity of LVL production	9.4	m ³ /hr	Expert opinion, 2020b
Productivity of CLT production	1.7	m ³ /hr	Expert opinion, 2020c
Labour cost	24.17	EUR/hr	[46]
Total electricity consumption of Sawnwood production ¹	23	kWh/m ³	Expert opinion, 2020d
Total electricity consumption of LVL production ¹	256	kWh/m ³	Expert opinion, 2020f
Total electricity consumption of CLT production ¹	90	kWh/m ³	Expert opinion, 2020g
Electricity price	0.0709	EUR/kwh	[50]
Adhesive price	5.75	EUR/m ³	Expert opinion, 2020h
Transportation (A2/A4)			
Labour cost	0.69	EUR/m ³ -km	[51]
Energy cost	0.569	EUR/km	[51]
Fuel consumption (Lorry)	0.4	l/km	Expert opinion, 2020i
Employment			
Working hour (forestry) in full time equivalent (FTE)	2096	hr/year	[52]
Working hour (manufacture) in full time equivalent (FTE)	1730	hr/year	[52]
Accidents with 4 or more lost days in Forestry	8.73	accident/ million m ³	[53]
Number of accidents/ million working hours (gravel)	19.18	per year	[54,55]
Number of accidents/million working hours (concrete)	5	per year	[56]
Concrete element			
Sandwich or solid wall ²	328–441	EUR/m ³	
Hollow core slab ²	191–263	EUR/m ³	[27,28]
Floor ²	150–263	EUR/m ³	
Limestone productivity	13.2	Million ton/year	[55,56]
Cement productivity	1.423	Million ton/year	[57]

¹Electricity from grid mix and sourced 46% from renewables and 32% nuclear energy and 22% hard coal, natural gas, peat and others [58]. ²Average value was used in the calculation.

Table S2. Parameter used for calculating environment indicator values. Raw material for wood elements and transportation distance from site to site is adjusted according to the case study buildings. In concrete elements, the values after “±” sign indicate that it is added or deducted from the base value for the sensitivity analysis.

Wood elements	Per m ³	Raw material (A1)	Transport (A2)	Production (A3)	Transport (A4)	Total
Laminated veneer lumber (LVL) [32]						
Greenhouse gas emissions	kg CO ₂ e	11.1	12.8	197.5	9.1	231
Renewable used as energy	MJ	9.2	2.2	3080.0	13.4	3105
Non-renewable used as energy	MJ	9.9	212.0	2620.0	1270.0	4112
Cross-laminated timber (CLT) [33]						
Greenhouse gas emissions	kg CO ₂ e	32.6	14.2	7.6	38.4	93
Renewable used as energy	MJ	2.8	12.3	32.6	6.8	54
Non-renewable used as energy	MJ	173.0	334.0	200.0	132.3	839
Sawnwood (SW) [34]						
Greenhouse gas emissions	kg CO ₂ e	11.1	16.9	5.9	9.8	44
Renewable used as energy	MJ	2.2	5.4	687.0	0.0	695
Non-renewable used as energy	MJ	158.0	334.0	200.0	132.3	824
Concrete elements	Per tonne	Raw material (A1)	Transport (A2)	Production (A3)	Transport (A4)	Total
External wall [59,60]						
Greenhouse gas emissions	kg CO ₂ e	153.09 ± 77	9.19 ± 5	14.68 ± 7	12.06 ± 6	189 ± 95
Renewable used as energy	MJ	98.2 ± 49	0.237 ± 0.1	0.882 ± 0.4	1.11 ± 0.6	100 ± 50
Non-renewable used as energy	MJ	1060 ± 530	140 ± 70	351 ± 176	193 ± 97	1744 ± 872
Concrete wall [60,61]						
Greenhouse gas emissions	kg CO ₂ e	174 ± 87	10.1 ± 5	20.2 ± 10	9.02 ± 5	213 ± 107
Renewable used as energy	MJ	1.92 ± 1	0.05 ± 0.02	12.3 ± 6	0.12 ± 0.06	14 ± 7
Non-renewable used as energy	MJ	0 ± 0	160 ± 80	288 ± 144	139.17 ± 70	587 ± 294
Hollow core slab [60,62]						
Greenhouse gas emissions	kg CO ₂ e	193 ± 97	6.5 ± 3	64 ± 32	9.02 ± 5	273 ± 136
Renewable used as energy	MJ	100 ± 50	4.5 ± 2	423 ± 212	3.5 ± 1.8	531 ± 266
Non-renewable used as energy	MJ	1068 ± 534	88 ± 44	54 ± 27	63 ± 32	1273 ± 637
Solid floor [60,63]						
Greenhouse gas emissions	kg CO ₂ e	155 ± 78	9.48 ± 5	12.44 ± 6	12.07 ± 6	189 ± 95
Renewable used as energy	MJ	226 ± 113	0.57 ± 0.29	77.7 ± 39	1.11 ± 0.6	305 ± 153
Non-renewable used as energy	MJ	694 ± 347	125 ± 63	302 ± 151	193 ± 97	1314 ± 657