Material, material specification	Ref. unit	Calorific value [MJ]	PEI primary energy non-renew. [MJ]	PEI primary energy renew. [MJ]	GWP global warming [kg CO_2 eq]	ODP ozone depletion [kg R11 eq]	AP acidification [kg SO_2 eq]	EP eutrophication [kg PO_4 eq]	POCP summer smog [kg C_2H_4 eq]
Solid reinforced concrete floor									
Precast concrete element,									
2% steel (FE 360 B, C 35/40), 120 mm	1 m²		492	10	55	0.0000038	0.115	0.0149	0.0145
Recycling potential (FE 360 B, 85% primary)	15 kg		-178	-4.2	-11	2.5 E-07	-0.046	-0.0036	-0.0074
Total:	**1 m²**		**314**	**6.2**	**44**	**0.0000040**	**0.069**	**0.0114**	**0.0070**
Edge-nailed timber floor									
Pine, 12% moisture content (local), 180 mm	1 m²	1580	110	1712	-143	0.0000016	0.067	0.0074	0.0565
Structural steel, hot-rolled section (FE 360 B)	2.5 kg		59	1.4	4.1	0.0000002	0.013	0.0011	0.0020
Total:	**1 m²**	**1580**	**168**	**1713**	**-138**	**0.0000018**	**0.080**	**0.0085**	**0.0585**

B 10.1

The recycling potential of FE 360 B is added to the reinforced concrete floor because after the period of usage the structural steel can be recycled. On the other hand, the reuse of the metal nails in the edge-nailed timber element appears unlikely and is therefore not considered. The comparison reveals better values for the edge-nailed timber element virtually throughout. Its stored primary energy (calorific value) is released again upon combustion to produce electricity and heat.

Origin of the data

Two computer programs were used for the assessments in this book. The program used for Part B (GaBi 4) made use of data based on experience from cooperation with industry plus patents and trade literature. In contrast to this, the software for Part C (LEGEP) provides assessments using inventory analyses calculated on the basis of a theoretical means of production between 1990 and 1999 at the Bauhaus University in Weimar (IREB) and the University of Karlsruhe (ifib), and are based on acknowledged sources such as the Ecoinvent Database (Swiss Federal Institute of Technology). The underlying data is not always equivalent. Reasons for this include the different strategies with which processes are considered and the way the fundamental data is determined. One example that illustrates the different approaches is gypsum. Whereas LEGEP assesses natural gypsum, GaBi – in accordance with the percentages consumed in Germany – considers 50% natural gypsum and 50% desulpho gypsum (a by-product of flue gas desulpherisation in coal-fired power stations).
In order to guarantee consistency within the programs, no data was transferred between them. Deviations between the individual programs are denoted by * in order to show that further coordination work is required at this point. The best matches between the life cycle assessments of the programs can be found in the parameters non-renewable primary energy input and global warming potential.
The goal of comparability among life cycle assessment data has therefore not yet been completely realised.

B 10.1 Compilation of application-related life cycle assessment values using the example of an intermediate floor
B 10.2 Material-related life cycle assessment values for common building materials

Material, material specification data origin (see above)	Ref. unit	Calorific value [MJ]	PEI primary energy non-renew. [MJ]	PEI primary energy renew. [MJ]	GWP global warming [kg CO_2 eq]	ODP ozone depletion [kg R11 eq]	AP acidification [kg SO_2 eq]	EP eutrophication [kg PO_4 eq]	POCP summer smog [kg C_2H_4 eq]
Stone									
Granite* (India), polished, ρ = 2750 kg/m³	1 m³		9837	332	626	0.00012	4.5	0.45	0.35
Sandstone (local), sawn, ρ = 2500 kg/m³	1 m³		4099	153	253	0.000047	0.48	0.076	0.058
Slates* (local), ρ = 2700 kg/m³	1 m³		4608	165	286	0.000055	0.64	0.10	0.084
Marble (Italy), polished, ρ = 2700 kg/m³	1 m³		6749	249	422	0.000080	1.8	0.20	0.16
Loam									
Compacted loam*, ρ = 2200 kg/m³	1 m³		158	1	9.7	0.000003	0.068	0.011	0.011
Loam bricks (sun-dried)*, ρ = 1200 kg/m³	1 m³		1257	4	74	0.000003	0.12	0.011	0.016
Materials with mineral binders									
Mortars and screeds									
Anhydrite, comp. strength class 20, 2350 kg/m³	1 m³		655	11	43	0.000010	0.24	0.040	0.037
Magnesia *, comp. strength class 20, 2000 kg/m³	1 m³		2439	9.9	348	0.000016	0.44	0.060	0.070
Cement, comp. strength class 20, 2250 kg/m³	1 m³		2161	27	389	0.000020	0.85	0.13	0.099
Gypsum, class (for render) PIVa, ρ = 1300 kg/m³	1 m³		1477	9.6	177	0.000008	0.15	0.016	0.029
Lime-cement, class (for render) PIIa, ρ = 1500 kg/m³	1 m³		2675	28	448	0.000020	0.61	0.090	0.083
Masonry units									
Calcium silicate, ρ = 1800 kg/m³	1 m³		2030	117	247	0.000008	0.22	0.031	0.035
Concrete (paving), ρ = 2500 kg/m³	1 m³		1990	46	310	0.000013	0.55	0.080	0.056
Aerated concrete, ρ = 400 kg/m³	1 m³		1484	81	186	0.000010	0.29	0.051	0.040
Lightweight concrete*, ρ = 600 kg/m³	1 m³		787	35	97	0.000011	0.33	0.048	0.048
Concrete									
In situ concrete (C 25/30), ρ = 2340 kg/m³	1 m³		1549	17	251	0.000018	0.68	0.11	0.086
In situ concrete (C 35/45), ρ = 2360 kg/m³	1 m³		1764	23	320	0.000016	0.68	0.10	0.078
Precast concrete element, 2% steel (FE 360 B, C 35/45), ρ = 2500 kg/m³	1 m³		4098	86	455	0.000031	0.96	0.12	0.12
Boards									
Cement fibreboard*, ρ = 1750 kg/m³	1 m³		26839	116	2200	0.00020	4.3	0.60	1.04
Gypsum plasterboard* (type A), ρ = 850 kg/m³	1 m³		2655	251	150	0.000027	0.41	0.063	0.052

Material, material specification	Ref. unit	Calorific value [MJ]	PEI primary energy non-renew. [MJ]	PEI primary energy renew. [MJ]	GWP global warming [kg CO_2eq]	ODP ozone depletion [kg R11eq]	AP acidification [kg SO_2eq]	EP eutrophication [kg PO_4eq]	POCP summer smog [kg C_2H_4eq]
Ceramic materials									
Vert. perforated clay bricks, external wall, ρ = 670 kg/m³	1 m³		1485	638	95	0.000010	0.31	0.034	0.050
Clay bricks, internal wall, ρ = 750 kg/m³	1 m³		1663	715	107	0.000011	0.34	0.038	0.056
Solid engineering bricks (KMz), ρ = 1600 kg/m³	1 m³		4776	39	301	0.000029	0.79	0.084	0.14
Glazed stoneware*, ρ = 2000 kg/m³	1 m³		6322	0.060	393	8.50 E-07	0.96	0.067	0.084
Unglazed stoneware, ρ = 2000 kg/m³	1 m³		7160	0.070	445	8.50 E-07	1.00	0.069	0.093
Bituminous materials									
Pure straight-run bitumen* (B100–B70)	1 kg		45.6	0.010	0.37	0.0000010	0.0020	0.00028	0.0026
Polymer-modified bitumen (PmB 65 A)	1 kg		35.3	0.020	0.50	8.24 E-07	0.0018	0.00023	0.0019
Wood and wood-based products									
Sawn timber									
Pine, 12% MC* (local), ODD 450 kg/m³	1 m³	8775	609	9512	-792 [1]	0.000009	0.37	0.041	0.31
Western red cedar, 12% MC (N. Am.), ODD** 630 kg/m³	1 m³	12285	4485	14359	-907 [1]	0.000049	6.00	0.61	0.56
Teak, 12% MC (Brazil), ODD 660 kg/m³	1 m³	12870	3217	13435	-1013 [1]	0.000015	3.99	0.41	0.37
Wood-based products									
Glued laminated timber, 12% MC, ODD 465 kg/m³	1 m³	9300	3578	13870	-662 [1]	0.000053	1.57	0.19	1.0
3-ply core plywood, 12% MC, ODD 430 kg/m³	1 m³	8618	2617	9387	-648 [1]	0.000030	0.54	0.065	0.36
Veneer plywood (BFU), 5% MC, ODD 490 kg/m³	1 m³	10175	4729	15041	-636 [1]	0.000070	1.62	0.19	1.3
Particleboard (P5, V100), 8.5% MC, ODD 690 kg/m³	1 m³	13998	5818	12614	-821 [1]	0.000086	1.22	0.16	0.40
Oriented strand bd. (OSB), 4% MC, ODD 620 kg/m³	1 m³	12555	4593	16479	-839 [1]	0.000052	1.52	0.19	1.3
Med. density fibrebd. (MDF)*, 7.5% MC, ODD 725 kg/m³	1 m³	15843	9767	12495	-515 [1]	0.000066	1.48	0.28	1.4
Metals									
Ferrous metals									
Cast iron*, casting (GG20; secondary), GJL	1 kg		10	0.49	0.97	4.26 E-08	0.0013	0.00011	0.00018
Structural steel, hot-rolled section (FE360B)	1 kg		24	0.54	1.7	6.62 E-08	0.0051	0.00042	0.00082
Steel mesh as concrete reinforcement (secondary)	1 kg		13	0.24	0.83	9.40 E-08	0.0020	0.00016	0.00031
Weathering steel, cold-rolled strip (WT St 37-2), 2 mm	1 kg		26	0.56	2.0	8.30 E-08	0.0057	0.00046	0.00088
Stainless steel (V2A, X 5 CrNi 18-10), 2 mm	1 kg		54	6.3	4.8	4.41 E-07	0.037	0.012	0.0026
Non-ferrous metals									
Alum. alloy (EN AW-7022 [AlZn5Mg3Cu]), sheet, 2 mm	1 kg		271	38	22	0.000004	0.069	0.0057	0.010
Lead*, sheet, 2 mm	1 kg		34	1.9	2.3	2.88 E-07	0.041	0.00061	0.0025
Titanium-zinc (pure Zn Z1, 0.003% Ti), sheet, 2 mm	1 kg		45	3.8	2.6	5.59 E-07	0.018	0.0010	0.0013
Copper*, sheet, 2 mm	1 kg		37	4.6	2.5	1.84 E-07	0.018	0.0023	0.0021
Metal, recycling potential									
Steel (FE360B, 85 % primary)	1 kg		-12	-0.28	-0.71	1.65 E-08	-0.0031	-0.00024	-0.00050
Steel (WT St 37-2, 85 % primary)	1 kg		-13	-0.25	-0.77	1.60 E-08	-0.0034	-0.00025	-0.00053
Stainless steel (CrNi 18-10, 25 % primary)	1 kg		-13	-1.2	-0.99	-4.30 E-08	-0.021	-0.0071	-0.0012
Aluminium (EN AW-7022, 100 % primary)	1 kg		-177	-34	-16	-0.000003	-0.053	-0.0041	-0.0081
Lead	1 kg		-21	-1.3	-1.5	-1.68 E-07	-0.036	-0.00043	-0.0021
Titanium zinc (65 % primary)	1 kg		-29	-2.9	-1.7	-3.86 E-07	-0.014	-0.00075	-0.00097
Copper (50 % primary)	1 kg		-18	-4.5	-1.4	-9.97 E-08	-0.015	-0.0021	-0.0018
Glass									
Float glass*, ρ = 2500 kg/m³	1 kg			14	0.08	0.88	2.83 E-06	0.006408	0.00090
0.00053									
Synthetic materials									
Thermoplastics									
Polyethylene (PE-HD)*, film	1 kg	41	75	0.09	1.82	0.000001	0.0050	0.00063	0.0059
Polyvinyl chloride (PVC- P)*, compound f. waterproof sht.	1 kg	17	61	2.1	2.28	8.97 E-07	0.013	0.0012	0.0021
Polyvinyl chloride (PVC- H)*, compound for pipes	1 kg	14	52	0.59	2.05	7.02 E-07	0.0072	0.00066	0.0017
Polymethyl methacrylate (PMMA "Perspex")*, panel	1 kg	24	87	0.29	3.39	0.000001	0.010	0.0010	0.0031
Polytetrafluoroethylene (PTFE "Teflon"), coating	1 kg	8.3	295	2.5	16.2	0.000008	0.069	0.0042	0.0068
EPDM*, sealing gasket	1 kg	27	76	0.25	1.97	5.60 E-07	0.0082	0.00054	0.0029
Thermosets									
Polyester resin* (UP)	1 kg	32	115	0.45	4.68	0.000002	0.012	0.0017	0.0059
Epoxy resin (EP)	1 kg	app. 30	137	0.78	6.47	0.000002	0.014	0.0021	0.0050
Elastomers									
Styrene-butadiene rubber (SBR), sealing gasket	1 kg	37	102	0.85	3.05	9.68 E-07	0.010	0.00096	0.0040
Chloroprene rubber (CR "Neopren"), bearing	1 kg	app. 25	96	0.96	3.65	8.81 E-07	0.012	0.0010	0.0031
Silicone (SI), sealing compound	1 kg	app. 25	91	30	4.07	7.43 E-07	0.028	0.0017	0.0023
Transport									
HGV*/22 t perm. tot. load/14.5 t payload/local/85% use	1/t km		1.5	0.00031	0.11	3.87 E-08	0.00099	0.00016	0.00019
Sea-going vessel*, contain. ship/approx. 27 500 dwt/at sea	1/t km		0.17	0.00004	0.013	4.34 E-09	0.00045	0.000041	0.000033

[1] The negative global warming potential of wood is due to the carbon dioxide that is removed from the atmosphere during photosynthesis. This is then released again upon rotting or burning of the wood at the end of its useful life. MC Moisture content ; ODD oven dry density