

EPiC Database

The EPiC Database contains hybrid environmental flow coefficients for 89 main construction materials and products as well as a further 195 material variations. A total of 284 coefficients are provided across three environmental flows - energy, water and greenhouse gas emissions. The reported embodied energy coefficients are in *primary energy* terms, covering the entire energy supply chain.

Materials and products are grouped into eight broad categories:

- Concrete and plaster products
- Glass
- Insulation
- Metals
- Miscellaneous
- Plastics
- Sand, stone and ceramics
- Timber products

While the database does not contain an exhaustive list of materials, additional materials can be added, especially where process data in the form of environmental product declarations or life cycle inventories already exist, as further data becomes available, or new materials are developed.

This section provides a summary of all coefficients contained within the EPiC Database.

The full EPiC Database can be downloaded here: <https://doi.org/10.26188/5dc228ef98c5a>

EPiC

D a t a b a s e

		Functional Unit	Embodied Energy	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)	
			(MJ)			
CONCRETE AND PLASTER PRODUCTS	Blocks	Concrete block	kg	2.6	3.7	0.24
		<i>390 × 190 × 90 mm</i>	no.	24.3	34.2	2.2
		<i>390 × 190 × 140 mm</i>	no.	29.6	41.6	2.7
		<i>390 × 190 × 190 mm</i>	no.	35.2	49.4	3.2
	Cement	Cement mortar	kg	3.9	3.7	0.35
		Portland cement	kg	11.8	7.8	1.3
	Concrete	Autoclaved aerated concrete (AAC)	kg	8.5	8.4	0.71
		<i>Block - 600 × 200 × 100 mm</i>	no.	56.4	55.4	4.7
		<i>Block - 600 × 200 × 150 mm</i>	no.	84.5	83.0	7.0
		<i>Block - 600 × 200 × 200 mm</i>	no.	113	111	9.4
		20 MPa	m ³	2 404	4 154	328
		<i>20 MPa - 30% fly ash</i>	m ³	2 026	4 011	251
		<i>20 MPa - 30% GGBFS</i>	m ³	2 186	4 034	263
		25 MPa	m ³	2 581	4 196	361
		<i>25 MPa - 30% fly ash</i>	m ³	2 241	4 028	277
		<i>25 MPa - 30% GGBFS</i>	m ³	2 441	4 105	293
		32 MPa	m ³	3 015	4 300	416
		<i>32 MPa - 30% fly ash</i>	m ³	2 484	4 066	314
		<i>32 MPa - 30% GGBFS</i>	m ³	2 704	4 103	331
		40 MPa	m ³	3 476	4 355	497
		<i>40 MPa - 30% fly ash</i>	m ³	2 854	4 075	373
		<i>40 MPa - 30% GGBFS</i>	m ³	3 106	4 120	392
		50 MPa	m ³	3 998	4 365	600
		<i>50 MPa - 30% fly ash</i>	m ³	3 634	4 246	467
		<i>50 MPa - 30% GGBFS</i>	m ³	3 958	4 325	492

			Functional Unit	Embodied Energy (MJ)	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
CONCRETE AND PLASTER PRODUCTS	Fibre cement	Sheet	kg	18.3	19.8	1.6
		4.5 mm	m ²	119	129	10.2
		6 mm	m ²	159	172	13.5
		7.5 mm	m ²	198	214	16.9
		18 mm	m ²	475	514	40.6
		24 mm	m ²	634	686	54.2
		Weatherboard	kg	26.0	31.3	2.2
		205 × 7.5 mm - per m ² wall	m ²	304	365	26.0
		230 × 7.5 mm - per m ² wall	m ²	284	341	24.2
		300 × 7.5 mm - per m ² wall	m ²	294	354	25.2
		150 × 16 mm - per m ² wall	m ²	549	660	46.9
		180 × 16 mm - per m ² wall	m ²	549	660	46.9
	Plaster	Gypsum plaster	kg	6.5	6.5	0.44
		Plasterboard - 10 mm	m ²	86.1	85.6	5.8
		Plasterboard - 13 mm	m ²	95.7	97.9	6.5
Tiles	Concrete roof tile	kg	4.3	5.7	0.39	
GLASS	Flat glass	Single glazing	kg	28.5	32.2	2.0
		3 mm	m ²	222	251	15.7
		4 mm	m ²	296	335	21.0
		5 mm	m ²	370	418	26.2
		6 mm	m ²	444	502	31.4
		10 mm	m ²	740	837	52.4
		12 mm	m ²	888	1 004	62.9
		Double glazing - 4:6:4	m ²	1 336	1 558	101
		Double glazing - 4:12:4	m ²	1 336	1 558	101
		Double glazing - 6:6:6	m ²	1 441	1 671	108
Double glazing - 6:12:6	m ²	1 441	1 671	108		

GLASS			Functional Unit	Embodied Energy (MJ)	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
Laminated glass	Single glazing	kg	36.4	59.7	2.8	
	6.38 mm	m ²	604	991	46.8	
	8.38 mm	m ²	794	1 302	61.4	
	10.38 mm	m ²	983	1 613	76.1	
	12.38 mm	m ²	1 172	1 923	90.7	
Toughened glass	Single glazing	kg	29.8	30.2	2.2	
	3 mm	m ²	232	235	17.1	
	4 mm	m ²	310	314	22.8	
	5 mm	m ²	387	392	28.5	
	6 mm	m ²	465	471	34.2	
	10 mm	m ²	775	785	56.9	
	12 mm	m ²	929	942	68.3	
	Double glazing - 4:6:4	m ²	1 536	1 772	115	
	Double glazing - 4:12:4	m ²	1 536	1 772	115	
	Double glazing - 5:6:5	m ²	1 635	1 879	122	
	Double glazing - 5:12:5	m ²	1 635	1 879	122	
	Double glazing - 6:6:6	m ²	1 729	1 980	128	
	Double glazing - 6:12:6	m ²	1 729	1 980	128	
	Double glazing - 10:6:6	m ²	2 254	2 543	165	
	Double glazing - 10:12:6	m ²	2 254	2 543	165	
	Double glazing - 10:6:10	m ²	2 779	3 107	202	
	Double glazing - 10:12:10	m ²	2 779	3 107	202	

INSULATION			Functional Unit	Embodied Energy (MJ)	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
Cellulose	General	kg	12.1	20.5	0.79	
	<i>Insulation - 80 mm (R2)</i>	m ²	48.3	82.1	3.1	
	<i>Insulation - 100 mm (R2.5)</i>	m ²	60.3	103	3.9	
Other	Aluminium foil insulation	m ²	25.6	33.8	1.9	
	Glasswool	kg	57.5	40.7	4.0	
	<i>Insulation - 80 mm (R2)</i>	m ²	115	81.4	8.0	
	<i>Insulation - 100 mm (R2.5)</i>	m ²	144	102	10.1	
	Rockwool	kg	57.1	62.2	3.8	
	<i>Insulation - 80 mm (R2)</i>	m ²	320	348	21.1	
	<i>Insulation - 100 mm (R2.5)</i>	m ²	400	435	26.4	
Polystyrene	Rigid foam (EPS/XPS)	kg	155	841	8.0	
	<i>Insulation - 72 mm (R2)</i>	m ²	251	1 362	12.9	
	<i>Insulation - 90 mm (R2.5)</i>	m ²	314	1 703	16.2	
Polyurethane	Rigid foam	kg	293	690	17.5	
	<i>Insulation - 44 mm (R2)</i>	m ²	387	911	23.1	
	<i>Insulation - 55 mm (R2.5)</i>	m ²	484	1 138	28.8	

METALS	Aluminium	Functional Unit	Embodied Energy	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
			(MJ)		
	Bar	kg	345	219	29.6
	<i>Flat - 12 mm × 3 mm</i>	m	33.7	21.3	2.9
	<i>Flat - 40 mm × 3 mm</i>	m	112	71.2	9.6
	<i>Flat - 100 mm × 6 mm</i>	m	562	356	48.2
	<i>Round - 16 mm dia.</i>	m	188	119	16.2
	<i>Round - 50 mm dia.</i>	m	1 838	1 164	158
	<i>Round - 150 mm dia.</i>	m	16 542	10 479	1 420
	Composite panel	m ²	1 196	1 174	102
	Extruded	kg	358	182	29.4
	<i>Round tube - 25 mm dia., 3.2 mm thick</i>	m	114	57.9	9.4
	<i>Round tube - 60 mm dia., 10 mm thick</i>	m	871	442	71.5
	<i>Round tube - 80 mm dia., 6 mm thick</i>	m	705	357	57.8
	<i>Square tube - 20 mm, 1.6 mm thick</i>	m	59.7	30.3	4.9
	<i>Square tube - 40 mm, 2 mm thick</i>	m	152	76.8	12.4
	<i>Square tube - 100 mm, 3 mm thick</i>	m	574	291	47.1
	Extruded powdercoated	kg	415	251	33.6
	Extruded angle	kg	383	244	32.7
	Sheet	kg	295	160	26.7
	<i>1.6 mm</i>	m ²	1 280	693	116
	<i>3 mm</i>	m ²	2 400	1 300	217
	<i>6 mm</i>	m ²	4 800	2 600	434

METALS			Functional Unit	Embodied Energy (MJ)	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
METALS	Copper	Sheet	kg	226	389	15.1
		<i>0.9 mm</i>	m ²	1 819	3 132	121
		<i>1.2 mm</i>	m ²	2 426	4 175	162
		<i>2 mm</i>	m ²	4 043	6 959	270
		<i>3 mm</i>	m ²	6 064	10 438	405
		Pipe	kg	150	289	10.1
		<i>12.7 mm outer dia., 0.91 mm thick</i>	m	45.1	87.0	3.0
		<i>19.05 mm outer dia., 1.02 mm thick</i>	m	77.3	149	5.2
		<i>40 mm outer dia., 1.22 mm thick</i>	m	199	384	13.4
		Wire	kg	671	897	41.8
	Stainless steel	Cold rolled	kg	123	168	9.2
		Extruded	kg	155	138	11.8
		Sheet	kg	97.6	140	7.2
		<i>Sheet products</i>	kg	238	263	14.7
		Wire	kg	226	253	13.9
		<i>Bare - 2 mm dia.</i>	m	5.5	6.2	0.34
		<i>Bare - 3.2 mm dia.</i>	m	14.1	15.8	0.87
		<i>Rope - 1.6 mm dia.</i>	m	2.4	2.7	0.15
		<i>Rope - 4 mm dia.</i>	m	14.2	15.9	0.87
<i>Rope - 8 mm dia.</i>		m	57.8	64.9	3.6	
<i>Rope - 12 mm dia.</i>	m	127	143	7.8		

METALS	Steel	Functional Unit	Embodied Energy	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
			(MJ)		
	Cold rolled	kg	51.7	77.6	3.7
	Hot rolled galvanised structural steel	kg	43.0	43.2	3.3
	Hot rolled structural steel	kg	38.8	37.1	2.9
	<i>Reinforcement bar - 6 mm dia.</i>	m	8.6	8.2	0.64
	<i>Reinforcement bar - 8 mm dia.</i>	m	15.3	14.6	1.1
	<i>Reinforcement bar - 12 mm dia.</i>	m	34.5	32.9	2.6
	Bar	kg	29.5	44.3	2.1
	Extruded hollow section	kg	54.8	45.2	4.6
	<i>Square tube - 20 mm, 1.6 mm thick</i>	m	55.0	45.4	4.6
	<i>Square tube - 50 mm, 2 mm thick</i>	m	172	142	14.5
	<i>Square tube - 100 mm, 4 mm thick</i>	m	688	568	57.8
	Pipe	kg	42.9	78.1	3.5
	<i>21.3 mm outer dia., 2.6 mm thick</i>	m	51.4	93.7	4.2
	<i>42.4 mm outer dia., 2.6 mm thick</i>	m	110	199	9.0
	<i>88.9 mm outer dia., 4 mm thick</i>	m	359	654	29.6
	<i>165.1 mm outer dia., 4.9 mm thick</i>	m	831	1 512	68.5
	Corrugated sheet	kg	79.6	73.4	5.5
	<i>per m²</i>	m ²	259	239	17.9
	<i>Corrugated sheet - pre-painted</i>	m ²	293	286	24.9

		Functional Unit	Embodied Energy	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)	
			(MJ)			
MISCELLANEOUS	Asphalt	General	kg	4.2	2.9	0.20
	Carpet	Tufted nylon - average	m ²	465	1 149	31.2
		<i>Tufted nylon - quality</i>	m ²	484	1 161	33.3
		<i>Tufted nylon - prestige</i>	m ²	785	1 866	55.3
		<i>Woven nylon - average</i>	m ²	364	908	23.9
		<i>Woven nylon - quality</i>	m ²	376	911	24.8
		Tufted wool - average	m ²	360	1 343	41.0
		<i>Tufted wool - quality</i>	m ²	407	1 545	49.1
		<i>Tufted wool - prestige</i>	m ²	509	1 945	64.2
	Other	Silicone	kg	224	589	13.8
		Water	kg	0.017	1.02	0.0013
		Wood glue (PVA)	kg	106	171	5.4
		Solar hot water system	no.	24 537	30 097	1 863
	Paint	Solvent-based	kg	124	197	6.3
		<i>per m²</i>	m ²	9.3	14.7	0.47
		Water-based	kg	111	206	6.8
		<i>per m²</i>	m ²	8.7	16.1	0.53
	Paper	Wallpaper	kg	263	448	16.0
		<i>per m²</i>	m ²	45.5	77.5	2.8
	Rubber	Natural	kg	75.2	92.1	2.5
		Synthetic	kg	92.8	111	3.7

PLASTICS			Functional Unit	Embodied Energy (MJ)	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
High density polyethylene (HDPE)	Film	kg	147	172	6.4	
	<i>100 μm</i>	m ²	13.8	16.2	0.60	
	<i>200 μm</i>	m ²	27.6	32.4	1.2	
	Pipe	kg	135	130	5.6	
	<i>32 mm inner dia., 1.88 mm thickness</i>	m	12.3	11.9	0.51	
	<i>63 mm inner dia., 3.75 mm thickness</i>	m	47.7	46.1	2.0	
	<i>125 mm inner dia., 7.35 mm thickness</i>	m	188	181	7.8	
	<i>250 mm inner dia., 14.71 mm thickness</i>	m	752	726	31.0	
	<i>500 mm inner dia., 29.41 mm thickness</i>	m	3 007	2 903	124	
	<i>800 mm inner dia., 47.06 mm thickness</i>	m	7 698	7 433	318	
	Low density polyethylene (LDPE)	Film	kg	136	122	6.4
		<i>100 μm</i>	m ²	12.3	11.1	0.58
		<i>200 μm</i>	m ²	24.7	22.2	1.2
		Pipe	kg	130	89.6	6.0
		<i>13 mm inner dia., 3.95 mm thickness</i>	m	11.0	7.6	0.51
<i>19 mm inner dia., 4.4 mm thickness</i>		m	17.3	11.9	0.80	
<i>25 mm inner dia., 5.2 mm thickness</i>		m	26.6	18.4	1.2	
<i>32 mm inner dia., 6.7 mm thickness</i>		m	43.9	30.3	2.0	
Nylon	Nylon 66	kg	335	910	22.2	
	<i>Sheet - 1.5 mm</i>	m ²	572	1 556	37.9	
	<i>Sheet - 3 mm</i>	m ²	1 145	3 113	75.8	
	<i>Sheet - 5 mm</i>	m ²	1 908	5 188	126	
Other	Acrylonitrile butadiene styrene (ABS)	kg	270	359	16.0	
	<i>Panel - 2mm</i>	m ²	577	767	34.3	
	<i>Panel - 3mm</i>	m ²	866	1 151	51.4	
	<i>Pipe - 21.4 mm outer dia., 2.1 mm thick</i>	m	36.8	48.9	2.2	
	<i>Pipe - 48.3 mm outer dia., 3.6 mm thick</i>	m	146	194	8.7	
	<i>Pipe - 168.3 mm outer dia., 7.7 mm thick</i>	m	1 122	1 491	66.6	

PLASTICS	Other	Functional Unit	Embodied Energy	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
			(MJ)		
	Ethylene tetrafluoroethylene (ETFE)	kg	12 063	22 606	798
	<i>Film - 25.4 μm</i>	m ²	306	574	20.3
	<i>Film - 50.8 μm</i>	m ²	613	1 148	40.5
	<i>Film - 127 μm</i>	m ²	1 532	2 871	101
	Glass reinforced plastic (GRP)	kg	299	529	18.8
	<i>Panel - 10 mm</i>	m ²	4 037	7 144	254
	<i>Panel - 20 mm</i>	m ²	8 075	14 288	509
	<i>Panel - 50 mm</i>	m ²	20 187	35 719	1 271
	Linoleum	kg	58.2	195	4.4
	<i>Sheet - 2 mm</i>	m ²	140	469	10.6
	<i>Sheet - 2.5 mm</i>	m ²	175	586	13.3
	<i>Sheet - 3.2 mm</i>	m ²	223	750	17.0
	<i>Sheet - 4 mm</i>	m ²	279	937	21.2
	Polycarbonate	kg	190	265	14.0
	<i>Roofing sheet - 1 mm</i>	m ²	228	318	16.7
	<i>Roofing sheet - 2 mm</i>	m ²	457	635	33.5
	<i>Roofing sheet - 3 mm</i>	m ²	685	953	50.2
	<i>Roofing sheet - 6 mm</i>	m ²	1 371	1 905	100
	Polymethyl methacrylate (PMMA)	kg	230	215	15.4
	<i>Sheet - 3 mm</i>	m ²	822	768	54.9
	<i>Sheet - 4 mm</i>	m ²	1 096	1 023	73.2
	<i>Sheet - 5 mm</i>	m ²	1 370	1 279	91.4
	<i>Sheet - 6 mm</i>	m ²	1 644	1 535	110
	<i>Sheet - 8 mm</i>	m ²	2 192	2 047	146
	<i>Sheet - 10 mm</i>	m ²	2 740	2 558	183

			Functional Unit	Embodied Energy (MJ)	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
PLASTICS	Polypropylene	Sheet	kg	159	186	7.4
		Sheet - 2 mm	m ²	287	335	13.4
		Sheet - 3 mm	m ²	431	502	20.0
		Sheet - 4 mm	m ²	574	670	26.7
		Sheet - 6 mm	m ²	861	1 005	40.1
		Sheet - 10 mm	m ²	1 435	1 675	66.8
		Sheet - 12 mm	m ²	1 722	2 010	80.2
		Sheet - 15 mm	m ²	2 153	2 512	100
	Polyurethane	Flexible foam	kg	127	443	7.7
		Underlay - 7 mm, 64 kg/m ³	m ²	56.8	198	3.4
		Underlay - 7 mm, 69 kg/m ³	m ²	61.4	214	3.7
		Underlay - 10 mm, 73 kg/m ³	m ²	92.5	323	5.6
		Underlay - 10 mm, 123 kg/m ³	m ²	156	543	9.4
	Polyvinyl chloride (PVC)	Film	kg	190	758	11.2
		19 μm	m ²	5.0	20.0	0.30
		25 μm	m ²	6.6	26.3	0.39
		uPVC	kg	76.3	561	4.2
		Pipe - 21.35 mm outer dia., 1.8 mm thick	m	11.7	86.2	0.64
		Pipe - 60.25 mm outer dia., 2.6 mm thick	m	50.0	367	2.7
		Pipe - 114.3 mm outer dia., 4.85 mm thick	m	177	1 301	9.7
		Pipe - 225.3 mm outer dia., 11.1 mm thick	m	792	5 826	43.2
SAND, STONE & CERAMICS	Brick	General	kg	3.5	1.8	0.32
	Other	Gravel	kg	0.48	1.9	0.036
		Recycled aggregate	kg	0.11	0.10	0.008
		Sand	kg	0.34	1.8	0.024
		Sanitary ceramic	kg	98.0	89.8	6.4
	Stone	Dimension stone	kg	16.3	16.5	1.3
	Tiles	Ceramic tile	kg	18.9	15.2	1.3
		Clay roof tile	kg	7.5	4.7	0.61

TIMBER PRODUCTS		Functional Unit	Embodied Energy	Embodied Water (L)	Embodied Greenhouse Gas Emissions (kgCO ₂ e)
			(MJ)		
Cork	Slab	kg	179	199	9.5
	6 mm	m ²	129	143	6.8
	10 mm	m ²	215	238	11.4
	12 mm	m ²	258	286	13.6
	20 mm	m ²	430	477	22.7
	50 mm	m ²	1 074	1 192	56.8
Hardwood	Air-dried	m ³	13 632	19 110	944
	Kiln-dried - dressed	m ³	41 597	58 411	2 269
	Kiln-dried - structural	m ³	19 389	25 332	1 178
Manufactured timber product	Cross laminated timber (CLT)	m ³	9 607	8 608	645
	60 mm	m ²	576	516	38.7
	105 mm	m ²	1 009	904	67.7
	175 mm	m ²	1 681	1 506	113
	Glulam - indoor	m ³	29 996	35 813	1 718
	Glulam - outdoor	m ³	28 279	31 246	1 605
	Laminated veneer lumber (LVL)	m ³	17 479	18 025	1 059
	MDF board	m ³	15 016	8 471	899
	Melamine-coated - 16 mm	m ²	344	283	18.7
	Melamine-coated - 18 mm	m ²	390	323	21.3
	Melamine-coated - 25 mm	m ²	557	453	30.5
	OSB sheet	m ³	14 422	17 997	751
	Particleboard - indoor	m ³	12 717	10 720	696
	Particleboard - outdoor	m ³	15 879	20 491	813
	Plywood - indoor decorative	m ³	63 691	69 363	3 680
	Plywood - outdoor	m ³	26 790	23 083	1 777
	Structural insulated panel (SIP) - 112 mm	m ²	2 624	4 219	135
	142 mm	m ²	3 327	5 349	171
162 mm	m ²	3 795	6 103	195	
Softwood	Air-dried	m ³	9 392	13 091	549
	Kiln-dried	m ³	9 704	13 181	583