

# Timber Framers' Embodied Carbon Tool

The Timber Framers' Embodied Carbon Tool is a tool that allows timber framers to readily assess the embodied carbon and the stored biogenic (sequestered) carbon in their products. These products might be wall panels or floor panels for example, and could be the bare timber frame or include insulation and finishes.

The tool is spreadsheet based to allow easy modification and updating and adapting to each framer's specific needs and products.

We worked with Lowfield Timber Frames to develop this tool and their input was invaluable in creating the framework for the tool and assessing carbon emissions outside the actual material in each product. Some of their images are also used in this report. Please note however that the carbon figures used in examples in this report are illustrative and do not reflect Lowfield's operations.

The tool provides a quick way of assessing the embodied carbon in any given product, which can be useful for disseminating to specifiers and as a marketing point. Moreover, as the tool is interactive, once set up with the initial data it can also be used to highlight the higher carbon components of any given product and drive down carbon, quickly seeing the effect of swapping out material to equivalently performing lower carbon options or by sourcing materials from closer to home where the opportunity exists.

## SET UP

As the upfront embodied carbon for any product is a sum of the carbon emissions from the production and transport of the materials and of the emissions in manufacturing the product, the tool works in two parts. Firstly, for the former carbon emissions, the Scope 1, 2 and 3 carbon emissions from the timber framer are imported to the tool.

As a reminder, Scope 1 are "direct emissions" and are broadly from combustion of fuel, including biomass, in equipment owned or controlled by the company as well as any greenhouse gases that are released in non-combustion processes or that escape.

Scope 2 are "indirect emissions" from purchased power (electricity, heating, and cooling etc) used by the company.

And Scope 3 are all other indirect emissions which for timber framers will mostly be their bought-in materials but also includes business travel and employee commuting etc.

See also Figure 1 and Figure 2.

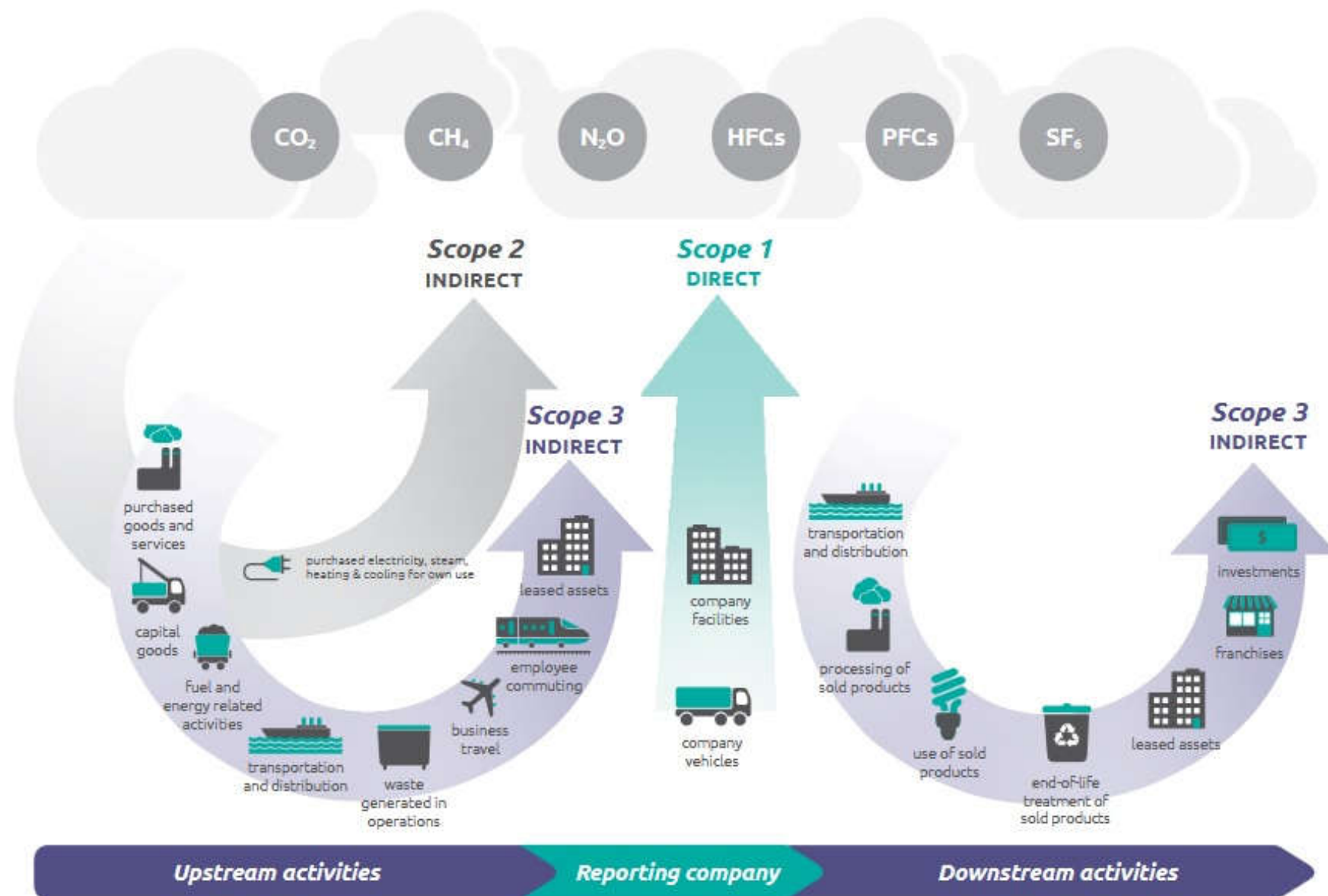


Figure 1: Overview of GHG Protocol scopes and emissions across the value chain (source: Corporate Value Chain (Scope 3) Accounting and Reporting Standard, Supplement to the GHG Protocol Corporate Accounting and Reporting Standard, Greenhouse Gas Protocol, 2011)

For a timber framer it is likely that the Scope 3 emissions, which in turn are dominated by the carbon footprint of the materials bought for their products, will be the greatest of these three scopes.

For some larger framers, they will already be obliged to report their carbon on an annual basis and so these figures should be readily available, but even if the company is below the threshold for mandatory carbon reporting, the figures should be relatively easy to compile, as they will follow the financial accounting for the volume or value of various materials, services and energy used. There are also a number of resources available to assist a company in compiling their Scope 1, 2 and 3 emissions (for example the [TDUK Carbon Calculator](#)).

## Embodied carbon and footprint assessment tools for sawmills and timber framers

### Data collection

#### Scope 1: Direct emissions

Scope 1 emissions are direct emissions from combustion of fuel, including biomass, in equipment owned or controlled by the company including boilers, furnaces, fleet vehicles and other equipment. It also covers any greenhouse gases that are released in non-combustion processes or that escape.

- *Collect volumes of all fuel combusted on site or in company-owned vehicles. For biomass the CO<sub>2</sub> emissions from combustion are reported separately (but embodied CO<sub>2</sub> of the timber product, if bought, is included in Scope 3)*
- *Assess the quantity of refrigerant gas losses*
- *Non-combustion processes unlikely to apply in the timber industry*

#### Scope 2: Indirect emissions from purchased electricity

Scope 2 emissions are the indirect emissions from the generation of purchased electricity, heating, and cooling etc used by the company.

- *How much and what type of energy did the company buy in a year?*

#### Scope 3: All other indirect emissions

Scope 3 emissions are all other indirect emissions not in scope 2. This covers everything from the emissions associated with all goods and services bought, business travel, employee commuting, waste disposal, how products sold by the company are used etc.

- *Collect all purchases to the business by category (from paper clips to buildings)*
- *Collect total business miles by vehicle type (non-fleet vehicles) and allowance for commuting.*
- *Assess product-miles sent out with logistics firms*
- *Assess water use and waste quantities by type*

Figure 2: summary of data collection for a timber framer (source: Allt Environmental)

Once the Scope 1 to 3 emissions are received there is a little bit of manipulation required in 2 steps. The first of these steps is to verify the figure in the Scope 3 reporting for materials bought in for manufacturing of the timber framer's products (the "production materials"). From a list of materials bought and their quantities (eg: sawn softwood, OSB panels, plasterboard, nails, membranes etc) the A1-A3 emissions at place of origin and the transport emissions to the framer are looked up in a materials carbon database held within the tool. If the framer uses any unusual materials, then they can be added to the

database in the tool and for each framer and for each material there is the option to use a specific Environmental Product Declaration (EPD) for the A1-A3 emission or to use a generic value (e.g: from the Circular Ecology ICE database or a TDUK meta-study of timber EPDs). Transport emissions for material supplied to the framer can be selected based on a number of defaults depending on the region they are coming from (local or regional, national, Europe or global) or specific data can be entered if the shipping route is known<sup>1</sup>. Meanwhile the allowance in the Scope 3 reporting for these production materials is removed as the tool will typically provide more accurate data.

The second step is to review if there are any carbon emissions in the Scope 1 to 3 reporting connected to events with a return period greater than a single year (eg: construction of a new building at the framer's site or renewing or adding to a fleet of vehicles) and if there are pre-owned (before the year in question) assets where the carbon emissions associated with those would have been included in previous years. These are termed "capital carbon emissions" (that is, the carbon emissions from capital assets) and amortised on a straight line basis over the expected service life by the tool. Although the GHG Protocol does not allow amortising of capital carbon emissions in company reporting (all the emissions are reported in the year they occur), if an allowance were not made in the tool for these capital carbon emissions the product embodied carbon emissions could be unduly skewed by the presence or absence of a large capital carbon emission in the year in question.

The final figure after these two steps will therefore be the Scope 1 to 3 emissions less the production materials emissions and adjusted to amortise any previous or current capital carbon emissions. This figure is termed the "overhead emissions" by the tool.

Example:

Scope 1 to 3 company reporting:

- Scope 1:  $S1 = 8 \text{ t CO}_2\text{e}$
- Scope 2:  $S2 = 115 \text{ t CO}_2\text{e}$
- Scope 3:  $S3 = 2,750 \text{ t CO}_2\text{e}$  of which  $S3_{\text{pm}} = 2,250 \text{ t CO}_2\text{e}$  are attributable to the company's assessment of their production materials emissions.

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<sup>1</sup> The transport emissions are based on the [GHG Conversion tables published by DESNZ](#) for 2024, include the well to tank (WTT) emissions and a default running empty factor in line with [RICS Whole Life Carbon Assessment for the Built Environment \(version 2\)](#) with a further allowance to recognise higher emission rates per unit weight of goods for low density goods.

Production material emissions (derived by entering the quantities of materials bought for production in to the tool)

- $PM = 2,625 \text{ t CO}_2\text{e}$

Capital Carbon emissions

#### Buildings

- Upfront embodied carbon (A1-A5) of a new building included in this years' reporting =  $160 \text{ t CO}_2\text{e}$
- Upfront embodied carbon (A1-A5) of existing buildings prior to this years' reporting =  $380 \text{ t CO}_2\text{e}$
- Total upfront embodied carbon (A1-A5) of all buildings =  $540 \text{ t CO}_2\text{e}$
- Service life of buildings, say 50 years
- Annual allowance for all buildings =  $540 / 50 = 10.8 \text{ t CO}_2\text{e} / \text{year}$
- Amount to vary Scope 1 to Scope 3 emissions by to allow for buildings for this year =  $CC_b = 10.8 - 160 = -149.8 \text{ t CO}_2\text{e}$

#### Vehicles

- Upfront embodied carbon (A1-A5) of a new vehicles included in this years' reporting =  $48 \text{ t CO}_2\text{e}$
- Upfront embodied carbon (A1-A5) of existing vehicles prior to this years' reporting =  $94 \text{ t CO}_2\text{e}$
- Total upfront embodied carbon (A1-A5) of all vehicles =  $142 \text{ t CO}_2\text{e}$
- Service life of vehicles, say 15 years
- Annual allowance for all vehicles =  $142 / 15 = 9.47 \text{ t CO}_2\text{e} / \text{year}$
- Amount to vary Scope 1 to Scope 3 emissions by to allow for vehicles for this year =  $CC_v = 9.47 - 48 = -38.53 \text{ t CO}_2\text{e}$

Of course, there may be capital allowances other than buildings and vehicles (eg: machinery) and these should broadly follow the financial accounting albeit with reasonable service life set for long term times such as buildings to ensure the upfront carbon emission is accounted for (eg: a building should not be given an indefinite service life).

In this example the overhead emissions (OH) for the company in question are:

$$OH = S1 + S2 + S3 - S3_{pm} + CC_b + CC_v = 8 + 115 + 2750 - 2250 - 149.8 - 38.53 = 434.67 \text{ t CO}_2\text{e}$$

The different stages (modules) of a lifecycle assessment (LCA) are shown below in Figure 3

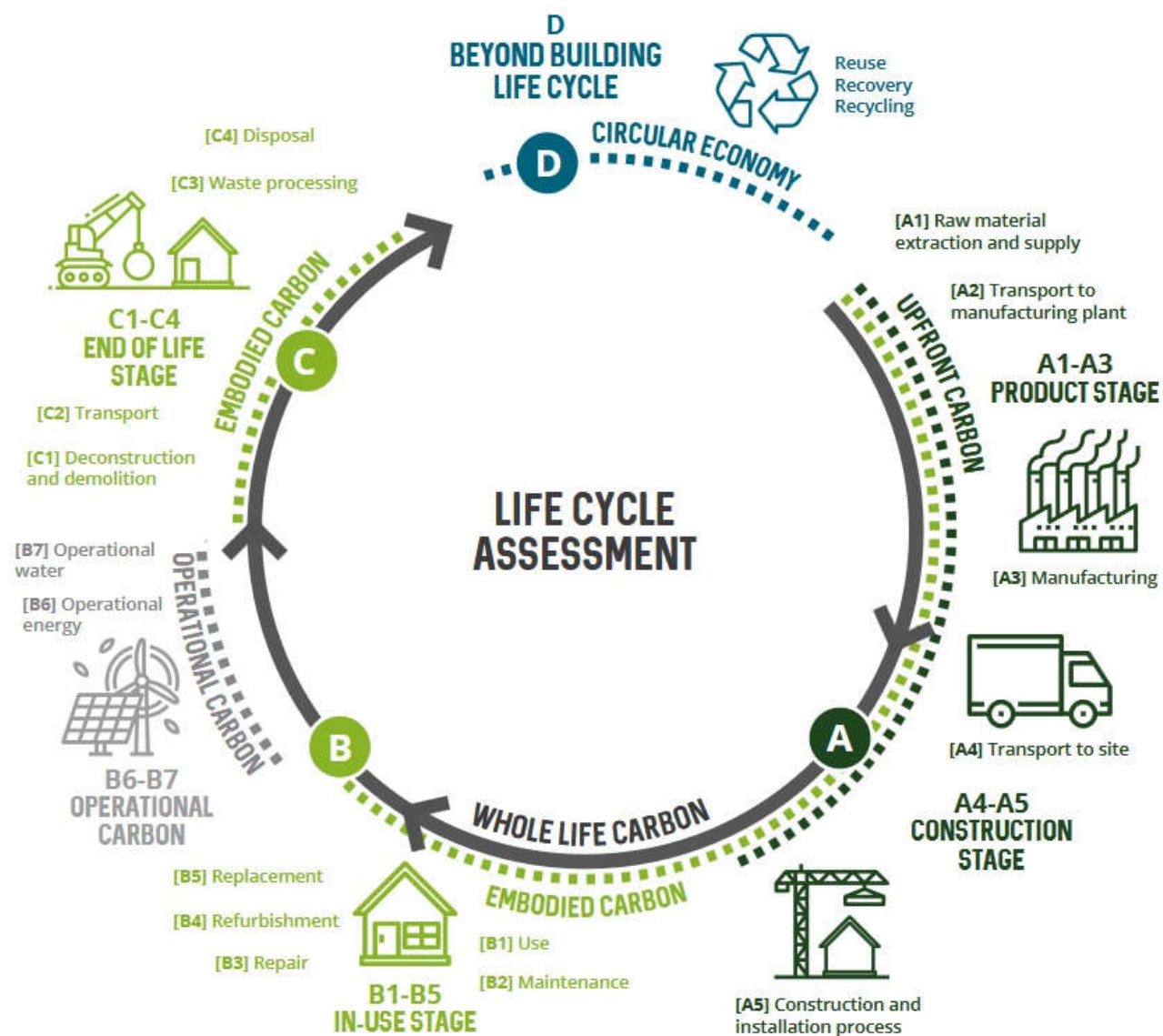


Figure 3: Embodied carbon relationships (source: The Home-Grown Homes Project, Woodknowledge Wales, 2020)

## ACCOUNTING FOR THE CARBON OVERHEAD

The total embodied carbon of any given product manufactured by the timber framer is more than the sum of the emissions from the materials used in that product, as the overhead emissions calculated in the previous section have to be accounted for too. There are a number of ways a share of the carbon overhead could be apportioned to each product but for ones that rely in some way on either the value or cost of the product, the tool would require additional financial information such as turnover or cost breakdowns. An alternative approach that assessed the carbon intensity associated with each product in terms of energy and other non-product resource use may be possible but would be outside the scope of this tool. Therefore, the chosen method is to apportion the carbon overhead to each product in a proportion to that product's share of the total product emissions. So, using the notation from the previous section this is calculated as follows:

Product emissions for any given product (excluding a share of the carbon overhead) =  $P_p$

Total emissions for any given product (including a share of the carbon overhead) =  $N_p$

$$N_p = P_p + (P_p / PM) \times OH$$

Which simplifies to:

$$N_p = P_p (1 + OH / PM)$$

Which implies that for all products the carbon overhead increases the product's material emissions by a constant percentage equal to  $OH / PM$ .

Using the figures from our example above we'd see that:

$$OH = 434.67 \text{ t CO}_2\text{e}, \text{ and}$$

$$PM = 2,625 \text{ t CO}_2\text{e}$$

So, the carbon overhead factor on all products would be:

$$(1 + OH / PM) = (1 + 434.67 / 2,625) = 1.166 \text{ (a 16.6\% overhead)}$$

While this carbon overhead will add to the A1-A3 emissions in an LCA for a building the products are used in (compared to assembling the product from components on site), it is expected that the A5 (construction stage emissions) for that building's LCA would be reduced by more than this amount to reflect



the greater inefficiencies of site work. We therefore recommend that carbon overhead is reported so the compiler of the building LCA can ensure they reduce their default A5 emissions by at least this amount.

## IN USE

Once the tool is set up for a timber frame, its use is very simple and new products can be entered from a series of dropdown menus and by entering the quantity of each material in any given product.

The materials required for each product are entered in the tool via dropdown menus of product types and by directly entering the lengths and sizes, or areas and thicknesses of each product used. As an example, we take a timber frame wall panel with PIR insulation below.

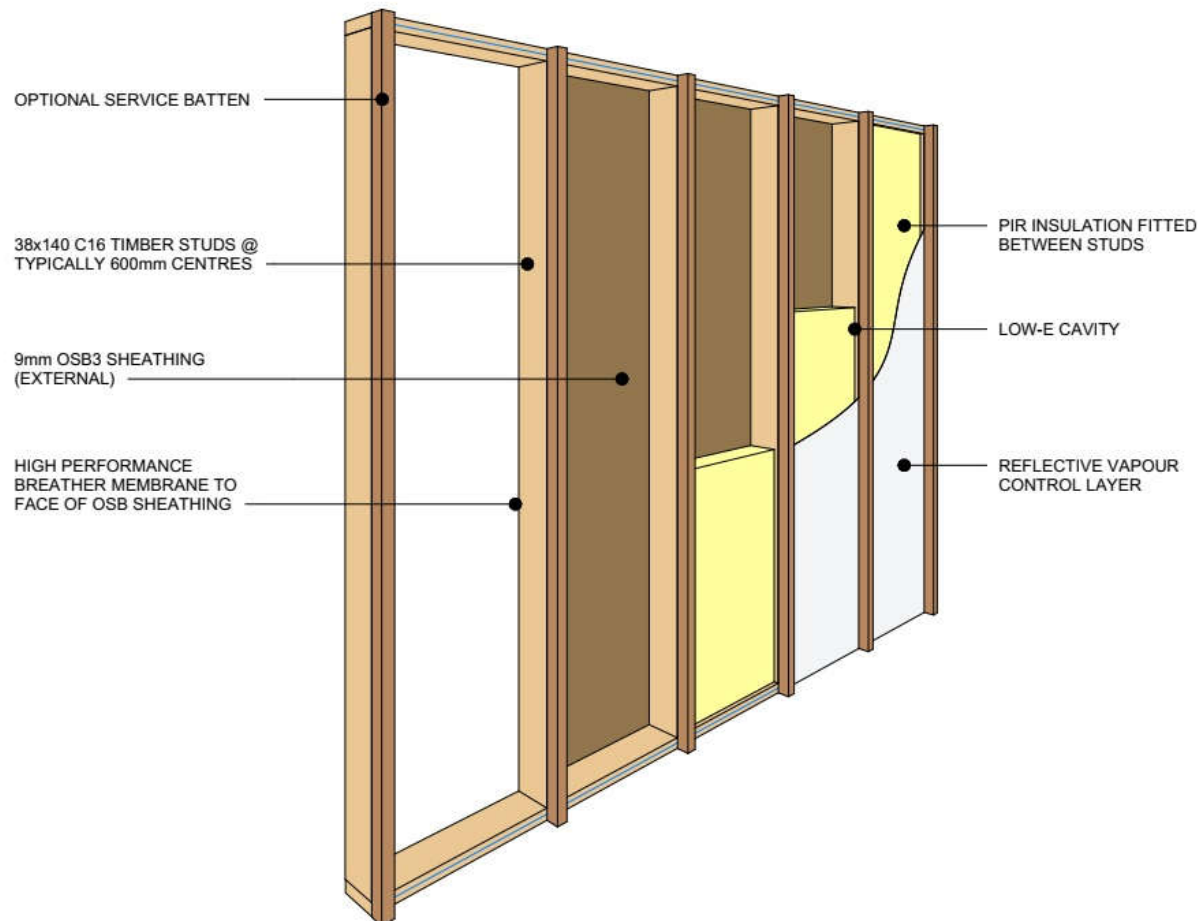


Figure 4: Typical timber framer's product (source: Lowfield Timber Frames)

A screenshot of the dropdown menus for each product is below:

				Choose whether to use default locations for			
Description keyword		product category	product type	sourced from	override default source	use this value instead	units to use for transport
verticals studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
top rail studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
bottom rail studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
service battens studs		Masonite_beams	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
sheathing board		JJI Joists	1m3 of OSB board	UK/imported averages	N		kg CO2/m3
insulation between studs	insulation	Finnjoist	1m3 of Reticel Eurothane Silver E PIR insulation	European	N		kg CO2/m3
insulation over studs	insulation	Posijoist	1m3 of Reticel Eurothane Silver E PIR insulation	European	N		kg CO2/m3
breather membrane	membranes	Kerto_LVL	1m2 of Glidevale Protect TF200 breather membrane	National	N		kg CO2/m2
vapour control layer	membranes	Glulam	1m2 of ECHOFOIL EXO Reflective breathable membrane	Ireland	N		kg CO2/m2
noggings, dwangs, blocking	studs	softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
Internal lining finishes		standard_plasterboard	1m3 of Standard plasterboard	National	N		kg CO2/m3
Internal lining finishes		standard_plasterboard	1m3 of Standard plasterboard	National	N		kg CO2/m3
fixings fixings		stainless_steel_nails_and	1kg of stainless steel fixings	European	N		kg CO2e/kg

Figure 5: Typical dropdown menu when entering a product in the tool

And while the transport details can be tailored for each timber framer that uses the tool, the user can also directly choose to vary the defaults at this point as shown below:

				Choose whether to use default locations for			
Description keyword		product category	product type	sourced from	override default source	use this value instead	units to use for transport
verticals studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
top rail studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
bottom rail studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
service battens studs		softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
sheathing board		OSB	1m3 of OSB board	UK/imported averages	N		kg CO2/m3
insulation between studs	insulation	PIR_insulation	1m3 of Reticel Eurothane Silver E PIR insulation	National	Y	2.88	kg CO2/m3
insulation over studs	insulation	PIR_insulation	1m3 of Reticel Eurothane Silver E PIR insulation	National	Y	2.88	kg CO2/m3
breather membrane	membranes	Glidevale_Protect_TF200	1m2 of Glidevale Protect TF200 breather membrane	National	N		kg CO2/m2
vapour control layer	membranes	ECHOFOIL_EXO_Reflectiv	1 m² of ECHOFOIL EXO Reflective breathable membrane	Ireland	N		kg CO2/m2
noggings, dwangs, blocking	studs	softwood	1m3 of Swedish sawn dried spruce or pine at 16% M UK/imported averages	N			kg CO2/m3
Internal lining finishes		standard_plasterboard	1m3 of Standard plasterboard	National	N		kg CO2/m3
Internal lining finishes		standard_plasterboard	1m3 of Standard plasterboard	National	N		kg CO2/m3
fixings fixings		stainless_steel_nails_and	1kg of stainless steel fixings	European	N		kg CO2e/kg

Figure 6: Option to vary source location of any given material used

The user can also enter the wastage they expect of each material used at their site ("A" below) and the tool also provides feedback on things like stud spacing in wall panels as a sense check for the user ("B" below).

quantity units	wastage %	Size (m) length	depth	thickness	nominal spacing	No. of	actual spacing
m3	5%	2.324	0.038	0.14	0.6	6	0.572
m3	5%	3	0.038	0.14		1	
m3	5%	3	0.038	0.14		1	
m3	5%	2.324	0.038	0.025	0.6	6	0.595
m3	5%	3	2.4	0.009		1	
m3	5%	2.772	2.324	0.14		1	
m3	5%	3	2.4	0.02		1	
m2	5%	3	2.4			1	
m2	5%	3	2.4			1	
m3	5%	2.772	0.038	0.14		1	
m3	5%	0	0	0		1	
m3	5%	0	0	0		1	
kg	5%					0.6	

Figure 7: Wastage rates can be tailored for each product or user

The tool also provides warnings and won't calculate the results if the user inadvertently uses the incorrect units for any product.

Description	keyword	product category	product type	quantity units	wastage %	Size (m) length	depth	thickness	nominal spacing	No. of	actual spacing
verticals	studs	softwood	1m3 of Swedish sawn dried spruce or pine	m3	5%	2.324	0.038	0.14	0.6	6	0.572
top rail	studs	softwood	1m3 of Swedish sawn dried spruce or pine	m3	5%	3	0.038	0.14		1	
bottom rail	studs	softwood	1m3 of Swedish sawn dried spruce or pine	m3	5%	3	0.038	0.14		1	
service battens	studs	softwood	1m3 of Swedish sawn dried spruce or pine	m3	5%	2.324	0.038	0.025	0.6	6	0.595
sheathing	board	OSB	1m3 of OSB board	m3	5%	3	2.4	0.009		1	
insulation between studs	insulation	PIR_insulation	1m3 of Retical Eurothane Silver E PIR insu	m3	5%	2.772	2.324	0.14		1	
insulation over studs	insulation	PIR_insulation	1m3 of Retical Eurothane Silver E PIR insu	m3	5%	3	2.4	0.02		1	
breather membrane	membranes	Glidevale_Protect_TF200	1m2 of Glidevale Protect TF200 breather m	m2	5%	3	2.4			1	
vapour control layer	membranes	ECHOFOIL_EXO_Reflectiv	1 m² of ECHOFOIL EXO Reflective breathat	m2	5%	3	2.4			1	
noggings, dwangs, blocking	studs	softwood	1m3 of Swedish sawn dried spruce or pine	m3	5%	2.772	0.038	0.14		1	
Internal lining	finishes	standard_plasterboard	1m3 of Standard plasterboard	m3	5%	0	0	0		1	
Internal lining	finishes	standard_plasterboard	1m3 of Standard plasterboard	m3	5%	0	0	0		1	
fixings	fixings	stainless_steel_nails_and	1kg of stainless steel fixings	kg	5%					0.6	

Figure 8: The tool has sense-checks on values used

## RESULTS

After the materials in the product are entered the results update automatically as below:

### Wall panels

1

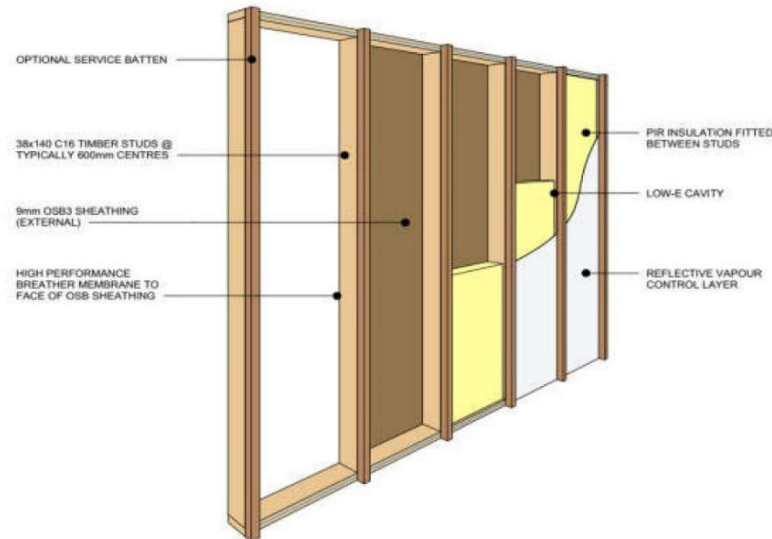
#### WT-EX-01 (PIR EU)

Overall dimensions

Height = 2.4 m

Length = 3 m

Area = 7.2 m<sup>2</sup>



### Results

	GWP totals		GWP totals / m2		Weight		% GWP
	GWP CO2e	Seq CO2e	GWP CO2e	Seq CO2e	kg	kg / m2	
	kg CO2e	kg CO2e	kg CO2e / m2	kg CO2e / m2			
TOTAL	169.1	-176.5	23.5	-24.5	142.7	19.8	100.0%
TOTAL inc o/h	197.1		27.4				

studs	17.5	-105.9	2.4	-14.7	67.0	9.3	10.4%
board	13.2	-67.5	1.8	-9.4	41.3	5.7	7.8%
insulation	129.3	-2.9	18.0	-0.4	31.8	4.4	76.5%
membranes	6.3	-0.3	0.9	0.0	1.9	0.3	3.7%
finishes	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
fixings	2.8	0.0	0.4	0.0	0.6	0.1	1.6%

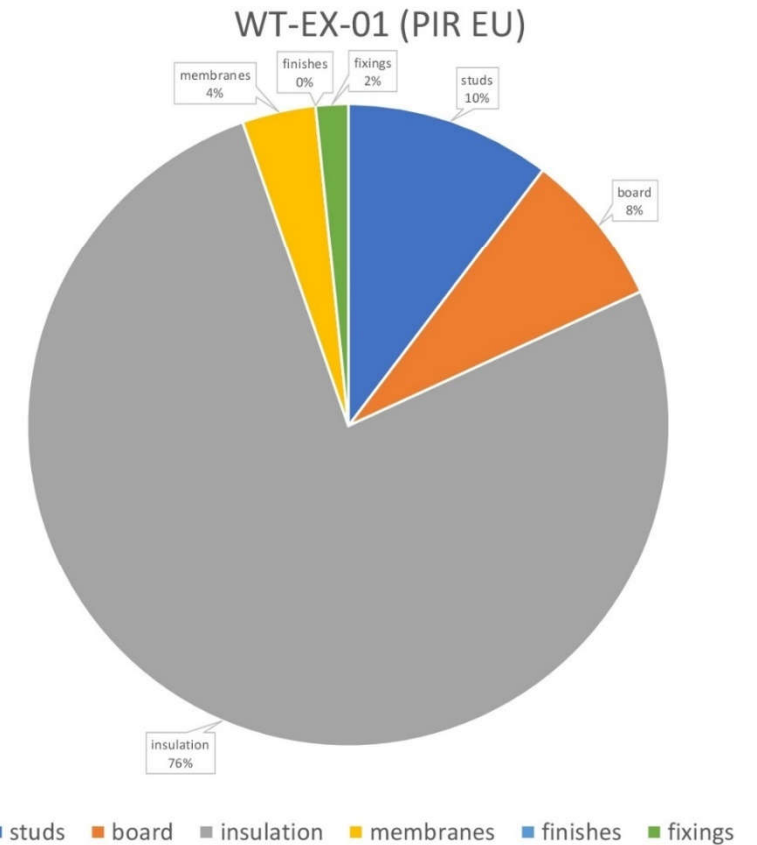


Figure 9: A typical results page for a framer's product

Note that the carbon overhead is applied only to the total figure, in this case increasing the upfront carbon for the product from 169.1 kg CO<sub>2</sub>e to 197.1kg CO<sub>2</sub>e (the 16.6% overhead that was calculated in the example earlier). Carbon rates per square metre of product are also provided to allow easy comparison.



Noting in the previous example the vast proportion of the embodied carbon is in the insulation of the wall panel (PIR from a generic source in Europe in this case) the user can review the impact of an alternative source of the same insulation (eg: from a UK manufacturer) or an alternative insulation material. The results below are for a PIR sourced from the UK (nationally) and show a reduction in embodied carbon from 197.1 kg CO<sub>2</sub>e to 160.3 kg CO<sub>2</sub>e<sup>[2]</sup> – a reduction of 19%.

#### Wall panels

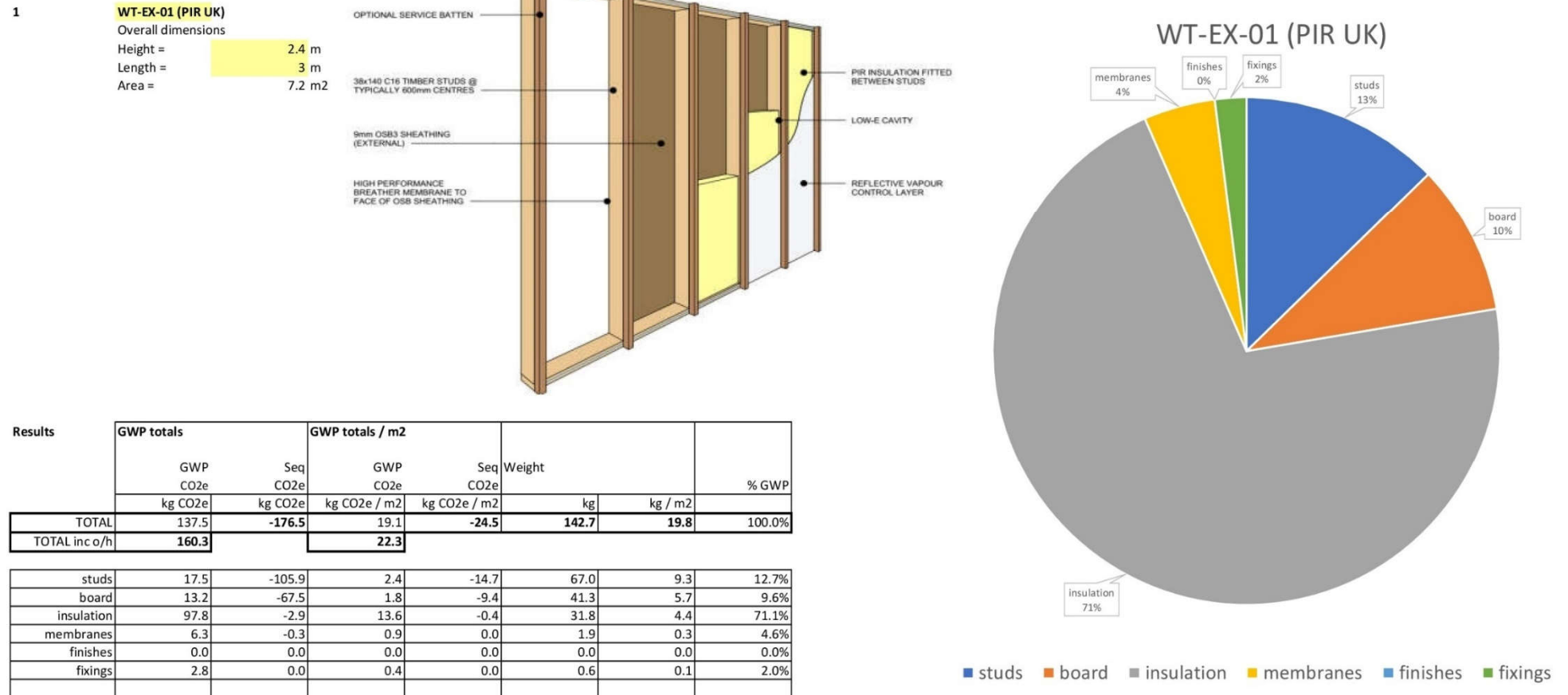


Figure 10: A typical results page updated for UK-sourced insulation

<sup>2</sup> Changing the supplier of insulation would also change the value PM slightly which would in turn also change the carbon overhead slightly.

The user can also check on the effect of using a different insulation and the results below are for a wood fibre option (sourced from Europe) and a mineral wool option (sourced from the UK) - both with a greater thickness of insulation than the PIR to allow for the higher thermal conductivity of the two. Again, the difference between the two set of results highlights the importance of transport emissions and especially of limiting road haulage to the minimum.

In the case of the wood fibre option the embodied carbon is increased, but accordingly so is the sequestered biogenic carbon which exceeds the insulation's embodied carbon even with high transport emissions from Europe.

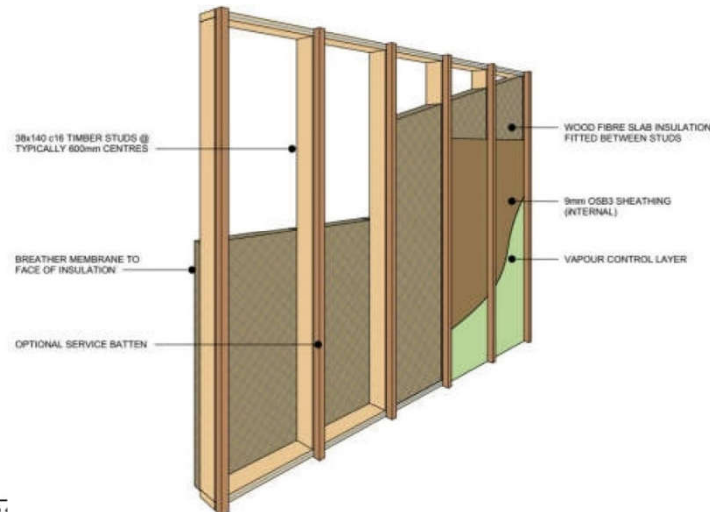
#### Wall panels

1

##### WT-EX-04 (wood fibre)

Overall dimensions

Height = 2.4 m  
Length = 3 m  
Area = 7.2 m<sup>2</sup>



Results	GWP totals		GWP <sup>1</sup>		Weight		% GWP
	GWP CO2e	Seq CO2e	GWP CO2e	Seq CO2e	kg	kg / m <sup>2</sup>	
	kg CO2e	kg CO2e	kg CO2e / m <sup>2</sup>	kg CO2e / m <sup>2</sup>	kg	kg / m <sup>2</sup>	
TOTAL	183.7	-421.8	25.5	-58.6	264.5	36.7	100.0%
TOTAL inc o/h	214.2		29.7				
studs	17.5	-105.9	2.4	-14.7	67.0	9.3	9.5%
board	13.2	-67.5	1.8	-9.4	41.3	5.7	7.2%
insulation	144.0	-248.2	20.0	-34.5	153.6	21.3	78.4%
membranes	6.3	-0.3	0.9	0.0	1.9	0.3	3.4%
finishes	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
fixings	2.8	0.0	0.4	0.0	0.6	0.1	1.5%

##### WT-EX-04 (wood fibre)

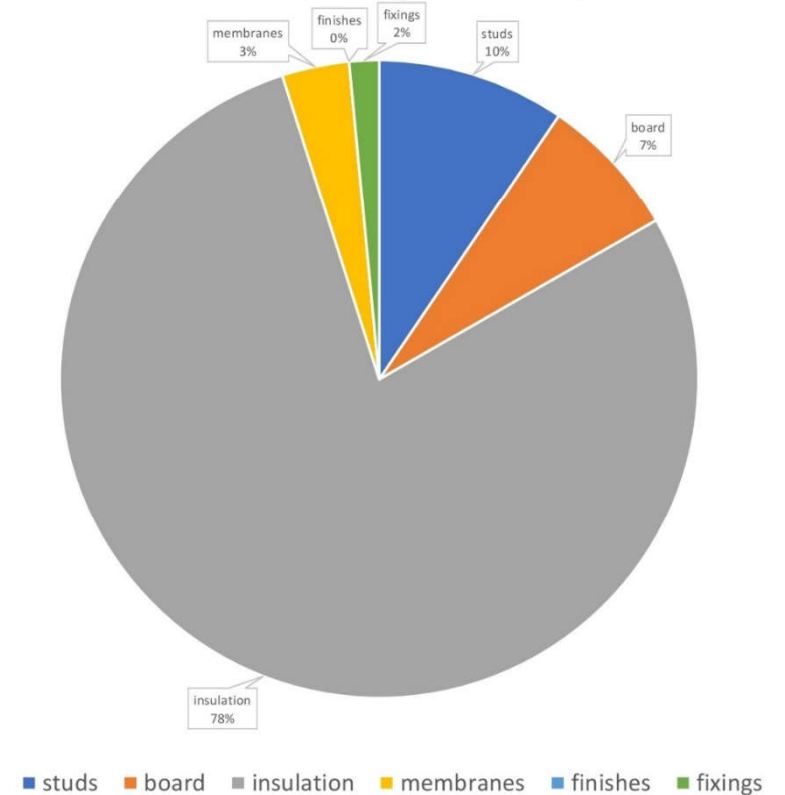


Figure 11: A typical results page updated for wood-fibre insulation



In the case of the more locally sourced mineral wool the embodied carbon is reduced but so is the sequestered carbon within the product.

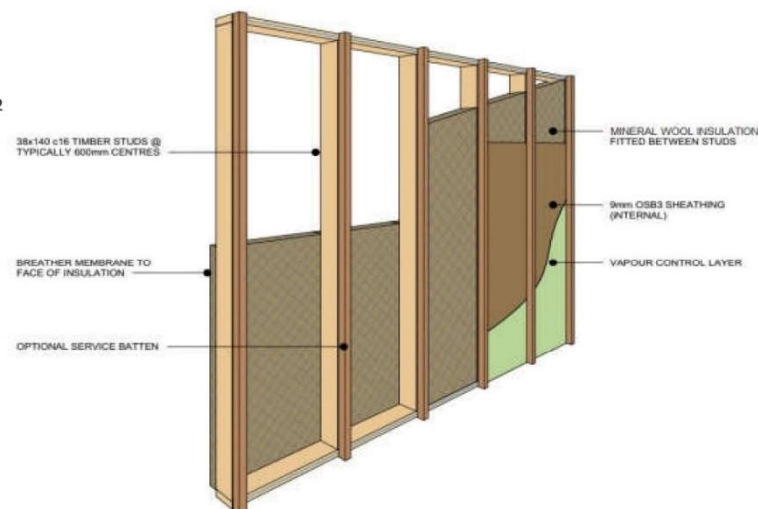
### Wall panels

1

#### WT-EX-04 (mineral wool)

Overall dimensions

Height = 2.4 m  
Length = 3 m  
Area = 7.2 m<sup>2</sup>



### Results

	GWP totals		GWP totals / m2		Weight		% GWP
	GWP CO2e	Seq CO2e	GWP CO2e	Seq CO2e	kg	kg / m2	
	kg CO2e	kg CO2e	kg CO2e / m2	kg CO2e / m2	kg	kg / m2	
TOTAL	119.1	-184.4	16.5	-25.6	166.8	23.2	100.0%
TOTAL inc o/h	138.8		19.3				
studs	17.5	-105.9	2.4	-14.7	67.0	9.3	14.7%
board	13.2	-67.5	1.8	-9.4	41.3	5.7	11.1%
insulation	79.3	-10.8	11.0	-1.5	55.9	7.8	66.6%
membranes	6.3	-0.3	0.9	0.0	1.9	0.3	5.3%
finishes	0.0	0.0	0.0	0.0	0.0	0.0	0.0%
fixings	2.8	0.0	0.4	0.0	0.6	0.1	2.3%

#### WT-EX-04 (mineral wool)

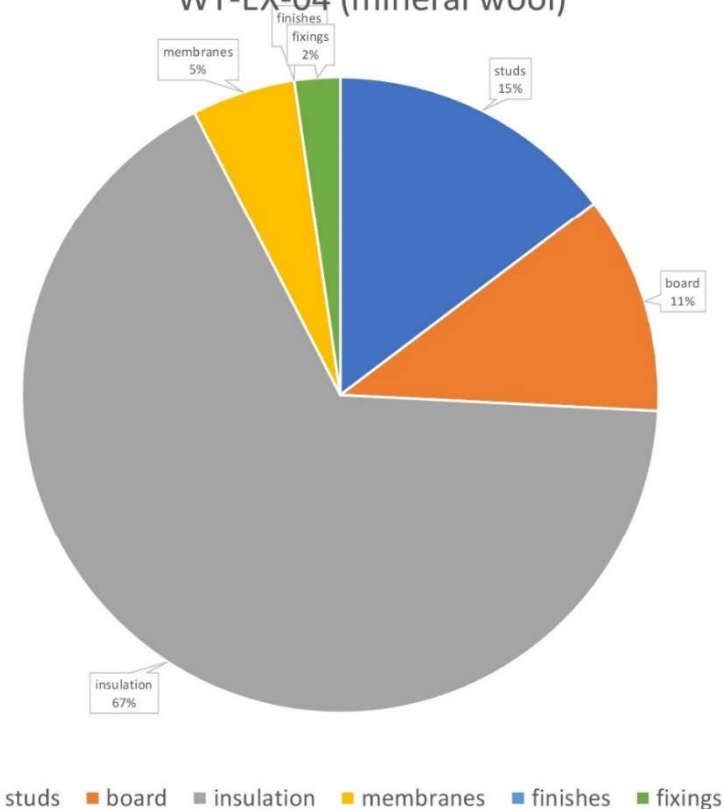


Figure 12: A typical results page updated for UK-sourced mineral wool insulation

## FOR SPECIFIERS AND LCAs

One further use of the tool is for specifiers or those undertaking LCAs for a building that the framer's products are incorporated into. A large part of compiling an LCA is in assessing the quantity of different materials used, but as this tool presents an aggregate embodied carbon figure for wall or floor panels per unit areas, all that is needed is to calculate the area of each panel type which greatly reduces the effort involved and the scope for error.

### Bonus for specifiers

*Embodied carbon calculation without the tool*

		volume type (m3)	multiplier on CO2	material density (kg/m3)	material weight (kg)	CO2 (A1-A3) (kg CO2e/kg)	Seq CO2 (kg CO2e/kg)	CO2 (A1-A3) (kg CO2e)	Seq CO2 (kg CO2e)
<b>Ground floor</b>									
timber	joists and battens	1.08 C16 softwood	1	475	511.93	0.16	1.55	79.8	793.5
	floor deck	0.94 OSB/3	1	606	566.61	0.24	1.50	133.7	849.9
	insulation	12.26 low density wood fibre	1	60	735.66	0.56	1.35	414.6	989.5
<b>Upper floors</b>									
timber	joists and battens	1.09 C16 softwood	1	475	519.63	0.16	1.55	81.0	805.4
	floor deck	0.94 OSB/3	1	606	566.61	0.24	1.50	133.7	849.9
lining	ceiling	0.58 plasterboard	1	640	374.00	0.39	0.00	145.9	0.0
<b>Roofs</b>									
timber	joists and battens	2.81 TR26 softwood	1	475	1334.29	0.16	1.55	207.9	2068.1
	roof deck	0.97 OSB/3	1	606	588.84	0.24	1.50	139.0	883.3
lining	ceiling	0.58 plasterboard	1	640	374.00	0.39	0.00	145.9	0.0
	insulation	12.62 low density glass wool	1	10	126.23	1.05	0.00	132.1	0.0
timber	battens for roofing	0.36 C16 softwood	1	475	168.77	0.16	1.55	26.3	261.6
<b>External walls</b>									
timber	studs and battens	1.36 C16 softwood	1	475	644.76	0.16	1.55	100.4	999.4
	sheathing	1.02 OSB/3	1	606	618.48	0.24	1.50	145.9	927.7
	insulation primary insulation	14.87 low density wood fibre	1	60	892.23	0.56	1.35	502.8	1200.1
	insulation secondary insulation	9.07 high density wood fibre	1	200	1814.40	0.35	1.61	626.0	2921.2
lining	internal finish	1.42 plasterboard	1	640	907.20	0.39	0.00	353.8	0.0
<b>Total</b>								<b>3369</b>	<b>13550</b>

*These quantities are a pain to work out*

Figure 13: A typical calculation by specifier before the tool was created

## Bonus for specifiers

*Embodied carbon calculation with the tool*

		Area (m <sup>2</sup> )	CO <sub>2</sub> (A1-A3) (kg CO <sub>2</sub> e/m <sup>2</sup> )	Seq CO <sub>2</sub> (kg CO <sub>2</sub> e/m <sup>2</sup> )	CO <sub>2</sub> (A1-A3) (kg CO <sub>2</sub> e)	Seq CO <sub>2</sub> (kg CO <sub>2</sub> e)
Walls	EX-W-01	100	23.6	26.4	2360	2640
	EX-W-02	25	26.4	27.8	660	695
	IN-W-01	30	17.2	22.2	516	666
	IN-W-02	5	21.4	24.2	107	121
Floors	GF-01	42	16	15.3	672	642.6
	UP-01	42	13.3	11.1	558.6	466.2
Roof	RP-01	48.3	22.5	15.6	1086.75	753.48
Total					5960	5984

*Just give the panel types and area of each*

Figure 14: A typical calculation by specifier after the tool was created