

The background of the slide features a low-angle, black and white photograph of several modern glass skyscrapers reaching towards the sky. The buildings are partially obscured by a large, dark blue diagonal banner that spans across the bottom half of the image. The banner has a slight gradient and a white border on its top edge.

CIBSE TM65 Embodied Carbon Calculator

Presenter:

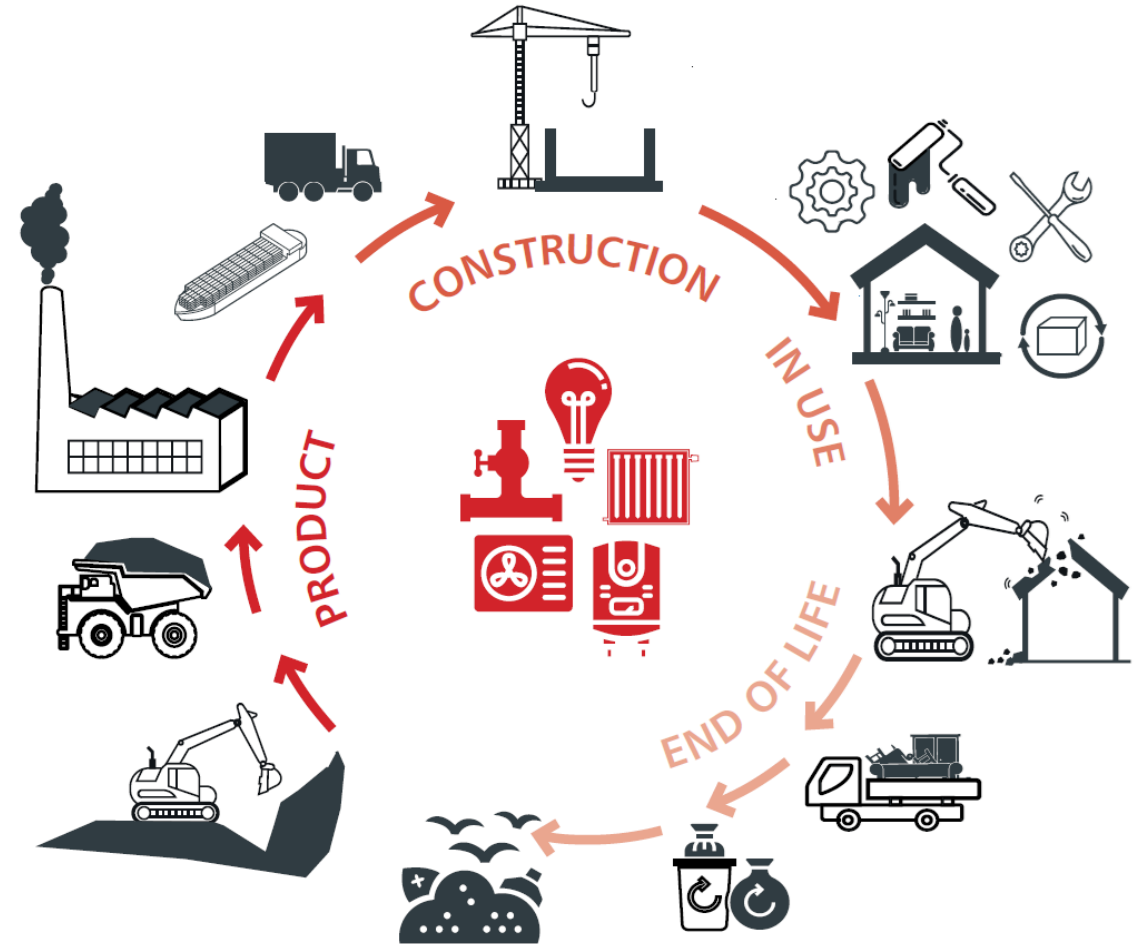
CIBSE TM65 Calculator developer



Carl Collins
Head of Digital Engineering, CIBSE

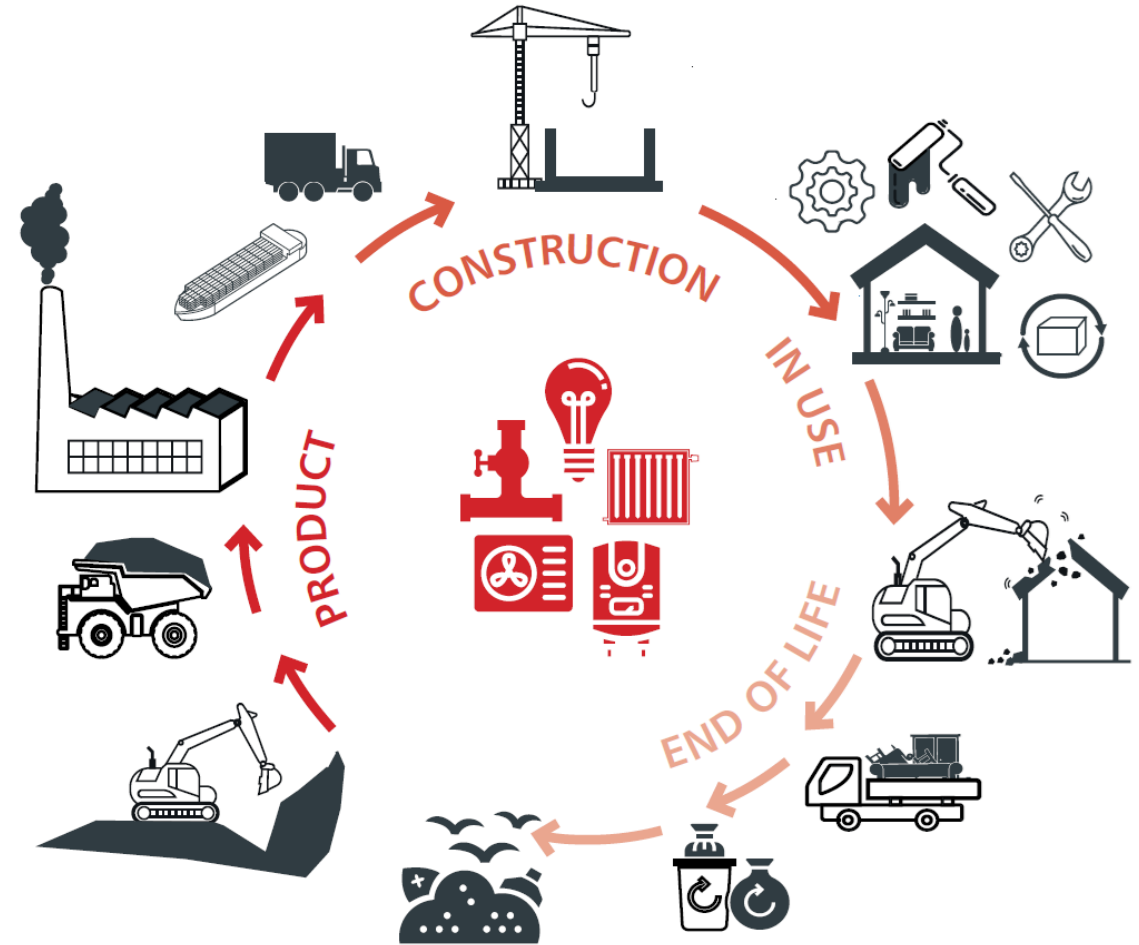
Agenda:

- Why do this?
- What does TM65 do?
- How does the tool work?
- Where can I get this tool?
- Future developments



Why do this?:

- Carbon neutral future
- EPDs
- Building Services



Carbon neutral future:

- Net zero by 2050
- 68% reduction in greenhouse gas emissions by the end of the decade
- Reducing emissions by the fastest rate of any major economy
- Create and support 250,000 jobs

Press release

UK sets ambitious new climate target ahead of UN Summit

A new plan aims for at least 68% reduction in greenhouse gas emissions by the end of the decade, compared to 1990 levels.

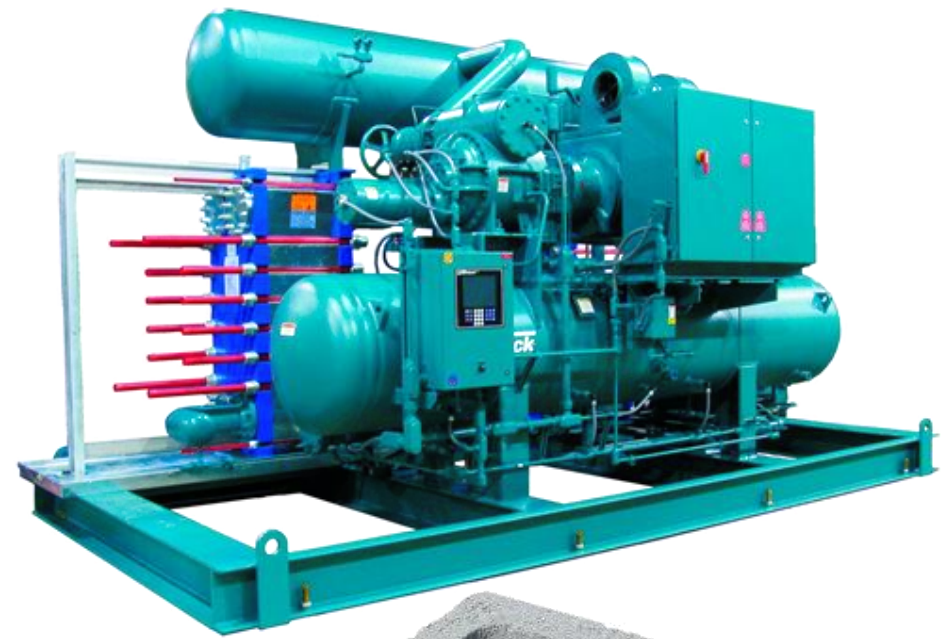
Environmental Product Declarations:

An environmental product declaration (EPD) should be considered as the most reliable source of information about the environmental impacts of a product. EPDs provide environmental information using a consistent methodology and reporting form.



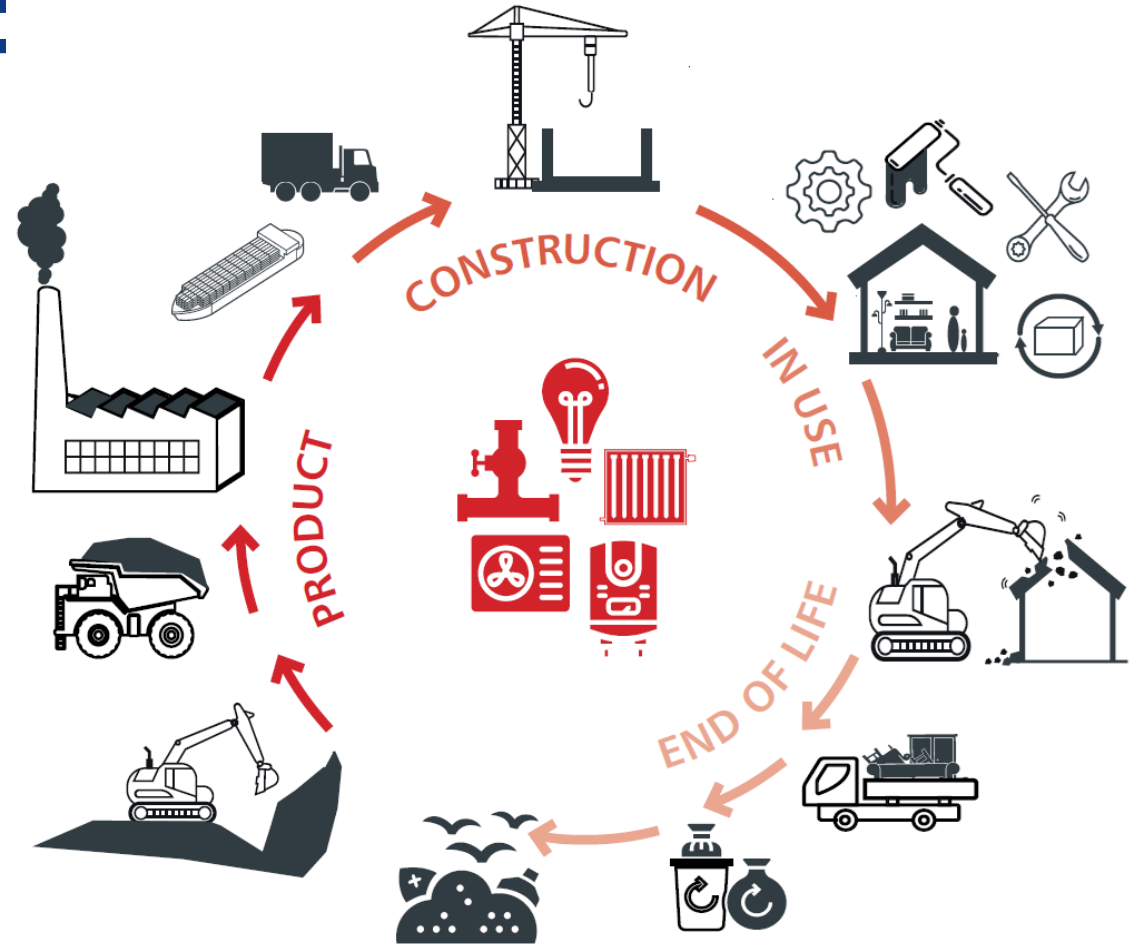
Building Services:

- “Too difficult”
- “Too expensive”
- “Time consuming”
- “No demand”



What does TM65 do?:

- Fill in the gaps
- Basic level calculation
- Mid-level calculation



Fill the gaps:

- “Too difficult”
 - Simplify process
- “Too expensive”
 - Cheaper process
- “Time consuming”
 - Quicker process
- “No demand”
 - Demonstrate need

Search the EPD Library

Filter

Product Category x | v

PCR x | v

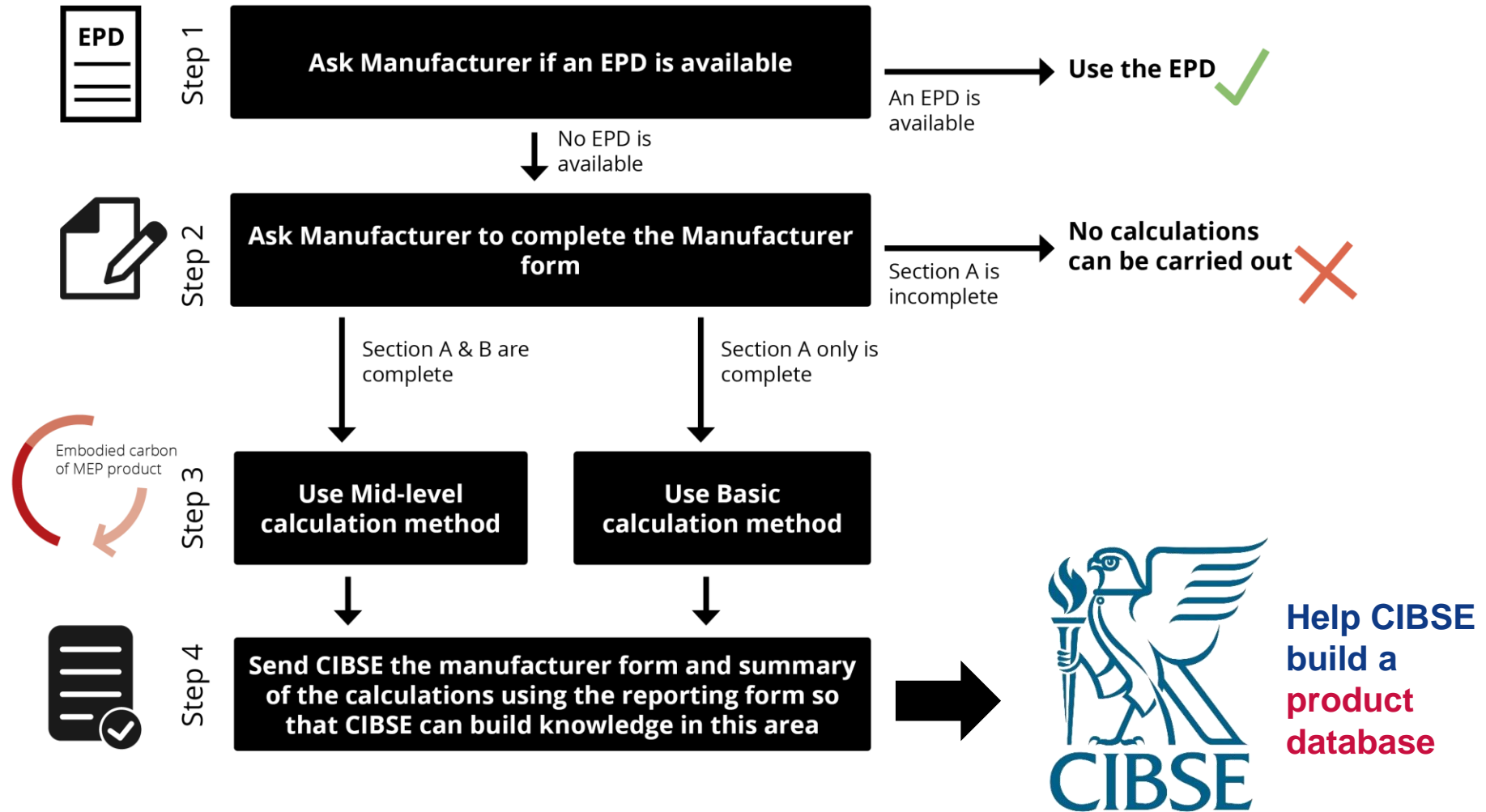
Geographical scope x | v

Validity | v

Only sector EPDs

No matches found

CIBSE TM65 - process:



CIBSE TM65 – Manufacturer form:

Data collection



Manufacturer form

Section A

Capacity of equipment/size
Product service life (year)
Product weight (kg)

Material composition breakdown (95%)

Refrigerant used + charge (kg)
Components replaced over service life

Essential
information
to carry any CIBSE
TM65 calculations

Section B

Final assembly factory location
Final assembly factory energy use (kWh)
Factories from supply chain location

Supplementary
information
needed for Mid Level
calculations

Section C

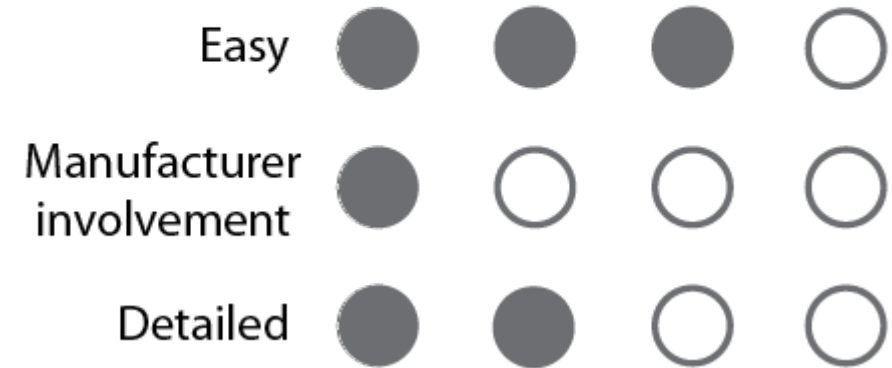
Operational efficiency of product
Annual waste output at final assembly
factory (kg)
Annual water consumption at final as-
sembly factory (m3)
Renewable energy onsite factory (kWh)
% product reused, recovered or recycled
Maintenance recommendations
Warranty (years)
Ownership mode

Optional
information
for development of the
next CIBSE TM65

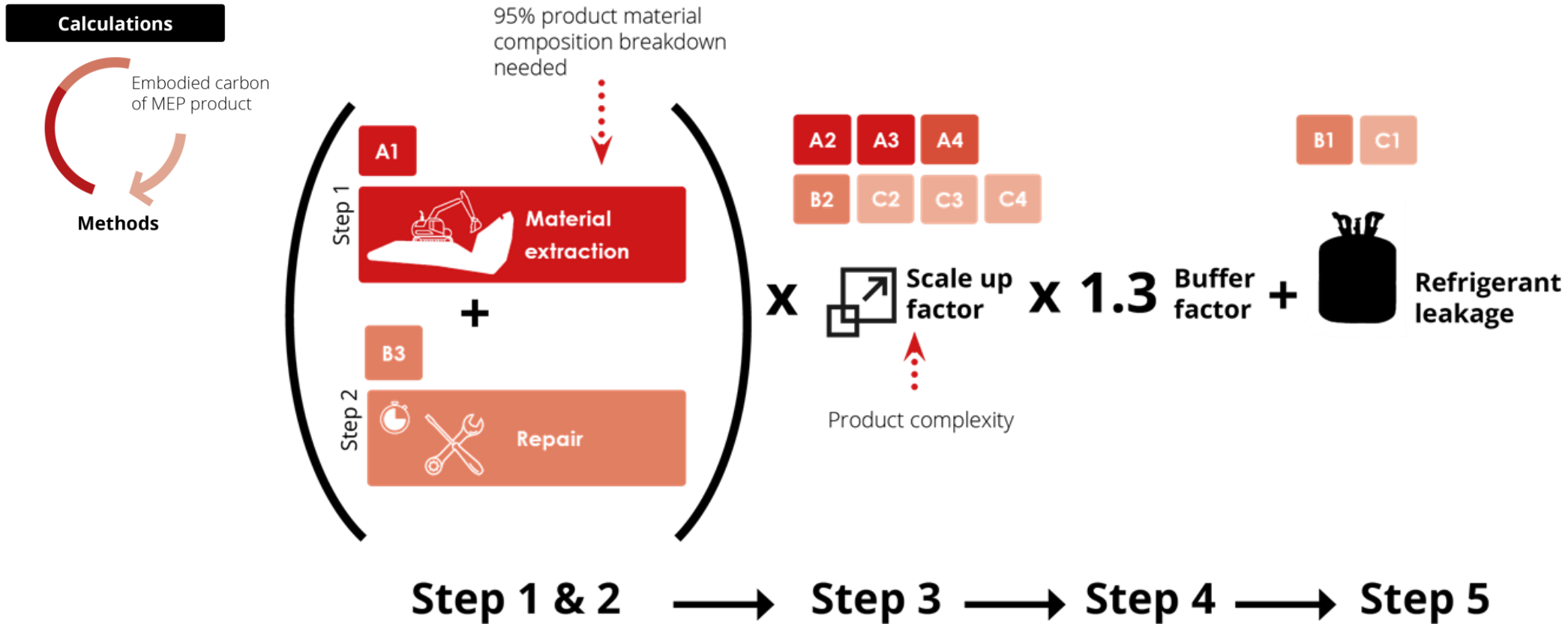
Basic level calculation:

Preliminary information		'Basic' calculation
Capacity of equipment/size		Mandatory
Product service life (years)		Mandatory
Refrigerant used, GWP, charge (kg)		Mandatory
Stage	Module	'Basic' calculation
A	A1 (material extraction)	Mandatory
	A2 (transport to factory)	Scale-up factor
	A3 (manufacturing)	
	A4 (transport to site)	
	A5 (installation)	—
B	B1 (use)	Mandatory for refrigerant based system
	B2 (maintenance)	Scale-up factor
	B3 (repair)	Mandatory
	B4 (replacement)	—
	B5 (refurbishment)	—
	B6 (operational energy)	—
	B7 (operational water)	—
C	C1 (deconstruction)	Mandatory for refrigerant based system
	C2 (transport)	Scale-up factor
	C3 (waste processing)	
	C4 (disposal)	
D	D (reuse, recover, recycle)	—

'Basic' calculation



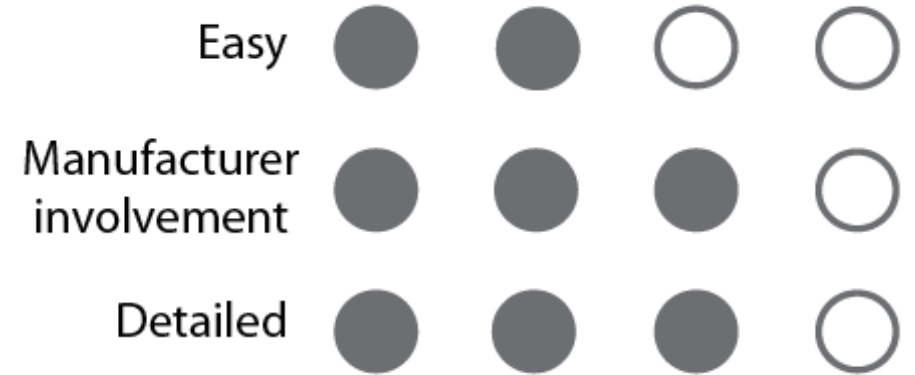
Basic level calculation:



Mid-level calculation:

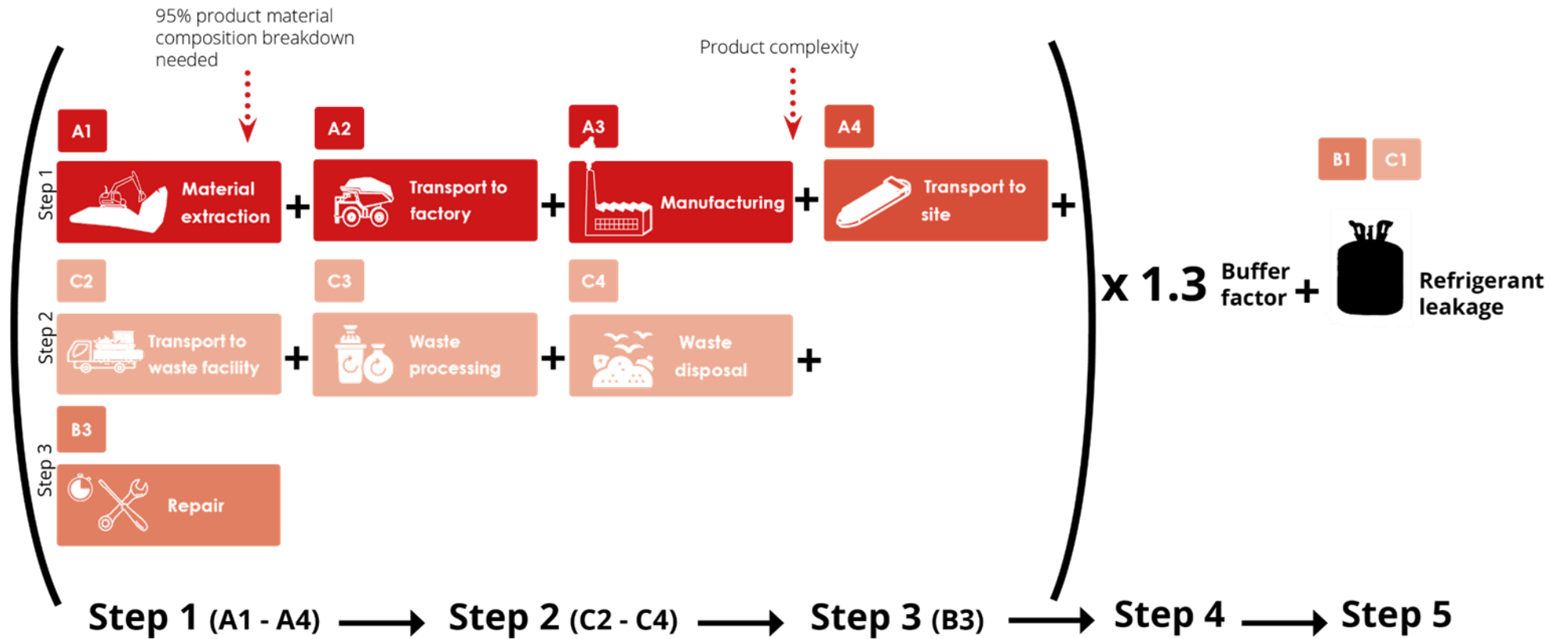
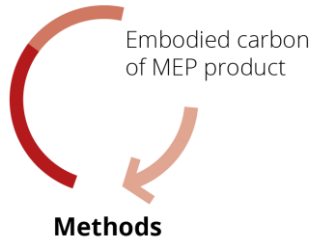
Preliminary information		'Mid-level' calculation
Capacity of equipment/size		Mandatory
Product service life (years)		Mandatory
Refrigerant used, GWP, charge (kg)		Mandatory
Stage	Module	'Mid-level' calculation
A	A1 (material extraction)	Mandatory
	A2 (transport to factory)	Mandatory
	A3 (manufacturing)	Mandatory
	A4 (transport to site)	Mandatory
	A5 (installation)	—
B	B1 (use)	Mandatory for refrigerant based system
	B2 (maintenance)	Optional
	B3 (repair)	Mandatory
	B4 (replacement)	—
	B5 (refurbishment)	—
	B6 (operational energy)	—
	B7 (operational water)	—
C	C1 (deconstruction)	Mandatory for refrigerant based system
	C2 (transport)	Mandatory
	C3 (waste processing)	Mandatory
	C4 (disposal)	Mandatory
D	D (reuse, recover, recycle)	—

'Mid level' calculation



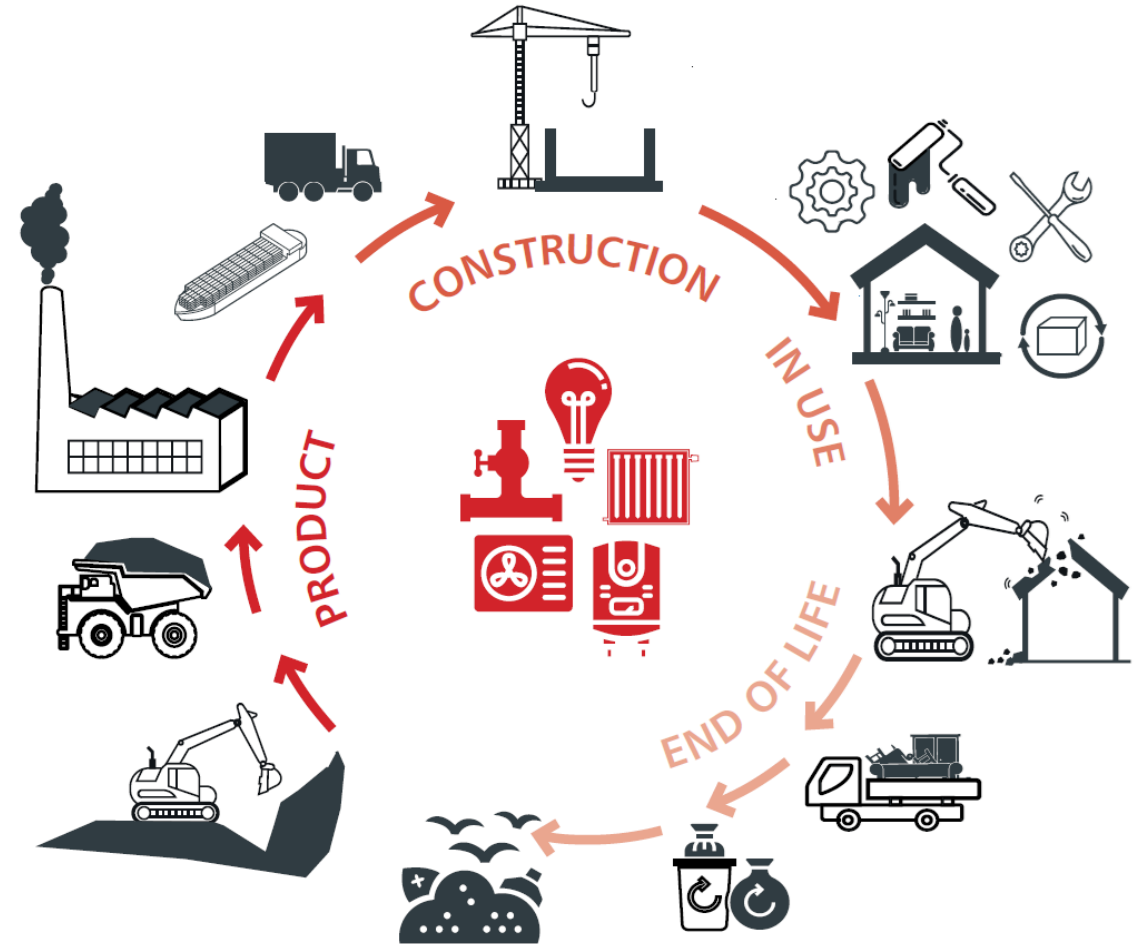
Mid-level calculation:

Calculations



How does the tool work?:

- Walk through tabs
- Input for Basic level
- Basic Calculations
- Basic Report
- Basic Graphs
- Input for Mid-level
- Mid-level Calculations
- Mid-level Report
- Mid-level Graphs



Walk through tabs:

Embodied Carbon Calculator (CIBSE TM65 Digital Tool)

January 2022

- Cover page



Walk through tabs: Embodied Carbon Calculator: Introduction and Instructions

(CIBSE TM65 Digital Tool)



- CIBSE TM65 Instructions

The CIBSE Embodied Carbon Calculator is provided alongside the CIBSE publication *Embodied carbon in building services: a calculation methodology* (TM65), and is intended to support consultants, researchers and manufacturers in implementing the TM65 methodology to calculate the embodied carbon of building services equipment when no Environmental Product Declaration (EPD) is available.

To use this tool:

1. Once it is confirmed that no EPD is available, ask the manufacturer to complete the TM65 Manufacturer Form (available at www.cibse.org/TM65/manufacturerform.)
3. Copy and paste data from Sections A and B of the TM65 Manufacturer Form into the 'Input' tab of this tool.
 - To complete a basic calculation, complete Section A only;
 - To complete a more robust mid-level calculation, complete Sections A and B.
4. Input contact details (purple fields) and consent to information disclosure (yellow fields) in the appropriate 'Report' tab. The result may now be used as a self-assessed value for the embodied carbon of the product.***
5. Name the completed file with the following structure: CIBSE ECC - Manufacturer Name - Product Name (for example: CIBSE ECC - Heat Pumps R Us - ASHP1).
6. Send the file and the TM65 Manufacturer Form to embodiedcarbon@cibse.org. This will assist CIBSE in the development of an embodied carbon database, and contribute greatly to industry knowledge in this field.

Please note that the Embodied Carbon Calculator does not currently allow users to do the following:

- Alter recycling rates of materials at end of life from the default assumptions in TM65
- Add additional material types.

Purple cells are compulsory
Yellow cells are compulsory drop-downs
Blue cells are optional
Green cells are optional drop-downs
Grey cells are protected



Walk through tabs:

- CIBSE TM65 Manufacturer Form

Embodied Carbon Calculator: Input

(CIBSE TM65 Digital Tool)



To create a basic report, complete all purple and yellow cells in Section A. Results will be displayed in the 'Basic Report' and the 'Basic Report Chart' tabs.
 To create a more robust mid-level report, complete all purple and yellow cells in Sections A and B. Results will be displayed in the 'Mid-level Report' and 'Mid-level Report Chart' tabs.
 Information disclosure options can be found in section D.

General information		
	Input	Notes
Type of product	Heat Pumps	
Manufacturer	Heat Pumps r Us	
Name of the product	ASHP-1	For 'Type of Product', select the type that most closely resembles the product being analysed. This cell provides 'Rounds of Manufacture' data to the tool. Refer to TM65 for details.
Contact details (email address)	person@HeatPumpsRUS.com	

Section A: Essential information required for both 'Basic' and 'Mid-level' calculation					
	Input				Notes
Capacity/size of equipment (kW; m ³ ; litres; etc.)	Insert size here		Insert unit here		For heating/cooling equipment, please indicate whether the capacity is for heating or cooling, as appropriate
	100.00		kW		
Product service life (years)	15 Years				As manufacturer recommendations or CIBSE Guide M
Product weight (kg)	1000.00 kg				
	Material	Material % by	Insert origin location, Latitude Longitude		Insert origin location and recycled content, if known. Latitude is the angle from the equator to the position, positive for North, negative for South. Longitude is the angle from
	ABS				
	Aluminium	7%			
	Brass	1%	51.442099	-0.154437	
					Show on Google Maps



Walk through tabs:

- Basic Calculation

Product information				
Type of product	Heat Pumps			
Capacity of equipment/size (kW; m ³ ; litre; etc.)	100 kW			
Product weight (kg)	1000.00 kg			
Material % breakdown for at least 95% of the product weight? (Y/N)	Y			
Product service life (years)	15 Years			
If refrigerant based, type of refrigerant used and GWP	R410a	2088.00 kgCO ₂ e		
Refrigerant charge (kg)	35.00 kg			
Product complexity category	Category 3		See CIBSE TM65 Table 4.3	
Embodied carbon results (kg CO ₂ e) — without refrigerant leakage				
	Material	Material % by weight	Insert recycled content (%), if known	Calculated Embodied Carbon
	ABS			
	Aluminium	7%		917.00 kgCO ₂ e
	Brass	1%		48.00 kgCO ₂ e
	Cast iron			
	Ceramic			
	Copper	10%		381.00 kgCO ₂ e
	Electronic component	3%		1470.00 kgCO ₂ e
	Expanded polystyrene			
	Glass			
	Insulation (general)			
	Iron			
	Lithium			
	Plastics (general)	4%		132.40 kgCO ₂ e
	Polyamide			
	Polycarbonate			

Walk through tabs:

- Basic Report

Embodied Carbon Calculator: Basic Report

(CIBSE TM65 Digital Tool)



If Section A of the 'Input' tab is correctly completed, the results will be shown here.

Please complete all purple and yellow cells.

If you would like to assist CIBSE in building knowledge on the embodied carbon of products used in building services, please complete as directed, name this file as instructed in the 'Introduction and Instructions' tab, and email this file to embodiedcarbon@cibse.org.

Basic report for ASHP-1 as manufactured by Heat Pumps r Us

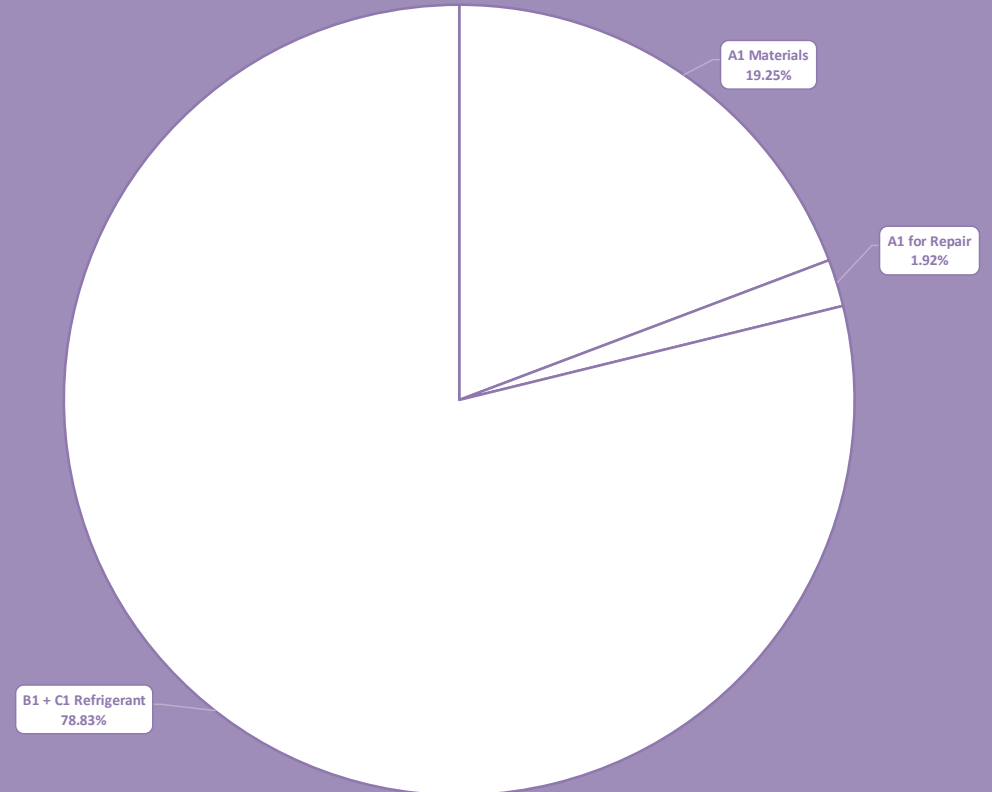
Basic calculation		Notes/source
Date of assessment		Form "dd/mm/yy"
Name of assessor and assessor organisation	Self Assessment	
Contact email address of assessor		

Product information		
Type of product	Heat Pumps	
Capacity of equipment/size (kW; m ³ ; litre; etc.)	100 kW	
Product weight (kg)	1000.00 kg	
Material % breakdown for at least 95% of the product weight? (Y/N)	Y	
Product service life (years)	15 Years	
If refrigerant based, type of refrigerant used and GWP	R410a, 2088 kgCO ₂ e	
Refrigerant charge (kg)	35.00 kg	
Product complexity category	Category 3	See CIBSE TM65 Table 4.3



Walk through tabs:

- Basic Report Graph



Walk through tabs:

- Mid-level Calculation

Product information					
Type of product	Heat Pumps				
Capacity of equipment/size (kW; m ³ ; litre; etc.)	100 kW				
Product weight (kg)	1000.00 kg				
Material % breakdown for at least 95% of the product weight? (Y/N)	Y				
Product service life (years)	15 Years				
If refrigerant based, type of refrigerant used and GWP	R410a	2088.00 kgCO ₂ e			
Refrigerant charge (kg)	35.00 kg				
Product complexity category	Category 3			See CIBSE TM65 Table 4.3	
Embodied carbon results (kg CO ₂ e) — without refrigerant leakage					
	Material	Material % by weight	Insert recycled content (%), if known	Calculated Embodied Carbon	Linear Distance Travelled
	ABS				
	Aluminium	7%		917.00 kgCO ₂ e	381 km
	Brass	1%		48.00 kgCO ₂ e	338 km
	Cast iron				
	Ceramic				
	Copper	10%		381.00 kgCO ₂ e	10764 km
	Electronic component	3%		1470.00 kgCO ₂ e	338 km
	Expanded polystyrene				
	Glass				
	Insulation (general)				
	Iron				

Walk through tabs:

- Mid-level Report

Embodied Carbon Calculator: Mid-level Report

(CIBSE TM65 Digital Tool)



If Section A of the 'Input' tab is correctly completed, the results will be shown here.

Please complete all purple and yellow cells.

If you would like to assist CIBSE in building knowledge on the embodied carbon of products used in building services, please complete as directed above, name this file as instructed in the 'Introduction and Instructions' tab, and email this file to embodiedcarbon@cibse.org.

If you are a manufacturer and would like to share the results of your calculations with clients, please create PDFs of the relevant tabs ONLY (instructions are available in the 'Introduction and Instructions' tab). You may not share any CIBSE tool with clients. Instead, please refer any interested party to www.cibse.org/TM65, where they will be able to download the most up-to-date

Mid-level report for ASHP-1 as manufactured by Heat Pumps r Us

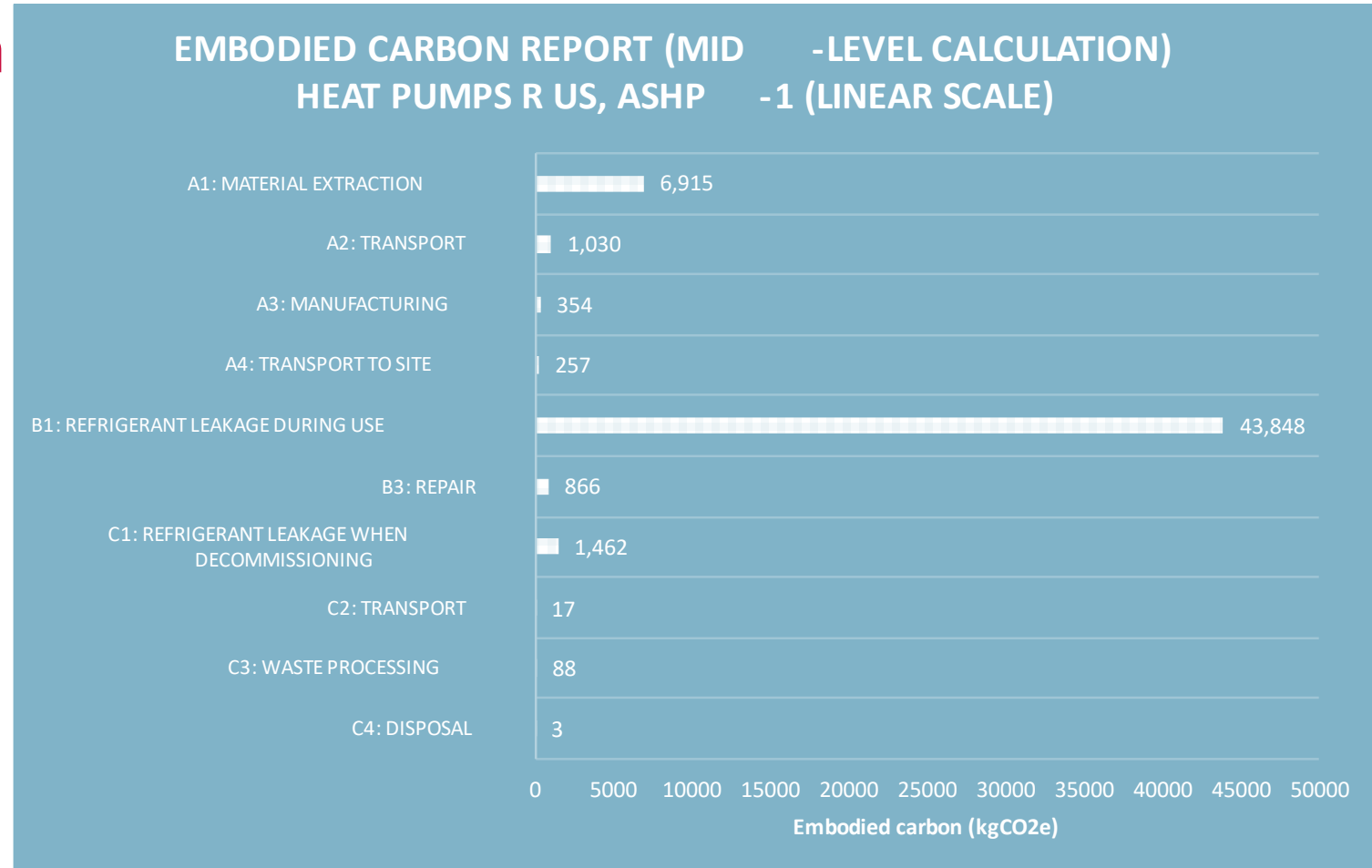
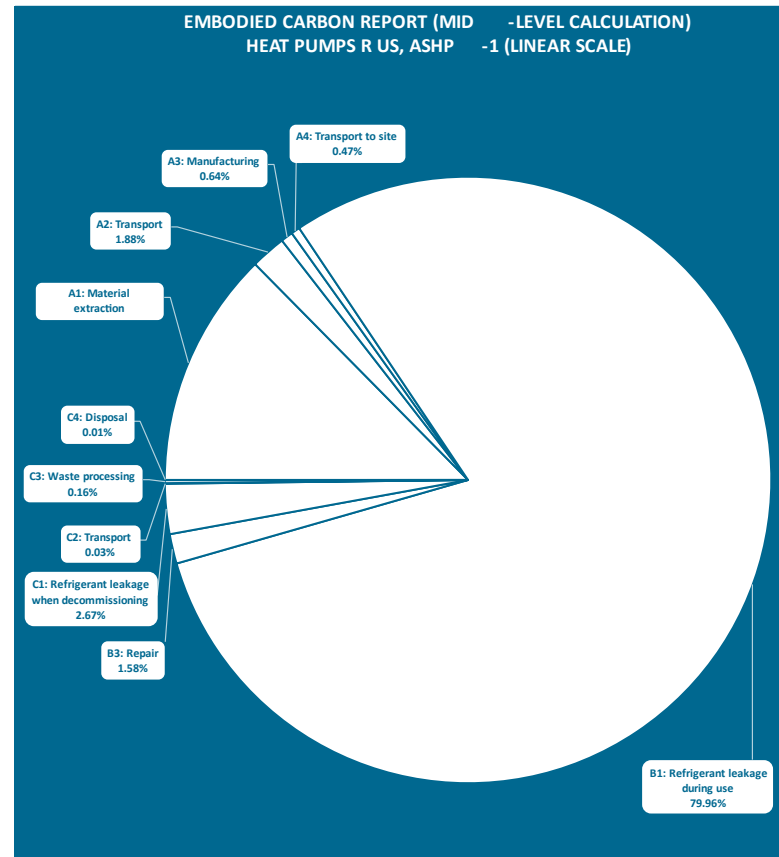
'Mid-level' calculation		Notes/source
Date of assessment		Form "dd/mm/yy"
Name of assessor and assessor organisation	Self Assessment	
Contact email address of assessor		

Product information		
Type of product	Heat Pumps	
Capacity of equipment/size (kW; m ³ ; litres; etc.)	100 kW	
Product weight (kg)	1000.00 kg	
Material % breakdown for at least 95% of the product weight? (Y/N)	Y	
Product service life (years)	15 Years	
If refrigerant based, type of refrigerant used and GWP	R410a, 2088 kgCO ₂ e	
Refrigerant charge (kg)	35.00 kg	



Walk through tabs:

- Mid-level Report Graph



Input for Basic level

- General information
- Section A

General information		Notes
Heat Pumps		
Product	Heat Pumps r Us	For 'Type of Product', select the type that most closely resembles the product to be analysed. This cell provides 'Rounds of Manufacture' data to the tool. Refer to the tool for details.
Product Code	ASHP-1	
Email	person@HeatPumpsRUS.com	

Section A: Essential information required for both 'Basic' and 'Mid-level' calculation				
		Input		Notes
Equipment capacity (kW)	Insert size here	Insert unit here		For heating/cooling equipment, please indicate whether the capacity is for heating, cooling, or both. If both, indicate the ratio of heating to cooling, as appropriate.
	100.00	kW		
Service life (years)	15 Years			As manufacturer recommendations or CIBSE Guide M
Weight (kg)	1000.00 kg			
	Material	Material % by	Insert origin location, Latitude Longitude	Insert recycled content (%), if known
	ABS			
	Aluminium	7%		
	Brass	1%	51.442099 -0.154437	Show on Google Maps
	Cast iron			
	Ceramic			
	Copper	10%	-24.270159 -69.073374	Show on Google Maps
	Electronic component	3%	51.442099 -0.154437	Show on Google Maps
	Expanded polystyrene			
	Glass			
	Insulation (general)			
	Iron			
	Lithium			
	Plastics (general)	4%	51.442099 -0.154437	Show on Google Maps
	Polycarbonate			
	Polycarbonate			
	Polycarbonate			
	Total	95%		0%
	Needs to be at least 95% of product weight. Cell will be green if requirement is met.			
If refrigerant based: type of refrigerant used	R410a			
If refrigerant based: refrigerant charge (kg)	35.00 kg			
If refrigerant based: refrigerant leakage scenario	Heat pump or chiller where some works to refrigerant pipework are carried out onsite			Type 2
List of components/materials typically replaced over the product service life	Insert component/material	Insert replacement	Component name	Aligned with CIBSE TM65, if these fields are left blank it is assumed that 10% of the materials are replaced in the lifetime of the product. How to calculate material replacement rate: Example 1: If all of the steel in the product is replaced once in the lifetime of the product, select steel and then input the replacement rate of 100%. Example 2: If there is a steel component weighing 10% of all steel in the product and it is replaced once in the lifetime of the product, select steel and then input the replacement rate of 10%.



Input for Basic level:

- Lat & Long

Brass	1%	51.442099	-0.154437		Show on Google Maps
Cast iron					
Ceramic					
Copper	10%	-24.270159	-69.073374		Show on Google Maps
Electronic component	3%	51.442099	-0.154437		Show on Google Maps
Expanded polystyrene					
Glass					
Insulation (general)					
Iron					
Lithium					
Plastics (general)	4%	51.442099	-0.154437		Show on Google Maps
Polyamide					

google.co.uk/maps/place/222+Balham+High+Rd,+Balham,+London+SW12+9BS/@51.4425585,-0.1536732,17z/data=!4m5!3m4!1s0x487605c53ab49ce9:0xc317df95b82d2eed!8m2!3d51.4420748!4d-0.154512?hl=en



Input for Basic level:

- Section C
 - If you want to

C. Further Information (not used in calculations)			
	Response	Qualifier	Notes
<i>Data entered in this section is not used in either calculation</i>			
Information regarding operational efficiency			<i>For heating this would be SCOP, for cooling generation this would be SEER. For pumps this would be $W/l\cdot s^{-1}$.</i>
Annual factory waste output (kg)*			<i>Either insert the total factory output or what you think is relevant to the manufacturing of the product. If you are giving outputs per product, please detail the assumptions.</i>
Annual factory water consumption (m ³)*			
Does the factory produce renewable energy and, if so, how much (kW·h)*			
Percentage of product reused at end of life (%)**			<i>If possible, describe which part of the product this refers to</i>
Percentage of product recovered at end of life (%)**			<i>If possible, describe which part of the product this refers to</i>
Percentage of product recycled at end of life (%)			<i>If possible, describe which part of the product this refers to</i>
Warranty (years)			
Cost (average sales price) (£)			
Ownership model (product as a service?)			
Maintenance recommendations and cycles			
* Please provide information on the final assembly factory. If you have more information on energy consumption of factories in the supply chain then please email to embodiedcarbon@cibse.org			
** Reused means that it will be reused for the same application that it was originally used for. Recovered means the component is used for a different application than it was originally used for.			

Input for Basic level:

- Section D
 - Important!

D. Information disclosure		
	Input	Notes
I consent to CIBSE's use of the data contained in this form for research purposes.		
I consent to CIBSE's use of the data contained in this form for research purposes, on the condition that all identifying information is removed from any published output.		If yes, please email this form to embodiedcarbon@cibse.org
I consent to CIBSE's use of the data contained in this form in order to establish an embodied carbon database for products used in building services, on the condition that all identifying information is removed from any published output.		
<i>Optional:</i> I am interested in finding out about becoming a CIBSE embodied carbon research partner.		If yes, please email embodiedcarbon@cibse.org for more information

Basic Calculations:

- This will be hidden
- Adds remaining % to Steel

<i>Steel (general or galvanised)</i>	65%		1930.50 kgCO2e
<i>Zinc</i>			
<i>Total</i>	100%	0%	5318.90 kgCO2e

Basic Report:

- Mainly auto-completed

Product information		
Type of product	Heat Pumps	
Capacity of equipment/size (kW; m ³ ; litre; etc.)	100 kW	
Product weight (kg)	1000.00 kg	
Material % breakdown for at least 95% of the product weight? (Y/N)	Y	
Product service life (years)	15 Years	
If refrigerant based, type of refrigerant used and GWP	R410a, 2088 kgCO ₂ e	
Refrigerant charge (kg)	35.00 kg	
Product complexity category	Category 3	See CIBSE TM65 Table 4.3

Embodied carbon results (kg CO ₂ e) – without refrigerant leakage		
A1: Material extraction (original product)	5319 kgCO ₂ e	
A1: Material extraction (components that are replaced in	532 kgCO ₂ e	
A1-A4, B3, C2-C4: Total embodied carbon with scale-up and buffer factor (excluding refrigerant leakage)	12170 kgCO ₂ e	

Embodied carbon result (kg CO ₂ e) – refrigerant leakage only		
B1 (refrigerant leakage during use) + C1 (refrigerant leakage at end of life)	45310 kgCO ₂ e	TM65 leakage Type 2

Embodied carbon result with 'basic' calculation method (kg CO ₂ e) – total		
Result of 'basic' calculation method	57479 kgCO ₂ e	

Basic Report:

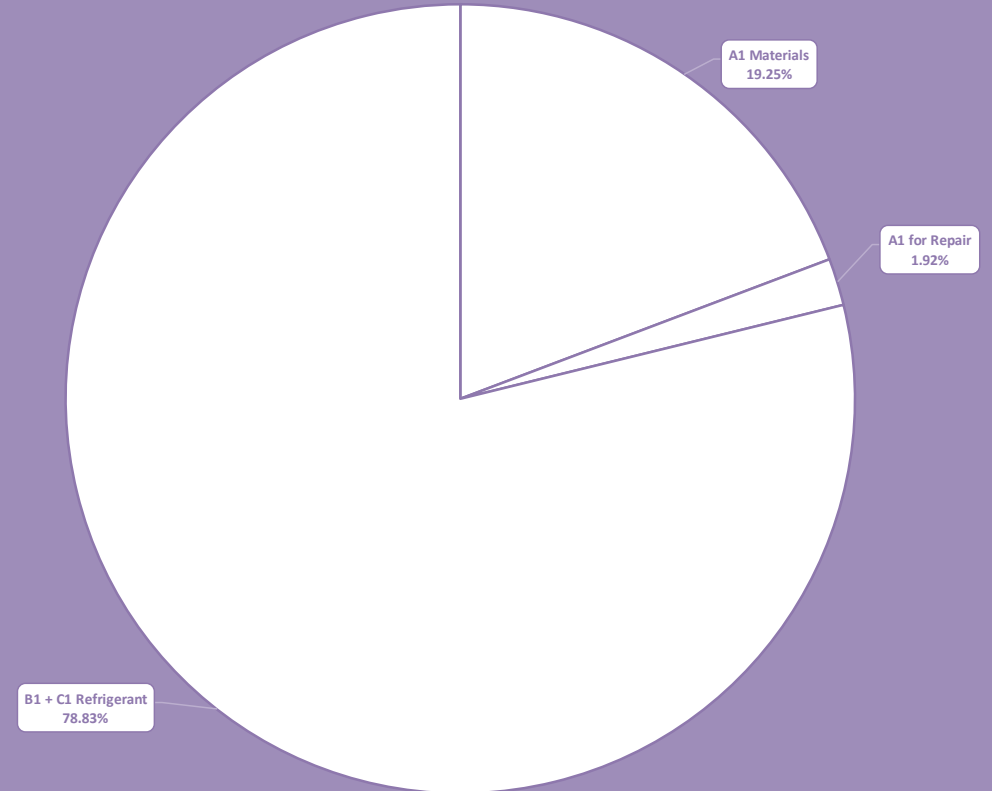
- Don't forget to sign-off

Details	
Please provide any relevant details	

Information disclosure	Select Yes if you agree	Notes
I consent to CIBSE's use of the data contained in this form for research purposes, on the condition that all identifying information is removed from any published output.		
I consent to CIBSE's use of the data contained in this form in order to establish an embodied carbon database for products used in building services.		

Basic Graph:

- Simple breakdown



Input for Mid-level:

- Same as for Basic

General information			
	Input		Notes
	Heat Pumps		
	Heat Pumps r Us		
Product	ASHP-1		For 'Type of Product', select the type that most closely resembles the product analysed. This cell provides 'Rounds of Manufacture' data to the tool. Refer to details.
Email	person@HeatPumpsRUS.com		

Section A: Essential information required for both 'Basic' and 'Mid-level' calculation				
	Input			Notes
Equipment (t.c.)	Insert size here	Insert unit here		For heating/cooling equipment, please indicate whether the capacity is for heating, cooling, or both, as appropriate
	100.00	kW		
Life (years)	15 Years			As manufacturer recommendations or CIBSE Guide M
Weight (kg)	1000.00 kg			
	Material	Material % by	Insert origin location, Latitude Longitude	Insert recycled content (%), if known
	ABS			
	Aluminium	7%		
	Brass	1%	51.442099 -0.154437	Show on Google Maps
	Cast iron			
	Ceramic			
	Copper	10%	-24.270159 -69.073374	Show on Google Maps
	Electronic component	3%	51.442099 -0.154437	Show on Google Maps
	Expanded polystyrene			
	Glass			
	Insulation (general)			
	Iron			
	Lithium			
	Plastics (general)	4%	51.442099 -0.154437	Show on Google Maps
	Polycarbonate			

	Insert other material here				
	Insert other material here				
	Insert other material here				
	Total	95%		0%	Needs to be at least 95% of product weight. Cell will be green if requirement is met.
If refrigerant based: type of refrigerant used	R410a				
If refrigerant based: refrigerant charge (kg)	35.00 kg				
If refrigerant based: refrigerant leakage scenario	Heat pump or chiller where some works to refrigerant pipework are carried out onsite			Type 2	
List of components/materials typically replaced over the product service life	Insert component/material	Insert replacement	Component name	Aligned with CIBSE TM65, if these fields are left blank it is assumed that 10% of the materials are replaced in the lifetime of the product. How to calculate material replacement rate: Example 1: If all of the steel in the product is replaced once in the lifetime of the product, select steel and then input the replacement rate of 100%. Example 2: If there is a steel component weighing 10% of all steel in the product and it is replaced once in the lifetime of the product, select steel and then input the replacement rate of 10%.	

Input for Mid-level:

- Plus Section B

Section B: Additional Information required for 'Mid-level' calculation only					
	Input				Notes
Location of final assembly factory (nearest city)	City		Latitude	Longitude	Nearest city lookup
	Paris, Île-de-France, France		48.856600	2.352200	Show on Google Maps
Annual factory energy consumption (kW·h)*	Insert kW·h		Insert fuel type		Enter total factory energy consumption for Electricity (select location) and Gas (or other secondary fuel).
	200.00 kWh		Electricity - Europe		
			Gas - Global		
Total quantity of products related to the annual energy consumption above	Average total tonnage (all products)	Average total tonnage (this product)	Tonnage percentage	No. of Products	Enter total factory output tonnage and proportion of that tonnage related to this product. This will apportion the factory energy usage to the individual product.
	1.00 tonnes	1.00 tonnes	100.00%	1	
List location of factories involved in supply chain before final assembly	Factory location	Component Weight (kg)	Insert factory location		Component name
	Lookup		Latitude	Longitude	
	Lookup		#N/A	#N/A	
	Lookup		#N/A	#N/A	
	Lookup		#N/A	#N/A	
	Lookup		#N/A	#N/A	
If possible, list location and component/part of the product associated with it					

* Please provide information on the final assembly factory. If you have more information on energy consumption of factories in the supply chain then please email embodiedcarbon@cibse.org

Mid-level Calculations:

- This will be hidden
- Adds remaining % to Steel
- Travel distance

Product information					
Type of product	Heat Pumps				
Capacity of equipment/size (kW; m ³ ; litre; etc.)	100 kW				
Product weight (kg)	1000.00 kg				
Material % breakdown for at least 95% of the product weight? (Y/N)	Y				
Product service life (years)	15 Years				
If refrigerant based, type of refrigerant used and GWP	R410a		2088.00 kgCO ₂ e		
Refrigerant charge (kg)	35.00 kg				
Product complexity category	Category 3			See CIBSE TM65 Table 4.3	
Embodied carbon results (kg CO ₂ e) — without refrigerant leakage					
	Material	Material % by weight	Insert recycled content (%), if known	Calculated Embodied Carbon	Linear Distance Travelled
	ABS				
	Aluminium	7%		917.00 kgCO ₂ e	381 km
	Brass	1%		48.00 kgCO ₂ e	338 km
	Cast iron				
	Ceramic				
	Copper	10%		381.00 kgCO ₂ e	10764 km
	Electronic component	3%		1470.00 kgCO ₂ e	338 km
	Expanded polystyrene				

Mid-level Report:

- Mainly auto-completed
- More detailed

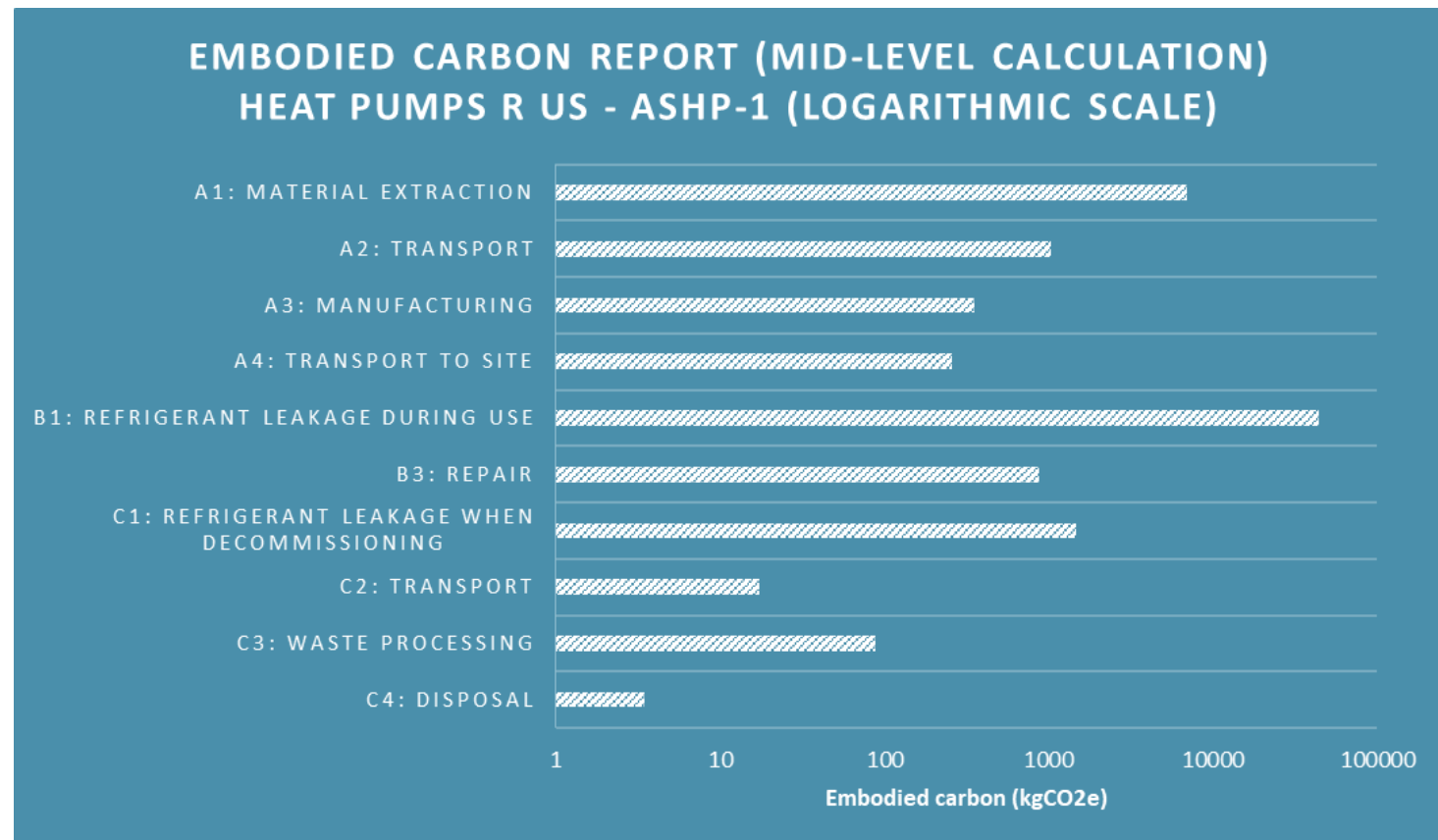
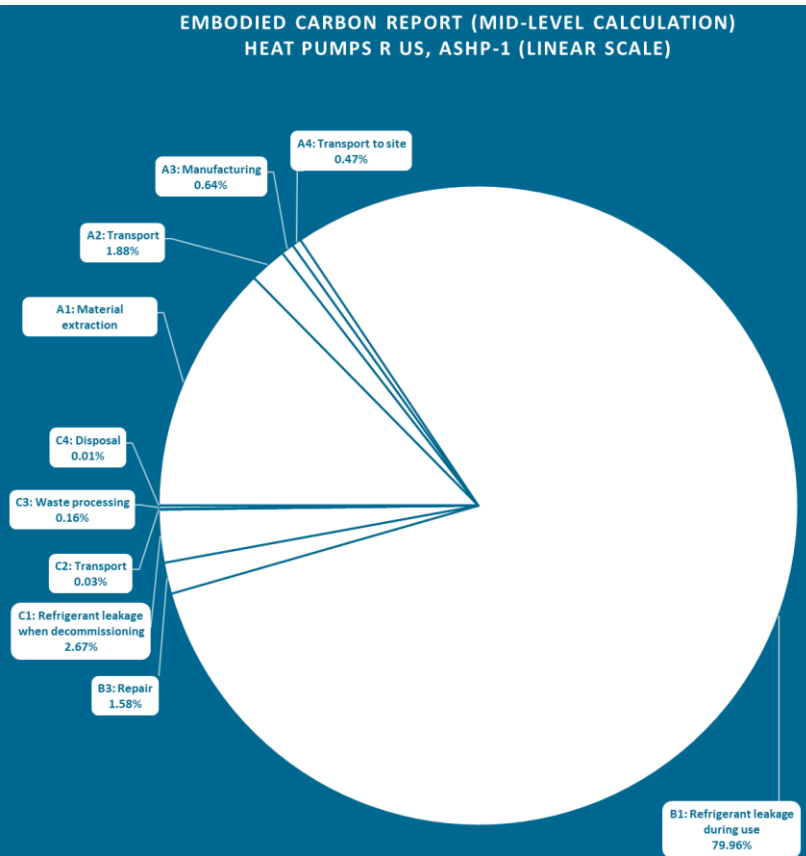
	'Mid-level' calculation	Notes/source
Date of assessment		Form "dd/mm/yy"
Name of assessor and assessor organisation	Self Assessment	
Contact email address of assessor		

Product information		
Type of product	Heat Pumps	
Capacity of equipment/size (kW; m ³ ; litres; etc.)	100 kW	
Product weight (kg)	1000.00 kg	
Material % breakdown for at least 95% of the product weight? (Y/N)	Y	
Product service life (years)	15 Years	
If refrigerant based, type of refrigerant used and GWP	R410a, 2088 kgCO ₂ e	
Refrigerant charge (kg)	35.00 kg	
Energy consumption of the factory* per unit of product	200.00 kWh	Electricity - Europe
Location of manufacture*	Paris, Île-de-France, France	
Product complexity category	Category 3	See CIBSE TM65 Table 4.3

Embodied carbon results (kg CO ₂ e) – breakdown		
A1: Material extraction	5319 kgCO ₂ e	TM65 assumption
A2: Transport	792 kgCO ₂ e	TM65 assumption
A3: Manufacturing	272 kgCO ₂ e	
A4: Transport to site	198 kgCO ₂ e	TM65 assumption
A5: Construction	n/a	
B1: Refrigerant leakage during use	43848 kgCO ₂ e	TM65 leakage Type 2
B2: Maintenance (if information given by manufacturer)	n/a	
B3: Repair	666 kgCO ₂ e	TM65 assumption
B4: Replacement	n/a	
B5: Refurbishment	n/a	
B6: Operational energy	n/a	
B7: Operational water	n/a	
C1: Refrigerant leakage when decommissioning	1462 kgCO ₂ e	TM65 leakage Type 2
C2: Transport	13 kgCO ₂ e	
C3: Waste processing	68 kgCO ₂ e	
C4: Disposal	3 kgCO ₂ e	TM65 assumption

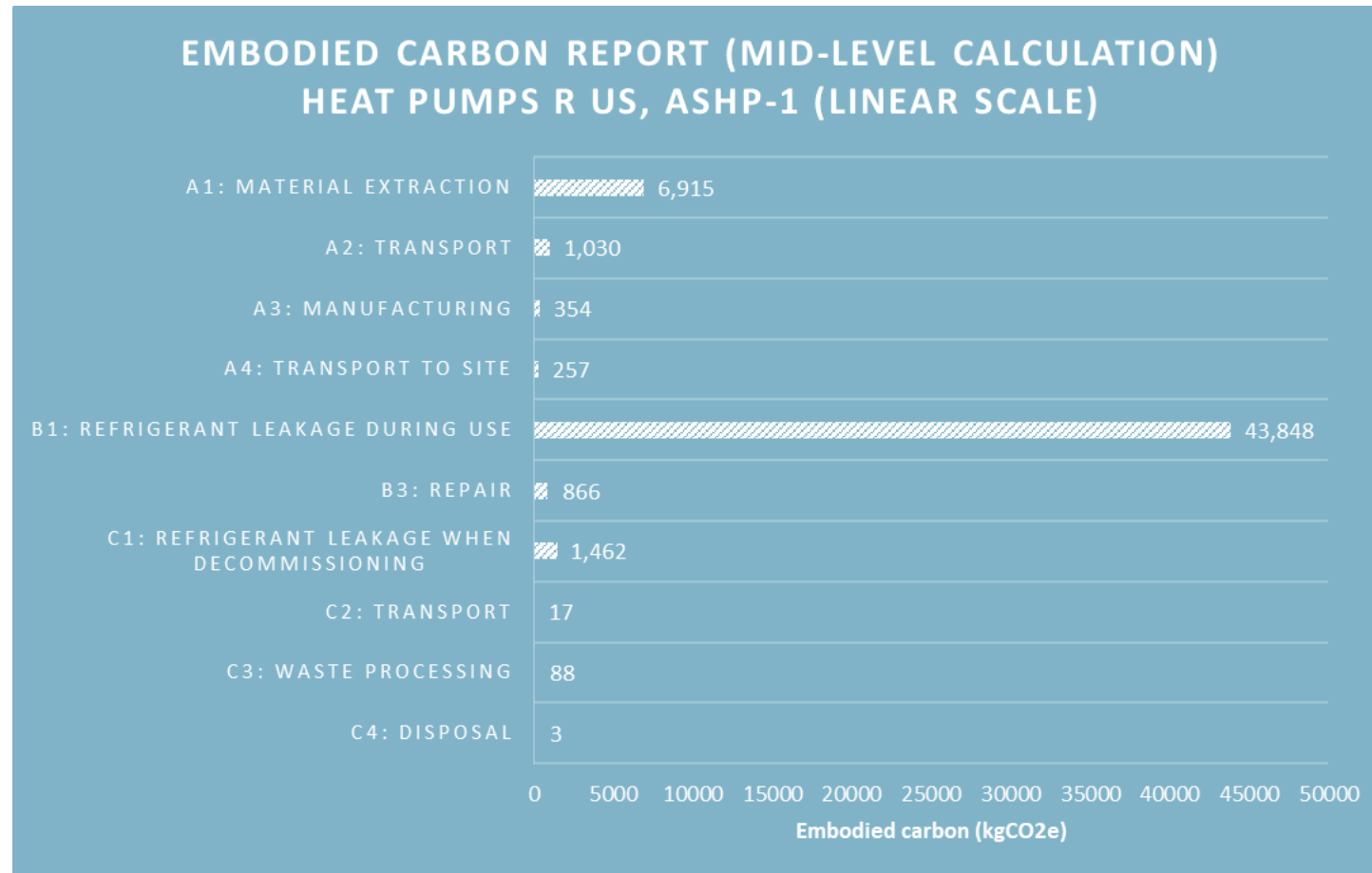
Mid-level Graph:

- Detailed breakdown

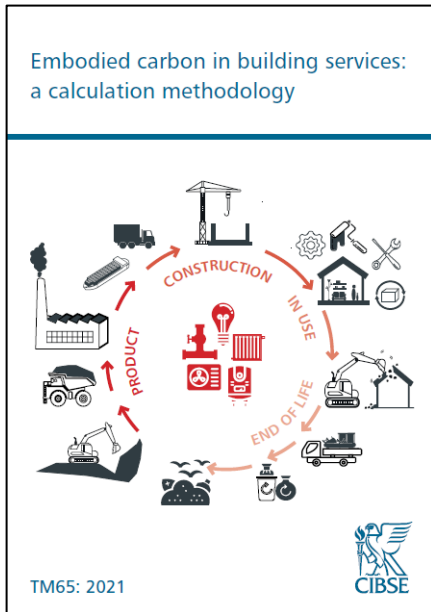


Mid-level Graph:

- Non-log scale



How do all the documents **work together?**



CIBSE TM65

Manufacturer form

Section A:
Info for basic calc

Section B:
Info for mid-level calc

Section C:
Additional Information

Section D:
Data disclosure

**Manufacturer
form**

Reporting form

Product information

Calculation results

Disclosure

**Reporting
form**

Calculator tool

**Calculator
tool**

Consultant/researcher – that carries out their own calculations

Step 1: Send the manufacturer the ‘manufacturer form’

Step 2: Receive the ‘manufacturer form’ from the manufacturer

Step 3: Use the CIBSE TM65 methodology to carry out the calculations

Step 4: Use the results in systems analysis

Step 5: Send the manufacturer form and the completed excel tool (which in effect becomes the reporting form) to CIBSE – to help develop knowledge on embodied and the development of an embodied carbon database.



Manufacturer form

Section A:

Section B:

Section C:

Section D:

Reporting form

Product information

Calculation results

Disclosure

Consultant/researcher – using the tool

Step 1: Send the manufacturer the ‘manufacturer form’

Step 2: Receive the ‘manufacturer form’ from the manufacturer

Step 3: Use the ‘calculator tool’ to carry out the calculations

Step 4: Use the results in systems analysis

Step 5: Send the manufacturer form and the completed excel tool (which in effect becomes the reporting form) to **CIBSE** – to help develop knowledge on embodied and the development of an embodied carbon database.



Manufacturer
form

Section A:

Section B:

Section C:

Section D:



Calculator tool

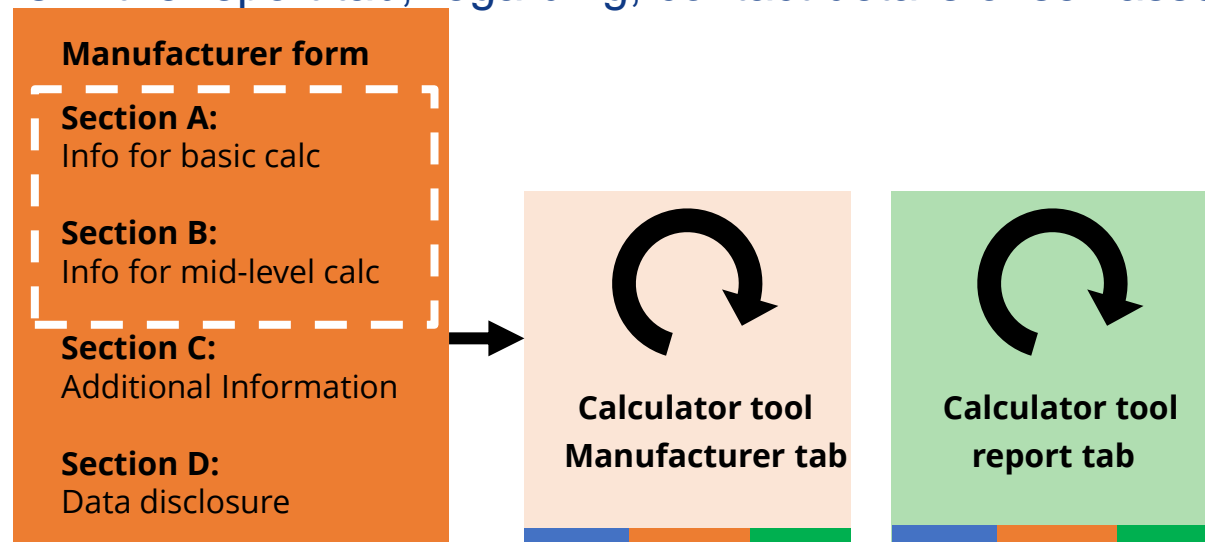
Consultant/researcher – using the tool - step 3 – the details

Step 3: Use the ‘calculator tool’ to carry out the calculations

3a: Copy section A and B into the ‘Manufacturer form’ of the tool

3b: The tool calculates the embodied carbon - and displays the results in the ‘report tab’ – which is the same format as the reporting form

3C: complete the remaining sections in the report tab, regarding, contact details of self assessor and disclosure options



Manufacturer – using the tool

Step 1: Use the ‘calculator tool’ to carry out the calculations (including filling out the disclosure section in the report tab)

Step 2: Print the manufacturer/report tabs to PDF - send this to **clients/consultants/contractors** to show the embodied carbon of the product

To help CIBSE develop knowledge on embodied and the development of an embodied carbon database.

Step 3: complete the manufacturer form (section C and D) and the completed excel tool (which in effect becomes the reporting form) to **CIBSE**



Manufacturer form

Section A:

Section B:

Section C:

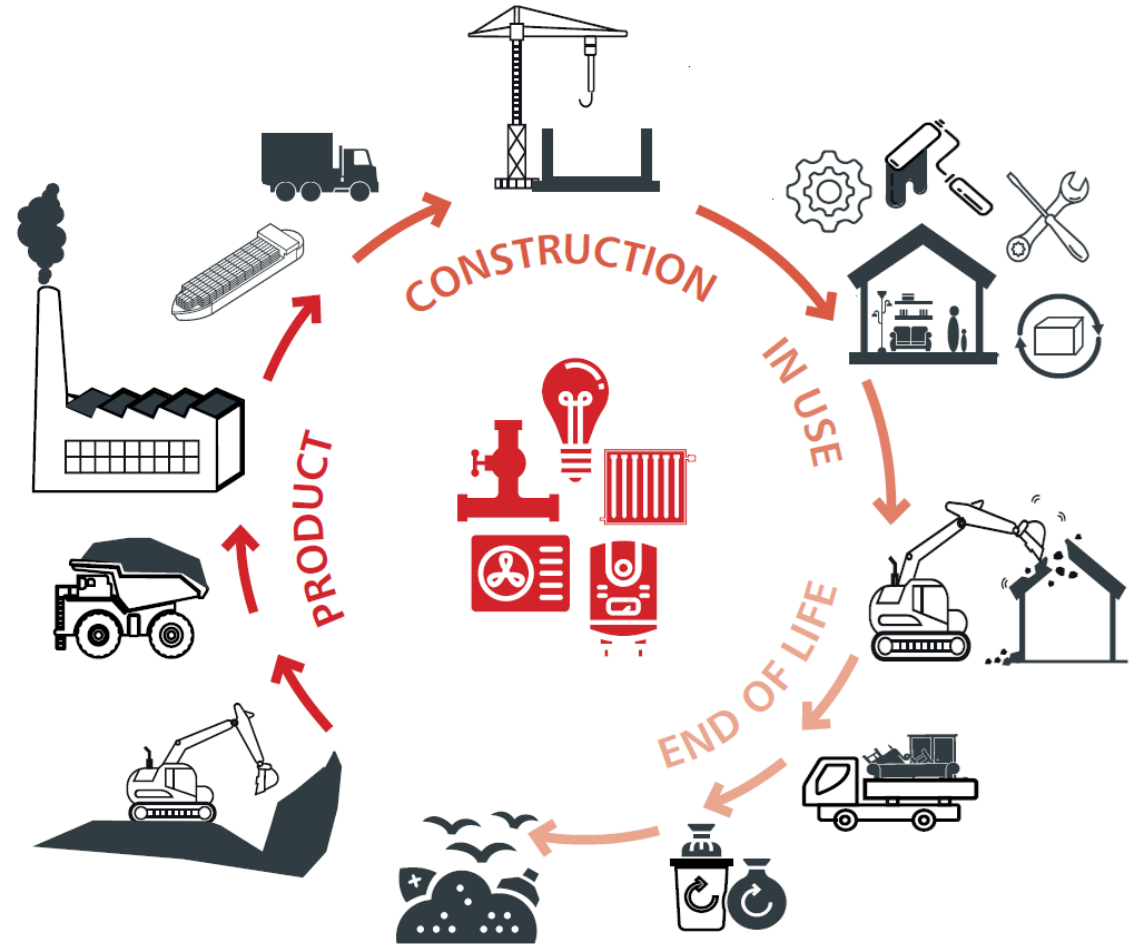
Section D:



Calculator tool

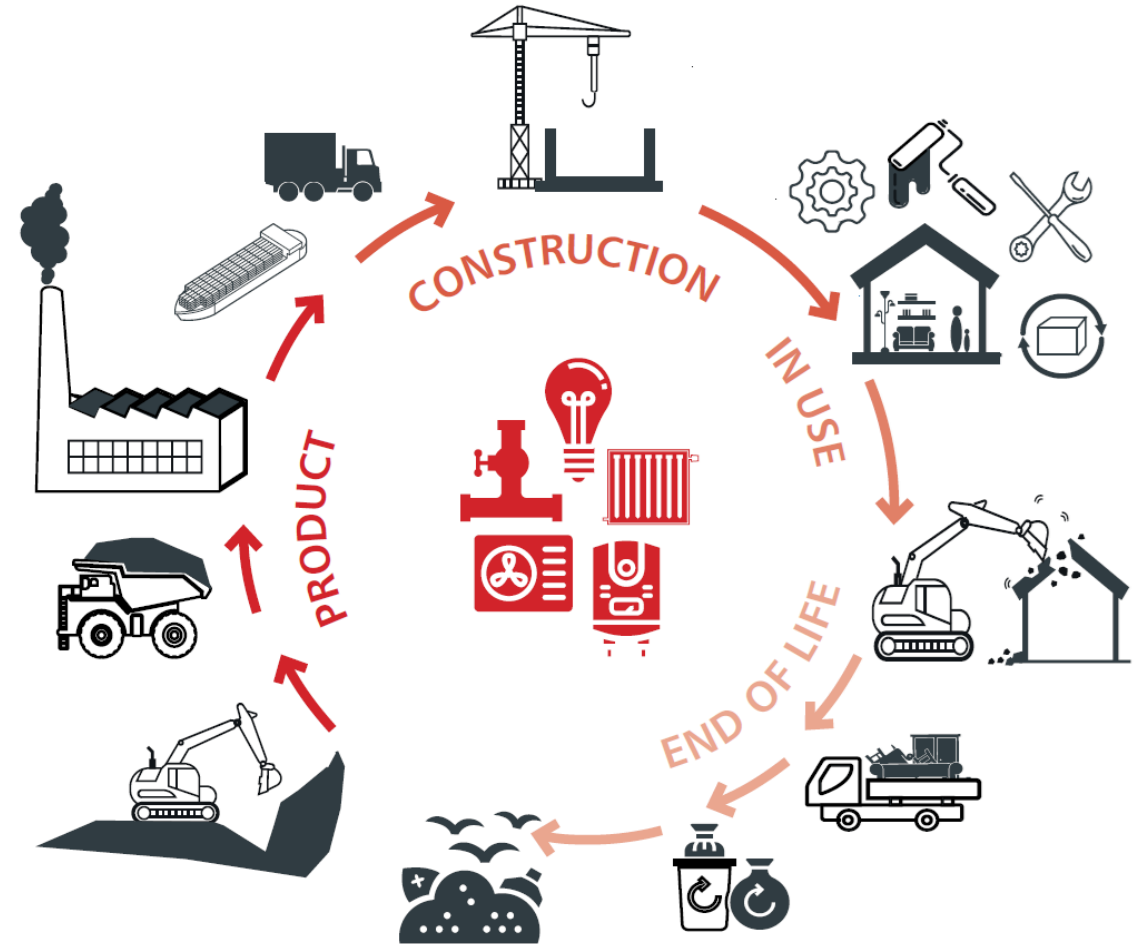
Where can I get this tool?:

- Knowledge portal

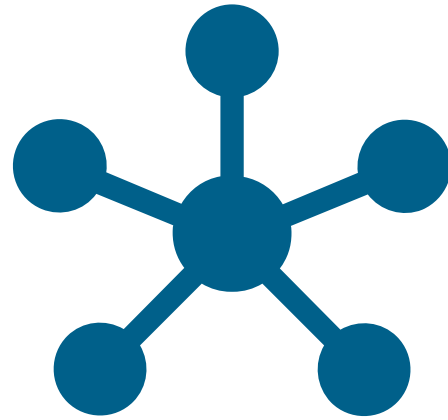


Future developments:

- Database
- Online tool
- Generic values
- Component sheet



CIBSE TM65 - Database:



embodiedcarbon@cibse.org

CIBSE TM65.1 – Research Insight paper:

**RESEARCH INSIGHT PAPER
ON EMBODIED CARBON OF
HEATING DESIGN IN RESIDENTIAL
SCHEMES (3 scales)**

CIBSE TM65 – Training:

Introduction

How to use the CIBSE TM65 excel based tool

Worked examples

When to question data from manufacturers

How to find embodied carbon coefficients for materials not listed in TM65

Range of expected results

CIBSE TM65 for Advanced users

Functional units, how to categorise products, generic data points, sharing data, embodied carbon at system level

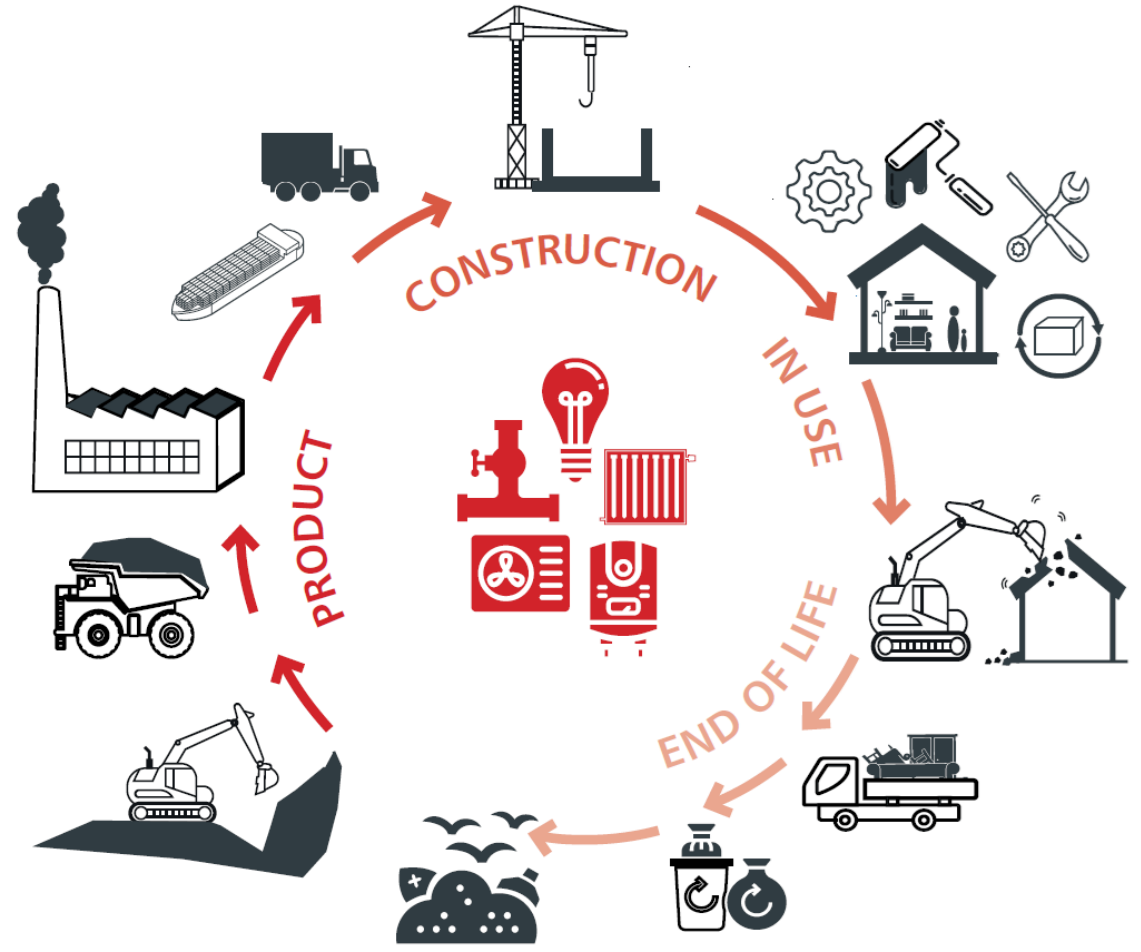
Next steps for CIBSE TM65

Development of the method, how data submitted to CIBSE will be used, Collaboration

Register your interest by emailing
embodiedcarbon@cibse.org



Questions?





Thank you