



MDDC 'Net Zero Housing Assessment Tool'

Background

Mid Devon District Council (MDDC) developed a tool with the University of Exeter to assess the costs and climate impacts of various "low carbon" standards for new housing developments. The project was funded through the Local Government Association's Housing Advisers Programme and will be available to other local authorities.

How the Tool Works

The tool calculates carbon performance (based on regulated emissions from Part L of the Building Regulations, and embodied carbon if selected) of four dwelling typologies: detached, attached, 1 bed flats and 2 bed flats for a range of fabric and building services specifications. The tool then sizes the required PV array to meet Part L, and any further improvements that have been stipulated. It then establishes the cost uplift to achieve performance standards compared to the lowest cost means of meeting the minimum requirements of the Building Regulations.

A full description of the model and calculations can be found in report CEE ID 1009 "The Development of a 'Low Carbon Affordable Housing Development Framework Assessment Tool' for New Development in Mid Devon", March 2022. The model is a high level tool that makes a number of assumptions and is NOT intended as a substitute for detailed SAP calculations.

How to Use the Tool

The Input Sheet

On the input sheet all yellow boxes are required inputs, and orange boxes are voluntary inputs. **Specific guidance for completion of each input is given on the Input sheet.**

In summary, these inputs are:

Development Description

Year of development: The tool assumes a development is delivered in a single year.

Number of dwellings: This is the total number of dwellings in the development.

Build mix: This is the % breakdown for each of the four dwelling types. These percentages must sum to 100%.

Height of buildings with flats: Where there are flats, the height in storeys of buildings containing flats must be entered.

Operational Standards:

Building Regulations Minimum Standard: The baseline operational performance standard is taken to be Part L of the day which is established from the build year and includes a 1 year transitional period. In other words, buildings prior to 2026 are assumed to be under Part L 2021, and from 2026 the Future Home Standard (FHS).

Fabric standard: It is possible to set a minimum fabric standard expressed in kWh/m² per year up to 15 kWh/m².year (Passivhaus standard).

Gas connection: It is possible to ban connection to the gas network. Even if gas is allowed, it is assumed that after 20 years all dwellings with gas boilers are replaced with heat pumps.

Carbon standard: It is possible to set improvement beyond Part L of the day as either 10%, 20%, 30%, 40%, 50%, or 100% (net zero) improvements for regulated emissions.

Embodied Standards:

Embodied standard: It is possible to set the required embodied carbon standard on an A++ to G rating (which relate to kgCO₂e/m² benchmarks).

The Output Sheet

The output sheet includes details of the specification selected by the tool to meet the input objectives for each of the four dwelling types, as well as operational and embodied carbon performance, cost uplifts, and lifecycle costs including fuel costs and the cost of carbon. Guidance for interpreting the results are given in the Output sheet.

[Go to INPUT](#)

[Go to OUTPUT](#)

[Go to
COVER](#)

[Go to
OUTPUT](#)

INPUT Sheet

Enter information to describe the proposed development. All yellow boxes need to be filled in. The orange boxes are optional if "bespoke" was chosen for the "Fabric Standard" input box.

Development Description

Year of development
Total number of dwellings
% as detached
% as attached
% as 1 bed flat
% as 2 bed flat
Build mix check
Height of buildings with flats

2026	
1000	
20%	
60%	
10%	
10%	
OK	
2	

Guidance/Instructions

Enter the start year of the development. This is used to choose the version of Part L to use, as well as assumptions about building technologies.
Enter the total number of dwellings to be assessed in the scheme.
Enter the percentage of the development that is detached. For example, for a 500 dwelling development with 100 detached dwellings, enter 20%.
Enter the percentage of the development that is attached. For these purposes attached means a house that is semi-detached or terraced.
Enter the percentage of the development that is 1 bed flat. This should be based on number of dwellings rather than buildings, for example a development of 200 dwellings including a building containin 20 x 1 bed flats enter 10%.
Enter the percentage of the development that is 2 bed flat. The percentage is worked out in a similar way for 1 bed flats above. If there are any 3 bed flats (or larger), include them here.
If the four percentage values above do not add up to 100%, then an error will be shown here until this is remedied.
If there are any flats, enter the average height of buildings containing flats across the development. A value of between 2 and 6 can be entered.

Operational Standards

Building Regulations Minimum Standard
Fabric Standard
Gas requirement?
Carbon standard

FHS	
No specific fabric standard	
Gas Possible	
Reduce Part L regulated: 30%	

This states the version of Part L that will be applied to the development. It assumes a transitional period of 1 year between the implementation of the Future Homes Standard.
To set a minimum fabric performance standard (in kWh/m2 per year) choose from the list here. If no improvements on the minimum requirements are required select "No specific fabric standard" here. In order to specify specific requirements for the fabric or building services, Choose "Bespoke" here and make sure to complete the orange boxes below.
It is possible to ban connection to the gas grid within the tool. To do this select "No gas connection allowed" from the drop-down list. It should be noted that if the scheme is brought forward under the Future Homes Standard (assumed from 2026 here) then gas will not be possible.
To set a minimum Part L standard (expressed as a % improvement over the minimum requirements) choose from the drop-down list. If no improvements are required select "Meet Part L only". This relates only to "regulated" emissions and does not include emissions associated with e.g. appliances.

Optional Bespoke Specification

This section only needs to be completed IF "Bespoke" has been chosen from the "Fabric Standard" input above.

Walls: Exposed
Walls: Semi-exposed
Floors
Roof
Doors
Windows
Air Permeability
Ventilation
Ventilation heat recovery eff.
Heat Source
Waste Water Heat Recovery

0.18	
0.21	
0.13	
0.13	
1	
1.4	
5	
Natural Ventilation	
0%	
ASHP	
None	

Enter the minimum required U-value for any "exposed" external walls in the development.
Enter the minimum required U-value for any "semi-exposed" external walls in the development.
Enter the minimum required U-value for the floors in the development.
Enter the minimum required U-value for the roofs in the development.
Enter the minimum required U-value for the doors in the development.
Enter the minimum required U-value for the windows in the development.
Enter the minimum air permeability value (m3 per hour per m2 @ 50 Pa) for the development.
The development can be set to have either Natural Ventilation (with extract fans in toilets) or full Mechanical Ventilation with Heat Recovery here.
If "Natural Ventilation" has been chosen above, enter 0% here. Otherwise set a minimum required mechanical ventilation heat recovery percentage here.
The heat source can be specified as either gas (boiler) or Air Source Heat Pump (ASHP) here. It should be noted that if the scheme is brought forward under the Future Homes Standard (assumed from 2026 here) then gas will not be possible.
Waste water heat recovery can be included in the bespoke specification here, if required.

Note: The calculations consider regulated emissions only, and not undergulated or in-use performance issues.

Note: The analysis is based on a number of housing archetypes with fixed geometry and façade design. It may be possible to improve (or perform worse than!) on the calculated values by optimising form, orientation and façade design.

Note: Options do not include district heating which would need to be assessed on a site by site basis if there is a suitable low carbon heat source nearby

Note: In this model there is no link between MVHR efficiency and price of MVHR unit.

Embodied Carbon

Target embodied carbon standard

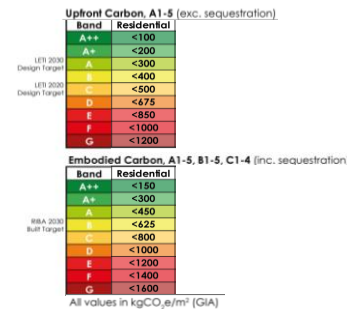
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A minimum embodied carbon standard for the development can be specified here from the drop-down list. These are based on the LETI benchmark A to G values shown below. The analysis includes "upfront" (i.e. up to the construction) and "embodied" (i.e. also including lifetime maintenance and disposal). Embodied carbon can be ignored in the analysis by choosing "Exclude embodied from analysis" here. It should be noted that the analysis does NOT include any cost implications for embodied carbon standards, as there is insufficient reference information.

Once all the above Inputs have been completed, please go to the Outputs to view the results.

[Go to
OUTPUT](#)

Embodied Carbon Benchmarks from LETI



OUTPUT Sheet

[Go to COVER](#)

[Go to INPUT](#)

Hover over each Result Table Title (red marker) to see guidance on interpreting the results

MODEL OPTIMISED SPECIFICATION

Measure	Detached	Attached	1 Bed Flat	2 Bed Flat
Number of Dwellings	200	600	100	100
Scenario Name	Notional Building C&B	Notional Building C&B	35 kWh/m2.year	35 kWh/m2.year
Heating System	ASHP	ASHP	ASHP	ASHP
Ventilation strategy	Natural Ventilation	Natural Ventilation	Natural Ventilation	Natural Ventilation
Walls: Exposed W/m².K	0.18	0.18	0.18	0.18
Walls: Semi-exposed W/m².K	N/A	N/A	0.21	0.21
Floors W/m².K	0.13	0.13	0.15	0.15
Roof W/m².K	0.13	0.13	0.11	0.11
Doors W/m².K	1	1	1.4	1.4
Windows W/m².K	1.4	1.4	1.4	1.2
Air Permeability @	5	5	4	5
PV Size kWp	1.2	0.9	0.9	1.1

GREENHOUSE GAS EMISSIONS

Absolute Emissions

Dwelling Type	Embodied Upfront tCO2e	Embodied In-Use tCO2e	Embodied End of Life tCO2e	Operational lifetime tCO2e	Total Lifetime tCO2e
Detached	19907	3789	4408	220	28324
Attached	43044	8192	9532	476	61244
1 Bed Flat	4250	809	941	32	6032
2 Bed Flat	5959	1134	1319	57	8469
TOTAL	73160	13924	16201	786	104070

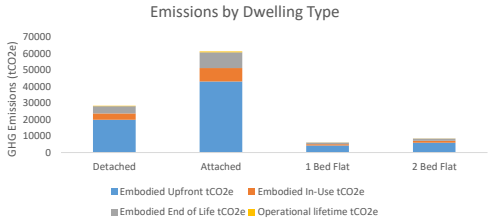
% Emissions

Dwelling Type	Embodied Upfront tCO2e	Embodied In-Use tCO2e	Embodied End of Life tCO2e	Operational lifetime tCO2e	Total Lifetime tCO2e
Detached	19%	4%	4%	0%	27%
Attached	41%	8%	9%	0%	59%
1 Bed Flat	4%	1%	1%	0%	6%
2 Bed Flat	6%	1%	1%	0%	8%
TOTAL	70%	13%	16%	1%	100%

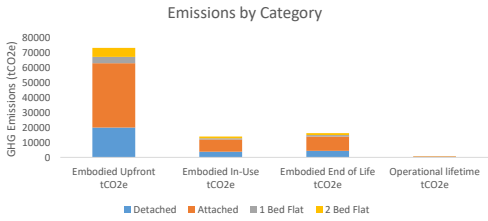
COST OUTPUTS

Dwelling Type	Development Additional Cost over Minimum	Av. Dwelling Additional Cost over Minimum	Discounted energy cost 30 years	Discounted energy cost 60 years	Discounted carbon cost 60 years
Detached	£ 130,056	£ 650	£ 2,024,567	£ 2,847,720	£ 890,983
Attached	£ 281,214	£ 469	£ 4,389,694	£ 6,174,466	£ 1,926,531
1 Bed Flat	£ 46,869	£ 469	£ 366,656	£ 515,732	£ 189,583
2 Bed Flat	£ 115,978	£ 1,160	£ 602,689	£ 847,731	£ 266,337
TOTAL	£ 574,117	£ 574	£ 7,383,606	£ 10,385,648	£ 3,273,434

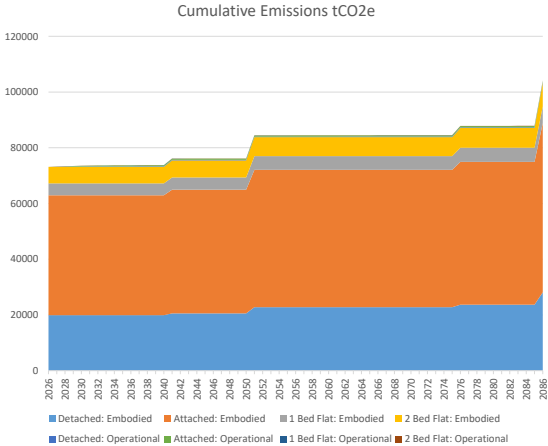
Graph Notes



Graph Notes



Graph Notes



Graph Notes

Upfront, Energy and Carbon Costs

