

Historic Environment Scotland embodied carbon calculator for sandstone or granite: instructions for use

1) Introduction

The calculator has been developed to support the calculation of the embodied carbon of stone, including the carbon emissions associated with transport to the construction site.

This document provides step-by-step instructions on how to use the pilot version of the calculator, which has been implemented in Microsoft Excel. Depending on the results of the pilot phase, the calculator may be further developed, and in a different format, in which case these instructions will no longer apply.

Information concerning the justification for the calculator, its limitations, and the associated methodologies will be made available in other documentation.

2) Getting started

Open the file

Open the calculator file in Microsoft Excel, and – if not already there – navigate to the title page, which is the worksheet labelled “FRONT SHEET” in the list of tabs along the bottom (Figure 1).

Note that the workbook includes several developer pages that are not intended for the user: click your mouse on the “Return to FRONT SHEET” hyperlink (or anywhere on the page) to get back to the title page.

Select the appropriate assessment option

1. Decide which of sandstone or granite will be the subject of the assessment.
2. Decide whether
 - a. an initial very rough approximation is all that will be required, in which case the ‘simplified’ version can be used, which is likely to take only a minute. Or,
 - b. a more thorough appraisal is required, making use of real input data about the supply chain. In this case the ‘detailed’ version is used: data entry should still take less than five minutes, but obtaining the data is likely to require some additional work.
3. Make the appropriate selection from the four hyperlinks on the FRONT SHEET (see Figure 1).

3) Simplified Appraisal

These instructions apply to the simplified appraisals, whichever option is chosen (sandstone or granite).

Data Entry

For the simplified appraisal, **only four entries are needed**. These include **the quantity of stone**, which is optional, as comparisons may be made on a per-tonne basis without entering a value here (the green box on the right – see Figure 2).

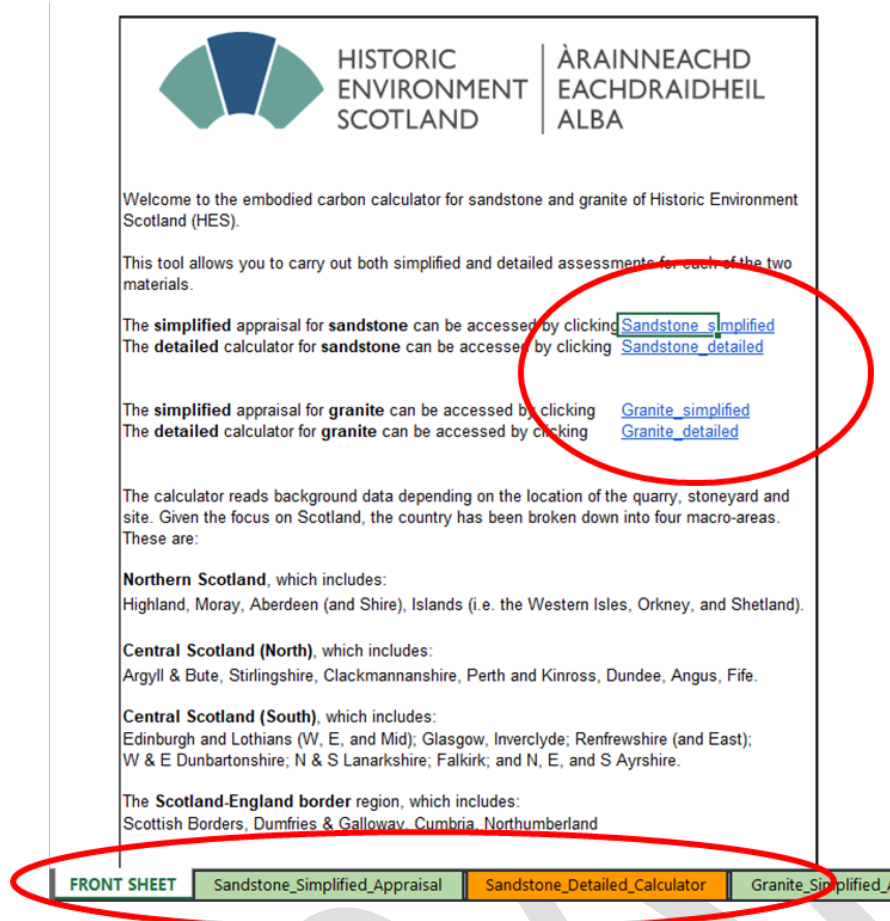


Figure 1. Front Sheet, with navigation options ringed (hyperlinks above, worksheet tabs below).

Figure 2 – Detail from simplified calculator for sandstone, the top part of the page showing the four data entry cells.

Locations of the quarry, the stone yard and the construction site are selected from dropdown lists on the left. The quarry is, of course, where the stone is extracted; the stone yard is the location where the most significant part of the processing is carried out (which in some cases will be the same location as the quarry); and the construction site is where the stone is ultimately to be used.

The dropdown lists for the quarry and stone yard are identical, and include options within Scotland, the wider UK, and the rest of the world (see the FRONT SHEET for definitions of the geographical regions for Scotland: the other regions should be obvious).

As the calculator is intended to apply to the use of stone in Scotland, the dropdown list for construction sites is limited accordingly.

To navigate to another assessment, use the tabs at the bottom of the page to go directly to the option needed, or to the FRONT SHEET and on from there via the title page, as detailed in Section 2.

Interpretation of Results

Results are presented in graphical format, underneath the data inputs. The graph on the left represents the results for one tonne of stone, and the graph on the right represents the results for the total quantity entered.

Results relate to the **life cycle stages** used in Environmental Product Declarations (EPD)¹. In summary, these are:

- A1 – Raw material supply
- A2 – Transport (of materials)
- A3 – Manufacturing
- A4 – Transport (of manufactured product to the point of use).

Subsequent life cycle (relating to construction processes, the use phase, and end of life) are not covered by this calculator.

The results represent embodied carbon (A1-A4) **in units of kg GHG** (or kg GHG per tonne of stone), which is short for kilograms of Greenhouse Gas weighted according to Global Warming Potential. This is also often referred to as kg CO₂e (kg of carbon dioxide equivalents).

The graphical output includes **error bars** (Figure 3). These are indicative rather than rigorously justified through statistical analysis. They serve as a reminder that the 'true' value can never be precisely known, but might reasonably be assumed to lie somewhere in the range indicated by the bar.

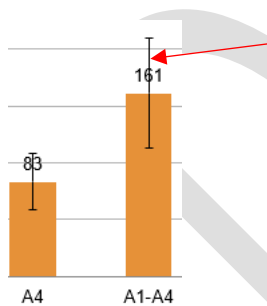


Figure 3. Detail of graphical output, with arrow indicating error bar.

4) Detailed Assessment

Data Entry

For the detailed assessment, the following information is required.

¹ For more details, see EN 15804+A2 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

1. High level information on locations **must be correctly entered** – from the three dropdown lists – just as in the simplified appraisal (see Section 3, data entry).
2. Below the dropdown boxes are three boxes where **the exact locations** of the same three sites may be entered as free text (potentially useful for subsequent auditing / review).
3. Below that, there are **two further yes/no selection boxes relating to sea transport**. Both questions **must be answered...**
4. ...If either of these questions is answered with “yes”, text boxes are made available directly below, where information may be entered about the **ports of departure and arrival** (again, with potential record-keeping value).
5. Numerical information is required on the right-hand side of the data entry form, starting with the option to enter the quantity of stone, as in the simplified appraisal.
6. Choose realistic routes – combining land and sea as appropriate – and calculate or estimate the distances of each leg of the journey.
 - a. External online tools can help in this regard: examples are given on the form.
 - b. For the road transport, calculate the distances outside Europe separately from those within Europe (including the UK).
 - c. Where a journey between two locations includes multiple legs of the same type (i.e. road in Europe, road outside Europe, or sea), aggregate all of those legs into a single number for each type.
 - d. **Road distances must be entered in units of km...**
 - e. **...and sea distances in units of nautical miles.**

Saving the Results

The calculator will not store results for multiple assessments of the same type in the same file.

Options for saving results are:

- Save (print) the relevant page of the spreadsheet as a PDF, or
- Save a new copy of the complete calculator for each assessment, with a suitable file name for ease of identification in future.

Interpretation of Results

The comments made under this heading for the simplified appraisal (Section 3) also apply here. The difference is that the results obtained in the detailed assessment are based on information specific to the supply chain, and are more likely to accurately represent the true situation.