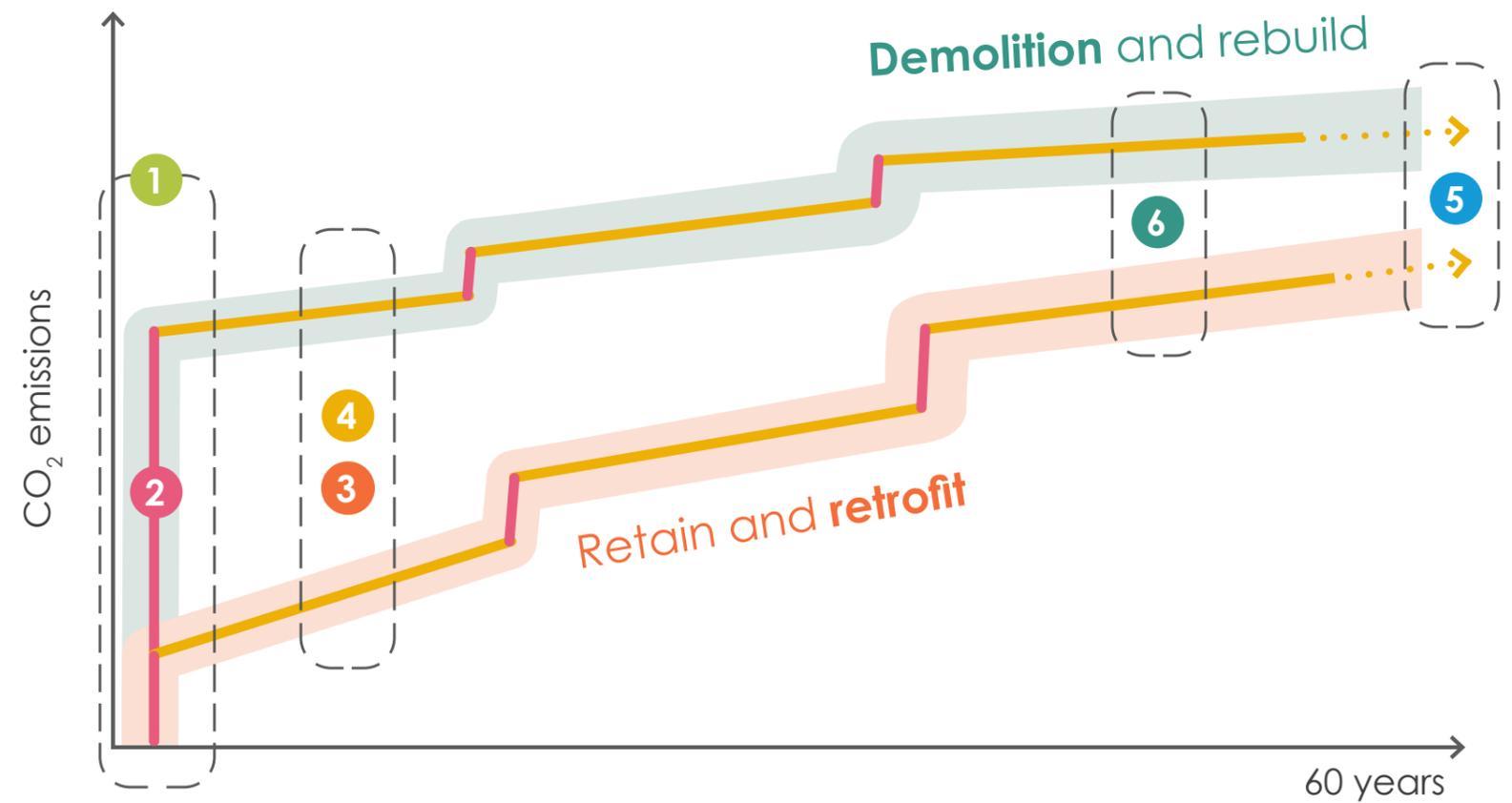


LETI Unpicker

Retrofit vs rebuild:
Unpicking the carbon
argument

Mar 2023



Retrofit vs rebuild: Unpicking the carbon argument

Introduction

This note provides guidance on how to compare whole life carbon for a retrofit versus its demolition and rebuild.

In practice, there will be many factors in the decision of whether or not to retain a building, including:

- **Carbon:** this is the focus of this note, considering both the embodied carbon implications, and the operational carbon implications related to energy use, in both the retrofit scenario and the demolish and rebuild scenario.
- **Value** such as heritage, benefits to users and the wider community.
- **Functionality and performance** including comfort and flexibility of use.
- **Other sustainability considerations** such as climate resilience, biodiversity and minimising water resources.

The initial embodied carbon emissions from demolition and rebuild will usually be higher than through retrofit, although extensive retrofit can also lead to high embodied carbon emissions. On the other hand, operational carbon emissions may be lower in a rebuild scenario, although deep retrofits can often approach similar operational carbon levels. On a whole life basis, the assessment is complex and relies on many assumptions.

This document aims to help review whole life carbon comparisons between rebuild and retrofit scenarios, to answer the following question:

Does the whole life carbon assessment and comparison provide a basis for decision on the carbon part of the retrofit versus rebuild argument?

To answer this, the unpicker helps establish whether the assessment and comparison are:

- As fair and like-for-like as possible
- Technically robust, thorough, and following best practice guidance
- Transparent e.g. clearly listed assumptions, open about areas of uncertainty.

This is a simple document aiming to provide an overview for non-technical specialists. More detailed guidance is available in the following LETI documents:

-  **SIGNPOST** *Operational energy and embodied targets and benchmarks: see LETI Carbon Alignment and Climate Emergency Design Guide*
-  **SIGNPOST** *Operational Carbon in Whole Life Carbon Assessments Opinion Piece*
-  **SIGNPOST** *Operational Energy modelling guide*
-  **SIGNPOST** *Upcoming guidance on Whole life carbon impacts of refurbishment vs new build*
-  **SIGNPOST** *LETI Opinion Piece on carbon factors in whole life carbon calculations*

Retrofit vs rebuild: Unpicker



1 What is the whole life carbon assessment methodology?

Is it consistent between scenarios, and does it follow best practice?

The whole life carbon (WLC) assessment should follow the RICS Professional Statement (PS) and list all assumptions and data sources. Life cycle stages should be explicitly mentioned so they can be compared across scenarios. All elements recommended in the PS should be included. If the assessment differs from the PS recommendations, this should be highlighted and justified, and the results shown alongside those obtained when following the PS recommendations.

The carbon impacts from demolition and strip-out should be included and identified within the total WLC figure.

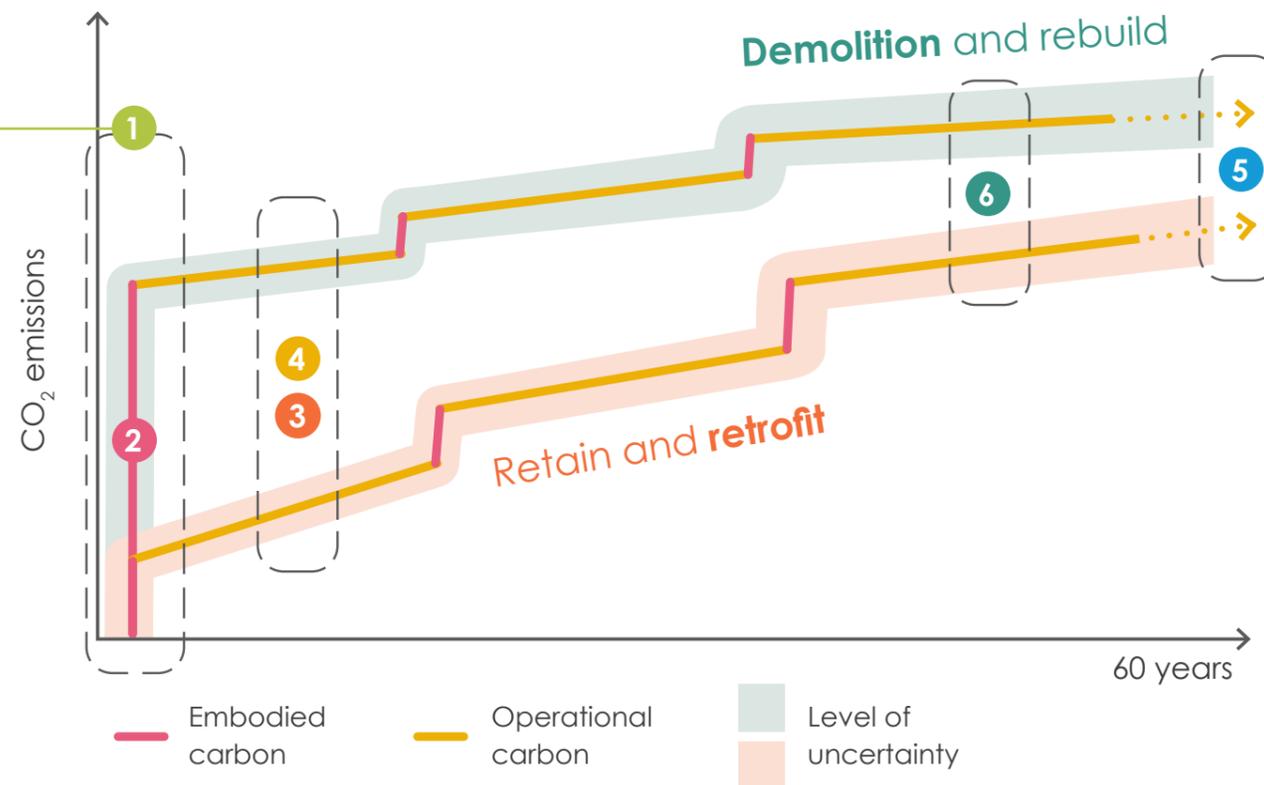
2 Do all scenarios follow best practice?

And do they show similar ambition to reduce carbon?

All scenarios should seek to reduce carbon as much as possible, and meet targets such as those from LETI e.g. re-using foundations, using materials efficiently, not over-sizing building services equipment. This should be consistent e.g. if the re-build scenario assumes innovative products to reduce carbon, innovation should also be explored in the retrofit scenario.

3 Is the potential performance of the existing building fully explored through a low carbon retrofit?

The WLC comparison should not be between a best performing new build, and an existing building with little or no improvement: it should consider, as alternative to demolition & new build, a low energy use, low carbon retrofit with similar level of ambition to that applied to the new build (i.e. using best practice measures and targets in both cases).



Illustrative graph of the sort of comparison graphs that this Unpicker helps to analyse; it is not necessarily representative of trends on all projects, nor a detailed representation of best practice LCA analysis.

4 Are operational emissions based on a robust and realistic energy performance assessment?

Energy performance modelling methods include CIBSE TM54, PPHP, and NABERS. Part L assessments are standardised asset comparisons, they are NOT energy performance assessments and should not be used for WLC assessments.

For best practice, energy use and associated operational carbon emissions should be shown as a range, to represent possible scenarios for occupancy and operation. Benchmarks or industry targets could possibly be used instead of energy performance modelling, but only at a very early stage, as they are much less informative about the specific project.

Metered energy use from the existing building should only be used to help calibrate the energy model before applying the retrofit measures to reduce operational energy.

5 Is the difference in carbon emissions between scenarios significant?

Or is it within the margin of error and uncertainty?

Assessment at early design stages will include many assumptions on specifications, supply chains etc. In addition, the standard period for a WLC assessment is 60 years, which inherently implies much uncertainty, and means that carbon benefits far into the future should be viewed much more cautiously than early ones. Altogether, if there is only a small difference (say, below 20%) in WLC emissions between the retrofit and rebuild scenarios, this is likely to be within the margin of error and uncertainty, and not a robust basis for decision on carbon grounds.

6 Are grid decarbonisation assumptions realistic?

Or do they risk under or over-estimating emissions from energy use?

There is reasonable agreement on future decarbonisation of the UK electricity grid. The "central" scenario in the WLC assessment should follow the RICS PS recommendation, but other scenarios could be explored e.g. using the LETI Opinion Piece. Assuming more rapid grid decarbonisation reduces operational carbon: relatively, it attributes less benefit to a highly efficient new build, and more to embodied carbon. Assuming slower grid decarbonisation increases operational carbon and, relatively, gives more benefit to energy efficiency.

Retrofit vs rebuild: Unpicker checklist

1 Whole life carbon (WLC) assessment methodology

- Is the WLC assessment best practice? RICS Professional Statement and latest industry guidance
- Is the WLC assessment consistent? E.g. replacement cycles
- Are the assumptions clearly stated?

The carbon impacts from demolition and strip-out should be included and identified within the total WLC figure.

2 Embodied carbon options

- Are the embodied carbon options best practice?
- Has similar ambition been assumed in the retrofit and rebuild scenarios?

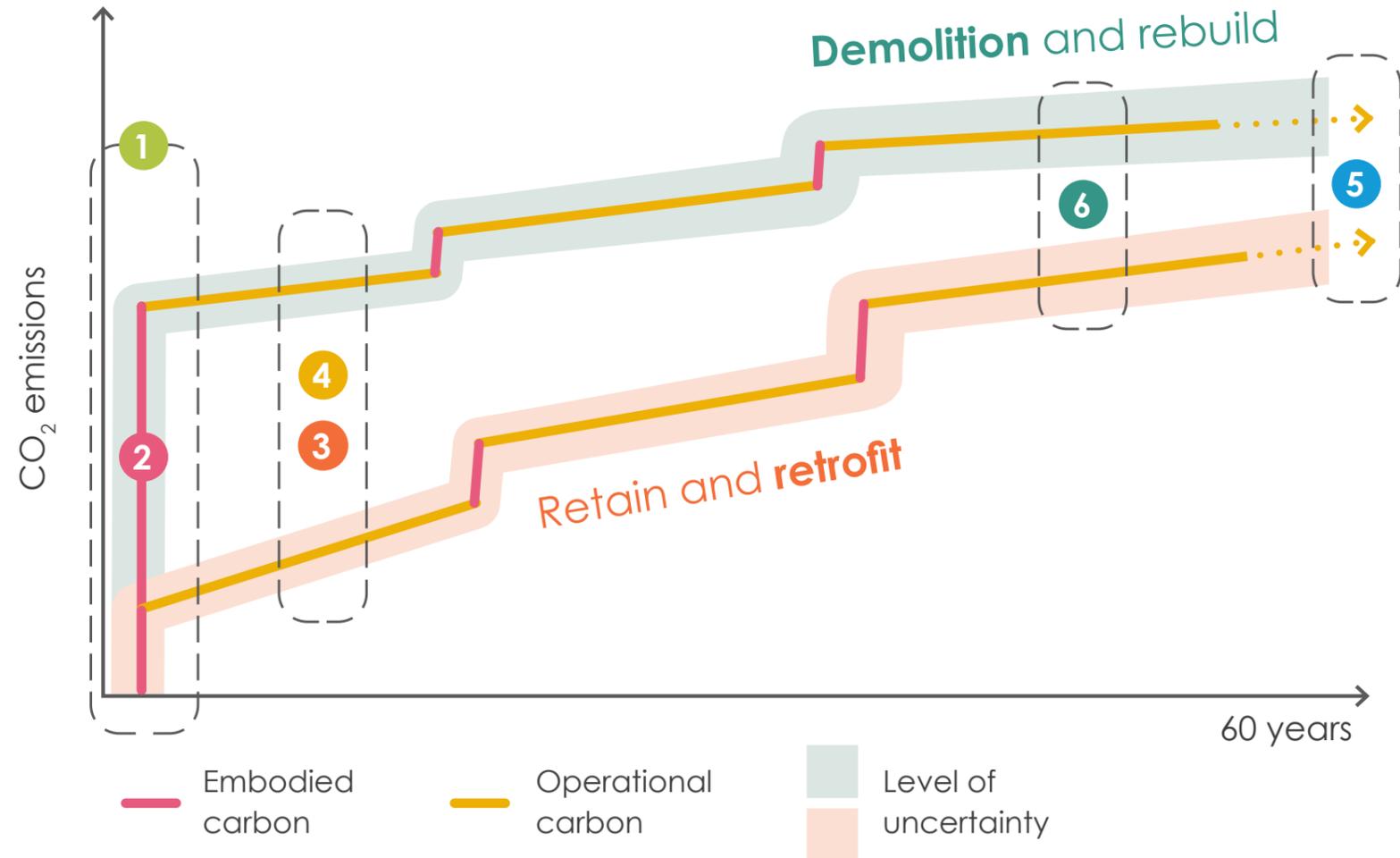
3 Potential of the existing building

- Has the full potential, including 'deep' low carbon retrofit been considered?

4 Assessment of operational energy use

- Is the assessment of energy use realistic? Based on performance assessment (rather than Building Regulations Part L compliance)?
- Is the assessment of energy use consistent? E.g. Not new build modelled energy use vs existing metered energy use.

Beware of benchmarks and targets as they are much less informative.



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5 Uncertainty

- Is there a significant difference between carbon emissions scenarios?
- Have carbon assessments far into the future been viewed cautiously?

6 Future grid scenarios

- Are future grid scenarios realistic, or is there a risk of under or over estimating emissions?

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