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Refurbishment & Demolition of Housing

Lifespans & Decisions: Factsheet

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What is the lifespan of a building and how is it estimated?

The lifetime of a building is how long it lasts from when it is first built to when it is replaced. Within this there maybe a shorter period of:

- economic life: ends when the building is judged to no longer be the least expensive way of performing its function
- service life: ends when the building is judged to no longer perform as intended
- technological life: ends if the intended performance of a building is judged to be mismatched with what inhabitants or users expect
- "effective lifetime" is the projected life of all our buildings given the total number of buildings in the UK and how many get built and demolished each year (not many are demolished so effective lifetime works out as about a thousand years)
- design life is decided by a building owner/developer to guide engineers and assure investors and insurers about the quality that has been specified for the building and its equipment.

How is it used in decision-making?

The end of a building's life is always a judgement based on its operation and maintenance costs and estimated value. The value of a building is linked to its location, the area and value of the land it sits on and the rents people pay to use it.

Decisions about refurbishment and demolition depend on judgements about building lifespan (the period over which its operational, maintenance costs and value are estimated) and the numbers and types of housing that could fit on the same area of land.

Refurbishment: what happens to the case for refurbishment when the lifespan changes

If a building has a short lifespan (30 to 60 years), and embodied and operational energy are accounted for, the case for refurbishment is strong. It can take many years for an efficient new building to catch up with an efficient refurbishment given the energy and carbon required to build it.

Short lifespans mean embodied energy and carbon make up a greater proportion of overall energy consumption and carbon emissions of a building because the building has been running for a shorter time and its operational emissions are proportionately smaller.

Short term cost benefit analyses may assume stable fuel prices and low inflation which favour less energy efficient buildings and lower cost improvements i.e minimal refurbishment.

Short term analysis may also assume that the UK energy supply will not change to renewable or nuclear sources (decarbonise). This assumption favours deeper retrofits and investment in energy efficient buildings.

The period of disruption to residents and the time it takes for residents to benefit from improvements is also important but there are limited data on the economic and social costs of this.

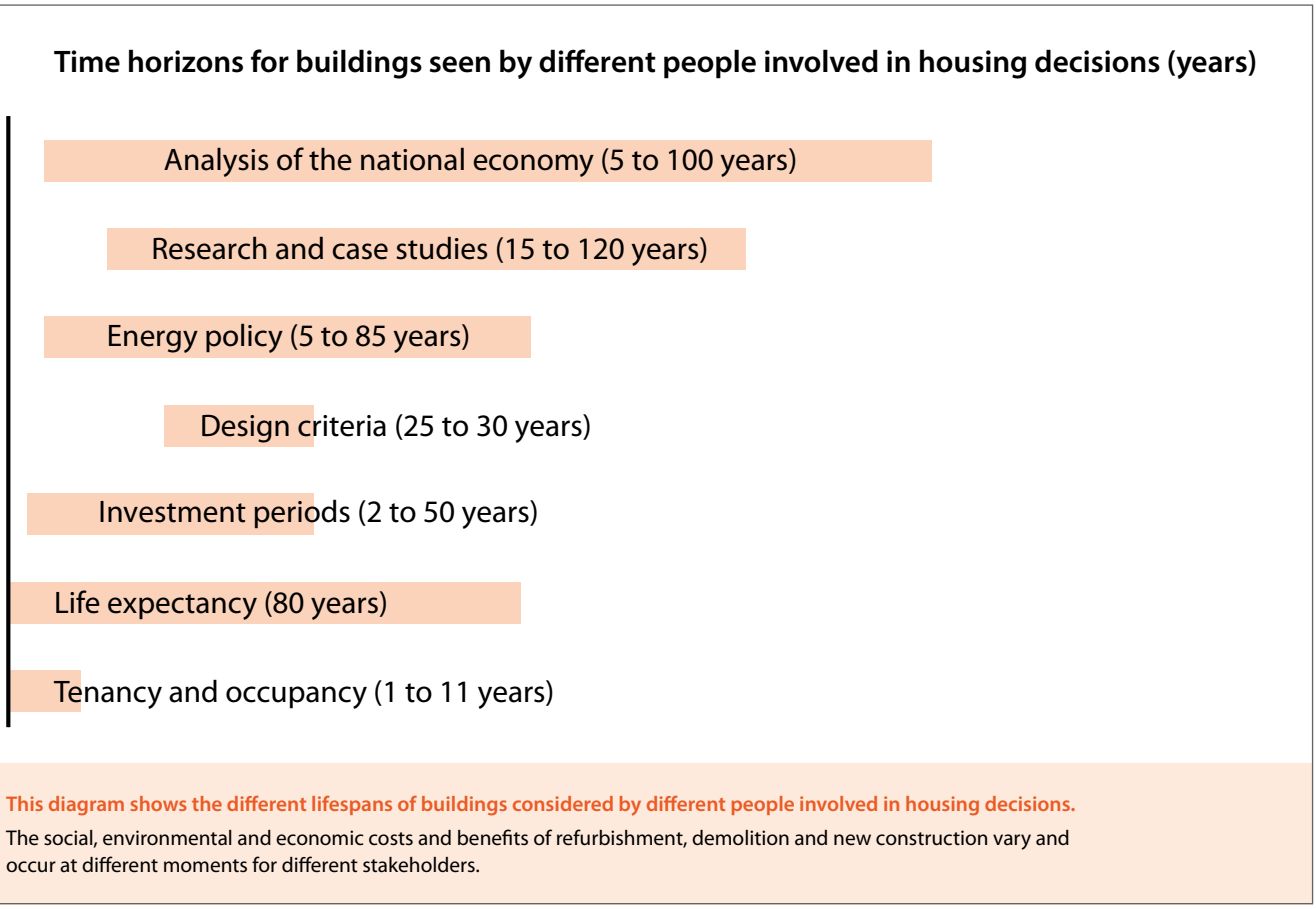
Demolition: what happens to the case for demolition when the lifespan changes

If a building has a longer lifespan (60-90 years), the case for demolition and new buildings is stronger.

Longer term analysis that accounts for rising fuel prices, favours deeper retrofits and investment in energy efficient buildings.

Decarbonisation of the UK electricity supply in the longer term (2030-2050) would favour minimal refurbishment because if energy supplies are not producing carbon emissions, then no matter how much energy a building uses, emissions will not increase.

It can take time for longer term impacts on health and well-being associated with regeneration or relocation to be understood.



This diagram shows the different lifespans of buildings considered by different people involved in housing decisions.

The social, environmental and economic costs and benefits of refurbishment, demolition and new construction vary and occur at different moments for different stakeholders.

Typical methods to record and compare the impacts of demolition and refurbishment on health and wellbeing

Comparison of carbon emissions, energy costs and construction costs for different options over the same lifetime (often about 30 years)

Comparison of carbon emissions, energy costs and construction costs for different options over different lifetimes recognising that buildings can last longer than 30 years

Requirements for consistency in estimating building life

Building lifespans used in energy, carbon and cost calculations are not always consistent. This is important because small differences in projected lifespan can make a big difference to the estimates. It should always be clear in reports what period is assumed and what difference a change in this assumption makes to the recommendations

Strategies for checking calculations

- Ask what is included and what is excluded in the calculations?
- Ask about the assumptions behind the calculations, especially building lifespan and energy prices?
- Ask how well the calculations match real-life measurements, bills or monitoring?
- Ask how well the results compare with similar projects?
- Ask what difference it makes to any recommendations if you change each assumption in turn?

Where can I find out more?

This factsheet is one of a series produced by University College London. Other factsheets in the series are:

1 **Embodied Carbon**

2 **Health & Well-being**

Clapham Park, London

The performance of a 'do nothing' scenario against refurbishment or against a 'demolition and new build' option is usually sensitive to assumptions about future prices and the building lifespan.

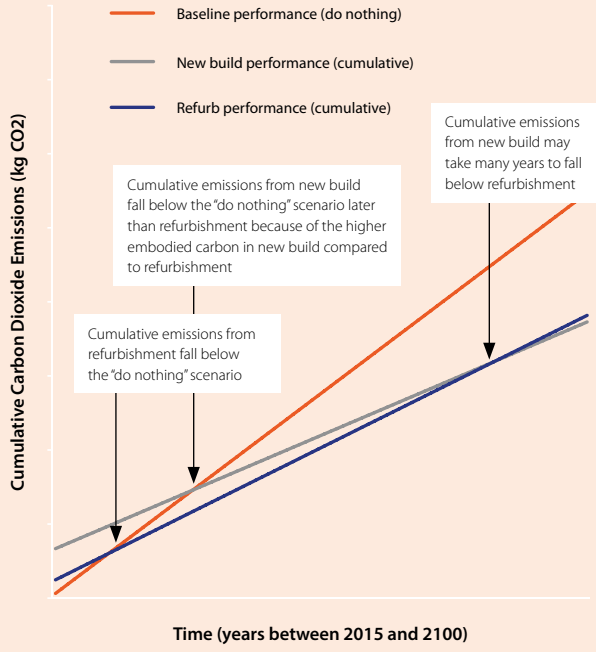
In an analysis of refurbishment in Clapham Park, London, one study (Sweetnam and Croxford 2011) found that modelling a shorter lifespan and assuming fixed future fuel prices favoured refurbishment because this involved smaller investments that paid back early in the lifecycle, within less than 30 years. This model included embodied and operational energy and carbon.

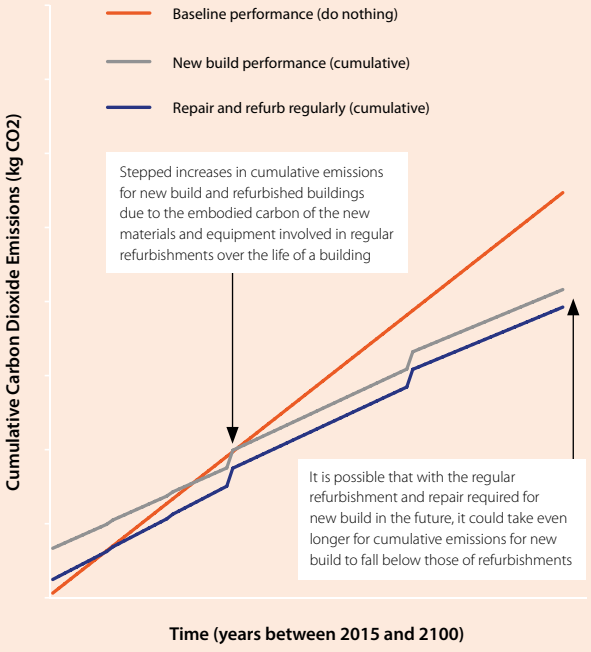
Over a lifespan of 60 years, in a scenario with rising fuel prices, refurbishment was about on a par with new build, although the costs of demolition and decanting were not included. Including these costs would improve the case for refurbishment.

It was only over a 90 year period with rising fuel prices that the model started to favour rebuilding over refurbishment. Again, the costs of demolition and decanting were not included. If they were included, it would take longer for the model to favour the rebuilding option.

When inflation is low, simple financial models favour low cost measures (now) that achieved modest savings (soon). Similarly, from the perspective of residents, especially tenants on short term tenancies, measures that cause the least disruption and deliver immediate savings are likely to be preferable.

Other factors come in to play in the short term. If land and building values are rising fast in the short term or much faster than energy prices, the returns from investing in an energy efficient refurbishment will be dwarfed by the returns from investing in increasing the floor space available to sell or let by demolishing housing and redeveloping more units on the same area of land.





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