

LIFE CYCLE ANALYSIS OF OUR BUILT ENVIRONMENT - AN IRISH VIEW



There is much confusion, some intended in assessing the carbon value of our built environment and much research is under way to try to clear up this confusion when evaluating the carbon value of our built environment. There is also a great deal of interest now in the "Circular Economy" which also highlights the immense carbon benefits of Adaptive Reuse of existing buildings as opposed to demolishing them. Most of the confusion comes when trying to assess or evaluate Operational Carbon (in the form of energy) versus Embodied Carbon versus Embedded Carbon.

Operational Carbon is the measurement or performance of a building using energy (the running costs) this can be evaluated monetarily and/or environmentally

Embodied Carbon is the measurement and carbon value of the existing construction including all its components – brick, stone, timber, roof material, heating, cooling and other mechanical systems etc.

Embedded Carbon is the calculation of the carbon footprint of all new materials used to either energy upgrade an existing building, building an extension to an existing building or replacing an existing building with a modern construction.

When people look at operational energy/carbon it is usually changing a fossil fuel heating system for a more efficient low energy solution such as a heat pump to heat or cool a building and yes if you want to make a building more energy efficient this is certainly a good start but it only relates to "Operational Energy" and most people only evaluates operational energy and does not consider whole life cycle carbon.

The real carbon value is in the structure that is there and this is called "Embodied Carbon" – the eminent US Architect coined the phrase "The Greenest Building is the one that is already Built". If one is to demolish an existing building then the carbon value of all the materials and actions must be calculated including the transport of the demolition machines to site, the fuel costs to running those machines, the transport of all waste to, usually a dump site, the cost of the workmen travelling to and from site and the cost of a design team meeting and visiting site to design a new building and then the realistic carbon cost of all new materials.

The replacement of an existing building with a "New Design" is most likely going to be constructed of "Carbon Intensive" products such as concrete, steel, glass, carbon intensive insulations and finishes so it is wholly inappropriate and misleading for a developer or architect to only evaluate the operational energy of a proposed development and not include the embodied and/or embedded carbon of that development.

All promotion for demolishing our built environment must take a **Whole Life Cycle Analysis** approach to the evaluation of carbon and not cherry pick Operational Energy of an existing building versus the Operational Energy of a new build.

Historic England commissioned a study in 2019 entitled "Understanding Carbon in the Built Environment" this report is available through their website under the title "Heritage Counts". In short, the study shows that by demolishing a single dwelling, replacing it with a new modern building to the same volume will take 63 years to pay back the whole life cycle carbon cost. If this is the case for a single-family dwelling then it is a multiple of this when considering demolishing a larger construction.

Our current BER (Building Energy Rating) system contributes to this confusion and misinformation as they give a "default" rating for all solid masonry wall construction and the default is a very high rating for U Value thus distorting the actual or real-life U Value of most of our existing buildings which does not paint the real picture of energy performance of older buildings. In turn this then often justifies the removal of some buildings with false information.

Historic Environment Scotland has a lot of research done in this area with many publications and technical papers available.

Thankfully there is now research underway to take 50 number traditional building types and to physically measure the U Value, dew point and hygroscopic measurements of the many different building materials – this will then form a new data base that will be available free of charge.

People on the front line of our planning and building control system such as planners, conservation officers, building standards and building control should be briefed and continually professionally developed in the area of Whole Life Cycle Carbon Costing as this is the only way that all our government's commitment to the "Climate Emergency" will be met.

Construction, in its widest term is responsible for between 40 and 50% of the worlds CO₂ emissions and the adaptive reuse of our existing buildings as opposed to demolishing them can play a large role in mitigating against climate change and could also contribute hugely to our current housing crisis.

I also believe that polices must change and that the whole industry must accept the potential for an economic overhaul with possible Carbon Fines for demolition and Carbon Credits for Adaptive Reuse. This discussion has already begun in a European context.

Peter A Cox FRSA
Carrig Conservation International Limited
Peter@carrig.ie

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