

Linking decarbonisation and circular economy

Complementary strategies for living within our planet's capacity

The concepts of achieving Circular Economy and minimising embodied carbon both help solve the global problems of resource scarcity, environmental degradation, and the climate emergency by accelerating the transition towards net-zero greenhouse gas emissions.

The two strategies/concepts are largely mutually supportive.

Why is it so?

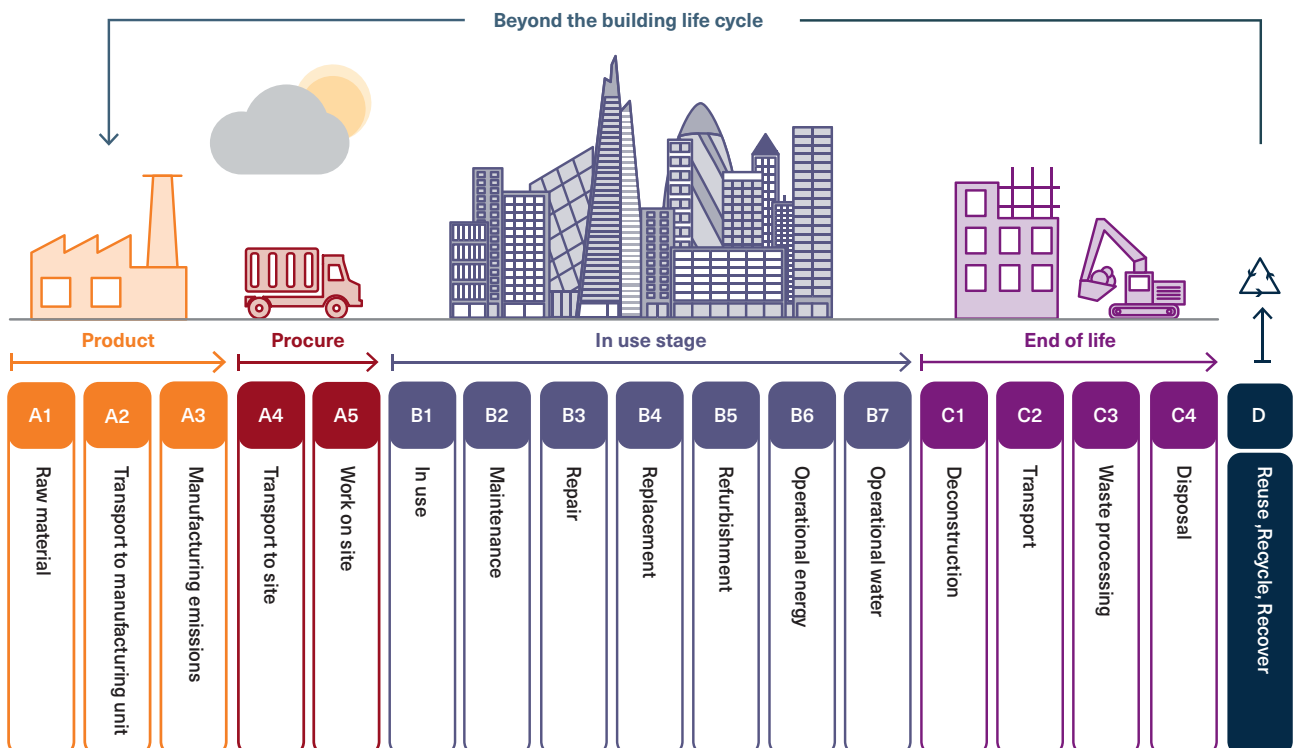
- The production of industry materials is a major barrier to reaching net zero carbon emissions – especially as developing buildings for a growing global population means demand for construction materials such as steel and concrete increases
- Circular economy principles can transform the production and stewardship of materials used in the built environment, offering significant potential to reduce carbon emissions

In the built environment, minimising upfront and whole life carbon AND achieving circular economy are generally related, because applying circular economy strategies usually lowers carbon (upfront and whole life) through displacing the need for new materials and products with higher embodied carbon footprints.

Conversely, lowering upfront and whole life carbon (aka embodied carbon) usually requires increased application of circular economy (using fewer new materials and products).

In other words: whether you start with the circular thinking, or start with embodied carbon thinking, both strategies bring substantial benefits and complement each other.

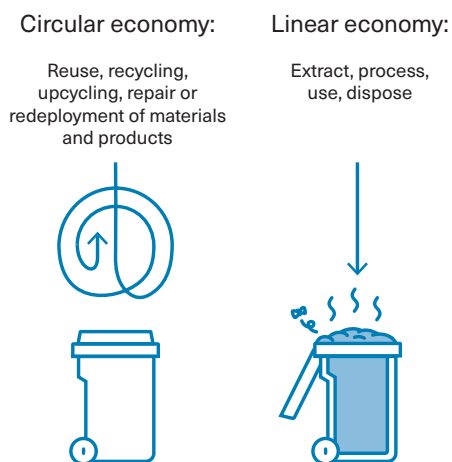
Just as energy-efficiency complements the renewable energy transition to reduce operational carbon emissions, circular economy principles provide practical options to unlock the embodied carbon reduction potential of the urban fabric and its support system.



Whole life carbon system boundary for the life cycle stages of buildings (EN15978)

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Circular economy principles:



Design is the key enabler for circular economy - from initial product design through to designing the reuse, upcycling or repair approaches.

Use less, pollute less.

Minimise waste of materials, resources, energy and human effort at each stage from first use to next use (and the use after that....)

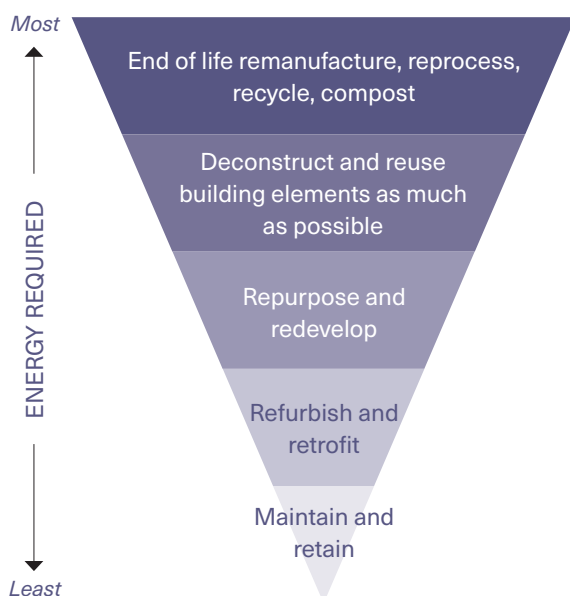
How this works:

Circular economy principles	The link to carbon emissions
Eliminate waste and pollution	Eliminating waste reduces pollution including GHG emissions
Circulate products and materials	Circulate products and materials to retain embodied energy
Regenerate nature	Regenerate nature to sequester and store carbon in the soil/land

Source: Ellen MacArthur Foundation

Circularity hierarchy (source: LETI)

The priority is keeping materials at the highest value possible minimising additional emissions and maximising the embodied carbon potential.



Topic	Supporting a circular economy	Minimising (upfront and whole life) carbon
Core issue	The need for living within planetary boundaries	Mitigate climate change and global system tipping points
Priority	Minimise long term finite virgin resource use and waste	Minimise short term (upfront) GHG emissions

Source: LETI

Circular economy strategies in the built environment

- **Designing for circularity** – new products and materials are made to be kept in use and/or regenerate natural systems
- **Designing out waste** – reduce material input and improve material efficiency by avoiding overspecification and customising products to specific uses
- **Material substitution** – use of renewable, low carbon, or secondary materials instead of using new extractive, energy-intensive or high carbon inputs
- **Reuse** – reusing products conserves the embodied energy used in manufacturing the initial product and avoids end-of-life emissions too
- **Recirculating** – recycling of materials for resource utilisation retains some embodied energy of products and may require less energy than manufacturing virgin materials

Forms of circular economy:

- **Reuse without processing or with minimal processing** – for example, bricks, timber, ceramic fixtures
- **Cross-industry** – for example soft plastics from agricultural silage wraps become part of furniture, edging, cable covers
- **Use of by-products from industry** – such as fly ash from coal fired power stations and ground granulated blast furnace slag (GGBS) from iron ore production, to partially replace clinker in cement or directly in concrete
- **Social circle** – fitout items from premium office distributed to community organisations
- **Closed loop** – takeback and reprocessing, for example leasing of carpet tiles that are then taken back and reprocessed
- **Industry stewardship** – take back of product type which is reprocessed via third party – for example aluminium fenestration assemblies in New Zealand OR repurposing of whole building!

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