The Importance of Dynamic Evolving Architecture.
The Evolution of Broken World Thinking to Dynamic World Thinking

Commentary
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Abstract

Broken World thinking encourages us to view existing buildings through a new lens, shifting our focus on sustainability from absolute measures like carbon emissions and energy consumption to circularity within the built environment. Existing and historic buildings transform from hard-to-treat assets into vital components of our sustainable future. Circularity in the built environment requires us to prioritise building reuse and adaptability over more conventional sustainability measures. The reprioritisation of building maintenance, alongside dynamic and evolutionary change, and a focus on building services, enables existing buildings to become part of the solution for our sustainable future.

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Introduction

Broken World Thinking (Jackson, 2014) encourages us to view existing buildings through a new lens. What may have been considered problematic in the past, through a different framework, may now be seen as immensely beneficial. Many regard architecture as a static element in our ever-changing world. However, buildings should be viewed as fragile and evolving, rather than static; any change, however, must be managed properly. The concept of *managing change* is well established within building conservation. Historic England defines “Building Conservation as the management of change within the historic built environment. It is not simply about preserving what exists” (Historic England, 2008: 22). While the UK’s political leaders set ambitious net-zero carbon targets and the built environment scrambles to adapt, many academics argue that circularity should be the primary focus. These trajectories are not mutually exclusive, as Basu et al. (2024: 1) describe them as the “Trilemma or Trinity.” Through the lens of circularity, existing buildings are viewed as an asset. Circularity (circular society and economy) is a systemic approach that seeks to eliminate waste and ensure resources are continuously reused, shared, and regenerated. Unlike the traditional linear model of *take, make, dispose*, in a circular economy, buildings are designed with durability, repairability, and adaptability in mind. The concept of managing change becomes a central component of circularity within the built environment.

The Future is the existing

A paradox exists in creating a sustainable future: the more developed a country or city is, the greater the emphasis needs to shift to the existing built environment. In Europe, our future will be based on the existing buildings and infrastructure. The scale of these retrofit challenges needs to be clearly understood because up to 80% of the buildings that will exist in 2050 have already been built (WEF, 2022). For example, the UK would need to refurbish 325 (pre-1919) houses every single day between now and 2050 to meet the carbon emission targets (Ritson, 2018: 182). Therefore, the focus must shift towards the existing built environment to meet any climate change and sustainability goals; Carl Elefante (2012: 62-72) put it more plainly: “The Greenest Building Is… One That Is Already Built.” Building conservation theory becomes part of a sustainable future strategy.

Dynamic not static

A range of different forces causes buildings to adapt to our constantly changing world; they evolve through decay and repair, maintenance, and interventions such as adaptation and retrofit. Surprisingly, many sustainability measures used are static and fail to reflect a building’s actual performance, primarily assessing a building at a fixed point in time and often are valid for many years. Few matrices measure a building’s dynamic capacities. Once measured, this assessment tends to stay fixed, with labels of *hard to treat* implying challenges in achieving new building performance. This negative perception is often used to categorise historic buildings when considering issues in combating climate change. Building changes can be categorised into two types: revolutionary and evolutionary. Revolutionary changes, such as retrofits and refurbishments, are more widely recognised, while evolutionary changes, such as maintenance, repair and building services upgrades, although essential, are often overlooked and seen as inconsequential. Such benign changes are crucial for a building's ongoing use and environmental performance, yet they're frequently excluded from sustainable performance evaluations.

New way of thinking

The idea that the developed world can *build our way to a sustainable future* needs to be revised. Historically, the predominant focus in the built environment and real estate markets has been that new real estate is created through demolition, rebuilding, and, in many instances, the development of previously undeveloped sites. Demolishing existing buildings to replace them with modern, *sustainable* ones may appear to be a solution. Previously, the UK government favoured experts, such as Brenda Boardman, who have proposed that at least 800,000 of the *leakiest* pre-1919 homes must be removed to meet the 2050 CO2 reduction target (Boardman, 2007: 55). However, subsequent studies by Carrig (Leeson, Kirkham, 2020: 39) indicate that a refurbished Victorian terraced house in the UK will have lower total carbon emissions than a newly built equivalent, if the embodied carbon and the emissions from use are considered. The notion of demolition and replacement is flawed, as while the new building might be *zero carbon* in terms of operational emissions, it does not represent the complete picture regarding total carbon emissions or broader sustainable criteria.

Changing the viewpoint

While industry and political discourse focus on achieving net-zero carbon emissions, academia argues that the aim should be towards a circular economy and society. These goals are not mutually exclusive; mitigating greenhouse gas emissions is essential, but it is only part of achieving a sustainable future. Many discussions centre on operational emissions, often overlooking embodied carbon. To shift our view of sustainability in retrofitting from carbon accounting to circularity. Existing buildings are vital assets for circularity, offering diverse sustainable advantages through refurbishment and reuse (Foster, 2020). Building reuse minimises resource consumption, reduces waste, and decreases carbon emissions. Refurbishing generates less waste by upgrading materials rather than demolishing, which is crucial for tackling landfill waste and environmental degradation (Mansfield, 2009). Additionally, building reuse fosters cultural continuity as older structures often hold historical significance, enhancing neighbourhood character. Turcu (2007) highlights the risks associated with demolition, which can impact local services, lead to the loss of cultural identity, and cause environmental issues, making it a last resort in achieving circularity. Revitalising existing structures helps preserve heritage and promotes sustainability, aligning with principles that address climate change and resource depletion.

Circularity in building reuse receives insufficient attention due to two factors. Firstly, measurement challenges arise, carbon emissions are easier to quantify than the complex metrics of circularity, which encompass resource flows, product lifecycles, and regional context. Secondly, circularity challenges the status quo by introducing intricate variables, making reporting more difficult compared to traditional emissions metrics, while qualitative aspects, such as social equity, are more challenging to quantify than emission targets. Organisations pursuing circularity must navigate a complicated landscape that requires innovative reporting approaches beyond standard building regulations.

Embedding circularity

Embedding circularity into building refurbishment requires a different approach to what is the norm for sustainable retrofit and refurbishment. The focus shifts from one of significant alteration to one more akin to a building conservation approach, returning the focus to managing change. Circularity requires a building to remain in use; therefore, adaptability is a priority. To support this, Dr William Bordass states “there is much that is sustainable about older buildings, not least that they have lasted. During the lives of these older buildings, some newer ones have come and gone” (Leeson, Kirkham, 2020: 49). When viewed through the lens of adaptability, historic buildings transition from being hard to treat to those with a proven track record of alteration.

Circularity requires designing buildings for adaptability and flexibility. The COVID-19 pandemic has underscored the need for buildings to adapt rapidly to shifting demands and societal changes. Historic buildings have thrived through adaptation. However, long-term adaptability must align with short-term design flexibility to accommodate various changes in use and layout. This adaptability poses challenges for conservation professionals, who prioritise preserving a building’s architectural integrity. Embedding circularity requires a balance between protecting cultural value and accepting necessary changes resulting from repair, building adaptation, and improvements to environmental performance, which can be contentious, particularly for culturally significant buildings (Foster, 2020).

Building maintenance is an accepted part of building conservation work, but is rarely seen by the wider built environment as a sustainability intervention. However, maintenance is a key part of any circular sustainability agenda. The Historic Town Forum supports this methodology, stating, “One of the most energy-efficient ways to preserve historic buildings is to ensure that continued, regular maintenance is carried out to safeguard its historic fabric” (HTF, 2011: 2). Both the Historic Town Forum and English Heritage encourage small/benign changes to improve the environmental performance of an existing building. Benign changes are defined as changes to the building that either have little or no effect on the heritage of the building or do not damage the building fabric (either to the fabric itself or the way it needs to perform or react) (Ritson, 2018). Maintenance and benign changes are key to caring for a building and the circular sustainability strategy, but are rarely included in any mainstream sustainability measurement framework.

Building services are a crucial factor in a building’s carbon emissions and energy usage, encompassing lighting, hot water, heating, and cooling systems. These services are highly dynamic due to the rapid evolution of technologies and shifting demands. While past efforts have focused on replacing fossil fuel systems, it is vital also to enhance control systems for greater adaptability. Most environmental rating frameworks still rely on outdated occupancy models from pre-COVID work patterns, failing to reflect today’s flexible work environments. Consequently, building management systems need to be equally dynamic and upgradeable (Ritson et.al., 2024). Building reuse and refurbishment should incorporate flexible and easily accessible building services, as these greatly influence energy efficiency and carbon emissions. Yet, many sustainability rating metrics overlook the adaptability and responsiveness of these systems, failing to measure how easily they can evolve and react. The flexibility of building services supports sustainable updates, allowing for the integration of new technologies, such as renewables, which are essential for reducing carbon emissions. Significantly, these changes do not diminish a building’s heritage value. In a circular economy that emphasises continuous use and adaptability, the dynamic nature of building services plays a crucial role.

The final main factor in circularity is the people. People’s unpredictable behaviour is the main variable in predictive modelling. Educating building users is crucial. Existing buildings vary as much as their users, so clear guidance is essential for any sustainable strategy. Circularity demands that management strategies be flexible and dynamic. Historically, management theory was not a focus for architects; however, it is vital for sustainable project outcomes. Architects and designers must collaborate with users to create adaptable designs that fit management styles and work patterns. For instance, should an office layout be organised by teams or temperature zones? Understanding the space’s purpose is critical for project success in our evolving world. The circularity approach does not eliminate the need to reduce carbon emissions and lower the building’s energy consumption. Instead, shifts the priority from the absolute measurement of carbon emissions to the continued use of the building as a whole.

Closing summary

Shifting the built environment towards circularity requires a change in how we view existing buildings. All buildings, even hard-to-treat ones, are valuable assets. Measuring circularity needs a new approach to sustainability metrics. We must monitor carbon emissions and energy consumption while integrating broader metrics that capture diverse sustainable criteria. By prioritising maintenance and adaptability in existing buildings – especially for water, heating, cooling, and lighting – we enhance our sustainable future. Reducing carbon emissions and energy use should align with our broader sustainability goals. Ensuring adaptability and dynamism is key to developing a circular economy, and recognising change as natural can challenge traditional perspectives across sectors of the built environment, from real estate to conservation. Current sustainability legislation needs to incorporate dynamic capabilities, property conditions, and adaptability to facilitate circularity in architecture. Building professionals can now emphasise circularity through sustainable reuse and refurbishment, prioritising care and adaptability. Integrating conservation principles into sustainable refurbishment ensures that existing and historic buildings are crucial to our sustainable future.

The cause of fragility is time; all buildings undergo a cycle of decay and (hopefully) renewal. Circularity and fragility exist in symbiosis within the context of a building's life cycle. Through our buildings, fragility becomes a mechanism of renewal, positively affecting the building's circularity and allowing it to evolve. This process has become an integral part of building conservation philosophy, yet it should also be regarded as essential for all buildings. By eliminating the notion of a building as static and recognising it as an evolving entity, fragility transforms into a catalyst for change in all buildings. The building's fragility is vital to sustainability when viewed through the lens of circularity. It serves as a significant driver for change in all buildings and is crucial for enhancing the sustainability of our existing environment.

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