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Seismic Retrofits – A Catalyst for Minimizing the Building Sector's Carbon Footprint

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Abstract : A life-cycle assessment was performed, looking at seven retrofit projects in New Zealand using LCAQuickV3.5. The study found that retrofits save up to 80% of embodied carbon emissions for the structural elements compared to a new building. In other words, it is only a 20% carbon investment to transform and extend a building's life. In addition, the systems were evaluated by looking at environmental impacts over the design life of these buildings and resilience using FEMA P58 and PACT software. With the increasing interest in Zero Carbon targets, significant changes in the building and construction sector are required. Emissions for buildings arise from both embodied carbon and operations. Based on the significant advancements in building energy technology, the focus is moving more toward embodied carbon, a large portion of which is associated with the structure. Since older buildings make up most of the real estate stock of our cities around the world, their reuse through structural retrofit and wider refurbishment plays an important role in extending the life of a building's embodied carbon. New Zealand's building owners and engineers have learned a lot about seismic issues following a decade of significant earthquakes. Recent earthquakes have brought to light the necessity to move away from constructing code-minimum structures that are designed for life safety but are frequently 'disposable' after a moderate earthquake event, especially in relation to a structure's ability to minimize damage. This means weaker buildings sit as 'carbon liabilities', with considerably more carbon likely to be expended remediating damage after a shake. Renovating and retrofitting older assets plays a big part in reducing the carbon profile of the buildings sector, as breathing new life into a building's structure is vastly more sustainable than the highest quality 'green' new builds, which are inherently more carbon-intensive. The demolition of viable older buildings (often including heritage buildings) is increasingly at odds with society's desire for a lower carbon economy. Bringing seismic resilience and carbon best practice together in decision-making can open the door to commercially attractive outcomes, with retrofits that include structural and sustainability upgrades transforming the asset's revenue generation. Across the global real estate market, tenants are increasingly demanding the buildings they occupy be resilient and aligned with their own climate targets. The relationship between seismic performance and 'sustainable design' has yet to fully mature, yet in a wider context is of profound consequence. A whole-of-life carbon perspective on a building means designing for the likely natural hazards within the asset's expected lifespan, be that earthquake, storms, damage, bushfires, fires, and so on, ¬with financial mitigation (e.g., insurance) part, but not all, of the picture.

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