

Increasing climate resilience in commercial property through the Adaptive Re-Use Stress Test (ARuST)

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Abstract

Changes in commercial (office) property utilisation and demand post-Covid have necessitated research into optimisation and adaptive re-use strategies. Specifically, an adaptive re-use stress-test for this increasingly under-utilised market segment is needed. Sustainability must be a focus of any adaptive re-use strategy. As climate change affects everyday life, and the built environment in a more pronounced manner, adaptive re-use approaches must not only optimise the use of assets but must improve its climate resilience.

As work modalities change and shift, office use has entered a new phase and tenancy covenants are changing, impacting income streams and values of buildings. This, in turn, changes Central Business District (CBD) composition as different worker visitation and footfall patterns emerge, resulting in a need for rejuvenation and (re)activation of areas, which can be achieved through considered adaptive re-use strategies.

Development of a stress test which examines a building's capacity to be adapted to an alternative use is critical, in the wake of Covid many office assets are unutilised, or under-utilised. The natural confluence of several critical research areas that promulgate environmental and economic efficiencies is the increased use and optimisation of these office spaces; this process should increasingly look to improve their sustainability credentials and climate resilience.

Keywords; Adaptive re-use, sustainability, commercial office, climate change, CBD rejuvenation, work from home (WFH)

Introduction

The need to increase environmental, economic, and social sustainability cannot be understated (Eichholtz et al., 2013). Most directly, adaptive re-use reduces building waste and reduces the loss of embodied energy, and the release of embodied carbon, by reusing existing built form, as opposed to demolishing and rebuilding. On a planet of finite resources with increasing pressure on the environment and increasing indicators of human-induced climate change and its deleterious effects the need to pursue sustainability objectives more stridently through adaptive re-use, is clear (Bullen 2007). As a major consumer of resources, it is incumbent on the property sector broadly to be a leader in this space. And the process of increasing resilience of built form is a key step, 'The IPCC defines resilience as 'the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organization, and the capacity to adapt to stress and change' (IPCC 2007).

We extend existing analysis in a logical manner to examine the benefits of adaptive re-use in the built environment as not only a sustainability measure, but as tool that can obviate certain, predicted future climate change impacts (Abdulameer and Sati'Abbas 2020). Adaptive re-use in its current guise can improve a manager's or owner's greening goals, often linked to Environmental Social and Governance (ESG) objectives, and drive-up ratings in NABERS or Greenstar ratings metrics. However, the benefits that can be derived from promulgation of adaptive re-use through the development of a stress-test are pronounced and extend to the futureproofing of assets.

The stress test for adaptive re-use that is being developed is driven by the need to make adaptive re-use more user friendly and widely understood. The development of a stress-test that employs a simple traffic-light system which can be applied to a building to determine its capacity to be adaptively re-

used, economic efficiencies of each aspect of the re-use, and any specific challenges will greatly increase consideration and application of this approach within the sector.

The aims of this research are primarily to extend the Sydney STAR model into the newer, ARUST Tool which provides a pathway for stakeholders to analyse adaptive re-use capacity of an asset, both from a sustainability perspective but also on a longer-term basis. The overarching research problem being addressed is how to implement adaptive re-use strategies and protocols most easily in the built environment.

RQ1 – How does a simplified tool increase the scale and rapidity of uptake of adaptive re-use approaches in Australia’s commercial property market?

RQ2 – How do we incorporate sustainability assessments as part of a re-use analysis?

RQ3 – Is the industry ready for longer term, adaptive re-use measures that include a sustainability and environmental resilience assessment?

Adaptive re-use is now examined as a tool to improve climate resilience. This extends the applicability of adaptive re-use in an environmental sustainability context to make existing buildings not only more environmentally efficient and sustainable in the present, but to make them more resilient to the increasingly worsening impacts of climate change over time. Any development in the built environment that reduces waste and improves how buildings function in increasingly challenging environmental conditions creates environmental sustainability uplifts and improves economic efficiencies by reducing construction and running costs (Mohamed et al., 2016). As adaptive re-use is more widely considered we see uplifts too in social efficiencies by creating more harmonious workplaces that can act as a focal point for a CBD and underpin community.

The Australian office sector’s changing profile

Demand for property, particularly commercial office stock, is shifting, impacting market performance, value and tenancy covenants. This is having effects on owners, developers and occupiers. The changing demand paradigm is causing an increasing level of inherent portfolio risk that can impact on the retirement savings of many Australians who are invested in commercial assets through their superannuation (Chau 2023).

The Covid ‘crisis’ (Fiorentino et al., 2024) drove long-term structural, socioeconomic and political shifts which are impacting on the way people live and work in cities. Work preferences and modalities continue to change, and with this, so does the utilisation of office-adjacent retail, particularly food retail, the structural change driven by WFH and increased office vacancy, ‘Large corporations and their towers bring in tens of thousands of workers daily and provide a customer base for retailing, entertainment and use of public spaces’ (Longtin and Mitchell 2021). The negative structural changes influenced by high office vacancy post-Covid can be addressed through adaptive re-use of underutilised assets.

As we move to a new era of property usage (McKinsey 2023), illustrated most obviously by the decline of the office-working model and an increase in work from home (WFH) and flexible working arrangements post-Covid, the momentum is building to drive more and better adaptive reuse approaches as CBDs change (PWC 2023). Office buildings are now less populated with workers, and staff are fulfilling their roles more efficiently with a lesser space requirement. There is the capacity to deliver benefit to multiple stakeholders if office spaces that are un-utilised or under-utilised, are adaptively re-used. To this end, we see stakeholders as inclusive of those frequenting CBD areas and seek to find intrinsic benefits to the built environment through adaptive re-use. Also highlighted is the positive benefit that the adaptive re-use of assets can have on the surrounding area and city’s broader socioeconomic wellbeing (Zbikowska et al., 2025).

To this end, an important consideration is how changing property use, and the associated changes in office staff populations day-to-day, footfall patterns, commuter movements, retail and other trading operations linked to office occupancy, and general CBD populations around business hours have changed post-Covid. Major structural changes have impacted not just individual buildings. As more people WFH more often and major tenants seek to decentralise, direct and indirect impacts on areas of Australian cities have been profound, and quadrants of major CBDs have been reshaped. The domino effect of lessening office occupancy has affected retail and other property uses leading to ‘dead zones’ which are reducing the appeal of large areas of CBDs. This became more pronounced on certain days as workers increasingly showed that certain days were preferred for office attendance (AIHW 2023).

COVID, work from home, and the permanent shift

The post-Covid world is characterised by changes in the status quo of property, typified by changing demand paradigms (Cheshmehzangi 2021). Early-stage research already highlighted the need for the sector to embrace ‘adaptive measures’ as part of a response to Covid impacts (Carnevale and Hatak 2020). While cities worldwide, by and large, have recovered from the Covid shock and returned to normal, it is almost universally a ‘new normal’. It’s evident too that, ‘the Covid-19 pandemic and its related lockdowns have driven a substantive change in the behavioral patterns of city users’ (Fieger et al., 2023) and the impact of this change over time on the built environment in Australian east coast capitals is evidenced below. Although we note the insulation experienced by Brisbane (Hull 2023), and its unique nature as a smaller, more specialised market – with strong resource-sector linkages - have resulted in overall better performance and a net-positive position in the Covid recovery.

Office vacancy and incentive data - Sydney

	Vacancy 2019 (%)	Vacancy 2025 (%)	Percentage Change	Average incentive 2019 (%)	Average incentive 2025(%)	Percentage Change
Prime	3	11.9	+297	17.5	36.2	+107
Secondary	4.7	11.1	+136	19.5	35.3	+81

Office vacancy and incentive data -Melbourne

	Vacancy 2019 (%)	Vacancy 2025 (%)	Percentage Change	Average incentive 2019 (%)	Average incentive 2025(%)	Percentage Change
Prime	3	18	+500	17.5	47	+169
Secondary	4.7	17.9	+281	19.5	47.9	+146

Office vacancy and incentive data – Brisbane

	Vacancy 2019 (%)	Vacancy 2025 (%)	Percentage Change	Average incentive 2019 (%)	Average incentive 2025(%)	Percentage Change
Prime	9.6	8	-20	35.5	38.5	+8.5
Secondary	14.9	13.4	-4.3	38.3	39.5	+3.1

(Source: Knight Frank 2025)

A new era of office use requires a new approach

The evolution of the office sector although slow, has been noticeable, and there is a body of knowledge that speaks to this continuing historical development (Cromwell 2025). In many ways Covid accelerated evolutionary change, while calls for work flexibility have been around since ~2015, the Pandemic accelerated this, and other changes in how offices are used. The shock of the Pandemic caused an anomaly in the typical, or expected, evolutionary pattern of cities too (Sassen and Kourtit 2021). Sustainability become a far more major component of stakeholder's checklists in engagement with property, but this was not limited to sustainability. The type of office accommodation changed over time; open plan offices and shared hot desks became common, and shared spaces and collaborative facilities emerged as part of new developments (Miller 2014; Bleby 2024). Tech adaptability in offices is paramount, and the lower levels now often accommodate meeting rooms, food offers and facilities such as, gyms or change facilities to accommodate cyclists, commonly referred to as 'end of trip' (Savills 2017). This is reflective of not only an evolution of the office market as we know it, but also a response to changing preferences amongst workers, consumers and residents.

Covid impacted the built environment and the property industry suddenly, and with force, this was a shock that has forced a change, and accelerated the natural, slower, evolutionary shifts. The shock of Covid as opposed to a slow, progressional change now means that owners must look to adapt and evolve or risk being left behind in obsolescence. The urban structures and morphologies of the city have been, and will continue to experience long-term effects from the Covid Pandemic, many of which remain challenging to predict (Mellander and Florida 2021).

The new model of what an office looks like and how it operates gives rise to great opportunity in the commercial property sector. We see these opportunities being taken up by early adopters in the space, and the emergence of sectors such as life sciences (PCA 2025). This speaks to the broader development of commercial property away from traditional defined categories such as office, retail and so on. There is now a need to develop new and inclusive models of property, the changing model of CBD areas is illustrative of this need (Salimi 2023).

To this end, Covid accelerated the evolution of office markets into a more flexible and adaptable paradigm. The evidence shows that office markets, like all property, have and will evolve relatively independently, but major crisis events that are on a global or national scale can drive this change, or alter how it progresses. The Covid pandemic highlighted the risks, specifically, that commercial property as it stood, couldn't accommodate or adapt to easily (Vigiola et al., 2022 and Oladrian et al., 2023). An inability to adjust to changes caused vacancy to swell (CBRE 2024; PCA 2025) and concurrently, investment interest reduced dramatically (Colliers 2024), forcing owners into a rapid rethink. These quickly occurring, negative impacts have revealed a need within the sector to update and adjust, showing that while the office market has evolved slowly over time it took the shock of Covid (Fiorentino et al., 2023) and rapid drop in occupancy levels to spur real, fundamental change. The reimagining of office stock is now occurring and generally seeks to increase sustainability while focusing on more functional office spaces, flexibility in floorplan and operational approach, increased parking and developments in decentralised or fringe locations as CBDs endure a transition.

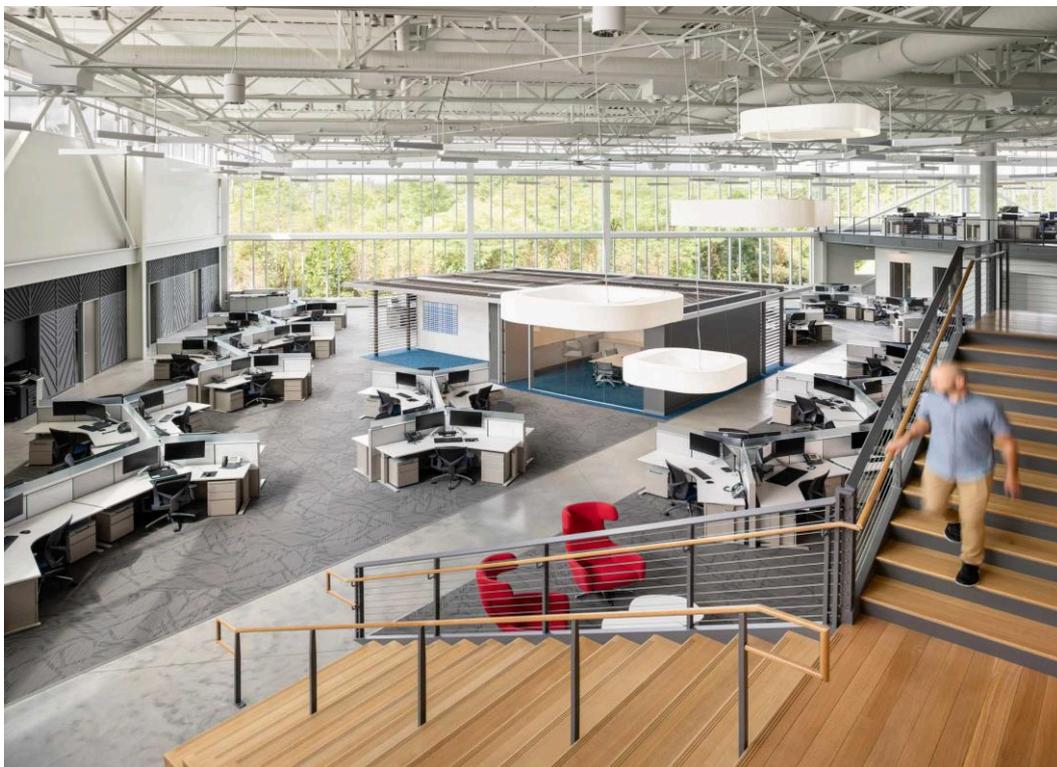
Figure 1 - An emerging office model



(Source: Stantec 2025)

The emerging office model illustrated in figure 1 is a contributory factor in the development of assessment tools such as ARUST. The evolution of office space formats as well as usage patterns reinforces the increasing need for assessment of existing office assets.

Figure 2 - The 'smart flexible' workspace



(Source: Stantec 2025)

The expansion of flexible workspaces has occurred rapidly post-Covid and is creating a new standard in office fit out which is increasing the assessment of capacity for re-fits of existing buildings.

Figure 3 – Evolution of integrated retail offers



(Source: 80 Collins Street)

The development of improved integrated retail offers impacts on the types of buildings being developed but also allows for considerable variety in adaptive re-use approaches and strategies, adaptive re-use approach doesn't need to be solely residential with capacity to include retail offers.

Flexibility and quality become peak considerations in space to market

There is great capacity for building owners to capitalise on changing property uses, shifting work models and differing staffing arrangements to use their assets in a more productive and efficient way. Increasingly too, sustainability is a major tenet for building owners and occupiers, and a 're-use' approach is more aligned with ESG guidelines than a 're-develop'. Adaptive re-use also presents economic opportunity and time efficiencies when compared to new builds further increasing the sustainability benefit (Langston 2008). Taken together, we are confident that stakeholders can benefit from adaptive-reuse assessment tools not only practically, but that the increasing application and increase in knowledge in this area dovetails with a sector increasingly aligned with corporate social responsibility (CSR), this itself is increasingly merging into ESG (McKinsey 2022) and companies continue to explore ways to meet these objectives and maintain their social license by increasing their sustainability credentials.

The capacity of adaptive re-use strategies to optimise a building's usage and to increase activation and rejuvenation of the adjacent area or CBD quadrant further broadens its appeal, with evidence that this approach too can revive urban areas (Heath 2013). As buildings became underutilised during Covid swathes of Australian CBD's become dead zones as they were 'hollowed out' (Maginn 2020). With a rapid decline in foot traffic and patronage during business hours, ancillary business and space users were forced out which in turn reduced the attractiveness of these areas to new tenants, residents and visitors (PWC 2021). Major parts of Australian cities need rejuvenation, and the tool kit as proposed has the potential to add value to CBD communities through the sustainable, adaptative re-use of buildings. The ability that adaptive re-use has to tailor a building to new use, i.e. reduce post Covid vacancy with an improved use, and in the process, increase climate resilience is a major driver of the ARuST toolkit.

The capacity of single building assessment and adaptive re-use of a building to its most suitable re-use optimisation will have profound, positive impact on an area's activation. As early as 2006 the revitalisation of an area through adaptive re-use approaches was introduced, the strategy could be used to achieve a 'vibrant and social economic climate' (Fealy 2006), pointing to the broader benefit the improved use of building can have. The capacity to test adaptive re-use options floor-by-floor and incorporate community and social uses further allows a building to be integrated back into the city and community, illustrating that adaptive re-use can rejuvenate a building and areas within a CBD while also striving to achieve sustainability and climate-resilience goals (Heath 2013).

Climate change and its implications for built environment

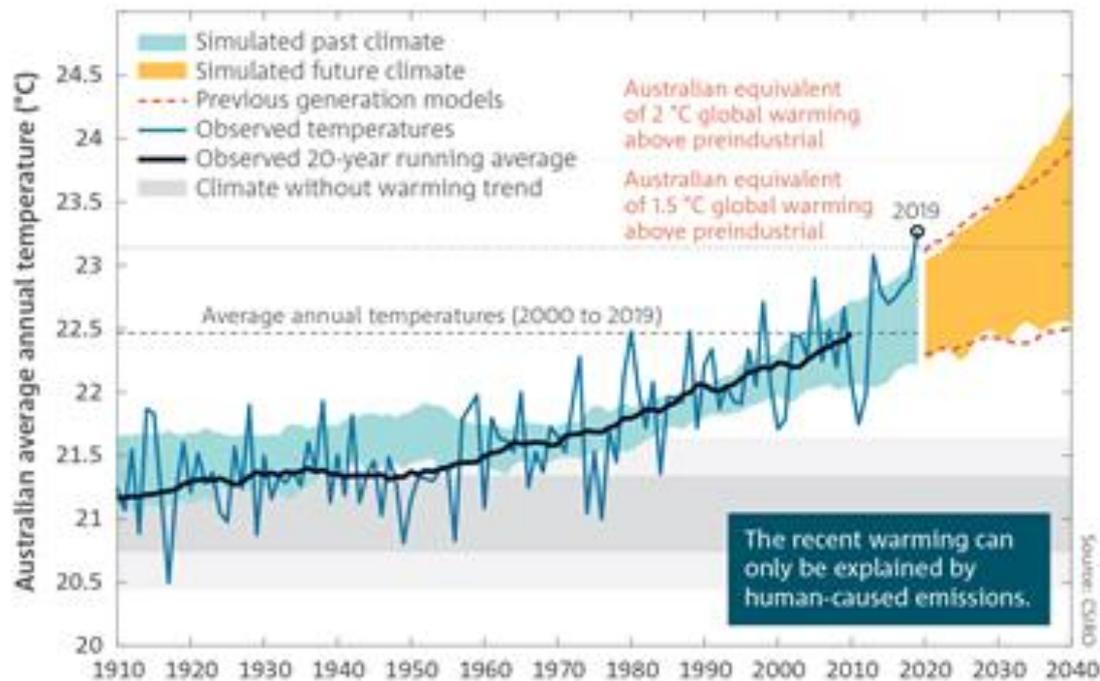
The impacts of climate change have become more pronounced, and these are accelerating (IPCC 2021), increasing the applicability of an adaptive re-use stress test tool for built environment. The worsening of human driven climate change expands the scope of application for adaptive re-use strategies, adaptive re-use can address changing market dynamics post-Covid, and while repurposing assets their sustainability credentials can be improved, the latter improving resilience to climate change impacts. The built environment must be better equipped to face, 'climate conditions that will become increasingly variable, dynamic and uncertain'(Tyler and Moench 2012).

While analysis of commercial office assets after workforce dynamic change following Covid is the most logical starting point for stakeholders to explore alternative uses, the changing climate and the increasing frequency and severity of major natural disasters (Ritchie and Rosado 2024) means assessment of adaptive re-use is not limited to commercial office assets in central business districts, nor will it only appeal to asset owners. Indeed, reuse of assets may become equally driven by changing environmental conditions as much as it is by changing economic conditions. The stress test has general appeal, not only for owners, but a broad range of stakeholders whereby improving climate resilience of an asset by way of adaptive re-use may see benefit in valuation practices and be meaningful for lenders, investors insurers or developers (Savino 2024).

In practical terms, the ARuST tool will become critical tool in valuation assessments as buildings reach the end of their lifecycle. The capacity for a building to be re-used could potentially alter a valuation assessment for an older, obsolete building. It is likely to positively impact future rental flows should the ARuST tool determine a high level of re-use potential. In investment terms, the tool allows for a second check on a buildings purchase viability as a positive ARuST assessment could show an improved lifecycle, and lessened CAPEX and OPEX.

As climate change and its impacts have accelerated rapidly (Hansen et al., 2025) the concept of sustainability has continually gained momentum in society. In the commercial property sector ideas such as greening and ESG initiatives have now become commonplace (McKinsey 2022) and research of ESG in academia has gained significant momentum (Robinson and McIntosh 2022). NABERS and Greenstar ratings are important to attract tenants (Dharmarantha et al., 2025). Forming part of the commercial property evolution, these now require mandatory disclosure requirement upon sale (Savills 2025). To this end, sustainability has gone from being barely recognised a decade ago to a critical factor in building tenancy, ownership, redevelopment or disposal. As climate change impacts become more pronounced and more widespread, sustainability measures within the built environment will have to become advanced to deal with more severe climate change impacts. This is where improved resilience comes into its own.

Figure 4 - Projected annual warming 2020-2040



(Source: CSIRO 2022)

The effects of climate on humans are becoming more pronounced, and more frequent with impacts of climate change increasingly impacting closer to built-up urban areas, and phenomena like the urban heat island effect means that rising temperatures are already on cities (Das et al 2025, Adapt NSW). With climate scientists increasingly suggesting current targets of emissions reduction will not be met we must brace for more sustained, more damaging and more frequent negative impacts. Places where we spend much of our time, specifically our homes and our workplaces will have to be improved to address the increasing environmental change characterised by more weather extremes (IPCC 2021) and more commonly occurring extreme weather events (Ritchie and Rosado 2024). Not only to make habitation more comfortable, but to increase the resilience of buildings to more extreme events and future proof these assets.

At its heart, the origins of the term 'resilience' imply strength and resistance, and indeed, a strengthening of built environment to improve resistance to more severe impacts of climate change is needed. However, as noted by Tyler and Moench (2012), new and emergent research in socio-ecological systems, disaster management and urban sustainability shows resilience, in contexts linking to property and built form, are understood as requiring flexibility, learning and change. As buildings adapt to new demand and use paradigms post-Covid (Longtin and Mitchell 2021) and pursue, as part of this, improved sustainability they will naturally seek out other benefits. Adaptive re-use methodologies are increasingly being applied to ensure user comfort, adaptability (flexibility) and an insurance of strength to promulgate longevity, both physically and functionally while broadly improving climate resilience (Hulathdoowage et al., 2024).

The case for adaptive re-use

Although not a new concept (Langston et al., 2008, Wilkinson et al., 2009), adaptive re-use has remained on the periphery in the property sector in Australia. Issues around a distinct definition exist, as highlighted by Moahmed et al. (2016) the definition of 'adaptive re-use' has changed little between Austin's early work (1988) and Douglas (2006) who defined it similarly, with little progress in definition of concept it is unsurprising it remains poorly understood and even less widely adopted. More

recently this is changing (PCA 2023, Hassell 2023), and as research links with industry and progresses to further examine adaptive reuse strategies, the development of a widely applicable stress test will hasten the process of bringing the adaptive re-use paradigm further into the mainstream.

Encouragingly, the changes in office market dynamics caused by Covid and associated lockdowns have had the side effect of bringing adaptive re-use, particularly for office to residential conversions, into the mainstream. The discourse around better using office buildings (Cromwell 2025, Longtin and Mitchell 2021), or finding a use for an office asset that has become vacant due to Covid impacts, has begun to proliferate in the mainstream media (Chau 2023, Kwan 2023 and Johnson 2023). Although in the commercial property sphere it is evident that the concept, particularly amongst agency, has been examined for some time (Colliers 2023B, Savills 2024). In many ways, Covid has worked as a catalyst to bring together the industry knowledge, mass media coverage and academic research on the issue and bring it to the fore as an important area of research (Remoy and van der Voordt 2014). It also offers a practical solution to housing provision (Stevens 2025) and offers improved use of underutilised office space as Australian CBDs evolve (Leshinsky et al., 2024).

With the case for adaptive re-use cemented by the changing office use patterns that have become pronounced post-Covid, and the ballooning vacancy rates that this has underpinned, there are other factors which encourage the uptake of adaptive re-use across the commercial property sector (Cushman and Wakefield 2025). Indeed, adaptive re-use of commercial assets, while focused on increasing occupancy, can and will have myriad flow on effects to an asset and for this reason should be more widely considered than we have hitherto experienced. The more critical considerations and concerns around sustainability, green credentials and the increasing need to be climate resilient as the impacts of climate change become more commonplace and more pronounced can all be achieved through the pursuit of adaptive re-use approaches (Stamatopolous et al., 2024). The growth of adaptive reuse theory in an academic context has repeatedly shown that adaptive re-use approaches to the built environment can have myriad positive impacts economically and socially, in addition to the sustainability benefits offered. PWC (2023) in their assessment of CBDs post-Covid highlighted the need for all facets of a CBD to work flexibly and be able to adapt quickly in this new phase of CBD use and occupancy.

The Covid Pandemic has had the effect of accelerating the need for adaptive re-use strategies. Specifically, the Covid crisis (Fiorentino et al., 2024) and the many flow-on impacts this had on Australian commercial property has moved timelines forward, buildings became obsolete quicker as the flight to quality ensued (Ghosh et al., 2025, PCA 2024) this happened almost in tandem with lessening and changing space requirements. This positions tenants to be able to seek out better quality, sustainable, refurbished assets. And it gives owners and landlords the capacity to undertake Capex and Opex work concurrently, redevelop an asset, lift the sustainability ratings or efficiencies and bring to market a property that is more in-line with the new market demands in what is a new paradigm across CBD markets – not only in Australia. Ostensibly, the sustainability and efficiency benefits would have taken time to mature as a sole driving force for adaptive re-use, however, the vacancy increases, and financial imposts associated with high incentives, low rent growth and soft yields (Lim et al., 2023, Harley 2025) are coalescing and forcing owners into action.

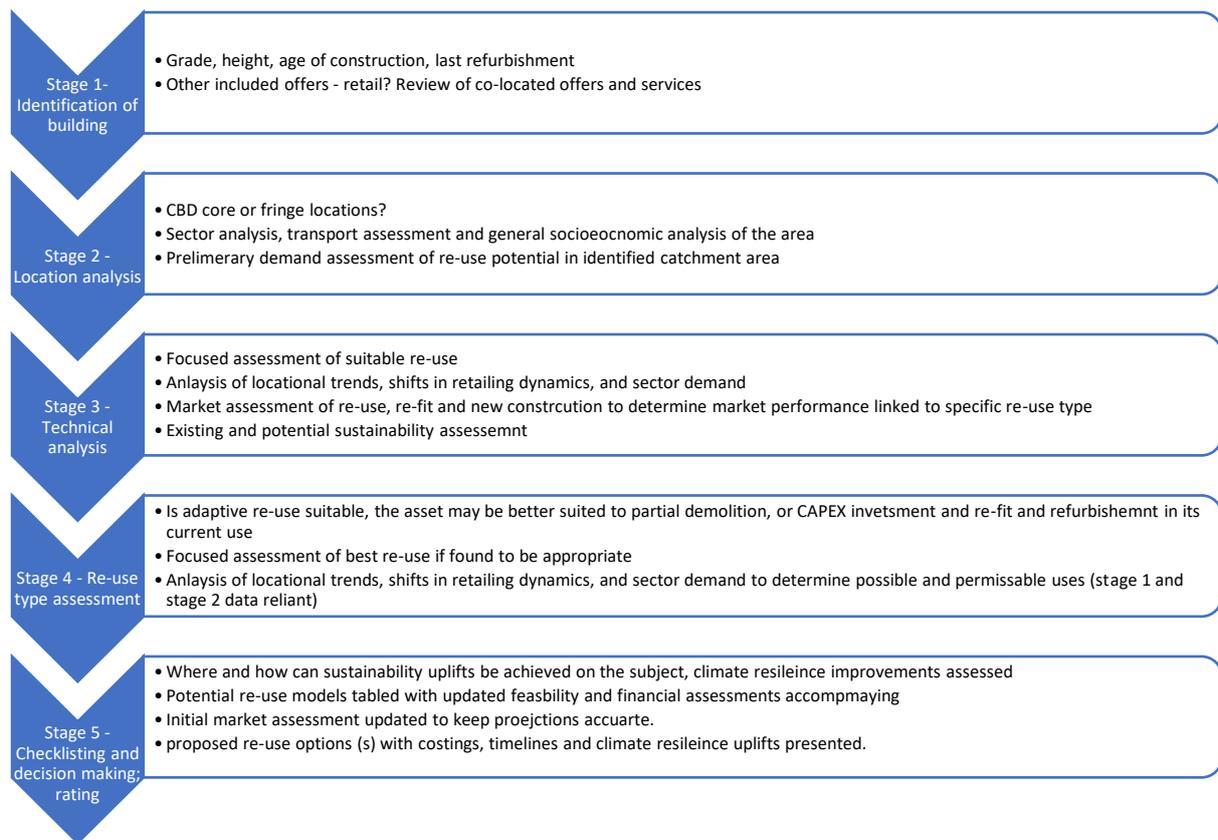
Ultimately, there is a need for further research to be developed through linkages with industry which can be mutually beneficial. Up until recently, adaptive re-use in this context has almost solely looked from the perspective of a changing use of an underutilised asset, most commonly the re-use of office space for residential apartments (Remoy and Wilkinson 2012), although other uses too are considered and need to be explored. In this paper however we develop and extend the concept to include analysis which looks at adapted uses but also an adaption of buildings to increase sustainability in the adaptive re-use process (Gupta et al., 2023) and tolerate increasingly severe climate change and impacts (Tyler and Moench 2012).

Partnerships with industry will be critical as they will allow for the development of adaptive re-use approaches in extant assets. A high level of engagement from industry partners will allow for the stress test to be finessed and move beyond theoretical functionality into climate resilience testing. The

development and application of this stress test tool will deliver a wide range of benefits to stakeholders across the sector. It will play a role in acquisition, redevelopment and rejuvenation, valuation, and sale and disposal, while also becoming integral to sustainability assessments and ESG reporting.

Sustainability through STAR, to ARuST, the natural progression

An initial response to post Covid working practices and increased office vacancy was the development of the Sustainable Temporary Adaptive Reuse (STAR) Toolkit (UTS 2025, STAR Toolkit). The STAR Toolkit project co-designed a toolkit for addressing pockets of vacancy within commercial buildings in the Sydney CBD and was funded by the City of Sydney. The toolkit supports the planning and establishment of low-cost, interim uses for underused buildings, countering the economic, social, and environmental stresses affecting urban vibrancy. In workshops, over three years, seven tools were developed. The initial phase explored understanding and definition of sustainable, temporary, and adaptive reuse to ensure participants had a shared conceptual understanding of STAR.



The above conceptual model shows the process in application of the ARUST model, noting that individual scoring cards that will be utilised in a particular asset are still under development. The factors in stages 1-3 all impact on the overall assessment and rating (score) of the sustainable adaptive re-use capacity of an asset. Stage 4 and 5 are focused on determination of actual uses and application of sustainable adaptive re-use protocols to a specific asset.

Ratings tools and assessments: a need to move from greening to prepared

The STAR Toolkit Guide normalises STAR. In producing the Toolkit, through collaborative research, the STAR Toolkit supports different stakeholders and helps stakeholders come together to undertake more STAR developments. The guide provides deeper context to help explain the need for and benefits of STAR and introduces each resource in the STAR Toolkit. STAR is a process rather than a product,

and it can be applied on, a whole, or part-building basis. The common features of any STAR process are:

- An objective to better use underoccupied space to attract or retain new users of the spaces within a building.
- A change of use, on a temporary or trial basis.
- A philanthropic mindset or creation of additional incomes which flows to a combination of the building owners, existing tenants, and STAR tenants including their wider community. The additional value is STAR income when compared with ‘wait and see’ or ‘do nothing’ approaches.
- The retention of most of the buildings structure and fabric, existing fittings, and furnishings, or responsible reuse or recycle any additional fittings, fittings and furnishings at the end of the temporary use.
- Any new STAR use(s) must be compatible with the existing building’s structure, plan, zoning, and existing services.
- The new STAR use(s) must also be considerate of existing tenants and surrounding communities in terms of noise, air quality, operation hours and access needs.

The STAR Vision Tool showcases ideas for new uses for office buildings. It was developed in collaboration with interior architecture studio leaders and graduates from universities in Sydney and internationally.

The STAR Matchmaker Tool supports the development of a matchmaking platforms by others. The need for a matchmaking platform was identified as useful by STAR stakeholders, including real estate professionals, building owners, and communities. In this tool the learnings of our prototype explorations and our resources are shared to support others in the next step of implementation to develop a viable, effective STAR matchmaking platform.

The STAR NCC Checklist Tool acknowledges some change of use proposals involve re-categorisation under the National Construction Code (NCC). Given the short-term nature of STAR, this checklist flags potential new uses which could trigger compliance issues with various aspects of the NCC which may add time and costs to the proposal. The checklist asks questions about current classification and proposed STAR use. Critical issues are fire loading, load bearing capacity of existing floors, means of escape, number and access to fire escapes, number of people using the STAR space, disability access and amenities such as WCs.

The STAR SDG Mapping Tool recognises that businesses and property owners are more conscious of the United Nations 17 Sustainable Development Goals (SDGs). As society and the property market moves from an economic centric way of applying value, there are opportunities for building uses, and retrofits and conversions being valued for the social and environmental positives that accrue. This information sheet summarises the 17 SDGS and gives examples of where STAR can deliver positive outcomes to owners and users.

The ESG Scorecard Tool takes users through a series of questions relating to social aspects of the proposed STAR use. By identifying these social uses, or values, it may make a STAR proposal more attractive to building owners, as they can promote this social value use of their property.

Finally, the STAR Video Suite explain the wider context for STAR, including motivations, enabling thinking to unpack STAR and vacant space in more detail for stakeholders to consider. The video suite includes a short explainer video gives an overview of the knowledge exchange research process and an understanding of STAR. The videos offer deeper insights, each from a different industry expert, or researcher.

Since the STAR Toolkit was conceived and developed, the market and economic outlook have changed and the need to increase climate resilience has become more pressing. Increasingly flood and fire, chronic heat, drought and other climate events impact cities and urban development globally. To such an extent that we need to include improving climate resilience in retrofit and adaptive reuse projects. From this the concept of the Adaptive Re-Use Stress Test (ARuST) emerged.

Defining climate resilience and measuring its importance

Climate resilience definitions are varied, The IPCC defines resilience as ‘the ability of a social or ecological system to absorb disturbances while retaining the same basic structure and ways of functioning, the capacity of self-organization, and the capacity to adapt to stress and change’ (IPCC, 2007). This serves as a sound baseline for exploring and measuring resilience, particularly following the shock of Covid (Fiorentino et al., 2023) after which, the ability of the built environment to adapt to stress and change, to be resilient to the economic and social stressors and change, was called into question.

The emergence of adaptive re-use as office vacancies increased due to Covid gives renewed focus to sustainability within built environment. Critically, adaptive re-use provides an identified pathway to further improve sustainability and green rating within buildings of lower classes. Identified as particularly suitable are those that have slipped into obsolescence, whereby sustainability improvements and future-proofing can be a defined component of any adaptive re-use strategy, thus improving the asset overall, and likely having myriad flow on effects within the CBD grid. Covid caused direct impacts on many facets of our lives and impacted on society broadly (Coulter 2021) but more specifically, it greatly shifted the paradigm in the built environment (Cheshmehzangi 2021) and refocused priorities for owners, tenants and stakeholders (Allan et al., 2021) as part of broader changes to cities (Wen et al., 2022).

The evolution and development of sustainability in commercial property over the last two decades indicates the sector’s capacity to change and improve, which provides optimism for the increasing uptake of adaptive re-use. From pioneering early work such as Ellison and Sayce (2007) and Wilkinson et al., (2009) through to more recent sustainability research (Hossain et al., 2023), the evolution of sustainability, as well as the increasing importance it plays is evidenced. The movement away from complete knock-down and rebuild approach to a re-fit and re-use approach in commercial property is a major step forward and speaks to the evolution of sustainability in property. Increasingly, higher expectations of sustainable practise are becoming more mainstream, as evidenced by sustainability rating disclosure requirements in commercial space over 1,000sqm (NABERS 2024, DCEW 2025). As sustainability has become more expansive and applied more commonly there has been an increasing movement of sustainability retrofitting or improvements to increasingly achieve climate resilience (Shen 2024).

That said, climate resilience has developed in the last decade (van der Heijden 2014). The body of knowledge around this is increasingly expanding the role of climate resilience in built environment (Scott et al., 2022) and the benefits of improving climate resilience within urban hubs and CBDs (Tyler et al., 2016). Methodologies and frameworks too are being developed to determine how to improve climate resilience (Tyler and Moench 2012) and improvements in practical understanding of creating pathways to more wide adoption of climate resilience approaches is also being undertaken (Shapiro 2016). We see the introduction of climate resilience uplifts that are achievable through adaptive re-use approaches as the next logical step in the process of built environment evolution. The shock the Covid Pandemic had on commercial property has provided an opportunity for the scope and capacity of adaptive re-use to be broadened.

Further research into adaptive re-use approaches, and the broader promulgation of this through the ARuST framework being developed will help bridge the gap between current sustainability praxis in the built environment and the next step for sustainability in property which is invariably the move to protection from future climate change and events, i.e. resilience. It is hoped that adaptive re-use will

provide a ‘launching pad’ for the industry to move from sustainable retrofitting and ratings of commercial assets into more advanced levels of future proofing through more comprehensive sustainability measures which build resilience and future proof assets (Rich 2016). These are beyond typical greening initiatives in commercial property which have hitherto predominated (Dixon 2014), climate resilience is the next step in the ‘green building revolution’ (Yudelson 2009).

The Covid Pandemic has forced cities and the buildings within them to change and adapt (Gujral et al., 2020), but its impacts can be seen positively, as a catalyst for increased development of new approaches to property usage, including but not limited to adaptively re-using assets (Wen et al., 2022). And in this process, driving forward climate resilience.

Conclusion

The Covid Pandemic was a worldwide shock with reverberations across the globe, in many ways it reshaped society and economies. Covid has caused ongoing changes, within the property sector it revealed issues with flexibility and adaptability across markets. It has affected how office space is utilised, by whom, when and where. This has had, and continues to have, myriad implications for cities globally including sustained high vacancy levels, limited rent growth, high incentives and multiple knock-on effects within CBD cores.

Positively, the pandemic has accelerated awareness of issues around office space utilisation, and with vacancy increases and more flexible working arrangements predominating adaptive re-use considerations have been brought to the fore. As a by-product of this it has opened other opportunities for building improvements and uplifts as part of adaptive re-use strategies. Both adaptive re-use and increases in climate resilience, which we contend will be increasing be undertake in concert, have a range of direct financial benefits by increasing occupancy and reducing outgoings. This paradigm change offers other long-term economic benefit too, by reducing insurance costs and reduced Opex as efficiencies increase in buildings that are better equipped to operate in changed socioeconomic conditions and withstand increasingly severe climate change impacts.

Economic analysis of commercial office market in Australia necessitates the consideration and application of adaptive re-use paradigms to return assets to viability. This need to adaptively re-use assets is an opportunity for owners to future-proof assets further through the implementation of climate resilience strategies which can be undertaken concurrently. As global warming increases and the severity and regularity of climate impacts increases too, the built environment must find ways to combat negative impacts, this is increasingly moving beyond sustainability retrofitting and requisite of more intensive climate-resilience future proofing.

Tools like STAR and ARuST are indicators of considerable progress in the typically slow-moving commercial property sector and are already accelerating great positive change and a shift in narrative around adaptive re-use. These tools offer property practitioners both an improved understanding of the praxis of adaptive re-use but also provide a framework. In this, they greatly expedite and simplify the process of adaptive re-use, from feasibility through to implementation. The accessibility that adaptive re-use now enjoys facilitates a better view to include climate-resilience improvements as buildings are re-fitted, re-purposed and re-used. Specifically, that adaptive re-use processes can include an increasing range of sustainability improvements and uplifts that will contribute to improved climate resilience within buildings that have been optimised to their most optimal use. This has been shown to benefit not only the owner, but tenants, cities and CBD populations.

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