Principles of Design for ensuring Sustainable Urban Centres

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ABSTRACT

The future ability of urban centres in Australia and around the globe to adapt and respond to big challenges of climate change, economic development and social inclusion, will depend on how well we embed structural and social resilience within these built environments. Such a complex urban resilience agenda presents a major collective challenge for designers, planners and engineers to work out with politicians, developers, financiers and community leaders. Central to achieving integrated design responses for thriving centres is the challenge of mobility, ensuring transit corridors that enable cool, comfortable and reliable transitions between home and workspaces, education, health facilities, entertainment and recreation. Refocusing design efforts on interstitial spaces between destinations will require collaborative processes and co-creation in a design space currently dominated by siloed approaches to traffic management, transport planning, precinct design and engineering, architecture and landscaping. With the aim of bridging these silos, this study – by an interdisciplinary team spanning engineering, science, business and planning – evaluates key literature to create a Place Making Framework that comprises seven principles and associated practices to address critical components of structural and social resilience within the built environment. The paper applies the framework to four urban fabric types, highlighting opportunities and considerations for regeneration development projects, towards urban environments where people can thrive in ways that are good for people and planet.

KEYWORDS

transit corridor, urbanism, centres of tomorrow, trackless tram systems

1. INTRODUCTION

Our ability to adapt and respond to the challenges of climate change, economic development and social inclusion, depends on how well we create and rejuvenate urban spaces, beyond conventional suburbs with their embedded flaws in design for resilience. Moving beyond champion-based *ad hoc* approaches to resilient city improvements, it is imperative that future-facing urban design becomes mainstreamed as a matter of urgency, requiring an approach that is readily understood and applicable to new-build and renewal projects [1].

The Sustainable Built Environment national research centre (SBEnrc) has been conducting research on how cities regenerate and create new and rejuvenated centres by focusing on the interstitial spaces that connect and engage with our built environment destinations [2]. In particular, the researchers have been focusing on integrating new forms of transit along streets (including trackless tram technology), enabling urban regeneration in and around stations that encourage social and structural resilience at the local suburban level. Indeed local mobility support has been widely cited as a priority need in rapid retrofitting of our cities in the face of extreme weather associated with climate change, enabling local resilience to create a foundation for resilience at the scale of city [3].

Previous research has concluded that such local interventions with mobility support could only be done by integrating a new approach to funding and financing with partnerships between land developers, the local community, and state agencies, addressing federal government goals for vibrant and resilient cities [4]. In 2015, the Australian Federal Government created a City Deal model [4] to support such initiatives, which are now being created and rolled-out across Australia.

Building on previous SBEnrc studies, this paper presents a key design innovation in the form of a Place Making Framework that comprises seven core principles and 21 practices that can guide a consistent approach to integrating local structural and social resilience within suburban centres, focusing on transport nodes and corridors. Given the national appetite (evidenced through SBEnrc consultation) for Trackless Tram System technology in particular, the paper focuses on this technology as an example key lever to unlock urban development potential. Moving beyond traditional design or redesign, Trackless Trams are an example of how a transport technology can be fitted into centres as a fast corridor service as well as enabling walkable, dense centres at stations.

The paper begins with a short literature review, discussing the city shaping opportunity provided by the Place Making Framework of principles and practices. The paper then presents how each of the seven principles can be applied, drawing on case studies to test and refine their usefulness. The authors also comment on the potential range of new forms of leadership, governance and co-creations that are being tested by local communities in order to address these design principles. The authors conclude with an invitation to colleagues from transport planning, engineering, architecture and business to use the Framework for urban regeneration development projects, towards urban environments where people can thrive in ways that are good for people and planet.

2. METHODS

The authors have used literature review and workshops to create and refine the framework. Subsequent workshops were then carried out to further establish the elements of the framework. This section presents the details of the literature review, workshops and the insights gained.

Academically refereed, full text journal, conference papers and technical reports on the urban regeneration, activated corridors, trackless tram systems were sought using clearly defined search strings in the urban development domain. More than 95 articles were analysed to define the principles of design and to create the framework for Centres of Tomorrow. The principle statements were further informed during workshops facilitated by co-authors Newman and Mouritz.

3. FINDINGS: THE PLACE MAKING FRAMEWORK

Based on the analysed literature, it was evident that that the coalescence of advancements of technologies in transport, communications and energy now presents a unique opportunity to achieve the city shaping transformational change required to meet the needs of our cities. Within this realm of integrated transit technologies, trackless tram systems have emerged as a potential city shaping technology with clear alignments of its benefits with the current Australian policy focus on the need of urban renewal and centre revitalisation. These key

elements have informed the principles and practices that could enable to build a framework for best practice and guide the Australian case studies for a sustainable centre of tomorrow.

Corridors, nodes, and places are the three key focus aspects that need to be considered in any city or local area when implementing integrated transit technologies towards local urban regeneration. The corridors are the large-scale overview that show where transit technologies are best located to provide good transport solutions and where good urban regeneration potential exists. The Nodes are where the most obvious urban regeneration exists and hence should likely be where a station is placed. The Places are where detailed design will optimise the integration of the trackless tram system to a range of accessibility and sustainability outcomes.

The Framework comprises seven core principles (in bold) and 21 practices (italicised), summarised in Table 1, targeting the design of corridors, nodes and places. Using this structure, the following sub-sections present the emergent principles (Section 3.1) and practices (Section 3.2) for successfully dealing with a range of structural and social urban design and infrastructure development issues in creating resilient suburban centres.

Table 1. Place Making Framework for resilient centres of tomorrow

Place Making Principle	Core Practices
1. Precinct safety and accessibility **Safe and healthy for people waiting to access transport nodes**	*Human centred design* *Walkable urban design* *Place and movement design*
2. Carbon neutral – positive approach **Carbon positive, being at least zero carbon (power and transport)**	*Solar passive design* *Solar active design* *Carbon neutral analysis*
3. Local shared mobility **Diverse local modal services to access the transit service, with defined spaces**	*Local mobility design* *Feeder transport design* *Mobility as a service*
4. Property diversity **Density and urban mix should contribute to urban regeneration**	*Community engaged planning* *Agglomeration economy analysis* *Financial modelling*
5. Property affordability **Diverse property options to provide affordable living as well as affordable housing**	*Social housing analysis* *Life cycle assessment* *Sustainability operational analysis*
6. Nature-oriented space and inclusive **Include and connect biophilic and biodiverse greenspaces, supporting endemic species and habitat**	*Biophilic design* *Water sensitive design* *Landscape oriented design*
7. Integrated, place-based planning **Involve diverse stakeholders and all tiers of government towards integrated place-based outcome**	*Joined up governance analysis* *Partnership analysis* *Procurement option analysis*

3.1 Seven Place Making Principles

The following paragraphs explain the merits of each principle in guiding a consistent approach to resilient place making, with reference to key literature and the lived experiences of the author team.

Principle 1: Precinct safety and accessibility

The development should be safe and healthy for people waiting to access transport nodes

Walkable urban design needs to provide safe, healthy and attractive spaces linking the transport nodes and right through the development [5]. Walkability has become the basis of the knowledge economy with its need for professional people to have face-to-face contact [6-8]. It is critical to assess therefore how the transport nodes could be optimised, along with the demand for management practice to improve the functionality of centres for human interaction and knowledge economy, adopting the principles of Human Centred Design [9]. While creating this healthy, attractive, human-centred spaces, a place-making approach [10] has emerged as a targeted method to examine the core elements of these processes, in particular the role of community-led processes and the role of the creative sector [11].

This walkability aspiration will not be possible unless the centre is part of a high-quality transit corridor which provides access across the city. This access is needed for people living in the centre catchment and also for those who live elsewhere and want to use the centre for work and services [6]. The importance of corridor access by transit as well as walkable access within a centre is a fundamental question for this research project. Rail stations in the past have been where walkable centres have emerged as they have been traditional places where walkability was possible. Similarly tram lines in the past had walkable areas around tram stops. However, the world of car-based planning has meant that tram lines have been either removed or filled with competing cars and increasingly heavy rail stations are being built with parking close to stations and hence walkability is lost. This project is now considering the potential for a Trackless Tram route down a street to reclaim walkability around stations as well as reclaiming speed along a corridor.

The resolution developed so far – through the SBEnrc project work with traffic engineers and urban designers – is to enable a transit urban fabric to develop where there is both corridor speed and nodal walkability. The two together can create a place of accessibility which is not car dependent. This requires corridor speeds of around 70 km/h with transit-way space that can enable such speeds, in addition to nodal speeds of around 30 km/h where traffic and space for cars is at a minimum and nodal walkability is maximised. This is not unlike how cities now function where they have quality transit along streets – with fast and slow sections – but it is not what is currently in traffic manuals, even those attempting to resolve issues of ‘place and movement’ [6].

Principle 2: **Carbon neutral–positive approach**

The development should aim for carbon positive, being at least zero carbon, in both power and transport

To adopt a carbon neutral or carbon positive approach to achieve close to zero carbon as possible in both power and transport it is important to evaluate how innovations can be utilised as a part of centres [12, 13]. This includes for example on-demand transportation ODT), Information and Communication Technologies (ICT), Autonomous Vehicles (AVs),

Electric vehicles (EVs), in addition to smart buildings, building design/building diversity and building types and associated smart cities concepts. To optimise their value, provisioning for flexibility is needed to accommodate these changes. This includes changes in renewable energy mix and solar passive, which are critical to provide sufficient solar power for the buildings, transit technologies and for local shared EVs. Various modelling techniques to optimise urban energy consumption have been developed using energy supply data and post-code information [14].

A three step process is required to integrate carbon neutral approaches for urban development [15], comprising: 1) reducing energy wherever possible (i.e.: building and transport sector), 2) using renewable energy, and 3) offsetting greenhouse gas emissions. For example, in Sydney, the State of New South Wales (through its Building and Sustainability Index (BASIX) programme), has mandated that new homes must now be designed to produce 40 per cent fewer greenhouse gas emissions, compared with an existing house. The programme targeted reducing carbon dioxide (CO_2) emissions by 8 million tonnes and water use by 287 billion litres in ten years [16]. Malmo (Sweden) claims that it has already become a carbon-neutral city and Newcastle in the United Kingdom and Adelaide also aspire to be carbon-neutral taking important steps in the direction of renewable energy. Carbon-neutral strategies are beginning in Singapore this city has demonstrated their interest in international forums that its CO_2 per dollar of gross national product (GNP) is going down steadily.

The implementation of solar energy in Barcelona was possible with a broad range of small actions and renewable energy projects spanning political commitment, capacity building and participation of the people. An innovative solar law, called "Barcelona Ordinance on Application of Solar Thermal Energy Systems into the Buildings" or "Barcelona Solar Ordinance, supported action*"*. This requires all new buildings in Barcelona to have solar thermal water systems to cover 60 per cent of sanitary water heating needs. This highlights the criticality of government commitment and community participation for changing the way energy is generated and used.

At the scale of country, Bhutan has formulated a *Low Emission Development Strategy* to reduce the emissions of their transport sector over a 25-year period. As an augmented strategy for sustainable urban design and reduce air pollution, a Green Tax was imposed on imported vehicles where electric vehicles, do not incur a tax and the tax imposed on hybrid vehicles is much less than the tax imposed on diesel and petrol motors [17]. In addition to working to increase a greater public transport share (up to 30 per cent), Vietnam is increasing energy efficiency and its share of biofuels through significantly reduced taxes for electric and hybrid vehicles [18]. These are clear examples of support through governance and policy formulation to promote a positive approach.

Principle 3: Local shared mobility

The development should encourage diverse local modal services to access the transit service, with defined spaces

To ensure that a precinct will not be dominated by parking and by vehicles trying to access the transit service options for local access via walking, biking and local shared mobility shuttle vehicles need to be facilitated [19]. Within this context, new city shaping technologies can be used to promote local connectivity, shared mobility and modal diversity. Integration of transport modes which includes walking and cycling, seeking to minimise the amount of travel and value-creation should be a key focus. Enhanced value-creation can be achieved through connecting the clusters, through well-defined corridors, serviced by a quality high

priority transit system and recognising that value-creation varies along the corridor as related to proximity to stations [20-23]. The local accessibility within centres aims to decreases the incentive for car ownership and use and encourages walking and cycling. The mixed land use within station precincts along rail corridors also makes the rail corridor and infrastructure itself more economically efficient, by creating destinations around stations that attract transit riders at all times of day and from all directions, rather than just transporting commuters to and from work [24].

The public perception of shared goods has shifted placing high importance on sharing bikes, cars or rides on on-demand basis [25]. This shared economy has gained popularity among many cities that are struggling with increased congestion and inner city traffic. Cohen and Kietzmann [25] proposed a shared mobility business model to demonstrate the optimal relationship between service providers and local government. European cities are classic examples of laboratories for sustainable mobility through walking (Barcelona) [26], cycling (Amsterdam, Groningen, Copenhagen, Odense, Berlin, and Muenster) [27] and shared mobility services (Berlin and Paris) [28]. Within the shared mobility services examples, the use of clean energy technologies received special attention. For example, two public electric car services in Berlin (BeMobility) and Paris (Autolib') demonstrated how each initiative enables shaping the future vision of sustainable mobility and transform regional transport systems in specific ways through their performative impact as local transport policy tools. BeMobility integrates electric cars as one element in Berlin's intermodal transport system, and focuses on 'intermodality' as the central vision of sustainable transport [28].

Principle 4: Property diversity

The density and urban mix should contribute to urban regeneration

Density and urban mix should be part of a local community engagement process to enable urban regeneration while fulfilling local needs and aspirations. For developers to evaluate how affordable higher density housing can be a key part of the 'people and place' transformation, a deep appreciation of creating centres through liveable, community-oriented design will be required. Community engaged planning process, diversity of property densification, evidenced based financial modelling have been identified as key practices to promote urban mix to enable developers to create viable and integrated corridors [14, 29, 30]. It is also key to understanding the value uplift that captures the land value and positive externalities to ensure establishment of context-based solution to creating a centre.

Density in activity centres has a clear link to urban productivity and it is established through 'The Triumph of the City' by Harvard Professor Ed Glaeser (2011) where it has been measured in a number of cities including Melbourne, Australia [31]. This phenomenon of agglomeration economies occurs as a result of clustering of urban activities and jobs that require face-to-face interactions for the creativity and innovation related to urban productivity gains, particularly in the knowledge economy sector. Within this context, agglomeration benefits such as economies that can be gained by the new density and mix of land uses that are facilitated by the project can be achieved. Such elasticities are assessed in many cities such as those developed on Australian cities [32].

Principle 5: Property Affordability

The development should include diverse property options to provide affordable living as well as affordable housing

There should be a clear goal of providing affordable and social housing along the corridor with particular goals for each station precinct. To achieve those goals, it is critical to assess how affordable higher density housing can be a key part of the 'people and place' transformation of centres through liveable, community-oriented design. Inclusion of diverse housing products, inclusion of social housing and diversity of property product are therefore critical aspects to promote property affordability. Within this milieu, it is imperative to strike the right balance between appropriate quality, sustainability and safety standards and responsiveness to housing supply and affordability.

For example, the Chinese government at the national level has responded by developing new policies to support affordable and social housing; and at local level various new housing provision schemes have been tested, but their scale and impact have been limited because of the priority given by the local state to economic growth and securing local land related revenues [33].

The Australian Housing and Urban Research Institute provides a report evaluating the diminishing supply of affordable housing options for lower income (LI) workers near job-rich central city (CC) locations is having an impact on CC businesses and on the overall productivity of CC economies. There is evidence of increasing recognition by major-city governments, both in Australia and overseas, of high housing costs. High housing costs is recognised as a social welfare and equity problem in a policy context. However, there are emerging conversations in a number of strategic planning policies that specifically address the direct impacts of housing costs on urban economic growth. For example, in both Sydney and Melbourne, housing and economic development strategies note that housing costs can limit access to central city locations, which can in turn thin lower income labour markets, reduce productivity [34].

Principle 6: Nature-loving and biodiverse spaces
The development should include and connect biophilic and biodiverse greenspaces, supporting endemic species and habit

Sustainable design embraces societal, economic and environmental principles, although conventionally landscape designers are brought into project works late, and with minimal scope or budget to effect design solutions that could be considered 'nature-loving' (biophilic) or biodiverse. Participation in the design process especially in landscape architecture and design is critical [35], to ensure solutions are community-oriented and sympathetic to local environmental attributes.

Within this context, biophilic design and water sensitive design principles should be required to be part of all buildings and across the precinct. Creating a nature-oriented space to promote diverse, resilient and healthy ecosystem that contributes to local biodiversity will also have impact on the health and wellbeing of our community. This was elaborated in the Urban Ecology and Biodiversity Strategy in the City of Melbourne [36]. To create better people friendly and place-based urban spaces that are not affected by excessive traffic nature-oriented spaces have emerged as a targeted practice adopted by many cities over the world. With the emergence of sustainable urban planning, the ideal of the sustainable cities can be characterized by high density, mixed land use and attractive green infrastructure. This has become a desirable urban form at global scale [37].

Urban greening, including urban gardening, has a great contribution in creating nature

orientated places while offering benefits such as shade and urban cooling [38, 39]. For example, Singapore demonstrates nature-oriented urban planning efforts weaving nature throughout—which includes plant life, in the form gardens, green roofs, cascading vertical gardens, and verdant walls. The policies and capacities both requires and enables this form of global cities and centres to be rapidly and constantly reworked while embedding nature-oriented spaces [40].

Principle 6: Nature-oriented space and inclusive

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Principle 7: Inclusive, integrated, place-based planning

Planning, design and implementation (operation, maintenance) should involve diverse stakeholders and all tiers of government to provide an integrated place-based approach.

The need for an inclusive and integrative design process that focuses on a place-based outcome is the final principle that needs to guide all planning and design. There are a range of processes that have been used over time but in recent periods, there has been an emphasis on City Deals that integrate the physical planning processes, the human-oriented planning processes and the financial planning processes. The guidelines of a partnership like a City Deal should be established with core functions involving planning strategy, planning controls, partnership development and investment mechanisms. The need for a single state agency to

provide the integrative process within the guidelines of a City Deal should be established but with core functions involving design, density/mix, and financing.

To examine partnership models for delivering transformation of centres, particularly the provision of private funding based on value creation/ capture approaches are critical for integrated partnerships. The governance process should identify the most appropriate procurement and delivery models, as well as statutory requirements, including a review of what powers local governments do have and recommend what extra powers might be useful. Key practices such as upfront and Integrative whole of agency approaches, regular and iterative consultation and harnessing existing incentive/schemes are key success factors for effective integrated planning processes [42, 43]. By overcoming institutional barriers related to cross-agency collaboration, governments must integrate transport and land use planning to realize integrated developments to enable people to walk or use transit between mixed-use complexes to satisfy daily needs [38]. As outlined in this and other SBE reports the role of private investment in enabling integration is also crucial.

To support each of these principles it is important to establish the most appropriate Transit Corridor governance arrangement that harness the best outcomes through urban re-shaping opportunities. A critical starting point is who is presently responsible for the preferred alignment and if there is a need for any shift in the governance of the alignment and the associated urban development opportunities presented by the introduction of trackless tram stations. Therefore, it is critical to identify what structure is best able to deliver such a project. Is it a local government, a series of local governments, a new integrated state agency with capability in both land management and transit with capacity to attract the funding and financing or a facilitated unsolicited bid process.

3.2 Core Place Making Practices

The authors considered how the seven core principles can be enabled through professional practices. Each principle is a necessary component that can support the integration of transit technology – specifically trackless tram technology – within cities and how they can assist the creation of new centres through urban regeneration. The coalescence of advancements of technologies in transport, communications and energy now presents a unique opportunity to achieve city shaping transformational change. Thus, the combination of practices brings together some new elements not usually considered as a necessary part of the tool kit used by urban designers, planners and transport engineers. Core practices are listed below in Table 2, along with some key references and links to manuals that help with these practices.

Table 2: Practices informing the Framework for designing and implementing Centres of Tomorrow

Practices informing the principles	Key literature references	References and resources for good practice
1. Precinct safety and accessibility		
• Human centred design	[44-46]	Design Kit (IDEO.org)
• Walkable urban design	[47-50]	Pedestrians First (ITDP.org)
• Place and movement design	[51, 52]	Movement and Place Framework (Transport Victoria)
2. Carbon neutral - positive approach		
• Solar passive design	[53-55]	A focus on Greening our Precincts (Aurecon)
• Solar active design	[56-58]	Solar Energy (International Energy Agency)
• Carbon neutral analysis	[59-61]	Carbon Value Analysis Tool (World Resources Institute)
3. Local shared mobility		
• Local mobility design	[62-64]	Pedestrian Access and Mobility Plan (NSW RTA)
• Feeder transport design	[65, 66]	Principles of Network Planning (Griffith University)
• Mobility as a service	[67-69]	Rise of Mobility as a Service (Deloittes)
4. Property diversity		
• Community engaged planning	[70-72]	Resources (Internat. Assoc. for Public Participation)
• Agglomeration economy analysis	[73-76]	Spatiotemporal Analysis Framework (Jin et al 2018)
• Financial modelling	[77, 78]	Toolkit for rapid economic assessment of cities (ADB)
5. Property affordability		
• Social housing analysis	[79-82]	Conceptual Analysis (AHURI)
• Life cycle assessment	[83-87]	Applied to Urban Fabric Planning (Gabbarell et al, 2015)
• Sustainability operational analysis	[88-91]	Sustainable affordable housing (Wiesel et al, 2012)
6. Nature-loving and biodiverse spaces		
• Biophilic design	[41, 92]	Biophilic Design Initiative (Living-Future.org)
• Water sensitive design	[93, 94]	Scenario Tool (CRC Water Sensitive Cities)
• Landscape oriented design	[95, 96]	Foreground Forum (Inst. of Landscape Architects)
7. Inclusive, integrated, place-based planning		
• Joined up governance analysis	[97-100]	A Joined Up Policy Guide (South Aust. Government)
• Partnership analysis	[101, 102]	Partnerships Analysis Tool (Vic Health)
• Procurement option analysis	[103, 104]	National Guideline (Australian Government)

4. DISCUSSION: APPLYING THE FRAMEWORK

Building on the discussion in the above sections, the seven core principles are applied to four kinds of urban fabrics that are relevant to the case studies in this research (Table 3). Based on the fabrics in the four case studies (Townsville, Sydney, Melbourne, Perth) being studied as part of the SBEnrc project.

Table 3: The Centres Framework applied to four different urban fabrics [105]

Core Principles/ Urban Fabric Examples	Central City Walking Fabric (current rail-based centre)	Inner City Transit Fabric (old tram line area)	Middle Suburb Transit Fabric (infill failing)	Outer Suburb Automobile Fabric (new area needing a centre)
1. Precinct safety and accessibility	Walkability the critical value	Walkability in centre and corridor access both critical	Walkability in centre and corridor access both critical	Walkability in centre and corridor access both critical
2. Carbon neutral – positive approach	Strong transport carbon reductions but harder to do solar on buildings	Easier to do solar on buildings and harder on transport carbon reductions	Easy to do solar on buildings and hard on transport carbon reductions	Very easy to do solar on buildings and much harder on transport carbon reductions
3. Local shared mobility	Essential character	Essential character	Essential character	Essential character
4. Property diversity	Essential character	Essential character	Essential character but markets harder on mixed use	Essential character but markets hard on mixed use
5. Property affordability	Important but more difficult	Important but still difficult	Important and easier to achieve	Important and easier to achieve
6. Nature oriented space	Critical with emphasis on biophilic buildings and small pocket parks	Critical with emphasis on biophilic buildings, small pocket parks and green corridor	Critical with emphasis on biophilic buildings, small pocket parks and green corridor	Critical with emphasis on small pocket parks, green corridor and landscape-oriented development
7. Inclusive, integrated, place-based planning	Essential for delivery	Essential for delivery	Essential for delivery	Essential for delivery

8.

All but two of the case studies go through a central city walking city, all but two go through an inner city transit fabric that has been defined by a previous tramway, all have a middle suburb with potential for transit fabric as the only redevelopment is backyard infill that is failing to provide a centre with transit, and all have an outer suburb automobile fabric area with the need for a centre and transit. Table 3 sets out the findings showing that the Design Framework can apply in all urban fabrics with some principles having higher potential and different tools to be implemented.

5. CONCLUSIONS

This paper has proposed a framework that can guide consistent design of locally appropriate urban development, considering the context of corridors, nodes and places, based on the Theory of Urban Fabrics. Using the Place Making Framework, the authors have considered four different urban fabric types, based on the fabrics in the five case studies being studied as part of the SBEnrc project 1.62 Sustainable Centres of Tomorrow [2]. In each case, desirable outcomes require a quality transit corridor that can reduce car dependence, nodes at stations, which emerge from redevelopment opportunities, and place-based design that can make the most of the amenity needed to create value along the whole corridor. This shift to more urban places and spaces will also require renewed leadership and governance approaches built around new forms of co-creation, ideally involving enhanced levels of civil society involvement.

The future of urbanism in Australia and around the globe to adapt and respond to the big challenges of climate change, economic development and social inclusion, will depend on how well we create the centres of tomorrow. How to deliver these different centre qualities along a new transit corridor in a main street remains a major challenge for designers, planners and engineers to work out with politicians, developers, financiers and community leaders. Achieving integrated design responses will require new collaborative processes and co-creation processes. The governance systems related to integrated transit systems are outlined have a range of private investment involved but all require significant levels of partnership.

This literature review provides an important foundation for the case studies to use the Framework in a range of different street corridors and a range of different cities. The authors invite colleagues from engineering, architecture, planning, science and business to consider the use of this framework as a way of focusing on priority needs for resilient urban design. It is intended that the Framework will be refined with the insights from these studies and feedback from colleagues herein.

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