Applying a Place Making Sustainable Centres Framework to Transit Activated Corridors in Australian cities

Savindi Caldera[1], Cheryl Desha[1], Sacha Reid[1], Peter Newman[2], Mike Mouritz[2]*
[1] Cities Research Institute, Griffith University, 170, Kessels Road, Nathan, QLD, Australia
[2] Sustainability Policy Institute, Curtin University, Kent St, Bentley WA, Australia
*e−mail: s.caldera@griffith.edu.au

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 integrate and embed them within these built environments. Such a complex agenda presents a major collective challenge for designers, planners and engineers to address with politicians, developers, financiers and community leaders. Refocusing design requires 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, an interdisciplinary research team has synthesised and then applied a set of principles of design to a range of development scenarios with the aim of delivering sustainable urban centre outcomes. This paper uses the lens of the Theory of Urban Fabrics to present a place making *Sustainable Centres Framework* created by the authors, comprising 7 principles and 21 associated practices of design. This formed a critical first step for a national sustainable centres research project underway at the time. The paper then presents the findings of a two-phase investigative study to apply the framework to four place-oriented urban regeneration initiatives (i.e. case study sites) that were endeavouring to enable transit activated corridors with local micro-mobility linkages, in Townsville, Sydney, Melbourne and Perth. The first phase of the study comprised a desk-based application of the *Sustainable Centres Framework* to the four sample urban fabric types observed the case study locations. The second phase involved detailed sense-checking of the framework in the one of the case study locations (Townsville), through stakeholder workshops. The findings provide insights into opportunities and considerations for managing the complexity of urban regeneration projects. The authors discuss the potential for the Framework to inform planning tools and decision support tools, and opportunities to further refine the Framework.

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, evolving

---

[1] Corresponding author

from conventional suburbs with their embedded flaws that do not prepare us for a future where these factors are much more critical. 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 integration of new transit systems with local mobility support [2] 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]. Risk assessment and modelling is critical for effective planning and design of resilient cities [4].

The Sustainable Built Environment national research centre (SBEnrc), Australia has been conducting research on integrating new accessibility technologies and precinct planning systems. Within the 'Greening the Built Environment' theme, research projects have explored new forms of transit along streets, enabling urban regeneration in and around stations that encourages social and structural resilience at the local suburban level. This research has concluded that enabling such interventions requires a new approach to scoping, funding and financing with partnerships between land developers, the local community, and state agencies, addressing Federal Government goals for vibrant and sustainable cities [5]. Given the increasing interest in Australia and overseas for a transit technology called a 'Trackless Tram System' [6], a previous SBEnrc project studied the merits of this technology to address the integrated agendas of climate change, economic development and social inclusion [7]. The authors concluded the feasibility and practicality of Trackless Tram Systems as a low-cost alternative to conventional systems. They are also aligned with the current Australian policy focus on urban regeneration and centre revitalisation, providing a fast corridor service as well as enabling walkable, dense centres at stations, moving beyond conventional suburban design or redesign [6].

Building on this work and reflecting on the need for a new approach to scoping urban regeneration initiatives, this paper addresses the research question in a current SBEnrc research project 1.62 Sustainable Centres of Tomorrow: People and Place, namely *"what key principles and practices can be used to ensure the process of planning for and implementing urban regeneration achieves sustainable urban centre outcomes?"*. We begin with a contextual overview of the city-shaping *Theory of Urban Fabrics* with its focus on nodes of activity and the corridors between them. We reference this theoretical narrative to present a place making *Sustainable Centres Framework* that synthesises the findings of previous projects (literature reviews) and peer review workshops. The seven principles and 21 practices are presented with regard to how they can guide public and private investment decisions to deliver people and place friendly urban centre outcomes.

We then present the methods and findings of applying the Framework in an SBEnrc study of proposed trackless tram system integration opportunities. The first phase of the study comprised a desk-top consideration of four different urban fabric types, in Townsville, Sydney, Melbourne and Perth. The second phase involved further sense-checking of the Framework in Townsville through stakeholder workshops and interviews. Synthesising these results, we discuss the utility of the Framework and its ability to support a range of new forms of leadership, governance and co-creations that deliver sustainable outcomes. Opportunities for further refining the Framework are also described.

THEORETICAL CONTEXT

This section overviews the Theory of Urban Fabrics which provides a lens through which to view key land development mechanisms and integrated transport technologies. The place making Sustainable Centres Framework is presented including key principles and practices.

Theory of Urban Fabrics

Urban fabrics are "*products of transport-related lifestyles and functions that have needed certain physical elements and environments to enable them*" [8, p.431]. Each fabric type comprises a particular set of '*spatial relationships, typology of buildings and specific land use patterns that are based on their transport infrastructure priorities*' [8]. Figure 1 illustrates the city footprint as a combination of three overlapping walking, transit and automobile fabrics, as described below. Walking city fabrics are dense in nature (e.g. 100 people per hectare), allowing people to walk with a speed of 3-4 kilometres per hour (km/h). Cities such as Barcelona, Mumbai, and Ho Chi Minh demonstrate key characteristics of cities with significant walking city fabric components [9]. Smaller towns can also include elements of a walking urban fabric within for example central business districts, riverside, and/or waterfront areas. Transit urban fabrics were historically based on trains (24-40km/h) and trams (10-20km/h) enabling people to travel faster than walking.
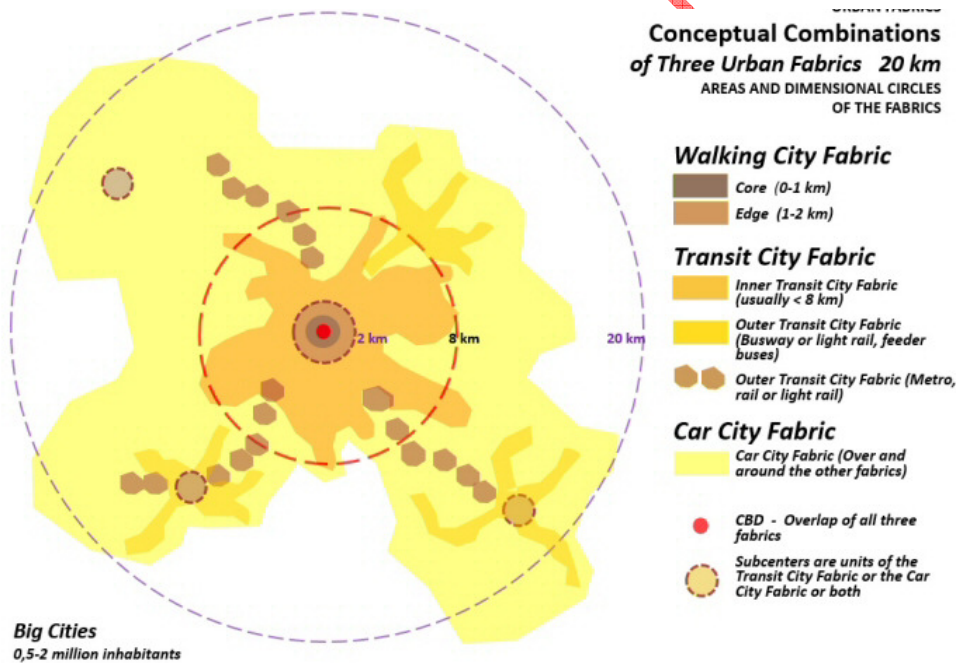
Figure 1. Walking, transit and automobile city a combination of three overlapping systems
Source: [10]

Within the inner city confines, it is common to find examples of linear (i.e. tram) and nodal (i.e. train) developments along corridors [11]. Car city fabrics evolved when the emergence of roads and parking for automobiles caused trams to often be replaced by buses. Buses were used as a supplementary service to the car, which led to higher loss of the transit urban fabric though the basic building structure and layout remained. From the 1950s onward, 'automobile cities' could span beyond the 20 km radius to 80 km diameter (i.e. up to 40 km radius) in all directions. With limited public transit to support the urban sprawl, citizens largely depended on automobility [12].

Considering this theory of urban fabrics, Thompson and Newman [9] present corridors, nodes, and places as three key aspects that need to be accommodated in any city or local area regeneration. Corridors are where transit technologies can be best located to improve transport solutions; where good urban regeneration potential exists. Nodes – where the most obvious urban regeneration potential exists – are likely candidates for a station/ stop. Places focus attention on using the nodes and corridors to deliver accessibility and sustainability outcomes for the spaces between and surrounding the nodes. This theoretical context helps to understand the broader urban system within which place making interventions can be developed and applied.

Sustainable Centres Framework

Appreciating the complexities arising with the three overlapping walking, transit and automobile fabrics in cities today, and the priorities of 'corridors', 'nodes', and 'places', the preparatory research in SBEnrc research project 1.62 involved synthesising a set of principles and practices that could guide design and public and private investment decisions to deliver people and place friendly urban centre outcomes. More than 95 articles were analysed to define the principles of design and to create the Sustainable Centres Framework, as previously documented in a SBEnrc industry report [13]. 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. Principle statements were further informed through six workshops facilitated by co-authors Newman, Desha and Mouritz for case studies in Townsville, Sydney, Melbourne, and Perth, Australia (described in a previous conference paper [7]), which followed the 3P method of 'Proper prior planning' to carry out an interactive workshop [14].

The resultant place making *Sustainable Centres Framework* is presented in Table 1, with the seven core principles in bold and the 21 practices italicised. The table also highlights how the seven core principles can be enabled through professional practices, along with some key references and links to tools and manuals that help with these practices. The following paragraphs explain the merits of each principle in guiding a consistent approach to sustainable and regenerative place making, with reference to key literature and the lived experiences of the author team spanning the disciplines of engineering, science, business, and planning.

Table 1. The place making Sustainable Centres Framework [7]

Practices informing the principles	Key literature references	References and resources for good practice
1. Precinct safety and accessibility: Safe and healthy for people waiting to access transport nodes		
• Human-centered design	[15]	Design Kit [16]
• Walkable urban design	[17]	Pedestrians First [18]
• Place and movement design	[19]	Movement and Place Framework [20]
2. Carbon neutral - positive approach: Carbon positive, being at least zero carbon (power and transport)		
• Solar passive design	[21]	A focus on Greening our Precincts [22]
• Solar active design	[23]	Solar Energy [24]
• Carbon neutral analysis	[25]	Carbon Value Analysis Tool [26]
3. Local shared mobility: Diverse local modal services to access the transit service, with defined spaces		
• Local mobility design	[27]	Pedestrian Access and Mobility Plan [28]
• Feeder transport design	[29]	Principles of Network Planning [30]
• Mobility as a service	[31]	Rise of Mobility as a Service [32]
4. Property diversity: Density and urban mix should contribute to urban regeneration		
• Community engaged planning	[33]	Resources [34]
• Agglomeration economy analysis	[35]	Spatiotemporal Analysis Framework [36]
• Financial modelling	[37]	Toolkit for rapid economic assessment of cities [38]
5. Property affordability: Diverse property options to provide affordable living as well as affordable housing		
• Social housing analysis	[39]	Conceptual Analysis [40]
• Life cycle assessment	[41]	Applied to Urban Fabric Planning [41]
• Sustainability operational analysis	[42]	Sustainable affordable housing [43]
6. Nature-loving and biodiverse spaces: Include and connect biophilic and biodiverse greenspaces, supporting endemic species and habitat		
• Biophilic design	[44]	Biophilic Design Initiative [45]
• Water sensitive design	[46]	Scenario Tool [47]
• Landscape oriented design	[48]	Foreground Forum [49]
7. Inclusive, integrated, place-based planning: Involve diverse stakeholders and all tiers of government towards an integrated place-based outcome		
• Joined-up governance analysis	[50]	A Joined Up Policy Guide [51]
• Partnership analysis	[52]	Partnerships Analysis Tool [53]
• Procurement option analysis	[54]	National Guideline [55]

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 [56]. Walkability has become the basis of the knowledge economy with its need for professional people to have face-to-face contact [8, 57, 58]. 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 [59]. While creating this healthy, attractive, human-centered spaces, a place-making approach [60] 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 [61].

This walkability aspiration would not be possible unless the centre forms part of a high-quality transit corridor which provides access across the city. Such 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 [8]. 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.

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 that 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 are 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' [8].

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 [62]. 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 the renewable energy mix and solar passive, which are critical to providing sufficient solar power for the buildings, transit technologies, and local shared EVs. Various modelling techniques to optimise urban energy consumption have been developed using energy supply data and post-code information [63].

A three-step process is required to integrate carbon neutral approaches for urban development [64], 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, (Australia) New South Wales, has brought in a Building and Sustainability Index (BASIX) program directing efforts to design houses that produce 40 per cent fewer greenhouse gas emissions, compared with an existing house. The programme targeted at reducing significant amounts of carbon dioxide (CO_2) emissions and water consumption [65]. Carbon-neutral strategies are beginning in Singapore. This city has demonstrated in international forums that its carbon dioxide per dollar of gross national product is gradually decreasing. Malmo (Sweden) on the other end claims that it has already become a carbon-neutral city and is inspiring other countries to benchmarks best practices in using renewable energy.

The implementation of solar energy in Barcelona has been demonstrated through targeted actions supported by government commitment and community engagement. 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 [66]. 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 decrease the emissions of their transport along with an augmented strategy for sustainable urban design and reduce air pollution. A Green Tax was imposed on imported vehicles encouraging consumers to purchase more hybrid vehicles with significantly low tax [67]. In addition to working to increase a greater public transport share (up to 30 per cent), Vietnam is improving energy efficiency and use of biofuels via lowered taxes for electric and hybrid vehicles [68]. 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 [69]. 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 [70].

The public perception of shared goods has shifted placing a high importance on sharing bikes, cars, or rides on an on-demand basis [71]. This shared economy has gained popularity among many cities that are struggling with increased congestion and inner-city traffic. Cohen and Kietzmann [71] 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) [72], cycling

(Amsterdam, Groningen, Copenhagen, Odense, Berlin, and Muenster) [73] and shared mobility services (Berlin and Paris) [74]. 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. Building on 'intermodality' as the central vision of sustainable transport Berlin's intermodal transport system incorporates electric cars as part of the BeMobility service[74].

Principle 4: Property diversity

The density and urban mix should contribute to urban regeneration

The 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 [63]. It is also key to understanding the value uplift that captures the land value and positive externalities to ensure establishment of a context-based solution to creating a centre.

Density in activity centres has a clear link to urban productivity, as established through 'The Triumph of the City' [75] where it has been measured in a number of cities including Melbourne, Australia. This phenomenon of agglomeration economies [76] 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 enabled by this study can be accomplished. Such elasticities are assessed in many cities such as those developed in Australian cities [77].

Principle 5: Property Affordability

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

Many low-income groups face challenges in finding housing options near central city locations where most jobs are typically found. It has been increasingly identified that housing cost can have impacts on limiting access to people and diminishing income in labour market and thus resulting in low levels of productivity [78].

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, the inclusion of social housing, and diversity of property products 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. Previous research presents local [78] and global [79] evidence of national-level policies to support affordable and social housing.

Principle 6: Nature-oriented and inclusive space

The development should include and connect biophilic and biodiverse greenspaces, supporting endemic species and habit

The 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 create design solutions that could be considered 'nature-loving' (biophilic) or biodiverse. Participation in the design process especially in landscape architecture and design is critical [80], 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 a diverse, sustainable, and healthy ecosystem that contributes to local biodiversity will also have an impact on the health and wellbeing of our community. This was elaborated in the Urban Ecology and Biodiversity Strategy in the City of Melbourne [81]. 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 idea of sustainable cities can be characterized by high density, mixed land use, and attractive green infrastructure. This has become a desirable urban form on a global scale [82].

Urban greening, including urban gardening, has a great contribution in creating nature orientated places while offering benefits such as shade and urban cooling [83]. 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 [84].

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 is a range of processes that have been used over time but in recent periods, there has been an emphasis on City Deals [5] 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 [85]. 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 [86].

To support each of these principles it is important to establish the most appropriate transit corridor governance arrangement that harnesses 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. For example, this could comprise a local government, a series of local governments, or a new integrated state agency with capability in both land management and transit with the capacity to attract the funding and financing or a facilitated unsolicited bid process.

FRAMEWORK APPLICATION METHODS

Reflecting on the Urban Fabrics Theory, the Framework was then tested through a two-phase exploratory study of case studies. In the first phase, the seven core principles were considered in relation to the four kinds of urban fabrics present in SBEnrc Project 1.62, in Townsville, Sydney, Melbourne, Perth [7]. As shown in Table 2, two of the case studies are embedded within a central city walking city, and two of them include an inner-city transit fabric that has been defined by a previous tramway. All four 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 four have an outer suburb automobile fabric area with the need for a centre and transit [7].

Table 2. Summary of the four case study sites as they were classified for the study

Case study sites	Description	Classification
1. Melbourne (City of Wyndham)	▪ Fast growing outer suburban council. ▪ Connection to rail station is critical and opportunities for new denser centres adjacent to connection route. ▪ Property affordability is not main issue but accessibility is.	Automobile City Fabric predominantly looking for a new Transit City Fabric
2. Perth (five local governments from Canning through the CBD to Stirling)	▪ Mixture of middle suburbs ready to redevelop, inner city old tram routes and CBD. ▪ Walkability in centre and corridor access are both essential. ▪ Property affordability is important for new dense urbanism proposed.	Middle Automobile City Fabric, Inner City Transit Fabric, and Central Walking City Fabric
3. Townsville (from CBD to James Cook University and Health Campus)	▪ Infill failing in central area. ▪ Outer areas around campus looking for new developments. ▪ Accessibility for transit sub-standard for students. ▪ Walkability in centre and corridor access are both essential. ▪ Property affordability is important and easier to accomplish.	Automobile City Fabric predominantly but looking for a new Transit City Fabric

4. Sydney (from Liverpool CBD to new Badgerys Creek Airport)	▪ Historic walking city now surrounded by fast growing automobile-based suburbs. ▪ New airport needs transit link to old centre with new dense precincts along the way. ▪ Walkability in centre and corridor access are both essential. ▪ Property affordability is important and easier to accomplish.	Outer Suburb Automobile Fabric predominantly with historic Walking Fabric and the need for a Transit City Fabric linking them.

In phase two of the study, the research team then selected Townsville, Australia as the case study site to sense-check the Framework in detail. This selection of one of the case study sites was predicated on the availability of seed-funding for additional exploration, through the CityDeal partnership that exists in Townsville [5]. The Townsville case study comprised the vision of a transit activated corridor that could build a new transit urban fabric with new centres along its length from the central business district (CBD) to the new TropIQ Centre (located in the James Cook University/ Health Centre precinct) and station precincts between. Workshops were deemed appropriate as a targeted method to foster engagement with the key stakeholders through collaborative discussion. Constructive feedback was received during the workshops [87].

The workshops were held in two stages to ensure prolonged engagement and it established trust between the researchers and participants [88]. Workshops were undertaken (ensuring anonymity of each participant) to explore stakeholder perspectives on unlocking urban potential, in accordance with Griffith University Human Research ethics approval (GU Ref No: 2019/701). Firstly, the team approached the project partners to identify key stakeholders and invited all relevant participants who were interested in a potential urban regeneration project in Townsville. Each of the workshop sessions consisted of showing a thought-provoking power point presentation, which was followed by a brainstorming activity to engage the participants. The research team made notes during the workshop and the consent was obtained from the participants to use their insights to support the research as de-identified data.

Trust was developed through the facilitators' enthusiasm in interacting with the participants which made them feel valued and heard [89]. This context also enabled the participants to provide rich insights into the practical application of the place-making Framework. Additional data were collected through industry and government reports suggested by the workshop participants and selected through a thorough desktop study to increase the credibility of the information (Attachment 1). Workshop notes were used to extract and transfer rich insights of the participants [90] in determining practical aspects of applying place making principles in Townsville.

RESULTS: APPLYING THE FRAMEWORK

In the following sub-sections, we summarise the data obtained by applying the Framework to 1) the four urban fabric types; and 2) the Townsville urban regeneration project.

Application to four urban fabrics

Table 3 summarises the application of the Framework to four urban fabrics, highlighting the place-based differences in potential and the different tools to be implemented depending on the

context. More detail about this application can be found in a conference paper delivered by the authors [7].

Table 3. The Centres Framework applied to four different urban fabrics [7]

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

Deep-dive Application to Townsville City Council

All seven principles were further explored within the Townsville case study of the SBEnrc Project 1.62, to examine priority design consideration demonstrating a strong commitment to inclusive, integrated place-based planning processes. The Framework was used to distil regenerative opportunities within the Townsville study area, extracting statements and vocabulary from the workshop notes and key technical reports, as summarised in Table 4.

Table 4. Place Making Framework applied to Townsville

Place Making Framework Core Principles & Elements	Key Report (Coordinating Agency/Authors, year)															
	Townsville City Deal Progress report	Townsville SDA Development Scheme	North Queensland Regional Plan	NW QLD Regional Transport Plan	DTMR Annual Report	DHPW Annual report	Queensland Housing Strategy 2017-2027	State of Environment report	TCC Community Insights Report	Mobility in Townsville	Townsville Integrated Transport Plan	Townsville Retail Information Sheet	Townsville Solar Cities Report	Energy Transformation Townsville	Tropic Economic Assessment	Vision & Transition: Water Sensitive Townsville
	Nat.	QLD	QLD	QLD	QLD	QLD	QLD	QLD	TCC	TCC	TCC	TCC	TCC	TCC	TropiQ	Nat
	2019	2019	2019	2019	2018	2018	2017	2008	2019	2019	2019	2015	2013	2015	2019	2018
1. Precinct safety and accessibility: *The development should be safe and healthy for people waiting to access transport nodes* Human centred design ǀ Walkable urban design ǀ Place and movement design																
1.1 Safe and accessible nodes connectivity *Use renewable energy for power and transport in the precinct*	●		●		●	●	●		●	●	●	●			●	
1.2 Cool and comfortable (shelters, paths) *Provide cool and comfortable shelters and pathways which elevates the quality of public space*					●	●	●		●				●		●	●
1.3 Safe, natural and open spaces *Include natural and open spaces that ensure personal safety*									●				●			●
1.4 Frequent and integrated *Deliver a seamless personalised journey*			●	●	●				●	●	●					
1.5 Resilience (economic recovery) *Design, maintain and operate a resilient network*		●	●	●	●	●		●			●					●

2. Carbon neutral - positive approach: The development should aim for carbon positive, being at least zero carbon, in both power and transport
Solar passive design | Solar active design | Carbon neutral analysis

2.1 Solar-powered with energy storage *Use renewable energy for power and transport in the precinct*	●		●					●		●				●		
2.2 Low carbon transport approach *Design transport solution to be more resource-efficient, have lower emissions and is ultimately more sustainable*				●	●	●	●						●	●		
2.3 Electric Mobility *Incorporate clean energy solution that can provide secure jobs, new industries and export earnings It is important to note that that hydrogen is sourced through renewable energy (solar, hydroelectric)*			●			●										
2.4 Sustainable urban design *Create the ability of communities and wider urban systems to minimize their impact on the environment*					●			●		●				●		
2.5 Low embodied energy infrastructure *Reduce energy consumption by all of the processes associated with the production of an infrastructure*																

3. Local shared mobility: *The development should encourage diverse local modal services to access the transit service, with defined spaces*
Local mobility design | Feeder transport design | Mobility as a service

3.1 Modernised systems e-ticketing *Ensure availability of electronic ticketing to user friendly platforms*						●										
3.2 Real-time data available to all *Enable people to easily plan their travel (schedules and timetables)*					●	●										
3.3 Paths that connect communal amenity *Modify infrastructure assets to accommodate local mobility*				●						●	●					

4. Property diversity: *The density and urban mix should contribute to urban regeneration*
Community engaged planning | Agglomeration economy analysis | Financial modelling

4.1	Robust and current survey data *Ensure the availability of accurate data for evidence-based decisions*	●					●	●		●						●	
4.2	Mapped population clusters, by type *Use modern mapping technology to evaluate current conditions, gaps and to identify opportunities to improve mobility*										●							
4.3	Long term planning considerations *Include long term modelling to ensure stronger and smarter solutions, delivering more productive economies and connecting communities*	●	●			●	●		●						●		●	

5. Property affordability: *The development should include diverse property options to provide affordable living as well as affordable housing*
Social housing analysis | Life cycle assessment | Sustainability operational analysis

5.1	A mix of housing lines (rent, purchase) *Include safe, secure and affordable housing enables people to fully participate in, and contribute to, the wellbeing of Townsville*	●					●	●										
5.2	Housing choice/ diversity *Increase the supply of diverse housing through improved housing design and renewed neighbourhoods with a greater choice about where they'd like to live, grow, raise a family and retire*						●	●										
5.3	Medium density residential housing *Include medium density residential designs to provide an alternative, as a more affordable housing option*			●						●								

6. Nature-loving and biodiverse spaces: *The development should include and connect biophilic and biodiverse greenspaces, supporting endemic species and habitat*
Biophilic design | Water sensitive design | Landscape oriented design

| 6.1 | Cool and comfortable
Provide more comfortable waiting space for customers and better pathways through the Townsville CBD | | | | | ● | ● | ● | | ● | | | | ● | | ● | ● |
| 6.2 | Water sensitive design
Develop quality urban space solutions supported by water sensitive design principles | | | | | | | | | | | | | | | | ● |

6.3	Along and connecting corridors *Create conditions conducive for natural environment (natural features, views, vegetation, topography, water, wildlife etc.) and public open space (street trees, footpaths, parks etc.), improved shading to address the urban heat island effect*											●		●										●
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* Joined up governance analysis | Partnership analysis | Procurement option analysis																							
7.1	Collaboration among key stakeholders *Embed genuine collaboration and partnership between the government and the local community to achieve significant outcomes*	●									●													●
7.2	Inclusive governance *Embed inclusive governance structures to enable integration, collaboration, innovation and collective leadership*	●					●		●		●													●
7.3	Working across agencies *Embed inter-agency collaboration to maximise the benefits of investment in transport*			●		●		●	●															

DISCUSSION

In this section we consider the ability of the Framework to enable sustainable planning in the context of disrupting the 'car city fabric' and prioritising considerations relating to corridors, nodes and places. We also reflect on the Framework's utility through the examples studied and consider the universal desire by stakeholders to enable transit activated corridors. This includes using the Framework as a planning tool for activated corridors regarding priorities, and as a decision-support tool for implementing the planning intent, across the government and private sectors.

Planning tool considerations

The four urban fabric examples highlight the need for differing approaches to integrating transit and urban regeneration in different parts of a city. The Framework helped to prioritise planning considerations for responding to big challenges of climate change, economic development, and social inclusion:

- (Principle 1) Walkability for safety and accessibility was observed as a critical consideration.

- (Principle 2) Achieving carbon neutral or carbon positive outcomes require a variety of technologies and investments depending on the proximity to the city centre.

- (Principle 3) Local shared mobility considerations were a priority to equitably address parking, particularly with the increasing use of on-demand and autonomous vehicles.

- (Principle 4) Property diversity considerations were a priority, highlighting the need for ensuring mixed land use outcomes for market viability and proactive zoning.

- (Principle 5) Property affordability was highlighted as a priority, particularly in proximity to the city centres.

- (Principle 6) Nature-oriented space was considered a critical element of all urban fabric types, as a core component rather than an ad hoc add-on feature.

- (Principle 7) Inclusive governance and partnerships were identified as critical, to enable inclusive, integrated, place-based planning outcomes.

Looking beyond the four examples studied, it is acknowledged that every city and urban regeneration opportunity will have a unique context of urban fabric types. The Framework provides a systematic process for working through the diversity of components of the regeneration project regardless of the urban fabric type, highlighting priorities relevant to that site.

Decision support tool considerations

Reflecting on the four examples studied, the Framework Principle 7 highlights the need for efforts beyond generating the ideas to address urban regeneration, to realise these intentions as delivered solutions. Notwithstanding the differences between the examples observed, the Framework enabled upfront discussions regarding urban regeneration priorities that were 'deal-breakers' or 'non-negotiable' outcomes for the stakeholders involved. Principle 7 also enabled discussions about the potential governance models and next steps forward, which may otherwise be forgotten or addressed in sub-optimal ways.

Delivering such different urban design qualities along a new transit corridor or in an old main street remains a major challenge for designers, planners, and engineers to work out with politicians, developers, financiers and community leaders. The planning governance systems in Australian cities will be tested for their flexibility and relevance to enable the range of private investment to be involved and will require significant levels of partnership to be developed to enable inclusive, integrated, place-based fabrics in each part of the city [10].

As discussed in the previous paper to the State of Australian Cities Conference 2019, urban regeneration and new transit systems must be done together [7]. Urban regeneration centres will not emerge unless the solution includes a quality transit corridor that can reduce car dependence, nodes at stations that emerge from redevelopment opportunities, and place-based design that can make the most of the amenity needed to create value along the whole corridor. The analysis of the four case studies concluded that although the differences in the urban fabric are considerable, transit technology such as a Trackless Tram System could provide a design solution for each of the four urban fabrics examined [7].

Sustainable Centres Framework refinement

The results of the sense-checking exercises provide insights into opportunities and considerations for managing the complexity of urban regeneration projects including further refinement of the Framework. Three observations are made for further refinement moving forward:

1. Global application: Currently the Framework has been developed by an Australian team of researchers, with Australian examples for sense-checking. The relevance of this Framework can be enhanced by augmenting the language used and practices to include international examples. This could be through peer-review and its application to international urban regeneration opportunities.

2. Template typologies: Drawing on Urban Fabric Theory, the Framework could include more guidance as to what is likely to need prioritising etc, for each major urban fabric type.

3. Additional/ amended principles: As the Framework is applied to further examples, there may be scope to add to the current list of seven core principles.

Moving forward, the authors are in the process of developing an online implementation resource to accompany the Framework, in a subsequent SBEnrc Project 1.74 [91]. Comments and feedback are welcomed from readers of this paper, with regard to opportunities to enhance its utility.

CONCLUSION

This paper brings together the concepts of urban fabrics and place making by exploring how a set of design principles and practices can be applied. These principles and practices are drawn from a wide body of literature and practice in a bid to help deal with the challenges of climate change, economic development and social inclusion within contemporary urban development and redevelopment projects. The aim is to embed these features in design and management of urban places to be more sustainable and regenerative.

The process of developing the principles and practices and testing them in workshop processes in a range of case studies has helped to refine and enhance learning about their application. As a research project, this work has shown that there is value in Principles and Practices and that using the four different urban fabric types as a starting point helps to identify the potential focus for interventions. The further development of potential practices in the Townsville case study has identified a suite of potential interventions in a particular context.

Moving from research into practice is always a challenge, however, the value of this work for the practitioners of urban development and renewal is that the Framework is drawn from real experience that can be translated into localised solutions. The suite of potential practices identified for each of the four case studies and in particular the Townsville project can now be used to guide the prioritisation works and/or development of suitable urban regeneration programs. Key to realising the value of these opportunities will be making sure these ideas are 'on the table' and championed by the key stakeholders as planning and development processes unfold in any urban development or urban regeneration process.

REFERENCES

1. United Nations, Revision of World Urbanization Prospects 2018, https://www.un.org/development/desa/publications/2018-revision-of-world-urbanization-prospects.html [Accessed: 20-Jan-2020]

2. Ortego, A., Valero, A., and Abadías, A., Environmental impacts of promoting new public transport systems in urban mobility: a case study, *Journal of Sustainable Development of Energy, Water and Environment Systems.*,Vol. 5, No. 3, pp 377-395, 2017, 10.13044/j.sdewes.d5.0143

3. Newman, P., Resilient infrastructure cities. In: Kallidaikurichi, S., Yuen, B., Editors, *Developing Living Cities: From Analysis to Action,* World Scientific., Singapore, 2010, pp. 77-106, 2010.

4. Mutani, G. and Todeschi, V., Energy resilience, vulnerability and risk in urban spaces, *Journal of Sustainable Development of Energy, Water and Environment Systems.,*Vol. 6, No.4, pp 694-709, 2018, http://dx.doi.org/10.13044/j.sdewes.d6.0203

5. Australian Government, City Deals 2019, https://www.infrastructure.gov.au/cities/city-deals/ [Accessed 19-November-2019]

6. Newman, P., Hargroves, K., Davies-Slate, S., Conley, D., Verschuer, M., Mouritz, M., & Yangka, D., The Trackless Tram: Is It the Transit and City Shaping Catalyst We Have Been Waiting for? *Journal of Transportation Technologies*., Vol. 9, No.1, pp 31-55, 2018, https://doi.org/10.4236/jtts.2019.91003

7. Mouritz, M., Newman, P., Verschuer, M., Davies-Slate, S., Caldera, S., Desha, C., and Reid S., Trackless Trams and Australian Urban Fabric. *Proceedings of State of Australian Cities Conference,* Perth Australia, 3-5 December 2019.

8. Newman, P., Kosonen, L., & Kenworthy, J., Theory of urban fabrics: Planning the walking, transit/public transport and automobile/motor car cities for reduced car dependency. *Town Planning Review*., 2016, Vol. 87, No.4, pp 429-458.

9. Thomson, G. and Newman, P., Urban fabrics and urban metabolism–from sustainable to regenerative cities. *Resources, Conservation and Recycling*., Vol. 132, pp 218-229, 2018, https://doi.org/10.1016/j.resconrec.2017.01.010

10. Kosonen, L., Model of three urban fabrics: adapted for Finnish intermediate cities 2014, http://urbanfabrics.fi/. [Accessed 19-November-2019]

11. Newman, P. and Kenworthy, J., 'Peak car use': understanding the demise of automobile dependence, *World Transport Policy & Practice*.,Vol. 17, No.2, pp. 31-42, 2011.

12. Newman, P.G. and Kenworthy, J.R., *Cities and automobile dependence: An international sourcebook,* Aldershot Gower Technical, Brookfield, United States, 1989.

13. Caldera, S., Desha, C., Reid, S., Newman, P. and Mouritz, M., *Sustainable centres of tomorrow: A Precinct Design Framework of Principles and Practices - Report for Project 1.62 Sustainable centres of Tomorrow: People and Place* 2019, Sustainable Built Environment National Research Centre. https://sbenrc.com.au/app/uploads/2020/07/1-62-Lit-Review-Report-FINAL-for-PSG-002-SC.pdf [Accessed 12-August-2020]

14. Inmark, E., Concept and methodology of Interactive Workshops 2010, D32Conceptandmethodologyofinteractiveworkshops.pdf [Accessed 12-August-2020]

15. Zhang, T., and Dong, H., Human-centred design: an emergent conceptual model, *Proceedings of Include2009*, Royal College of Art, London, April 8-10, 2009.

16. IDEO.org, Design Kit 2018, https://www.designkit.org/human-centered-design [Accessed 07-July-2019]

17. Badland, H., Mavoa, S., Boulangé, C., Eagleson, S., Gunn, L., Stewart, J., David, S. and Giles-Corti, B., Identifying, creating, and testing urban planning measures for transport walking: Findings from the Australian national liveability study. *Journal of Transport & Health*.,Vol. 5, pp 151-162, 2017, https://doi.org/10.1016/j.jth.2016.08.010

18. Institute for Transportation and Development Policy, Pedestrians First: Tools for a Walkable City 2020, https://www.itdp.org/history/ [Accessed: 12-February-2020]

19. Wunderlich, F., Place-temporality and rhythmicity: a new aesthetic and methodological foundation for urban design theory and practice. In: Carmona, M., Editor, *Explorations in Urban Design*, Routledge., Surrey, Engalnd, 2017, pp 85-100.

20. Department of Transport Victoria, Movement and Place 2019, https://transport.vic.gov.au/-/media/tfv-documents/movement-and-place-in-victoria---february-2019.pdf?la=en&hash=7DAF14EBF38CC3 BF34944BB345CF3DD1 [Accessed: 20- February-2019]

21. Strømann-Andersen, J. and Sattrup, P.A., The urban canyon and building energy use: Urban density versus daylight and passive solar gains, *Energy Buildings*.,Vol. 43, No.8, 2011, https://doi.org/10.1016/j.enbuild.2011.04.007

22. Aurecon, Moving beyond green buildings – a focus on greening our precincts 2020, https://www.aurecongroup.com/thinking/thinking-papers/moving-beyond-green-buildings-a-focus-on-greening-our-precincts [Accessed: 20-January-2020]

23. Kanters, J., Wall, M., and Dubois, M.-C., Typical values for active solar energy in urban planning, *Energy Procedia*., Vol. 48, pp 1607-1616, 2014, https://doi.org/10.1016/j.egypro.2014.02.181

24. Internaitonal Energy Agency, Solar Energy and Architecture 2015 http://task41.iea-shc.org/publications [Accessed: 20-January 2019]

25. Tozer, L. and Klenk, N., Discourses of carbon neutrality and imaginaries of urban futures, *Energy research & social science*., Vol. 35, pp 174-181, 2018, https://doi.org/10.1016/j.erss.2017.10.017

26. World Resources Institute, Carbon Value Analysis Tool (CVAT) 2008, https://www.wri.org/publication/carbon-value-analysis-tool-cvat [Accessed: 20-January-2019]

27. Lyons, G., Getting smart about urban mobility–aligning the paradigms of smart and sustainable, *Transportation Research Part A: Policy and Practice*.,Vol. 115, pp 4-14, 2018, https://doi.org/10.1016/j.tra.2016.12.001

28. Roads and Traffic Authority, How to prepare a Pedestrian Access and Mobility Plan - An easy three stage guide 2002, https://www.rms.nsw.gov.au/business-industry/partners-suppliers/documents/technical-manuals/mobility-plan_how-to.pdf [Accessed: 25-January-2019]

29. Enrique Fernández L, J., de Cea Ch, J. and Malbran, R.H., Demand responsive urban public transport system design: Methodology and application, *Transportation Research Part A: Policy and Practice*.,Vol. 42, No.7, pp. 951-972., 2008, https://doi.org/10.1016/j.tra.2007.12.008

30. Dodson,J., Mees, P., Stone, J., and Burke, M., The Principles of Public Transport Network Planning: A review of the emerging literature with select examples 2011, http://www.ppt.asn.au/pubdocs/ip15-dodson-et-al-2011.pdf [Accessed: 20 -January-2020]

31. Hietanen, S., Mobility as a Service 2014, https://www.itscanada.ca/files/MaaS %20 Canada%20by%20Sampo%20Hietanen%20and%20Sami%20Sahala.pdf [Accessed: 20 -January-2020]

32. Deloitte, The rise of mobility as a service 2017, https://www2.deloitte.com/content/dam/Deloitte/nl/Documents/consumer-business/deloitte-nl-cb-ths-rise-of-mobility-as-a-service.pdf [Accessed: 20 -January-2020]

33. Konsti-Laakso, S. and Rantala, T., Managing community engagement: A process model for urban planning*, European Journal of Operational Research*.,Vol. 268, No. 3, pp 1040-1049, 2018, https://doi.org/10.1016/j.ejor.2017.12.002

34. International Association for Public Participation, Resources 2019, https://www.iap2.org.au/resources/[Accessed: 20 -January-2020]

35. Trubka, R.L., Agglomeration economies in Australian cities: productivity benefits of increasing urban density and accessibility, PhD Thesis, Curtin University Sustainability Policy (CUSP) Institute, Curtin University, Perth, 2011.

36. Cao, G., Wang, S., Hwang, M., Padmanabhan, A., Zhang, Z. and Soltani, K., A scalable framework for spatiotemporal analysis of location-based social media data*. Computers, Environment and Urban Systems*.,Vol. 51. pp 70-82, 2015, https://doi.org/10.1016/j.compenvurbsys.2015.01.002

37. Evans, G., Foord, J., Porta, S., Thwaites, K., Romice, O. and Greaves, M., *T*he generation of diversity: mixed-use and urban sustainability, In: Thwaites, K., Porta, S., Romice, O., and Greaves, M., editors, *Urban Sustainability Through Environmental Design: Approaches to time-people-place responsive urban spaces*, Taylor & Francis., New York, 2007, pp 95-101.

38. Roberts, B.H., Tool Kit Guide for Rapid Economic Assessment, Planning, and Development of Cities in Asia 2015, https://www.adb.org/documents/tool-kit-economic-assessment-planning-development-cities-asia [Accessed: 20 -January-2020]

39. Mulliner, E. and Maliene, V., An analysis of professional perceptions of criteria contributing to sustainable housing affordability, *Sustainability*.,Vol. 7, No.1, pp 248-270, 2015, https://doi.org/10.3390/su7010248

40. Flanagan, K., Martin, C., Jacobs, K. and Lawson, J., A conceptual analysis of social housing as infrastructure, AHURI Final Report, 2019, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3330386 [Accessed: 20 -January-2020]

41. Gabarrell, X., Rieradevall, J., Josa, A., Oliver-Solà, J., Mendoza, J.M.F., Sanjuan-Delmás, D., Petit-Boix, A. and Sanyé-Mengual, E., Life Cycle Management Applied to Urban Fabric Planning, In: Sonnemann, G., and Margni, M., editors. *Life Cycle Management*, Springer, Dordrecht Netherlands., 2015, pp 307-317.

42. Gunasekaran, A. and Irani, Z., Sustainable Operations Management: design, modelling and analysis*, Journal of the Operational Research Society*, No.65, pp 801-805, 2015, https://doi.org/10.1057/jors.2014.26

43. Wiesel, I., Davison, G., Milligan, V., Phibbs, P., Judd, B. and Zanardo, M., Developing sustainable affordable housing: a project level analysis 2012, https://www.ahuri.edu.au/__data/assets/pdf_file/0012/2190/AHURI_Final_Report_No183_Developing_sustainable_affordable_housing_a_project_level_analysis.pdf [Accessed: 20 -January-2020]

44. Cabanek, A. and Newman, P., Biophilic urban regeneration: can biophilics be a land value capture mechanism*?* In: Brebbia, C.A., Zubir,S.S., and Hassan, A.S., editors, *WIT Transactions on Ecology the Environment*, WIT Press., Southampton, 2017, pp 65-74.

45. International Living Future Institute, Biophilic Design Initiative 2020, https://living-future.org/biophilic-design/ [Accessed: 20 -January-2020]

46. Furlong, C., Dobbie, M., Morison, P., Dodson, J. and Pendergast, M., Infrastructure and Urban Planning Context for Achieving the Visions of Integrated Urban Water Management and Water Sensitive Urban Design: The Case of Melbourne. In: Sharma, A. K., Gardner, T., and Begbie, D., *Approaches to Water Sensitive Urban Design,* Elsevier, Amsterdam, 2019, pp. 329-350.

47. Cooperative Research Centre for Water Sensitive Cities Ltd, Water Sensitive Cities Scenario Tool (WSC Scenario Tool) 2020, https://watersensitivecities.org.au/solutions/water-sensitive-cities-scenario-tool/[Accessed: 25-January-2020]

48. Dennis, M., Barlow, D., Cavan, G., Cook, P.A., Gilchrist, A., Handley, J., James, P., Thompson, J., Tzoulas, K., Wheater, C.P. and Lindley, S., Mapping urban green infrastructure: A novel landscape-based approach to incorporating land use and land cover in the mapping of human-dominated systems, *Land.*,Vol. 7, No.1, pp 17, 2018, https://doi.org/10.3390/land7010017

49. Australian Institute of Landscape Architects, *Industry publications* 2020, https://www.aila.org.au/AILAWeb/News/Industry_Publications/AILAWeb/Industry_Publications.aspx?hkey=521dbd98-c10e-47c7-9893-685a1777cab7 [Accessed: 25-January-2020]

50. Keast, R., Joined-up governance in Australia: how the past can inform the future, *International Journal of Public Administration.*,Vol. 34, No.4, pp 221-231, 2011, https://doi.org/10.1080/01900692.2010.549799

51. Government of South Australia, *Working Together: A Joined-Up Policy Guide.* 2016,http://www.democracyco.com.au/wp-content/uploads/2016/02/JUP-smaller.pdf [Accessed: 25-January-2020]

52. Farhat, R., Accountability in urban regeneration partnerships: A role for design centers, *Cities.*,Vol. 72, pp 8-16, 2018, 10.1016/j.cities.2017.07.001

53. VicHealth, The partnerships analysis tool 2011, https://www.vichealth.vic.gov.au/media-and-resources/publications/the-partnerships-analysis-tool# [Accessed: 17- March-2019]

54. Hueskes, M., Verhoest, K. and Block, T., Governing public–private partnerships for sustainability: An analysis of procurement and governance practices of PPP infrastructure projects, *International journal of project management.*, Vol. 35, No. 6, pp 1184-1195, 2017, https://doi.org/10.1016/j.ijproman.2017.02.020

55. Australian Government, National Public Private Partnership Guidelines 2008, https://www.infrastructure.gov.au/infrastructure/ngpd/files/Volume-1-Procurement-Options-Analysis-Dec-2008-FA.pdf [Accessed: 17- March-2019]

56. Gehl, J., *Cities for people*, Island Press., Washington, 2013.

57. Matan, A. and Newman, P., *People cities: The life and legacy of Jan Gehl*, Island Press, Washington, 2016.

58. Matan, A. and Newman, P., Jan Gehl and new visions for walkable Australian cities, *World Transport Policy & Practice.*,Vol. 17, No.4, pp 30-41, 2012.

59. Maguire, M., Methods to support human-centred design. *International journal of human-computer studies.*, Vol. 55, No.4, pp 587-634, 2001, https://doi.org/10.1006/ijhc.2001.0503

60. Glazebrook, G. and Newman, P. , The city of the future, *Urban Planning.*, Vol. 3, No. 2, pp 1-20, 2018.

61. Suleman, M., The role of urban design in promoting cycle friendly environments in Johannesburg: the educational corridor 2013, https://www.academia.edu/8025710/The_Role_of_Urban_Design_in_Promoting

_Cycle_Friendly_Environments_in_Johannesburg_The_Educational_Corridor
[Accessed: 25-January-2020]

62. Kennedy, S. and Sgouridis, S., Rigorous classification and carbon accounting principles for low and Zero Carbon Cities, *Energy Policy*., Vol. 39, No.9, pp 5259-5268, 2011, https://doi.org/10.1016/j.enpol.2011.05.038

63. Brownsword, R., Fleming, P.D., Powell, J.C. and Pearsall, N., Sustainable cities– modelling urban energy supply and demand, *Applied Energy*.,Vol. 82, No.2, pp 167-180, 2005, https://doi.org/10.1016/j.apenergy.2004.10.005

64. Newman, P., Green urbanism and its application to Singapore,. *Environment urbanization Asia*., Vol. 1, No.2, pp 149-170, 2010, https://doi.org/10.1177%2F097542531000100204

65. The Sydney Morning Herald, Attack of common sense hits planners 2005, https://www.smh.com.au/national/attack-of-common-sense-hits-planners-20050426-gdl769.html [Accessed: 25-January-2020]

66. Puig, J., Barcelona and the Power of Solar Ordinances: Political Will, Capacity Building and People's Participation. In: Droege, P., *Urban Energy Transition,* Elsevier, Amsterdam, Netherlands, 2008, pp 431-449.

67. Royal Government of Bhutan, Levy of Green Tax. 2012, https://www.mof.gov.bt/wp-content/uploads/2014/08/lgt31082012.pdf [Accessed: 25-January-2020]

68. Sehlleier, F., Moving fuel economy policy forward in Thailand 2017, https://www.transportandclimatechange.org/wp-content/uploads/2017/08/TCC_ThailandMovingFuel-EconomyPolicyForward_Trigg_August2017.pdf [Accessed: 25-January-2020]

69. Kenworthy, J.R. and Laube, F.B., Automobile dependence in cities: An international comparison of urban transport and land use patterns with implications for sustainability, *Environmental Impact Assessment Review*.,Vol. 16, No.4, pp 279-308, 1996, https://doi.org/10.1016/S0195-9255(96)00023-6

70. Scheurer, J., Navigating the ethical challenges of Trackless Tram promotion, *Proceedings of Ethics and Transport Planning Symposium*, February 2, 2019.

71. Cohen, B. and Kietzmann, J., Ride On! Mobility Business Models for the Sharing Economy, *Organization & Environment*., Vol. 27, No.3, pp 279-296, 2014, https://doi.org/10.1177%2F1086026614546199

72. Roca, E., Aquilué, I., and Gomes, R., *Walking the city. Barcelona as an urban experience,* Edicions Universitat Barcelona., Barcelona, 2015.

73. Pucher, J. and Buehler, R., Cycling for everyone: lessons from Europe, *Transportation research record*., Vol. 2074, No.1, pp 58-65, 2018, https://doi.org/10.3141%2F2074-08

74. Hildermeier, J. and Villareal, A., Two ways of defining sustainable mobility: Autolib' and BeMobility. *Journal of Environmental Policy & Planning*.Vol 16, No(3): pp. 321-336, 2014, https://doi.org/10.1080/1523908X.2014.880336

75. Glaeser, E., *Triumph of the city: How urban spaces make us human*, Pan Macmillan., London, 2011.

76. Fang, C., and Yu, D., Urban agglomeration: An evolving concept of an emerging phenomenon. *Landscape and Urban Planning*, Vol. 62, pp 126-36, 2017.

77. Newman, P., Davies-Slate, S. and Jones, E., The Entrepreneur Rail Model: Funding urban rail through majority private investment in urban regeneration, *Research in Transportation Economics*.,Vol. 67, pp 19-28, 2018, https://doi.org/10.1016/j.retrec.2017.04.005

78. Van Den Nouwelant, R., Crommelin, L., Herath, S., and Randolph, B., Housing affordability, central city economic productivity and the lower income labour marke, https://www.ahuri.edu.au/__data/assets/pdf_file/0015/7431/ AHURI_Final_Report_No261_Housing-affordability-central-city-economic-productivity-and-the-lower-income-labour-market.pdf [Accessed: 25-January-2020]

79. Wang, Y.P. and Murie, A., The new affordable and social housing provision system in China: implications for comparative housing studies, *International Journal of Housing Policy*., Vol. 11, No. 3, pp. 237-254, 2011, https://doi.org/10.1080/14616718.2011.599130

80. el-Baghdadi, O. and Desha, C., Conceptualising a biophilic services model for urban areas, *Urban Forestry & Urban Greening*., Vol. 27, pp 399-408, 2017, https://doi.org/10.1016/j.ufug.2016.10.016

81. Ives, C.D., Beilin, R., Gordon, A., Kendal, D., Hahs, A.K. and McDonnell, M.J., Local assessment of Melbourne: the biodiversity and social-ecological dynamics of Melbourne, Australia. In: Elmqvist, T., Fragkias, M., Goodness, J., Güneralp, B., Marcotullio, P.J., McDonald, R.I., Parnell, S., Schewenius, M., Sendstad, M., Seto, K.C. and Wilkinson, C., editors, *Urbanization, Biodiversity and Ecosystem Services: Challenges and Opportunities*, Springer, Dordrecht, 2013, pp 385-407.

82. Tappert, S., Klöti, T. and Drilling, M., Contested urban green spaces in the compact city: The (re-)negotiation of urban gardening in Swiss cities, *Landscape and Urban Planning*., Vol. 170, pp 69-78, 2018, https://doi.org/10.1016/j.landurbplan.2017.08.016

83. Desha, C., Reeve, A., Newman, P. and Beately, T., Urban nature for resilient and liveable cities, *Smart and Sustainable Built Environment*.,Vol. 5, No.1, pp 1-2, https://doi.org/10.1108/SASBE-02-2016-0003.

84. Olds, K. and Yeung, H., Pathways to global city formation: a view from the developmental city-state of Singapore, *Review of International Political Economy*., Vol. 11, No.3, pp. 489-521, 2004, https://doi.org/10.1080/0969229042000252873

85. Goldman, T. and Gorham, R., Sustainable urban transport: Four innovative directions, *Technology in society*.,Vol. 28, No.1-2, pp 261-273, 2006, https://doi.org/10.1016/j.techsoc.2005.10.007

86. Karlson'Charlie'Hargroves, D.C., Conley, D., Gallina, L. and Newman, P., Sustainable urban design co-benefits: role of EST in reducing air pollution and climate change mitigation, In *Background paper for Eleventh Regional EST Forum in Asia,* October 2018, Mongolia 2018.

87. Ørngreen, R. and Levinsen, K., Workshops as a Research Methodology, *Electronic Journal of E-learning*., Vol. 15, No. 1, pp. 70-81, 2017.

88. Lain, S., Show, Don't Tell: Reading Workshop Fosters Engagement and Success, *Texas Journal of Literacy Education*., Vol. 5, No.2, pp. 160-167, 2017.

89. Spagnoletti, C.L., Spencer, A.L., Bonnema, R.A., McNamara, M.C. and McNeil, M.A., Workshop Preparation and Presentation: A Valuable Form of Scholarship for the Clinician-Educator, *Journal of graduate medical education.,* Vol. 5, No.1, pp 155-156, 2013.

90. Guba, E. G., and Lincoln, Y. S., Competing paradigms in qualitative research. In: Denzin, N. K., and Lincoln, Y.S, editors. *Handbook of qualitative research,*. Sage Publications, Inc, California, 1994, pp 105-117.

91. Sustainable Built Environment National Research Centre (SBEnrc), Transit Activated Corridors 2020, [Accessed: 10-June-2020]