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The Performance of Urban Precincts: Towards Integrated Assessment

Peter Newton

Introduction

Precincts are the acknowledged building blocks of cities—the scale at which our built environments have been historically conceived and constructed (EIT & Climate-KIC 2017; Frater 2013; Infrastructure Australia 2018b; Newton et al. 2013). In advanced economies, they reflect the influence that dominant transport technologies have had in the resultant urban forms and fabrics that have been laid down: the walking city, the transit city and the automobile city (Thomson et al. this volume). Urban precincts have also reflected the spatial imprints of successive global industrial revolutions, from agricultural to industrial, and post-industrial (reflecting the emergence of service, information and creative-based economies: Brotchie et al. 1991; Florida 2009; Jones 1982); and major population, housing market and labour market shifts

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that have radically altered the social and cultural geographies of cities, suburbs and neighbourhoods (Knox & Pinch 2010). Until relatively recently in human history, settlements have also evolved during a long era of relative global climate stability (Steffen et al. 2015a) and freedom from resource constraints (Rees & Roseland 1991).

In the twenty-first century there are several new drivers that require a fundamental change in the way our cities and precincts are planned and designed in order to respond to:

- Climate change (and its associated increasing frequency of extreme rainfall events, heat waves, local flash flooding, megafires in peri-urban areas, sea level rise and storm surges in coastal settings, increased urban heat: Newton et al. 2018) and the need for more *adaptive urban design* that delivers greater urban resilience to vulnerable localities and populations.
- Resource constraints (water and food security; reliable and affordable renewable energy) and resource waste; and the associated challenge of *regenerative urban development* that can radically shrink the ecological and carbon footprints of cities in advanced high-income societies and increase the resource self-sufficiency of neighbourhoods (Newton 2017).
- Mobility challenges for an increasing proportion of residents in big rapidly growing cities where there is increasing geographic separation of home and workplace and a dependence on longer commutes in congested traffic; requiring renewed efforts at integrated land use-transport planning and a focus on *low carbon mobility* requiring extension of public transport as well as designing-in active transport and shared mobility services that deliver the 20-minute neighbourhood and the 30-minute city (Newton et al. 2017b).
- Provision of appropriate and affordable housing supply to accommodate rapidly growing urban populations without traditional reliance on greenfield development; requiring high levels of urban infill development in established greyfield and brownfield suburbs ideally undertaken as *precinct scale medium density redevelopment*—the 'missing middle'—compared to suboptimal small lot subdivision knock down rebuild (Newton 2018; Newton & Glackin 2018).

- Deficiencies in urban governance associated with planning and implementing development in major Australian cities that reflect a planning deficit: lack of horizontal integration across agencies responsible for metropolitan strategic planning as well as lack of vertical integration between the three tiers of government—and local communities; requiring real engagement (Tomlinson & Spiller 2018). *Technological innovation* can provide *advanced digital platforms and instruments* for more effective interaction and participation in decision-making; but they also require new and more effective *process innovations* related to optimising the life cycle performance of urban development projects (Newton & Burry 2018).
- The increased complexity of cities and human settlement systems and the pace at which urban change is occurring requires the development and use of *more advanced digital tools* that can bring evidence from *integrated modelling* of urban development scenarios or urban precinct development designs into decision-making in a more timely manner than is currently the case. Building, Precinct and City Information Modelling (BIM, PIM, CIM) provides an analytical platform where integrated performance assessment can more effectively occur (Newton et al. 2017a).

If cities are to achieve the international performance goals and objectives outlined by the United Nation's Sustainable Development Goals and the New Urban Agenda as well as those identified at a national level *then* it will be necessary for their constituent precincts to demonstrate performance outcomes that align with and add to, rather than subtract from, these objectives.

Urban Development Goals and Precinct Design Context

The global context for urban development is one where the world's current urban population is forecast to double by 2050 (IRP 2018), where global resource use is exceeding the earth's ecological capacity (GFN 2018; WWF 2016) and threatening critical planetary boundaries (Steffen et al. 2015b), most clearly in relation to increased greenhouse gas (GHG) concentrations in the atmosphere. The modelled trajectory of these concentrations is capable of driving global warming 2–4 °C above pre-industrial levels triggering potentially irreversible climate change, unless reductions in GHG emissions of the order of 70–80% are locked in by 2050 (IPCC 2014; Levin & Tomkins 2014; WRI 2018). Contemporary city development patterns along with current modes of industrial production and consumption constitute a driving force for these trends.

A growing body of international studies highlight the unsustainable nature of current development trajectories, unless there is systemic intervention across multiple sectors. To this end, the United Nations has been attempting to redress growing environmental problems on a global basis since the 1970s (UN 1987, 1992, 2000; Ward & Dubos 1972). These efforts have accelerated this century, culminating in the release of the United Nations Development Program's Sustainable Development Goals in 2015 (UN 2018). They outline a collaborative global roadmap with 17 Goals and 169 targets which are meant to be achieved by 2030. The Australian Government is a party to the Agreement and has provided a first Voluntary National Review (Australian Government 2018) and a first assessment of 86 targets and 144 indicators for Australia (DFAT 2018) where there is significant lag in performance against targets, especially in relation to cities and climate action. SDG 11 is directly focused on Sustainable Cities and Communities and SDG 13 on Climate Action, although it is clear that cities and urban development are linked with many of the 17 goals. A further set of 175 objectives are outlined in the UN New Urban Agenda (UN 2017) that are centred on cities and communities.

These global goals are *values-based* and have been designed to raise awareness and create an understanding of the complex challenges facing societies and their development in the twenty-first century. They require a shift from 'siloed thinking' to an *integrated approach* designed to "put to rest the futile debates that pit one dimension of sustainable development against another…. each goal should be analysed and pursued with full regard to the three dimensions of sustainable development - economic, social and environmental" (SDSN 2015, p. 9). The significance of the UNSDGs is this: *if* these values are broadly shared they can provide a basis for all stakeholders pursuing solutions to these challenging goals. There are numerous examples of how these global goals are being used to frame future planning strategies in multiple sectors, especially those related to building and construction (Bioregional 2018) and transport (IST 2018), the two most intensive resource consuming and GHG emitting urban sectors (Newton 2017); where mitigation potential is high but lagging (Climateworks 2018). A major contributor to this is the fact that there is no uniform commitment in Australia across all tiers of government (especially at federal level: Newton et al. 2018) or private sector-built environment organisations (Giesekam, Tingley & Cotton 2018; Newton & Newman 2015) to appropriate renewable energy goals, climate change mitigation strategies, green economy transition policies and sustainable urban development objectives. This hiatus inhibits development and alignment of public and private sector strategies and investment capable of more rapidly and confidently driving the urban, infrastructure and industrial transformations required in the twenty-first century. Moreover, there is no clear and consistent message being communicated to the Australian population capable of building social norms around sustainable behaviours/sustainability. Their surveyed attitudes reflect this (Leviston 2014).

The local context is critical to any national alignment and implementation of broader global goals related to sustainable urban development. Australia's cities have among the highest population growth rates within the OECD and these are projected to continue. The high growth rates have exposed multiple deficiencies in the capacity to plan for urban change at all levels of government (Newton et al. 2017b). The high liveability ratings that Australia's largest capital cities have received for a decade (EIU 2018) have masked the unsustainable dimensions of their metropolitan development (Newton 2012). Their ecological and carbon footprints are among the highest in the world (GFN 2018) as are their urban footprints (Coleman 2017), property prices and household indebtedness are world-leading, and there are increasing levels of spatial disadvantage that are concentrating in the outer suburbs (Randolph & Tice 2015). A major contributing factor has been the failure of metropolitan planning since the 1950s to curb low density sprawl and invest in more integrated land use and (public) transport development that supports more sustainable low carbon living (Newton 1997, 2000); what has been termed a *planning deficit* (Gleeson, Dodson & Spiller 2012). Issues of governance are also at the heart of what has been termed a *democratic deficit* (Williams 2018), referring to the multiple levels of government that are disconnected horizontally (e.g. interdepartmental and cross-agency) as well as vertically (e.g. federal-state-municipal-community) in relation to metropolitan urban planning. Despite clearly articulated performance goals for Australia's cities—competitive, productive, liveable, sustainable, resilient and inclusive (Department of Infrastructure 2011)—there is no metropolitan planning authority accountable for urban development in Australia's four mega-metro regions, much less for precincts which we see as encompassing 'district', 'neighbourhood' and 'street' levels—the building blocks of cities (Newton et al. 2013; Tomlinson & Spiller 2018).

The current problems and challenges facing Australia's cities are a combination of joint failures to undertake and implement integrated land use—transport planning at a metropolitan scale (with particular reference to public transport, services and jobs) and the finer grained urban design of neighbourhoods that are required to accommodate a growing number and diversity of residents. Here it has been argued that the unsustainable nature of today's cities is due in part to poor planning and development assessment at the precinct level (Codoban & Kennedy 2008) as well as lack of horizontally and vertically integrated planning at city scale. The challenge for twenty-first century urban planning and design is to discover effective ways to RE-develop/renew/retrofit/regenerate our cities in a way that redresses deficiencies in past planning and development by pursuing the *objectives* outlined in the following section.

Urban Performance Concepts, Models and Objectives

'Regenerative urbanism' has emerged as a new objective for urban development that presents the opportunity and challenge to go beyond minimal reductions in environmental impact to a new vision of how cities can be designed and operate in an 'eco-positive' manner, while maintaining or enhancing liveability (Birkeland 2008); that is, removing negative environmental impacts from development and providing ecological gain. This requires regenerative development that is based on "*giving back* as well as taking" (Girardet 2015, p. 11) and needs to operate across all urban sectors and all urban scales: building, precinct and city.

Regenerative urbanism is embodied in the technologies, design thinking and new process approaches represented in the Factor 4 and Factor 5 paradigms that outline pathways to achieve reductions in resource and energy use by up to 80% (von Wiezsacker et al. 1997, 2009). Regenerative urbanism also relies heavily on the use of the urban metabolism model framework for representing (and measuring) the flow of resources into and waste outputs from built environments. This model was employed by Newman et al. (1996) and extended by Newton and Bai (2008) for State of Environment Reporting to include the exogenous pressures on human settlement as well as the endogenous urban systems and processes that are required to manage large complex urban systems. It also recognises the two dimensions of urban liveability that are associated with human well-being and urban environmental quality. The latest version of this framework is presented in Fig. 19.1.

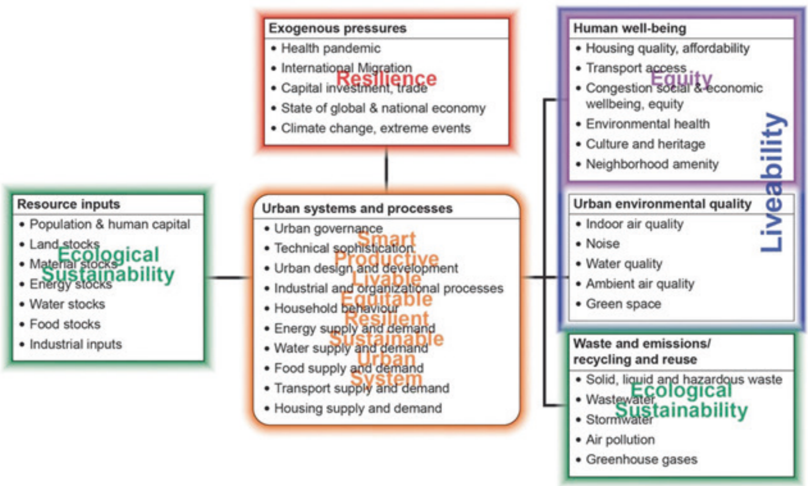

Fig. 19.1 Framework for assessing urban system performance

This framework can be used to highlight the transformational changes that need to occur in our urban systems:

- *reduction* in use of natural resources—dramatically shrinking ecological footprints by dematerialising industrial and construction processes by the adoption of eco-efficient technologies. This involves cities creating more renewable energy than they need—energy *from* the city; and significantly reducing the need to import potable water that has been traditionally diverted from environmental flows in the hinterland of cities
- *reduction* in emissions and waste streams, with particular focus on decarbonisation of energy and deep mitigation of greenhouse gases; capturing and treating stormwater and wastewater for non-potable urban water uses; and creating zero-waste pathways for industrial, construction and domestic waste streams linked to transition to a circular economy based on industrial ecology principles
- *substitution* of *smart* urban systems and processes for those currently in use to achieve more effective and efficient economic, social and environmental planning and management of cities (smart strategies as well as smart technologies)
- *improvement* in urban environmental quality of the public realm (e.g. waterways, green space); as well as responding to the environmental stressors linked to reduced private green space associated with the intensified urban retrofitting and densification of cites; for example, changes in surface permeability and stormwater run-off and increased urban heat; and more effectively integrating concepts of biophilic design and natural urbanism into city planning in the face of global warming
- *improvement* in liveability and well-being across the entire metro region. Long established urban planning concepts such as equity and access are being lost in a neo-liberal era where significant privatisation of urban services has occurred and where housing affordability is a challenge for residents of major cities; liveability outcomes are influenced by where people live and the quality and characteristics of the built environment that surrounds them.

- *increase* in the resilience of cities to the array of exogenous and endogenous pressures now evident. Foremost among these is adaptive capacity to climate change threats of flooding, drought, extreme temperatures, sea level rise, storm surges and mega bushfires.

Smart, sustainable urban development strategies are needed that are capable of delivering transformative change to cities. Newton (2019a) begins to flesh these out in more detail in the context of *performance objectives* capable of guiding design thinking at building, precinct and city levels. It is clear that there are cross domain and cross scale interactions that need to be accommodated in the design process. Regenerative urban development also requires engagement with a new generation of urban infrastructure technologies, more sustainable materials and more innovative design thinking supported by a rapidly evolving digital information platform. It also will require a new generation of built environment assessment tools capable of rapidly and comprehensively assessing the performance of development projects, especially those at a precinct level.

Precinct Design and the Development Assessment Process

The critical relationship between precinct design (and its embedded sets of performance goals, objectives and targets) and precinct design assessment is outlined in Fig. 19.2, providing core elements in the conceptual and methodological frameworks that have shaped specific precinct design assessment tools developed in the CRC for Low Carbon Living.

Ability to positively influence the cost and performance of a built environment project is always highest at the front end, in the concept-design-feasibility stages, a period during which information to aid decision-making in a timely manner has proven more difficult to assemble. The design assessment tools outlined in this chapter, and in much greater detail in the Guide (Newton & Taylor 2019), attempt to redress this information deficit—to lift the information base for

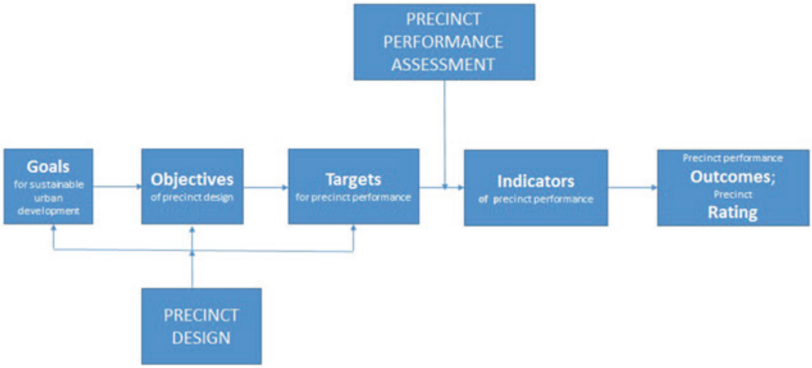

Fig. 19.2 Key design and assessment processes underpinning smart sustainable urban development

decision-making higher during concept/feasibility/design phases. It is for this reason that increasing attention is being paid to new processes, instruments and platforms that can be introduced for smarter precinct planning and design at concept and design phase.

The CRC for Low Carbon Living has developed a framework and tool for the built environment sector to help facilitate strategic conversations within a project team about project impacts (positive and negative), and help conceptualise, prioritise and enhance its capacity to deliver greater value for the environment, society and economy (Haas-Jones & Balatbat 2017). *The Built Environment Impact Guidance Tool* is applied in facilitated sessions with the project team in the process of developing a vision for the precinct development. As part of this process the team will prioritise the thematic areas and issues of significance to its stakeholders and identify the associated tangible goals and indicators for the project (see Fig. 19.3).

Precinct sketch planning and design follows with additional disciplinary skills being assembled for a range of tasks associated with realising specific performance objectives of the development concept.

There is an absence of an appropriate suite of government-endorsed best practice performance standards for precinct scale urban development in Australia. Outside a limited set of prescriptive local government statutory planning regulations and Building Code of

Fig. 19.3 The built environment impact guidance tool framework (*Source* Haas-Jones and Balatbat (2017); CRC for Low Carbon Living, with permission)

Australia specifications there is little stimulus to advance sustainable (regenerative and adaptive) urban development where more extensive performance assessment is required to be built into the development assessment process (see Harrington and Hoy, this volume). This is seen by many in the property development industry as unnecessary 'green tape'. As a result of this government inertia, a number of industry-initiated building and precinct rating and certification systems have emerged in Australia that 'brand' developments according to their preferred criteria and weightings. The motivation is to assist more innovative companies promote the environmental credentials of their project and create market profile and a return on investment premium for the property owners. These rating systems are: Green Building Council of Australia's *Green Star Communities* (https://new.gbca.org.au/green-star/rating-system/communities/), Urban Development Institute of Australia's *EnviroDevelopment* (http://www.envirodevelopment.com.au/), and Bioregional Australia's *One Planet Communities* (https://bioregional.com.au/oneplanetliving/oneplanetcommunities/). Leading international precinct rating tools have emerged from North America (LEED-Neighbourhood Development), Europe (BREEAM) and Japan (CASBEE-Urban Development) and are reviewed in

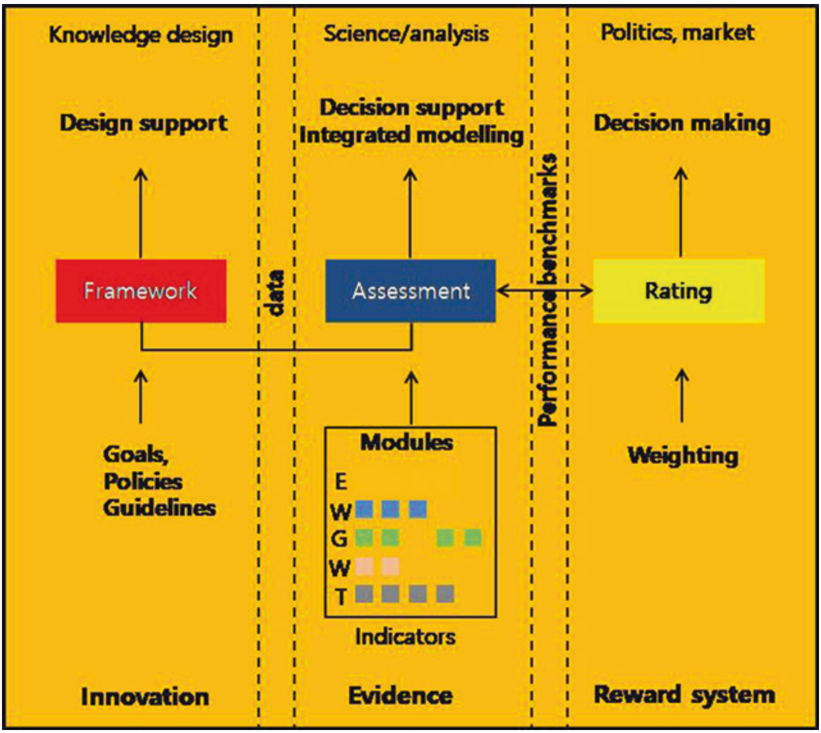

Fig. 19.4 Lenses on precinct assessment and rating (*Source* Newton et al. (2013); CRC for Low Carbon Living, with permission. *Note* Assessment modules address key thematic areas e.g. Energy, Water, Greenspace, Waste, Transport etc.)

Säynäjoki et al. (2012) and Sharifi and Murayama (2015). The consensus from these studies is that a single global tool and associated set of standards is not viable given the specificities of different geographic locations, jurisdictions, sites and stakeholder needs.

There is growing global consensus, however, around themes, issues, goals and indicators linked to sustainable urban development where scientifically validated assessment *is* required. *If* aspirations for city liveability and sustainability are to be realised and global twenty-first century sustainable urban development challenges met, then assessment of the building blocks of the built environment—infrastructures, buildings, precincts—must be advanced beyond current practice. The Precinct Scoping Study (Newton et al. 2013) undertaken at the beginning of the CRC for Low Carbon Living concluded that the quality and veracity of neighbourhood/precinct ratings were only as good as the performance assessments made for each of the built environment issues being rated (see Fig. 19.4). The lack of transparency currently associated with the voluntary project rating systems (e.g. the assessment techniques and processes employed) limits their capacity for the type of *transformational change* required of the built environment.

Precinct Performance Assessment Tools

The research focus for CRC Program 2 (Low Carbon Precincts) was subsequently focused on developing precinct design assessment tools associated with key sustainable urban development goals and objectives that could be directly employed in local government development assessment processes as well as by industry in the design and development assessment and rating of precinct scale projects. Table 19.1 provides a brief snapshot of the assessment capabilities of each tool. A full description of all underpinning analytical methods and data requirements as well as illustrative case study applications of the tools are found in Newton and Taylor (2019).

Table 19.1 CRC Low Carbon Living Precinct Tools—key performance assessment capabilities

Tool	Key performance assessment capability	Key reference
ICM: Integrated Carbon Metrics	A suite of carbon accounting tools that can be applied to the product, building, precinct or city scale to provide a complete picture of the carbon life cycle in the Australian built environment	Wiedmann et al. (2019)
ICM: Embodied CO_2—Products	An eco-efficiency tool that provides an integrated life cycle (carbon) and economic (cost) assessment of building material products	Schmidt and Crawford (2019)
ICM: Embodied Carbon Explorer for Precincts	Quantifies Scope 3 carbon emissions for precincts (i.e. indirect, embodied emissions used in construction and maintenance operations of the built environment provided via materials and services imported into the precinct via supply chains) for use in the Australian government's National Carbon Offset Standard for Precincts, NCOS-P	Wiedmann and Teh (2019)
ICM: Carbon Footprint Analysis of Cities	Quantifies Scope 1, 2 and 3 carbon emissions for cities using multi-regional input-output data that highlights the relative significance of each in a total city carbon map	Wiedmann, Chen and Teh (2019)
PCA: Precinct Carbon Assessment	Tool assesses the whole life cycle of carbon emissions at precinct scale (embodied and operating) via an object-based spatial model that is capable of examining alternative design scenarios (building types and materials; mobility options; alternative energy sources, including renewables; and resident consumption profiles)	Xing, Huang and Pullen (2019)
ESP: Envision Scenario Planner	ESP provides a comparison of alternative greyfield infill precinct sketch designs on the basis of energy and carbon (embodied and operating) and can be linked to a financial feasibility assessment tool to provide an eco-efficiency assessment	Glackin and Newton (2019)

(continued)

Table 19.1 (continued)

Tool	Key performance assessment capability	Key reference
ETWW: Forecasting Demand for Precinct Energy, Transport, Water and Waste (Integrated)	Forecasts demand for electricity, water and transport at a precinct scale linked to utility service provision planning. Provides scenario planning capability for alternative types of precinct development that examines interactions between the different demand domains (e.g. energy-water; energy-transport). Also accommodates impacts of population change and socio-demographic variability of precinct residents. Provides core set of carbon metrics for all scenarios, in addition to other domain-specific indicators	Taylor et al. (2019); Holyoak et al. (2019)
ETWW: Electricity Demand Module	Integrated modelling and optimisation tool for assessing performance of precinct scale micro-grids (in relation to carbon emissions and cost) with distributed generation and storage as core technologies, responding to different electricity demand models of household types, appliance ownership and climate	Percy (2019)
ETWW: Water Demand Module	Provides integrated assessment of water demand and associated energy and greenhouse gas emissions. Accommodates variations in climate (temperature, rainfall), water and electricity supply mix, wastewater treatment, water heating options, rainwater harvesting and household types	Hadjikakou (2019)
Greening Urban Mobility	A suite of three tools for devising alternatives to private car use in suburban settings	Dia et al. (2019)
SNAMUTS: Urban Land Use Transport Model	Tool for exploring changes to public transport services required to shift a significant percentage of trips towards low carbon travel modes for major suburban employment precincts	Perkovic, Stone and Curtis (2019)
AMoD: Autonomous Mobility	Agent-based model for assessing feasibility of Autonomous Mobility-on-Demand (AMoD) services for meeting the first and last kilometre travel requirements associated with origin and destination precincts within cities [20 min neighbourhoods]	Dia and Javanshour (2019)

(continued)

Table 19.1 (continued)

Tool	Key performance assessment capability	Key reference
PSUMC: Precinct Shared Use Mobility Calculator	PSUMC provides municipal decision-makers with assessments of likely impacts of low carbon transport interventions: specifically, the capacity for redistributing private car trips to other modes (e.g. train, tram, bus, walk, cycle, taxi, ride share, car pool)	Moffatt and Dia (2019)
CBC: Co-Benefits Calculator—City Scale	In this mode the CBC calculates and maps distinctive land use typologies that exist across a city and examines the strength of association—‘ecological correlations’—with a range of human health and well-being variables (linked to the premise that liveability outcomes are influenced by where people live and the quality and characteristics of the built environment that surrounds them)	Thompson and Stevenson (2019a)
CBC: Co-Benefits Calculator—Precinct Scale	In this context, the CBC is used to identify the relative advantages (as well as challenges to be addressed) associated with specific small scale precincts selected for redevelopment	Thompson and Stevenson (2019b)
Mitigating Urban Heat	A set of tools that provide city wide assessment of suburb level resident vulnerability to episodes of extreme heat; as well urban heat island mitigation options for specific precincts undergoing higher density urban redevelopment	Ding and Craft (2019)
UHVI: Urban Heat Vulnerability Index	UHVI provides a measure of the spatial and temporal patterns of population vulnerability to periods of extreme heat across a metropolitan region, taking into account: the built environment fabric and housing types; the social and demographic characteristics of the resident population; local climate conditions; water bodies; green space etcetera.	Bodilis, Yenneti and Hawken (2019)
UHI-DS: Urban Heat Island Decision Support	UHI-DS is available for use by urban designers and developers to assess precinct redevelopment plans for urban precincts in relation to mitigating increased temperature that is often associated with increased density. It is also a critical tool for use by local governments in their development assessment process	Craft et al. (2019)

Source Extracted from Newton and Taylor (2019); CRC for Low Carbon Living, with permission

Advanced Precinct Assessment: Integrated Precinct Modelling

Given the multiple objectives that are associated with achieving sustainable urban development, how precinct performance is assessed is challenging—even when focus is primarily on environmental performance and economics. We are currently at a similar stage of applied research activity for precincts as we were for buildings at the end of the twentieth century, due to the relative complexity of the topic. Digitalisation proved to be the principal driver of innovation in combined building performance design and assessment, with BIM capability meshing with increased knowledge about the environmental performance of building objects and spaces (Newton, Hampson & Drogemuller 2009).

A similar transition is required for PIM as a new digital platform capable of supporting integrated assessment and integrated modelling at a precinct scale. Figure 19.5 represents this trajectory. At present there is a growing collection of software tools that focus on particular aspects of precinct performance—such as those represented in Table 19.1 and a comprehensive Precinct Design Assessment Guide (Newton & Taylor 2019).

Material presented in this chapter takes us but a small distance up this innovation curve. Most of the material has focused on computer based models targeting some important facets of precinct design performance: energy and water use; mobility; waste generation; influence of dwelling type on resource use and carbon emissions; regenerative impact of distributed technologies such as solar PV and storage and microgrids; integrated

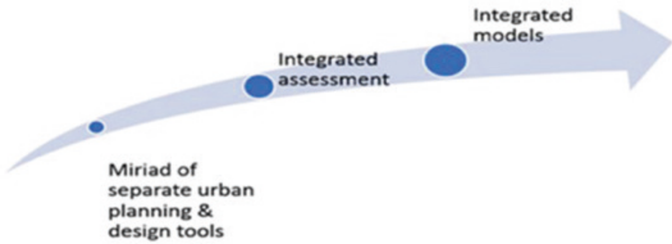

Fig. 19.5 Three horizons of urban analytics

water systems; car and ride sharing; accounting for embodied energy as well as operating energy in relation to the carbon footprints of materials, buildings and cities; assessing the health and wellbeing co-benefits of living in a particular type of neighbourhood; and the capacity of different urban fabrics to adapt to global warming and climate change.

The precinct assessment toolkits to emerge from the CRC for Spatial Information, CRC for Low Carbon Living and CRC for Water Sensitive Cities are considerable in scope. They provide a powerful capability for transitioning to *integrated assessment* of precincts—at any stage of precinct development from 'as conceived/planned' to 'as designed' to 'as built' and 'as operated'. The insights and benefits to be gained from research synthesis workshops employing integrated assessment of a particular precinct are considerable and have been documented for Fishermans Bend, Australia's largest brownfield precinct (Newton 2019b).

Integrated modelling, using PIM as a platform, represents a challenge for the next generation of applied urban research (again see Fig. 19.5, as well as 19.6). Newton et al. (2017a) and Plume, Marchant and

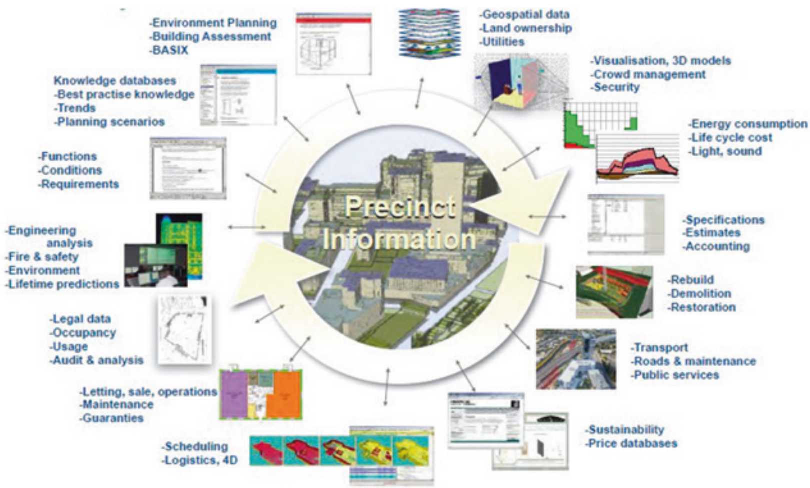

Fig. 19.6 Integrated precinct modelling across the project life cycle (*Source* Plume, Marchant and Mitchell (2019); CRC for Low Carbon Living, with permission)

Mitchell (2019) indicate the benefits to be gained for integrated precinct analytics. Realisation of these efficiency, productivity and performance benefits, however, will require greater engagement from national and international spatial standards bodies as well as major firms involved in BIM, PIM and CIM to establish codes and standards for the interoperability of spatial data and spatial software. The benefits are considerable (BuildingSmart & SIBA 2015; OGC, ISO & IHO 2018).

A New Platform for Transforming Urban Governance and Planning—And Precincts

The mounting calls for better urban governance (Burton 2017; Williams 2018) and better urban planning (ASBEC 2015; Commonwealth of Australia 2018; Infrastructure Australia 2018a; PIA 2018) are connected. A game-changer capable of providing a transition on both fronts has emerged in the form of a twenty-first century smart, networked decision support platform for applied urban research, synthesis and participation. Labelled the *iHUB-Network* (Newton & Burry 2018), it is being developed as a readily scalable state-of-the-art multilayered facility for applied urban research, synthesis and engagement that enables smart decision support for urban policy-making, plan-making and place-making (Fig. 19.7). Funded by a A$1.8 million Australian Research Council LIEF grant awarded in November 2018 to a consortium of five universities located in Australia's four largest capital cities, this initiative will enable 'city as laboratory' to be realised on a national scale, linking individual university labs as a single collaborative research space (including Swinburne's Smart Cities Research Institute and Centre for Urban Transitions; University of NSW's City Analytics Lab and Urban Pinboard; Monash University's Urban Lab; Curtin's Circular Economy Living Lab; and University of Queensland's individual research centres in the Faculty of Engineering, Architecture and IT)—in combination with governments at all three levels, the built environment industry—and communities. Utilising a common infrastructure and leading software such as outlined in this chapter, the *iHUB*-network is designed to deliver superior computational, visualisation and broadband

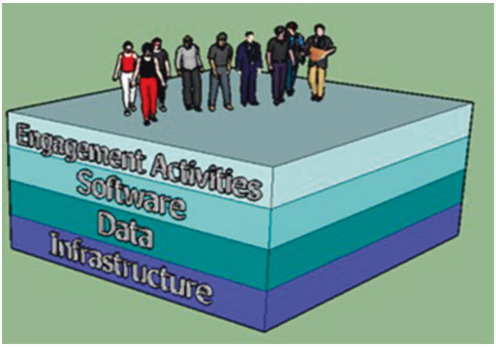

Fig. 19.7 *iHUB* facility layers

communications infrastructure capable of supporting a broad spectrum of applied and strategic urban research and engagement objectives with digital pin-ups, high speed computing and broadband, enabling real time distributed synchronous computing and communication nationally and internationally 24/7. The objective: creating and implementing sustainable solutions to the nation's growing list of urban development challenges.

Conclusion

Clearly, precinct design assessment tools of the type featured in this chapter are a necessary but not sufficient trigger for transformational change in built environment outcomes that seek to deliver on global, national, metropolitan and local sustainable urban development goals and objectives. But they provide a critical step in that direction. However, they also need to be embedded in new urban governance frameworks and processes supported by new digital platforms capable of effectively locking in *built environment assessment*—as designed, as built and as operated—as a routine feature of city management and reporting. That would provide a basis for achieving sustainable urban development in twenty-first century cities.

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