
How green urban precincts can revitalise Melbourne post COVID-19

A Greener Start initiative

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What's next...



How green urban precincts can revitalise Melbourne post COVID-19: A Greener Start initiative

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Acknowledgement of Country

We at the Centre for Urban Research and Sustainability & Urban Planning acknowledge the people of the Woi wurrung and Boon wurrung language groups of the eastern Kulin Nation on whose unceded lands we conduct our research, teaching and service. We respectfully acknowledge Ancestors and Elders past, present and emerging who have always been caring for Country. We pay our respects to Country, the lifeworld that sustains us all.

Our research, education and service are already in a relationship with Country and the people of Country, here and in all the places we undertake our business. As mostly non-Indigenous people, we acknowledge our obligation in this relationship: to uphold the ngarn-ga [understanding] of Bundjil and practice respect for community and culture. Though there is much we still need to learn, especially about ourselves, we affirm our dhumbali [commitment] to that work. We hold as central to our business, dhumbali to a shared future with Indigenous peoples everywhere and especially Kulin Country and peoples.

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Figure 1: View of Paris Rive Gauche and the Paris Fashion Institute from the right bank of the Seine.
Source: L. Dorignon, 2018.



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Plan for green urban precincts in the recovering city

Policy Brief

This briefing has been written by researchers affiliated with RMIT's Urban Futures Enabling Capability Platform as part of RMIT's Greener Start Initiative to inform policy makers and the wider community on opportunities to develop integrated urban precincts for a greener Melbourne.

Overview

The need for green urban precincts stems from the mounting pressures driven by environmental change on cities. While Australian cities continue to grow, it is critical to consider the effects of urban extension on greenfield sites and to reduce the negative outcomes that come with an overconsumption of natural resources. This is particularly the case for Melbourne, which prior to COVID-19 was predicted to overtake Sydney as the most populous city in Australia. As much of Melbourne's growth is occurring in outer suburban areas, it is more critical than ever to identify ways to reduce and prevent the negative impacts of the highly car-dependent and low-density suburbs.

Within urban sustainability concerns, planning to mitigate the effects of climate change for the built environment and societies has emphasised the relevance of local interventions. The benefits of adopting a precinct scale approach are apparent in the State government's '20-minute neighbourhood' policy. Many aspects of the 20-minute neighbourhood policy, such as the provision of safe spaces in which active transport is

achievable for all, are encapsulated in the local and efficient objectives of the green urban precinct. As a framework for urban development, the defining feature of the green urban precinct is the additional benefits that accrue from systematic and multi-faceted approaches to urban challenges, to create more resilient urban infrastructure and mitigate environmental change. Other underlying design principles of green precincts are community consultation, human-scale urban forms, active transport and public transport access, and greenery.

This policy brief provides insights into how Melbourne can implement and benefit from developing green urban precincts, drawing on the analysis of five international precinct-scale developments:

- ▶ **Augustenborg**, a renewal of a 1950s social housing precinct in Malmö, Sweden.
- ▶ **Paris Rive Gauche**, a master planned redevelopment with a focus on urban innovations and social housing in the Masséna sector.
- ▶ **Peña Station NEXT**, a joint proposal by the City of Denver and local property developers, with technical expertise and digital experience provided by Panasonic, a project partner.
- ▶ **Vauban**, the formative example of sustainable, bottom-up green urban precinct development in the German city of Freiburg.
- ▶ **Vulkan**, a mixed-use precinct in the centre of Oslo, which has benefited from an underlying commitment to sharing resources.

These precincts provided examples of outcomes that could result from re-orienting Melbourne and its development by creating

green, inclusive and amenable suburbs facilitated by co-ordinated interventions. The analysis resulted in practical and policy solutions, planning/urban models and governance arrangements that have integrated multiple urban systems (e.g., land use, energy, water, urban greening, housing, waste, etc.) and facilitated change in other cities across the world.

Green urban precinct developments in Melbourne need to address existing conditions within the city and/or in suburbs such as poor public transport, a lack of fundamental social infrastructure and distance from activity centres. There, prevailing conditions need to substantially change before green urban precincts can be developed¹. The required shifts in infrastructure provision, urban structures, and the development industry indicates that the wide adoption of green urban precincts as a development paradigm in Melbourne requires a process of transformation. “Melbourne’s policy makers and its development industry must be encouraged to embark on program of urban experimentation and innovation, as the resulting outcomes of innovative design and development that respond to these conclusions may result in different solutions when shaped by the Melbourne’s urban forms.

Key recommendations

The benefits of integrated precincts

The case study analysis indicates that there are benefits of urban development and redevelopment that are only achievable through precinct-scale design and development. The advantages of an integrated precinct approach were evident in the shared and co-dependent infrastructure systems in Vulkan, the drainage solution in Augustenborg and the state-of-the-art systems being installed at Peña Station NEXT. Overall, the case-studies show three main benefits to adopting an integrated approach while developing green urban precincts:

- A systemic approach to infrastructure delivers more efficient and widespread outcomes. In particular, precinct-scale design for energy efficiencies provides better results than a suburb with energy-performant buildings in it.
- Planners and policy makers need to consider the ‘greenness’ of how people live around their dwelling, rather than the housing infrastructure they inhabit, and what other health, well-being and environmental benefits it may afford.
- Integrating multiple urban systems in the planning of green precincts is the most time-efficient approach at a time when cities are facing critical environmental pressures.

Place-based design and close attention to the wider urban context

in which the precinct is situated was a key commonality between the case-study precincts. All five precincts were planned with a focus on a human-scale delivery of infrastructure and spaces. Built form and population density was forefront in each green urban precinct design, and significant mixed land use created opportunities for a diversity of practices and interaction, fostering vibrant and safe (through passive surveillance) streetscapes. Modal hierarchy prioritising public and active transport, with related spatial allocations, was also present in all five case studies. Street trees and open spaces were particularly prioritised around high-density housing, as demonstrated in Augustenborg. Importantly, the adoption of core site principles was initiated from the start, and green objectives ‘baked-in’ from the outset rather than added later in most case-study precincts. The experience of Paris Rive Gauche in responding to changing requirements over the duration of the project indicated a need to be progressive in approaches to standards in long-term projects, as well as to be flexible enough to cater for policy and social changes.

The case-studies emphasised the positive results of empowering local residents, in guiding projects forward, the key role of participatory planning and in establishing and coproducing the project. This was reinforced by the opposite effect, where the capacity of local groups and activists, equipped with professional-like legal and planning expertise, were able to oppose aspects of developments that were not seen as socially beneficial. The initial plans to redevelop the Frigos refrigerated warehouse in Paris Rive Gauche was an example of this. In Augustenborg, this engagement was performed in a genuinely inclusive way with CALD (culturally and linguistically diverse) residents involved in the design process. Initial urban design decisions can be strongly informed by residents, and more likely to be socially accepted and understood.

Two related factors in the success of green urban precincts were the quality of public transport provision and the access to employment, which were key features that enabled car free environments. The success of Vauban was in part a result of the high-quality public transport provision, with tram services running through the centre that provides access to Freiburg’s employment hubs. The Paris Rive Gauche project was initiated with the opening of the first self-driving subway line in the capital, which efficiently linked this eastern and southern precinct to the northern and western neighbourhoods of Paris in 6 stops and 9 minutes, with a 5-minute frequency. Paris Rive Gauche was intended to become an affordable residential area – although median real-estate prices in this neighbourhood remains much higher than the rest of the metropolitan region² – as well as a new major employment and activity hub. Vulkan is on a bus route and is less than 25 minutes’ walk from central Oslo. In addition to the substantial employment provided by Panasonic’s offices, Peña Station NEXT is an example of a precinct development that has public

transport provision at its core, with the train station allowing ready access to employment and services at the airport and in Denver's central business district. Access to the train services is to be provided through either active transport or the autonomous shuttle bus service.

Outer suburban development in Melbourne has typically been highly car-dependent and have limited employment opportunities, which has created demands for infrastructure investment³. There is a move towards decentralising employment in Melbourne, with the development of suburban employment hubs part of the justification for the Suburban Rail Loop project⁴. For Melbourne, successful green urban precincts require locations well serviced by public transport and ready access to employment, and therefore if they are to be implemented across the city, investment in services and the redistribution of services is required.

Green energy has been in the main focus of case-studies, for electricity and heating supply. Solar panels play the main role in electricity generation, with support from biomass in Augustenborg, heat reuse and geothermal systems in Vulkan and biomass experimentation in Paris Rive Gauche. The new Pena Station NEXT proposes a microgrid by combining extensive solar panel installations with batteries. This is a high technology solution for increasing self-sufficiency inside a neighbourhood. The precinct-scale infrastructure systems enabled Vauban and Pena Station NEXT to consolidate solar panels within the precinct to reduce technical issues. The precinct examples also provide evidence of the benefits of wider systems approaches to energy supply: Vauban, Vulkan and Augustenborg have responded to the opportunities presented by the conditions and uses within their precincts to develop connected systems of energy supply. The case-studies also provided examples of e-mobility charging and sharing infrastructure, which is important as electric vehicle uptake is expected to increase which need an infrastructure for getting charges and to be discharged.

- **Create a systemic approach to infrastructure in order to deliver more efficient and widespread outcomes.**
- **Consider opportunities for multiple use of by-products and mixed social activities in well-serviced precincts.**
- **Explicitly promote climate-adapted, biodiverse neighbourhoods to foster high-amenity neighbourhoods.**
- **Guide innovative solutions in green urban precincts with a set of relevant policies and regulations such as tariff policy in battery-dominant region and regulations for technological information gathering through internet of things**

- **Plan for an early delivery of social infrastructure, with a focus on inclusive cultural, social and educational spaces**
- **Involve local residents in the design of the precinct and keep them informed at every stages.**
- **Inclusionary zoning, the supply of new social housing units and of diverse housing typologies should be prioritised to retain long-term residents in the precinct.**
- **Make provision of public transport and access to employment a central consideration for precinct development.**

Opportunities and obstacles for Melbourne

The pandemic and lockdowns are being framed as an impetus for change in the way cities operate. People have experienced working from home, and while it is unlikely to replace commuting to the office entirely, an increase in teleworking is expected alongside a devaluation of central business district property⁵. As the examples of Paris Rive Gauche and Vulkan show in particular, changes to the structure and the geography of economic activity opens up space for the creation of new wealth as existing use values decline. COVID-19 has been a source of financial as well as other forms of hardship, but it is possible to seize this moment to create opportunities for change⁶.

For the many outer areas of Melbourne that do not have access to high frequency public transport services or proximity to employment hubs that are features of the case studies, significant interventions would be required as pre-conditions for the implementation of green urban precincts. Additionally, the prospect of mixed-use developments with high rates of people working and living in the same precinct are unlikely, given the specialisation, the processes of corporate unbundling and outsourcing geographically dispersing economic activity within production processes, and the added complexity of two-worker households. In this regard, the distinction between inner-city Melbourne and the middle and outer suburbs is more important for the prospect of green urban precinct development than distinctions between green-, grey- and brownfield sites, albeit with the higher costs associated with retro-fitting infrastructure.

Therefore, in addition to the precinct-scale design advantages discussed above, additional precinct considerations need to be included such as access to employment and health, education and retail services. Such a shift in focus from sustainable buildings to development that allows people to live sustainably has direct implications for government and industry. For government, residential rezoning processes and authorisations, the provision of infrastructure and efficiency ratings systems would need to be revisited. For the real-estate development industry, as well as for consumers, it is

critical to reconsider Australia's ongoing attachment to detached houses and land packages. A more market-orientated approach to this issue would be to mandate more information for housing purchases, including typical transport costs and other expenses and impacts associated with housing.

The policies recommended in Climate Change Mitigation & Adaptation in Suburban Melbourne provide detail on land use, transport, water, energy and waste, that need to be taken into account in facilitating the development of green urban precincts in Melbourne's middle and outer suburbs. This includes access to public and active transport, increased urban densities and better access to employment and service hubs⁷.

- **Strategic investments in amenity and infrastructure can guide the development of a greener, more inclusive post-COVID city.**
- **Supplement housing standards with assessments of the efficiencies of living in place, as well as better information for potential purchasers on cost and sustainability impacts of housing choices.**
- **Green urban precincts, and greener suburbs in general, require greater emphasis on interconnected and efficient land use, transport and infrastructure planning.**

Experiments and Interventions

There are actions that can be undertaken in the short-term that can provide impetus for the development of green urban precincts. These recommendations also reflect the urban development framework discussed above, providing insights into aspects of the development industry and housing supply in Melbourne.

The Grattan Institute undertook stated preference experiments in 2011 to develop an understanding of the willingness to pay for different types of housing, and the trade-offs between form and location⁸. Similar experiments would provide insights into the demand for housing in green urban precincts and provide confidence to developers in undertaking innovative and sustainable developments in Melbourne. Developing an understanding of the market for such housing options may also inform the development and intensification of land use around the proposed station locations for the Suburban Rail Loop. Similar experiments may also be used to determine if there is a market for office and other commercial developments as part of mixed-use green urban precincts. Objective, public-funded research is likely to have greater benefit than private-sector led research in this instance.

The recent announcement of State Government investment in social housing⁹ provides an opportunity for precinct-scale design

experimentation, drawing on the examples of Augustenborg and Paris Rive Gauche in particular. Given the designs are likely to respond to a budget allocation rather than a profit motive, there is an opportunity to promote innovative responses that are assessed on green outcomes achieved, rather than meeting mandated standards. In addition to improving the lives of residents and reducing the costs of occupancy, there is an opportunity to showcase new ways of addressing urban problems and as such instil greater confidence in the development industry. The 20-minute neighbourhood pilot projects underway in Melbourne suburbs, as well as future greenfield experiments, already indicate a willingness to progress and change urban development.

Additionally, a related opportunity is to draw on the example of Baugruppen in Vauban. Baugruppen, an economic model for housing which involves sharing the costs of developing among future residents, was instrumental in the design of the precinct. While undoubtedly a success in the Vauban example, in other instances the results have been less remarkable, a reflection of the distinct community residing in Vauban at the time of the project. The opportunity is therefore to develop communities of shared interest, using social media for example, that can form Baugruppen-like urban development collectives. As an experiment in urban development, social housing initiatives may provide a suitable vehicle.

Governments can mitigate risk through guaranteed income streams, but it is the outcome that is important, not the method of long-term rentals by public organisations as occurred in Vulkan. If housing was reframed as infrastructure, similar to transport projects with dimensions of private and public good and an understanding of the benefits of facilitating interventions that contribute to a better city, then there is an argument for extending similar financial arrangements to the housing sector. While public-private partnerships are not without their critics, they are a standard method of project delivery in Victoria.

- Consider the interaction of markets and policies and the prospects for transforming Melbourne's housing and development industries, as implementation rather than design is the main barrier to green urban precincts and other urban innovations.
- Undertake stated preference experiments to test property markets and instil confidence in developer innovations.
- Make use of major government interventions in housing and the transport to leverage urban experiments.
- Governments should consider ways to mitigate developer risks to support green urban precincts, reflecting the public benefit of better housing provision.

Introduction

The COVID-19 pandemic and subsequent public health response have had an immense impact on people, communities and cities. It is too early to tell what long-term changes may arise from these events, but for many the consequences have been or will be disastrous. Nevertheless, there is an opportunity to consider how to reconfigure different ways of living and working as societies emerge from severe lockdowns and physical distancing measures. For instance, individuals have been reluctant to use public transport due to the risk of transmission, but recent research shows this reluctance may decline over time and there are indications that there will be a return of patronage as public health restrictions ease.¹⁰


For some, aspects of working from home has been a positive experience, and it is likely that working from home will increase, along with other flexible working arrangements. A COVID-19 survey by VicHealth¹¹ found that around 25% of adults would prefer to continue working from home, although other research indicates most people – particularly non-office low-wage jobs - will still be present on-site for some part of their working week¹². More people working from home could provide support for 20-minute neighbourhoods, as people spend more time in their communities and use local services and facilities. Notably however, it is estimated that only 40% of jobs in Australia can be done from home¹³. Jobs that are less likely to be work-at-home suitable are also associated with higher rates of commuting by private car, in part because the jobs that are more readily undertaken at home are concentrated within the inner city¹⁴ which is better serviced by public transport. Regardless of this qualification, increased working from home has the potential to reduce traffic congestion and pressures on public transport, as well as have an effect on demand for inner city commercial property.

In Melbourne, these changes are occurring in a city with vast tracts of low-density and car dependent suburbs, which need to be addressed in response to climate change and to ensure a sustainable future. Previous Centre for Urban Research analysis of interventions to improve the sustainability of suburban Melbourne provided recommendations related to green urban precincts, such as policies to increase housing density, particularly close to the public transport network and activity centres, a greater concern for walkable neighbourhoods and more transport services for neighbourhood centres, train stations, employment and education hubs¹⁵. Replacing stamp duties with a broad-based tax on land holdings was also recommended, as it would provide economic incentives for more

intensive land-use as well as improve housing affordability. These recommendations provide insights into what needs to change in suburban Melbourne and provides foundation for the consideration of how green urban precincts address the energy consumption and emissions, land and material consumption, loss of biodiversity and the high levels of car dependence prevalent in much of inner and outer Melbourne¹⁶.

The shapes and systems of the post-COVID city are yet to be determined, but more time spent locally as a result of lockdowns introduces the prospect of reinstating the role of the neighbourhood within cities, realising the 20-minute neighbourhood promoted by the Victorian Government and its agencies for much of the last decade. Thus, this represents a pivotal moment and an opportunity for experimentation about how to reconstitute neighbourhoods that are greener, more vibrant and more welcoming.

In this concept paper, the focus is on green urban precincts, an extension of the 20-minute neighbourhood directive. Green urban precincts bring together locally based interventions, including infrastructure, technologies and planning mechanisms, in suburb-scale areas and are designed to achieve sustainability outcomes across energy consumption, water management, social outcomes and natural habitats.



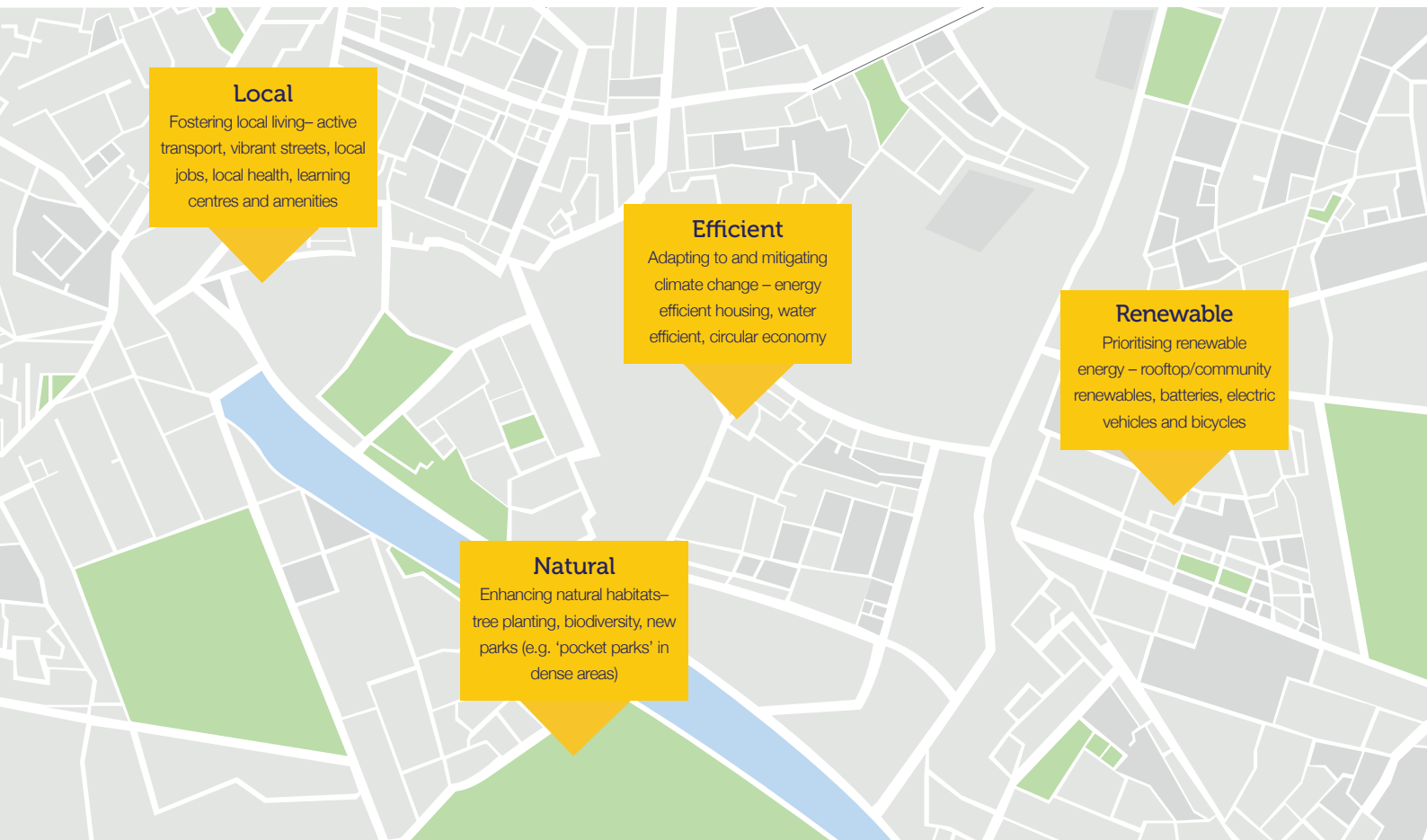
This concept paper is a response to the policy provocation of RMIT's
Post-COVID 19 Greener Start Initiative:

As we look to the future and investments
that will stimulate the economy, what
infrastructure, interventions and
policies can be implemented to enable
a healthier, more sustainable future that
protects people, the eco-system, the
environment, as well as the economy?

Objectives

As one part of the Greener Start Initiative, this concept paper assesses case studies of international precinct-scale urban development to inform the opportunities and lays out the implementation challenges for green urban precincts in Melbourne.

In doing so, the focus is on the following outcomes:



In addition to these physical and functional attributes of the case study precincts, consideration is also given to the social and political aspects of their development and outcomes, particularly:



This concept paper on international precincts and urban redevelopment projects provides insights into how similar projects could be undertaken in Melbourne. Therefore, the overarching research question that guides the development of this research concept paper:

How could precinct-scale urban interventions leave Melbourne greener and Melbournians closer to nature, as well as potentially more prosperous, happier and with more free time?

The three research questions (RQ) that underpin the research are:

RQ1. What did the international case studies show was the path to implementation, including the role of government, community and commercial actors?

RQ2. What are the barriers and/or opportunities within Melbourne's social, urban and governance environments to implement such projects?

RQ3. Given the outcomes from the international case studies, what types of experiments and developments should be undertaken in Melbourne?

Melbourne's Precinct Opportunity

This section of the concept paper provides the arguments for the study of green urban precincts and their implementation in Melbourne, including the opportunity presented as framed by the state's planning system. There are two elements to this argument. First, green urban precincts are defined, and also distinguished from 20-minute neighbourhoods due to the more systems-based approach to achieving efficiencies and sustainability. The second element to the argument is a consideration of the planning context for green urban precincts, focusing on recent metropolitan planning strategies.

Why green urban precincts?

The need for green urban precincts stems from the mounting pressures on cities from the effects of environmental change. While Australian cities continue to grow, it is critical to consider the effects of urban extension on greenfield sites and to reduce the negative outcomes that come with an overconsumption of natural resources. This is particularly the case for Melbourne, which prior to COVID19 was predicted to overtake Sydney as the most populous city in Australia, with much of the growth occurring in outer suburban growth areas. There is also a need to identify ways to reduce the impact of the highly car-dependent and low-density suburbs that typify the growth of the city in the second half of the 20th century.

Within urban sustainability concerns, planning to mitigate the effects of climate change for the built environment and societies has emphasised the relevance of local interventions and the benefits of working at the precinct scale¹⁷. They are also less likely to be hampered by the lack of coordination in climate and environment policy across levels of government, whilst improving liveability and effectively reducing carbon emissions¹⁸. This is as applicable to retrofitting existing suburbs as greenfield sites, as the precinct-scale focus interventions on walkable scales and provide benefits of scale when considering systems for the provision of essential services.

The 20-minute neighbourhood is a prominent concept in Victorian urban policy. It is founded in the benefits of proximity and ease of access, with the aim of providing residents with the ability to meet their needs within a 20-minute walk¹⁹. The concept of green urban precinct extends the 20-minute neighbourhood to include the need for and benefits of integrated urban systems. While the systemic and distributed approach afforded by green urban precinct has not yet

been consistently developed, there is evidence showing that "renewal projects in existing urban areas would benefit from precinct-scaled redevelopments that could drive sustainable transformations in the broader urban environment"²⁰. Local governments can therefore be instrumental in producing green outcomes, in particular through residential changes towards design-led intensification and more diverse housing stock located in proximity to essential services and nature.

In this concept paper, we frame the green urban precincts with four key components forming the basis of multiple urban systems: local, natural, efficient and renewable. Many aspects of the 20-minute neighbourhood framework, such as the provision of safe spaces in which active transport is achievable for all, are contained in the local and efficient objectives of the green urban precinct. As a framework for urban development, the defining feature of the green urban precinct is the additional benefits that accrue from systematic and multi-faceted approaches to urban challenges, to create more resilient urban infrastructure and mitigate environmental change.

Policy environment

The need to re-localise Melbourne's suburbs, to focus on the neighbourhood scale, is a feature of metropolitan strategic planning of the past decade. The support for restructuring the city and its systems at a neighbourhood scale is a recognition of the need to increase active and public transport usage, and make Melbournians lives more sustainable and liveable, indicating at least in principle support for green urban precincts.

The 20-minute city concept (Figure 2), analogous to the green urban precinct, has been a frequent topic in Melbourne’s urban planning policy discussions over the past decade. Sustainability Victoria commissioned a report on business models for green precincts in 2011.²¹ It was further promoted by the Ministerial Advisory Committee that led and reviewed Plan Melbourne, the current metropolitan planning strategy for Melbourne ²². In addition to featuring prominently within the 2014 version of Plan Melbourne and its 2017 refresh ²³, the 20-minute policy heuristic was further developed in a government report released in 2019²⁴ and is prominent with the recent Victorian Planning Authority’s draft guidelines for greenfield development²⁵. At first glance, this policy history indicates an authorising environment that is amenable to the types of development included in this concept paper, a view supported by the inclusion of sustainability principles in current precinct-scale developments in very different locations in Melbourne.²⁶

In 2011, the main barriers to green urban precinct developments were a range of factors relating to property markets and the commercial aspects of development. The only policy-related barrier was seen as the problems in gaining government approvals for new technologies, although it was noted that “there was considerable government

support, which in some cases provided additional assistance with approvals processes”²⁷. The need for such support for innovative approaches to urban infrastructure can be most clearly seen in the current discussion draft for the development of precinct structure plans in Victoria, which have not been updated since 2013. The proposal includes an “innovation pathway” for projects including 20-minute city outcomes, where approval authorities can support development by “waiving or varying selected subsidiary regulatory requirements”²⁸.

The initiatives relating to precinct development and 20-minute neighbourhoods in the first version of Plan Melbourne were focused on planning policy for existing neighbourhoods and their services, as well as proposing a fund for supporting 20-minute neighbourhood initiatives²⁹. While the second iteration of Plan Melbourne was released in 2017 retained the 20-minute city concept, as depicted in Figure 2 below, it did not include the recommendation of the Ministerial Advisory Committee that regulatory and other obstacles to the use of upper floor spaces in neighbourhood activity centres be reviewed³⁰ in order to help increase mixed-use precincts. As with the earlier version of Plan Melbourne the benefits of the 20-minute city, and thus green urban precincts, are clearly articulated.



Figure 2: The 20-minute neighbourhood. Source: Plan Melbourne³¹

There are three 20-minute city pilot projects underway in Melbourne, in the established suburbs of Croydon South, Sunshine West and Strathmore³². A subsequent phase will focus on greenfield sites. Each of the existing suburban sites had a different focusing, reflecting their situations and needs. The recommendations arising from the pilots include streetscape and landscape improvements, providing diverse housing options, cultural facilities and support for the local economy.

There are also indications that parts of Melbourne are transitioning towards a 20-minute neighbourhood, as medium-rise apartment blocks appear near public transport services in inner- to middle-ring suburbs such as Brunswick East and in proximity to Fairfield Station (Figure 3). There has been some innovation in individual buildings in Melbourne, such as Nightingale, Council House 2 and 60L, the offices

of the Australian Conservation Foundation. However, the relative lack of innovation in precinct-scale development in Melbourne - based on the search for exemplars undertaken for this project - the implication is that it is not metropolitan-level strategic planning that is the barrier for such urban experimentation, or necessarily the right policy vehicle to foster it. The implication is that an element of the systems of or markets for property development in Melbourne are not connecting in ways that foster innovation: it may be either the authorising environment, the supply, the demand, or some combination of them. The distinction between 20-minute neighbourhoods and green urban precincts is also important, given the benefits that result from the systems approach to development that defines the green urban precinct.



Figure 3: Medium density housing near Fairfield Train Station, Victoria
Source: T. Denham, November 2020

An urban systems approach opens up the possibility that the economic barriers to the types of medium-density, mixed used green precincts identified in 2011 are still relevant: willingness to pay a premium for sustainable dwellings; poor information or understanding of the benefits; the opportunity costs associated with innovative development; and the different cost motivations for developers and occupants³³.

Despite the policy and public appear of the 20-minute neighbourhood

over the last decade, there remains a gap between Victorian government policy and reports, and the ability to re-orient development to deliver the 20-minute neighbourhood ideal. While the scope of this research does not allow for detailed recommendations as to why this is the case, it provides insights from international examples, that when held up against the physical, social, governance and economic structures of Melbourne indicate a way forward.

Green Urban Precinct

Case Studies

This section of the concept paper includes the analysis of green urban precinct case studies and what they indicate for similar developments in Melbourne. It provides insights into how Melbourne can implement and benefit from developing green urban precincts drawing from the analysis of five international, precinct-scale developments:

- Augustenborg, a renewal of a 1950s social housing precinct in Malmö, Sweden.
- Paris Rive Gauche, a master planned redevelopment with a focus on urban innovations and social housing in the Masséna sector.
- Peña Station NEXT, a joint proposal by the City of Denver and local property developers, with technical expertise and digital experience provided by Panasonic, a project partner.
- Vauban, the formative example of sustainable, bottom-up green urban precinct development in the German city of Freiburg.
- Vulkan, a mixed-use precinct in the centre of Oslo, which has benefited from an underlying commitment to sharing.

These precincts provided examples of outcomes that could result from re-orienting our city and its development, by creating green, inclusive and amenable suburbs facilitated by co-ordinated interventions in urban form, transport, infrastructure and land use. A green urban precinct for Melbourne could be founded in its communities, and would be fair and inclusive:

A program of 'green neighbourhoods' could help address all aspects of sustainability. Much of this effort could be community-based, with activities to bring people of diverse ages, ethnicities, abilities and life stages together³⁴.

The analysis results in practical and policy solutions, planning/urban models and governance arrangements that have integrated multiple urban systems (e.g., land use, energy, water, urban greening, housing, waste, etc.) and facilitated change in other cities across the world.

Case study selection

This concept paper considers how precinct-scale development in Melbourne can improve urban environments, foster sustainable living and livelihoods and reduce their environmental impacts by considering precincts from other cities. This focus implies that the case studies selected for review and analysis have affected multiple urban system and involved a co-ordinated approach to infrastructure, built form and land use. It is also suggested that the planning of these precinct have resulted in greater benefits than if changes to urban systems had been undertaken in isolation. Three criteria have been used to select precedent locations for review:

1. The first criterion for case-studies was successful precinct-based approaches to urban experimentation that draw benefits from a range of co-ordinated and mutually reinforcing interventions. The focus was on best-practice sustainable, integrated and innovative precincts that could inform pathways to development for Melbourne and its suburbs.
2. The second criterion was that the case-studies provide insights into how precinct-based urban developments can be successfully undertaken in different urban contexts and for different communities. It is likely that the possibilities for and realities of precincts will be different depending on the site. Thus, incremental and short-term fixes needed to be considered alongside long-term master-planned developments.
3. The third criterion was pragmatic, in that for a precedent location to be included, information on the site's planning, implementation, governance arrangements and outcomes needed to be available.

Analytical framework

Our analysis was two-fold. First, we conducted a short desktop review of 20 green urban precincts. We sought input from relevant stakeholders and experts to inform our selection. We performed an extensive review of one of the suggested case-study, Vauban, to ground our analysis and test our interpretive framework. Second, we selected five urban precincts based on the available information and the location of the precincts and conducted a desktop-review of the grey literature and evidence-based research available on these case studies.

To perform and structure the analysis, we used the four integrated components - local, natural, efficient and renewable - to conduct a systematic review of the benefits and outcomes of the precincts.

Various temporalities were observed which have an impact on how successfully green outcomes were implemented, as shown on the timeline below (Figure 4).

The limitations to our study were inherent to those of a desktop-based review of precincts, including some gaps in the critical assessment of some of these precincts' outcomes, particularly around their liveability, and detailed explanations of planning and building code regulations as they shaped these precincts. The case studies from countries where official documentation is in languages the project team are not conversant was also a factor in obtaining resources for the analysis.

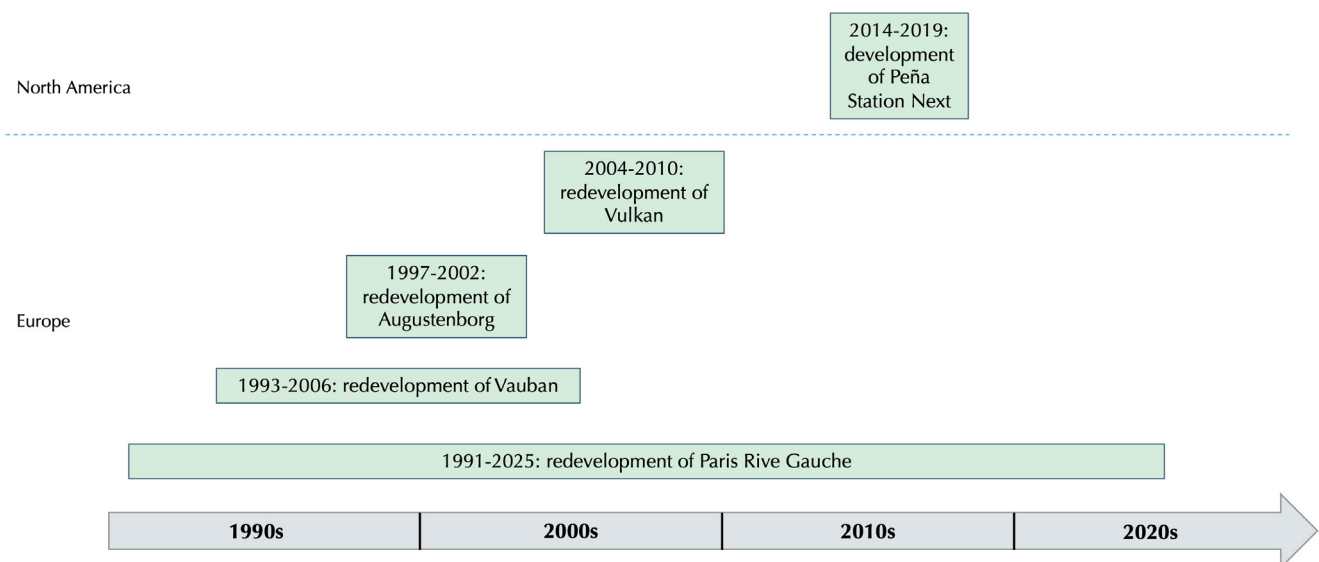


Figure 4: The redevelopment timeline for the five case-studies.



Augustenborg, Malmö Sweden

Overview

Augustenborg is an inner suburb of Malmö, Sweden where a significant urban renewal project took place between 1997 and 2002. It was also the city's first public housing estate, completed in 1952, and 89 per cent of dwellings in Augustenborg remain public housing (Figure 5). The site is located approximately 3.5km from the central district of Malmö. The precinct is 32 hectares and has approximately 1,800 dwellings and 3,000 residents, equating to a density of approximately 94 residents per hectare. Before the renewal, the site struggled with recurrent flooding, high energy costs, high turnover of residents, and other social challenges. The renewal delivered a very leafy, flood-proof and socially vibrant precinct.

This project involved energy efficiency upgrades, renewable installation, composting and biogas generation, and an especially significant delivery of water-sensitive urban design, using green roofs in conjunction with ponds and swales to intercept and absorb stormwater. The presence of water in the landscape is both attractive and an exemplary act of climate change adaptation – peak flows have been reduced by 80 per cent in this precinct.

The increased amenity and improved infrastructure as a result of the upgrade of this precinct has reduced turnover in apartments by 50 per cent, and vacancies are now rare³⁵. Unemployment has reduced by 15 per cent and a number of local enterprises have been established. A reduction in graffiti and vandalism in the precinct is an indicator of the positive outcomes for the residents.



Figure 5: Mid-rise public housing in Augustenborg.³⁶
Source: Creative commons image

large areas of the site for green spaces that might otherwise be dedicated to vehicular circulation (Figure 6).

What was achieved

Flood mitigation

Flooding was a key issue on site, and the community was central to the selection and design of a new stormwater system based on blue-green infrastructure (Figure 7). One of the key achievements of this project is how effectively this new system mitigates flooding, using a range of attractive urban greening approaches. Onsite capture and treatment of stormwater takes place in lowered gardens, playgrounds, public spaces as well as ponds and swales, and has helped make this an attractive, green precinct.

Green roofs also form a significant part of Augustenborg's flood mitigation strategy, with over 11,000m² of green roof cover. The precinct is now host to the Scandinavian Green Roof Institute, which is topped with a 9,500m² botanic green roof, providing a flood protection asset and a site of considerable innovation and research .

Rainwater no longer causes flooding, but instead is an important asset for the area, improving its aesthetic value and supporting biodiversity as many collection ponds now feature fish and other riparian species³⁹. When Malmö was hit by major floods during a major downpour in 2014, the previously flood-affected district of Augustenborg managed without damage (Figure 8), indicating the success of the flood mitigation strategies⁴⁰.



Figure 6: View of Augustenborg.
Source: Google Earth 2020.



Figure 7: Map of Augustenborg showing blue-green solutions in public open spaces.
 Source: Mottaghi et al., 2020

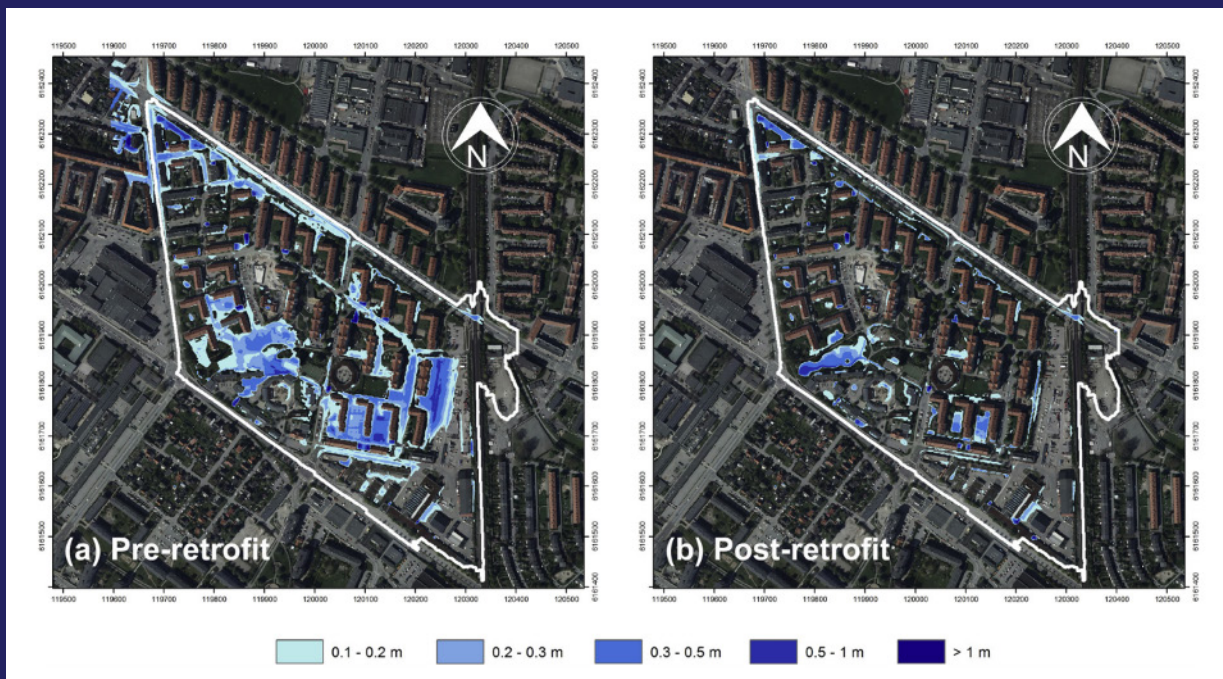


Figure 8: Flood map of Augustenborg based on simulations of the cloud-burst for (a) pre-retrofit and (b) post-retrofit cases.
 Source: Salar Haghghatafshar et al., 2018

Transition to renewable energy

In the past, Augustenborg was served by a coal-powered district heating unit. Its replacement by multiple systems of renewable energy generation is central to Augustenborg's low emissions retrofit. Biogas from local food waste, heat pumps, wind generation at the school, and 450m² of solar panels all contribute to electricity generation and water heating.

Surplus energy from the solar system and ground source heat pump feed directly into the district heating system, adding efficiency to the system. As a result, 85 per cent of the precinct heating system is renewable. Thanks to this, the heat and hot water consumption had decreased by 25 per cent by 2009 compared to 1998 levels, and it is estimated that the carbon emissions from the neighbourhood have fallen by more than 20 per cent⁴².

The football pitch has been fitted with underground piping to produce hot water for the district heating system. It pumps solar heat out of the ground in summer and the residual heat from the ground in winter. As a side effect, when the temperature drops below 5 degrees, an ice rink can be created for children from the school and neighbourhood⁴³.

Built form

Energy efficiency retrofits were carried out in the apartment structures as a core aspect of the original 1997-2002 retrofit. Following the success of the broader retrofit of Augustenborg, The Greenhouse



Figure 9: View of the Greenhouse building.
Source: Google Earth 2020.

apartment building (Figure 9) was built in 2016 with 14 floors and 56 apartments, also managed by MKB for public use. The Greenhouse is built to the stringent Passivhaus energy efficiency standard, resulting in homes that require almost no energy for heating or cooling⁴⁴.

Waste

Thirteen centres for waste collection, reuse, recycling and composting were built throughout the neighbourhood (Figure 10) and include smart systems for tracking weight of waste diverted.

Significant public education campaigns were carried out to help change waste management behaviour. Diversion of organic waste has enabled the creation of compost and biogas for energy generation⁴⁶.

How it was done

The role of government

This project was delivered primarily as a partnership between the public housing corporation (MKB), the city of Malmö and an EU urban renewal project, Urban I. Additional funding and support was provided by the Swedish government's Local Investment Program.

The project was initiated by leaders in three key institutions: the MKB, Malmö city and the URBAN I project. They acted as project champions and their collaboration meant that from the beginning, the institutions involved had alignment of purpose. The project's early engagement



Figure 10: One of Augustenborg's thirteen waste management stations.
Source: Bernstad, 2010⁴⁵

of the community and willingness to meet their wishes mean that local residents have also served as significant inputs to the process.

The process started in 1997 when there were discussions about closing down Kommunteknik's industrial area. Peter Lindqvist at the Service Department (in Malmö City) suggested that an eco-friendly industrial park opened in the area. At the same time Bertil Nilsson, former headmaster at the school in Augustenborg, had become one of the coordinators for the Swedish Urban Program in Malmö. He contacted Christer Sandgren at MKB, Malmö's public housing company, who was their housing manager for Augustenborg, with the mission to renew the area. The three men pulled all their strings and gathered a group of senior officers, colleagues and most important residents in the area who all wanted to turn the area into a sustainable district of Malmö. Some finance was raised from the Swedish government's Local Investment Program (LIP), a steering committee was founded and in 1998 a model of the area with suggestions for change based on the wishes of local stakeholders and residents was presented: No more flooding, green roofs, a musical theme playground, an open storm water system...Close to 400 people showed up at the first meeting.⁴⁷

The early buy-in of the mayor of Malmö, Ilmar Reepalu, was also significant. Ilmar is an architect and had a specific interest in deliberative process as well as technical actions⁴⁸.

Planning and Implementation

MKB redeveloped their land following close engagement with the community, in partnership with the City of Malmö's technical specialists. Funding was provided by MKB, the City of Malmö, the Swedish Government and a smaller EU urban renewal program⁴⁹.

For example, the stormwater system was a joint project involving the city's water department, landscape designers, MKB and the local residents. The renewable energy system included a renewables firm in addition to the above stakeholders.

The work done to involve the community was a crucial aspect of the project's success⁵⁰. Key features include:

- Engaging early and giving residents a real say in project outcomes⁵¹
- Using translators to help diverse residents engage in meetings and with project materials

- Transparency in project progress
- Continuous and two-way communication on the project. This communication was realised in many different ways, privileging direct contacts and face-to-face interactions between technical staff, experts and citizens

The organisations involved hired a project lead for delivery, and to work with the community. The project lead had experience from working in Groundwork UK, a coalition of charities focused on community based environmental action and poverty alleviation. This project lead remained on the project for ten years and provided continuity in the work. It has been noted that staff turnover and continuity of knowledge had been a challenge in the project, underlining the value of this long-term commitment⁵².

On-going management and maintenance work are jointly funded through the MKB through rent revenues, the water board through the water rates, and the City of Malmö's standard maintenance budgets.

Application to Melbourne

Augustenborg provides four insights for application to Melbourne:

- This project had long-term champions at the executive and delivery levels across three organisations. This enabled smooth cooperation between key agencies as well as effective co-funding and sufficient continuity to carry out
- The community chose the most sustainable features of the project. There was considerable engagement support to enable this, including translation and a range of workshops and discussions, as well as a long-term project leader trusted by the community.
- Urban greening delivered climate adaptation but also urban renewal. This was driven by an engaged community and a history of flooding but helped produce an area that people wanted to stay.
- Consolidated land ownership (in this case due to public housing) reduced the complexity of housing retrofits and enabled the public housing corporation to directly carry out the site's renewal.

In addition, the redevelopment of Augustenborg also provides an example of a successful social housing precinct-scale project, providing efficient, green and social benefits to its residents. The prominent role of project champions and advocates, as well as engagement with the community, provides a model for guiding the development of social housing included in the recent Victorian budget⁵³.



Paris Rive Gauche, Paris France

Overview

Paris Rive Gauche is a precinct in the inner east of Paris and an example of large-scale and long-term master planned redevelopment led by an urban municipality. The project has combined socio-economic ambitions with the delivery of green outcomes in a highly dense city and in precinct defined by imposing road and railway infrastructure (Figure 11). Since its inception in 1991, the redevelopment has repurposed underused brownfield railway sites in a historically less affluent neighbourhood of Paris⁵⁴. The project's final phase is due to be completed in 2025, providing additional employment and housing units in the precinct. Governed by a municipal design and planning agency, Paris Rive Gauche has worked through the hurdles of a complex project spanning several decades to become the largest urban redevelopment in Paris since Haussmann in the 19th century. By 2020, the 130 hectares of Paris Rive Gauche comprised approximately 100,000 m² of green spaces; 1,500 housing units, 50 per cent of which will be social housing; 405,000 m² of shops and businesses; and 720,000 m² of public facilities including educational, cultural and recreational spaces.

Due to its scale and complexity, Paris Rive Gauche is considered an important contribution in contemporary urbanism and acts as an urban laboratory within the city. Examples of experimentation include the involvement of the city through a semi-public governance structure, the inclusion of innovative social housing provisions, the technical construction of a slab above railway tracks and biology-infused built form. The precinct successfully navigated a high level of public involvement, a sophisticated and evolving legal planning context and a demanding financial background while creating diverse, vibrant and green urban spaces.



Figure 11: View of the Masséna Nord and Bruneseau sectors, in the southern part of Paris Rive Gauche. At the centre, the university campus; in the south, the road and railway fields and administrative boundaries with Ivry-sur-Seine.
Source: Google Earth 2020

Google

What was achieved

Local

Central to the development of Paris Rive Gauche was the aim of diminishing the effects of the historic divide between the city's western and eastern neighbourhoods and the reduction of socio-economic inequalities. Paris Rive Gauche is bordered by the river Seine to the North. The southern part of the precinct is delimited by a ring road, which forms the border of Paris and Ivry-sur-Seine, a traditionally working-class municipality of the east. In 2001, the final phase of Paris Rive Gauche was launched and focuses on breaking off this socio-spatial rupture by enabling active transport and providing social infrastructure, notably through the delivery of new public squares, linkages and residential high-rise buildings in the southern district of Bruneseau.

The original rationale for redeveloping Masséna was to keep employment within the political boundaries of Paris and provide a mixed-used environment combining office and residential spaces. A focus was also placed on achieving the creation of pedestrian- and cyclist-friendly grid alongside multiple public transportation solutions and access (Figure 13), building on the access provided by significant investments in public transport in the wider Paris Rive Gauche precinct⁵⁶.

This high density of built form was accompanied by an increase in green and communal open spaces, which stands in contrast to the 19th century design of Parisian apartment buildings which separated the courtyard from the street. Open-block urbanism, which is present throughout Masséna (Figure 14), was also intended to balance an alignment of buildings on the main thoroughfare from the first wave of

An overarching plan for Paris Rive Gauche was established in 1991, albeit each of the four constituent sectors had different guiding principles following various revisions of the plan in 1997, 2002 and 2009. Our review focuses on the 12.5-hectare Masséna sector of Paris Rive Gauche, as shown in Figure 12, an obsolete industrial district turned into a mixed-use, dense and transit-oriented precinct. It is one of the most recent sectors to have been redeveloped. Encompassing a university campus (Grand Moulins), Masséna includes similar urban conditions to some of Melbourne's university precincts (CBD, Parkville, Monash, Fisherman's bend etc.), which aspire to combine university facilities and student accommodation with local employment.



Figure 12: The four main districts within Paris Rive Gauche and their land use typology (from left to right: offices, residential, public spaces, commercial).
Source: Treize Urbain⁵⁵



Figure 13: Priority is given to public and active modes of transport
Source: L. Dorignon, 2017

construction, with green and accessible spaces open to the street. This combination of residential density and open space runs is a frequent element of best-practice urbanism ideal, yet notably it is rarely observed in Melbourne outside of the 1960s public housing blocks that ring central Melbourne. The result in Masséna is a dense and compact, yet green and breathable precinct equipped with a mix of mid- and high-rise buildings. Pedestrian circulation is stimulated by small plots, narrow streets and architectural diversity. Finally, active ground floors and an open perspective to the river and green spaces help define a sense of place.

The strong social policies that formed the agenda of Paris Rive Gauche have been important for Masséna in this regard. This was exemplified through an early delivery of new social infrastructure, such as schools, activity and sporting centres, small shops and converted university spaces within Paris Rive Gauche. Social housing buildings such as the Tour de la Biodiversité (Figure 18) were often designed to provide the residents with social infrastructure, such as community day-care and community spaces for young workers, often young, male and working-class migrants needing affordable accommodation and social services support.

The National Library is a prominent example of inclusionary facilities within Rive Gauche. Erected in 1995 in the Tolbiac sector and one of the first sites to open to the public, it stands at the centrepiece of Rive Gauche redevelopment and serves as a major civic, architectural and public space landmark (Figure 15).

Paris Rive Gauche has been successful in bringing offices and businesses to provide local employment, as well as in stimulating economic innovation. The creation of Station F in 2017 in a 1920s converted railway building led to the launch of what is thought to be the world's largest start-up incubator at 51,000 m², partnered with giant tech players such as Facebook, Microsoft and Ubisoft. Station F includes shared workspaces, restaurants and provides shared accommodation in Ivry-sur-Seine for the start-up employees (600 bedrooms across 100 apartments), from which employees are encouraged to cycle. It is home to private programs and start-ups as well as public administration offices to help support the creation of enterprises with legal, tax or research guidance. The success of this public-private coordinated investment model reasserted Paris Rive Gauche's role as a frontrunner in urban innovation experiments, while consolidating the attractiveness of the precinct. Many other industrial buildings have been retrofitted to accommodate cultural or educational sites, such as the Frigos building, a former refrigerated warehouse now a residence for artists, the Grand Moulins (industrial mills) now a university building or the SUDAC, a former compressed air plant repurposed into a design school.



Figure 14: Open block urbanism in Masséna, 'Jardin Grands Moulins Abbé Pierre' public park).
Source: L. Dorigon, 2017



Figure 15: The iconic National Library in the Tolbiac sector.
Source: L. Dorigon, 2017

Natural

In 2002, the municipality of Paris added natural objectives to the Zone d'Aménagement Concerté (ZAC) legal requirements. These consisted in the creation of additional open green spaces (10 ha), green linkages (2000 trees) and greenery (Figure 16), and the development of a better embedded natural riverside environment along the Seine through processes of revegetation. The SEMAPA (Société d'Économie Mixte d'Aménagement de Paris) drafted environmental requirements under the form of a sustainable development charter and added requirements for further environmental studies to the planning and building process within each of the sectors, including Masséna.

This increase of green spaces over office spaces in the early 2000s points to limitations regarding natural habitats in the original project plan, while demonstrating the capacity from the governing bodies to work with evolving objectives. In the Masséna plan, the land-use is now distributed as follows:

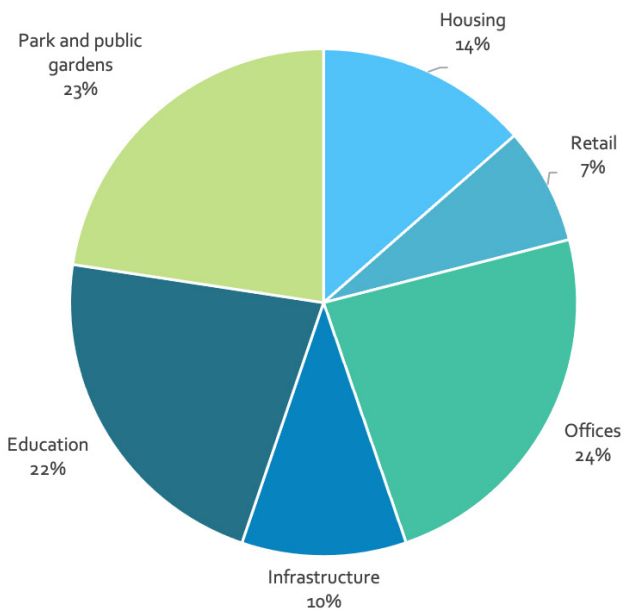


Figure 17: Land use in Masséna urban plan.
Source: adapted from www.christiandeporzamparc.com

Recently, the focus on better integrating natural ecosystems in the precinct surfaced in innovative projects which foster shared flora, fauna and human modes of living. This is illustrated by the Tour de la Biodiversité (Figure 18), a residential high-rise building composed exclusively of social housing units and a tool for biodiversity management and regeneration in the surrounding urban space⁵⁷. Whilst the façade allows the wind to spread seeds in its immediate environment, the building comprises 140 family apartments, a worker's home, a community day care and four shops.



Figure 16: University campus in Masséna.
Source: L. Dorignon, 2017



Figure 18: Social housing building 'Tour de la biodiversité', place Farhat-Hached, completed in 2016.
Source: L. Dorignon, 2017

Efficient

In Masséna, residential buildings must be certified by an independent French certifier and obtain a certification inspired by the HQE (Haute Qualité Environnementale) principles. In terms of building designs, natural light, natural ventilation, solar protections as well as exposure to winter winds were parameters used to ensure energy performance in each building⁵⁸. No energy loop between the various buildings was established in Masséna but will be considered for the Bruneseau sector.

More recently, Masséna has become home to a series of winning innovative projects, particularly following the 2016 municipal architectural and design competition 'Réinventer Paris'⁵⁹ (Reinventing Paris). This competition funded the project Alguésens, a trio of 'living green' mixed-use buildings expected to be completed in 2022⁶⁰. Including a large, single-storey garden balcony in each unit, one of the buildings aims to form a biodiversity refuge. Another building, offering accommodation to students and young researchers, is to be covered with solar-powered algae and photoreceptors which is expected to generate biomass for medical research and a renewable source of heat energy. This energy will be stored and used for domestic hot water and heating. The third building will be devoted to urban agriculture while also offering rental housing units.

Alguésens will host research labs, student centres and public spaces, including a café and 2,000 m² community garden. The project is a good example of how integrated urban elements are designed at the building scale, and of the efforts to rethink urban metabolism. If delivered, the building will be the first in Paris with a nature-based façade uniting climatic benefits and cultivated microalgae with the aim to recycle CO² and purify the air of the city.

Renewable

One of the challenges of Paris Rive Gauche was the necessary adaptation to changing energy performance requirements which progressed over the life of the project. This became more urgent after the municipality of Paris adopted the Climate Protection Plan (Plan Climat) in 2007, a strategic plan to reduce greenhouse gas emissions, achieve energy transition and combat climate change⁶¹. As a result, architects bidding for Masséna had to address a set of energy performance requirements such as the building shell quality, how they will achieve the Climate Protection Plan objectives, and the overall environmental quality of the building.

However, each developer within Paris Rive Gauche was free to choose the systems to supply heat, cooling and electricity for the buildings. In Masséna, environmental specifications were established at the

precinct scale, with specifications made for each plot. The precinct-scale document also contained many detailed recommendations on building design under the form of a contract, establishing the context of the building and its environmental objectives⁶². The Paris Rive Gauche primary energy consumption target was set in the 2007 Climate Protection Plan at 50 kWh/m². In terms of renewable energy production, there were some quantified targets and technical evaluations were required. The installation of solar panels for domestic hot water was recommended to developers and photovoltaic panels on roofs optional. Yet in Masséna, energy consumption prescriptions were strict and were the most used methods of regulation in the sector. Building design recommendations in Masséna also imposed a requirement to consider grey-water heat recovery, as well as the possibility of implementing wind energy production, even though it was unlikely to be achieved in this dense urban context. Specifications imposed in Masséna and Bruneseau some limitations on the carbon impact of materials and required low embodied energy⁶³. Finally, the winning masterplan for Bruneseau plans to have 65% of energy production come from renewable sources through the installation of a smart grid and the solarisation of building facades.

Despite these efforts, this energy model has been characterised as ‘business as usual’⁶⁴ as it does not allow wider levels of coverage at the precinct scale by renewable energies and prevents the implementation of pooled solutions, such as those in the Vauban and Vulkan case studies described later. Research also shows that “in order to obtain an energy label or comply with the objectives of thermal regulations, it may be sufficient to play on the thermal performance of the building”⁶⁵, without regard for the energy performance of the neighbourhood or precinct. This critique reflects the complexity of long-term development responding to changing energy policies and practices.

How it was done

Governance

Paris Rive Gauche is characterised by a high level of public control. It is managed by a semi-public company formed by various municipal and public shareholders, SEMAPA (Société d’Économie Mixte d’Aménagement de Paris), which carries out the whole project and coordinate plans for the various sectors. SEMAPA is itself administrated by the municipal government of the 13th arrondissement. With the establishment of the ZAC (Zone d’Aménagement Concerté), a concession contract was signed between the SEMAPA and the City of Paris in 1991. The municipality of Paris is the main shareholder,

with 57 per cent of the shares. The national railway company holds 20 per cent, the French State and the Île-de-France Region each hold 5 per cent. Following changes in the European legislation in the 2000s, the SPLA (Société Publique Locale d’Aménagement) was implemented, which reverted the development to a solely public mode of shareholding.

Multiple legislative changes have occurred since the 1990s as French urban regulations have evolved, reflecting changing planning priorities and a shift from creating monofunctional blocks --of social housing in particular-- to fostering social mix and economic activities. The ZAC (Zone d’Aménagement Concerté) designations were intended to direct flows of private capital towards state-managed projects.

While SEMAPA only finances public infrastructure and amenities, most buildings within Paris Rive Gauche were developed through private investments. Yet one specificity of Paris Rive Gauche lies in the fact that the SEMAPA acts as a middleman between municipal stakeholders and private landlords. SEMAPA acts as the owner of the land for a short amount of time, guaranteeing the transition between the railway company which owns most of the land and future interested investors. This system allows developers to mobilise capital only when the development rights are sold. This staged approach to redevelopment can be seen as minimising developers’ exposure to financial risk while allowing the project to move forward.

An important limitation to the project was the slow acceptance of the redevelopment by local residents, showing the limits of a top-down approach despite improved consultation initiatives over time. The early plans for Paris Rive Gauche received important criticism from locals which formed a highly organised network of associations including Tam-Tam --from the names of the three sectors Tolbiac, Austerlitz, Masséna. At that time, Tam-Tam was campaigning against what they saw as a future of monoculture office buildings, underground expressways, slab urbanism and the negation of industrial heritage . One Masséna site in particular became the object of contestation: the redevelopment of Les Frigos in 1998. Originally a refrigerated railway depot built in 1921 then occupied by artists and squatters during the 1990s, this derelict and vacant space attracted many for its spacious spaces and acoustic insulation. Ultimately divided into two plots after consultation processes, the municipality acquired its ownership in 2003. It has been converted to an artist studio and the municipality has worked to retain its heritage.

A Permanent Consultation Committee was set up in 1997 on the basis of a charter drawn up by the Ministry of the Environment, in order to respond, rather belatedly, to the need and obligation to accompany this major development operation with a process of participatory democracy. Since then, consultation in Paris Rive Gauche has



Figure 19: Social housing building 'Home' from the other side of the railway tracks
Source: L. Dorignon, 2017

operated on the basis of thematic working groups which bring together the public and local residents alongside key stakeholders including several local associations, the developers, the municipality of Paris and the directors of SEMAPA. The regional prefect also attends these meetings as a legal guardian of the process. This Committee is unique in France and is supported by an autonomous operating budget. The minutes from the working groups are made available to all, adding transparency to the consultation process. Other communication and information tools have been created, including a permanent project site open to the public, a website and a magazine distributed every trimester to all residents of the 13th arrondissement.

Planning and implementation

Architectural projects were chosen for their flexibility and capacity to evolve with the changing visions for the city and preferences of residents, as original residents were unlikely to be the same residents at the end of the project. Accommodating the long temporality of this urban redevelopment (1981-2025) was made a priority in the way the project itself was designed, acknowledging early the need to adjust to emerging social needs, changing climate and evolving political context.

Different architects were entrusted with the architectural coordination

of the various sectors that were designed to function as urban 'living units' for the duration of this exceptionally long project. This model has shown positive results overall, in terms of urban quality and has introduced a wide variety of urban configurations. However, throughout the project, architectural design was strictly controlled. Several procedures were used in the ZAC, including the method of preselecting architects. Although private operators were free to put together a list of three architects' names when calls for tenders for the sale of land were made, the final choice was in the hands of a collegial decision made of the municipality of Paris and SEMAPA.

The masterplan for each block gave creative freedom to architects and bidders, which has resulted in great variations between plots. While a similar practice employed in Docklands has been met with criticism, such design competitions have the potential to generate varied and interesting built form, human-scaling precincts in ways that monolithic developments do not permit. Building heights, which increase towards the eastern part of Masséna, were unprecedented in the Parisian landscape. This level of the eastern part of the precinct built above the train tracks (Figure 19) by 7 meters was a costly operation that was required to sell some of the plots to private developers. A technical accomplishment, buildings of Masséna Nord were all developed on an artificial slope as a way to avoid podium development urbanism and were mounted on springs to prevent the vibrations of passing trains. In particular, the housing ensemble Home (Figure 19) completed in 2015 was the first social housing building higher than 50m built in Paris since the 1970s. It is comprised of 188 apartments, combining 92 social housing units and 96 private housing units with home-ownership schemes, and has obtained energy-efficiency certification for its low energy consumption (less than 48 kWh/m²/year). Another particularity of this development is the diversity of dwelling types, from studio units to 5 bedrooms apartments designed to accommodate large families.

The vision for the area of Masséna stemmed from the work of architect Christian de Portzamparc and his concept of *îlot ouvert* (i.e. open-block) where no buildings are attached. The open-block concept designates "a composite of a traditional urban form with closed perimeter block developments, and a more Modernist vision of freestanding and well-ventilated mini-towers"⁶⁹. The result is a combination of clearly defined street spaces, a landmark of Parisian urbanism, and more loosely formed building arrangements. Distance between buildings in Masséna also provides residents with well-lit internal spaces and open views, but also retains visual privacy.

Overall, the main obstacle was the duration of the project, which had to accommodate changing visions and economic situations. This was overcome through attention to how the different sectors

of the project interact with each other, making sure there were some connections between the previously developed areas of Paris Rive Gauche (such as the Austerlitz and the Tolbiac sector) and the newer sectors⁷⁰ of Masséna and Bruneseau, to avoid the formation of social fragmentation and insular precincts. This attention to the social cohesion of the precinct operates not only at the precinct scale, between the sectors of Paris Rive Gauche, but also at the metropolitan scale with adjacent municipality Ivry-sur-Seine.

Application to Melbourne

Paris Rive Gauche has overcome multiple challenges involving complex urban systems such as land use, energy, water, urban greening and housing. It is regarded as a model of inclusive, quality urban design, planning integration and sustainable mobilities. Three key lessons emerge from this example as possible pathways to application elsewhere:

Firstly, the public ownership of the land facilitated a great level of control at both the metropolitan and local scale. This allowed for a tried and tested model of governance in which the centrality of functions, alongside a resilient governing entity, led to a highly agile and adaptable project. For example, the lack of public engagement at the start of the project was rectified through increased consultation and worked to reduce the mistrust between residents and developers. Another example is the adaptability of the project to emerging and more demanding goals in terms of carbon emissions and climate change mitigation, which is exemplified in the strategic direction taken by the masterplan for Bruneseau.

Secondly, social equity goals and the reduction of inequalities was placed at the core of the project. This means that the vision for and benefits of the green urban precinct have been distributed among residents of various socio-economic backgrounds. The project took into account the high level of social diversity in this neighbourhood of Paris and as a result is a strength of the project.

Thirdly, the precinct is home to a great number of urban innovation projects, which, alongside the delivery of a high number of affordable and social housing dwellings, position it at the forefront of the French urban landscape with regards to sustainable goals, social equity and urban resilience. Several urban innovation projects – the social housing, green bio-buildings have come about through competitive bids for sites within the precinct. Fostering true innovation (not surface-level) seems key in the success of the green urban precinct.

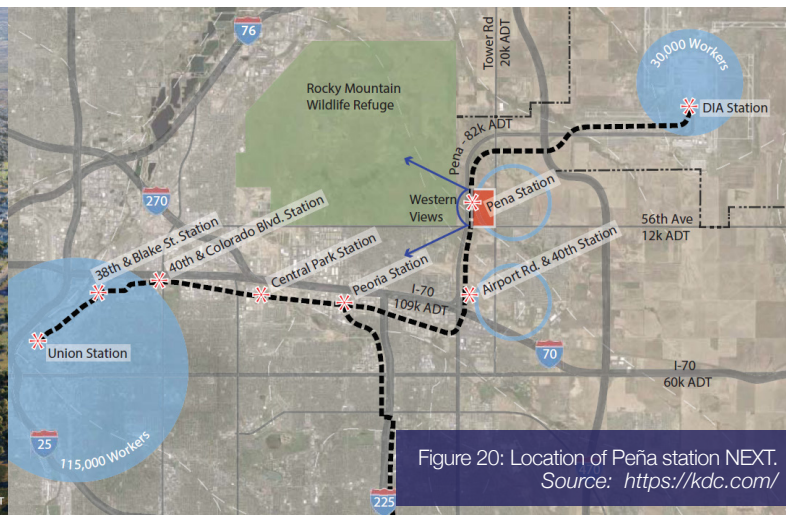


Peña Station NEXT, Denver United States of America

Overview

Peña Station NEXT is an under-construction \$500 million, 160-hectare development in Denver, Colorado, US. The project, initiated in 2014, was a collaboration between the City of Denver, Panasonic's CityNOW initiative, Denver International Airport and LC Fulenwider, a Colorado real-estate company. Peña Station provides the central hub for the development and is one stop (12 minutes) on the train service from the Denver International Airport (DIA), and only 28 minutes on the train to downtown Denver with its retail and social amenities (Figure 20). Construction started in late 2015. A seven-storey hotel and 220 apartments were built by mid-2019 and the first residents moved in.

Peña Station NEXT includes integrated and connected community where smart-grid clean energy and enhanced mobility are design principles and is inspired by the Panasonic's experience in developing the Fujisawa Sustainable Smart Town (FSST) in Japan. When completed, the Peña Station precinct will include offices, retail and hospitality, housing, hotel, health and wellbeing facilities, and parks and green space. Panasonic are providing smart energy systems and internet of things (IoT) based technologies to support the efficient and green design goals of the precinct.



What was achieved

Local

Peña Station NEXT is intended to become a self-sufficient district, providing homes and employment. The project is planned around a train station which facilitates transit to the city and to the airport, providing ready access to employment, businesses and transport. The master plan for Peña station NEXT is framed by three primary axes to tie the site together internally and two activity nodes (Figure 21)⁷³.

1. The Neighbourhood Axis: The Neighbourhood Axis is a pedestrian-oriented retail and entertainment experience comprising the key link to the train station.
2. The Innovation Axis: Showcasing the technology and forward-thinking, the Innovation Axis connects the development to the existing Panasonic CityNOW Headquarters.
3. The Eco Axis: The western edge of Peña station NEXT creates a unique setting in vibrant contrast to the urban fabric created within the site.
4. The Activity Nodes: The intersections of the three axes catalyse a dynamic and vibrant civic realm. These nodes will foster chance encounters that lead to innovation.

As the masterplan in Figure 21 and 22 shows, there is a park in the centre of the precinct, connected to Peña Station by the Neighbourhood Axis, and is edged retail and residential mixed use, a grocery store, a plaza and the wellness centre.

Peña Station NEXT has included employment opportunities within the development, as well as access to external employment hubs. When complete, it is expected to include more than 280,000 m² of

office and retail space, providing 49,000 jobs, and house 81,000 residents⁷⁴.

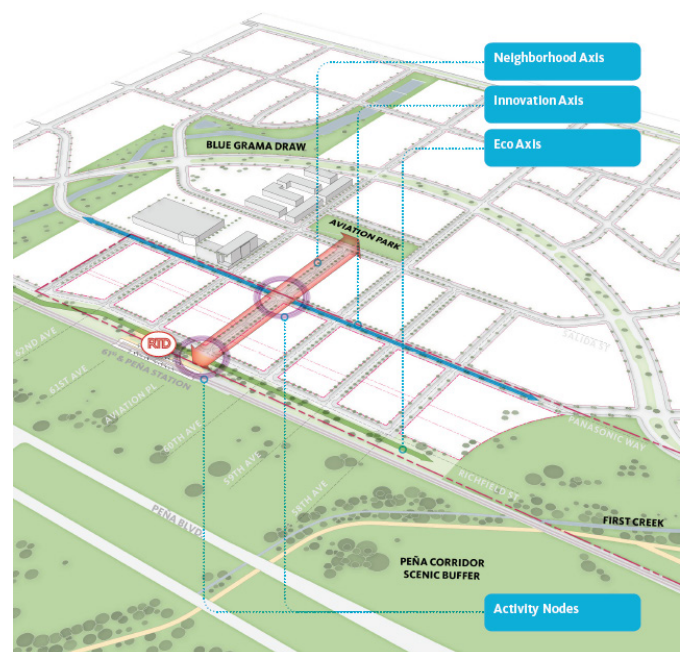


Figure 21: Peña station NEXT primary axes and activity nodes.
Source: Gensler-DEN, "61st+Peña Master Plan Report," August 2019.⁴

Panasonic are implementing transport systems developed for the FSST precinct in Fujisawa. The main modes of transportation within the precinct will be walking and biking, along with an autonomous shuttle service providing connection to the train station, offices and park and ride stations. Car-to-car or car-to-infrastructure

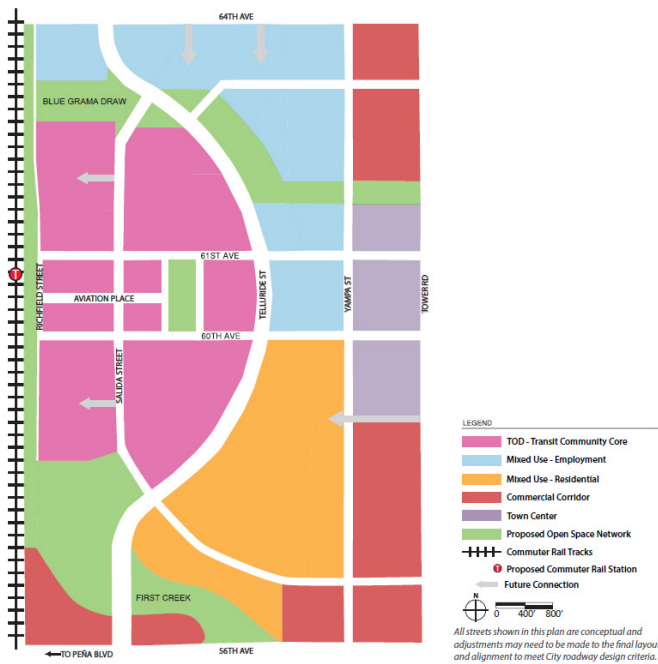


Figure 22: Peña station NEXT masterplan. Source: Design Standards and Guidelines, P. S. NEXT, 2016. ⁵

communication technology is also proposed, to improve safety and efficiency of vehicles. Information panels will provide information on the shared transport services, as shown in Figure 23. These will form part of the Total Mobility Sharing Centre which will offer sharing services for electric vehicles (EV) and electric-assisted bicycles.

The battery sharing service promotes active transport by eliminating the time and effort for charging batteries of electric-assisted bicycles and minimizing the prospect of flat batteries mid-journey. Active transport will also be supported by a network of trails for cycling and pedestrians, that covers Peña Station NEXT and links to networks outside of the precinct.

A 'Wellness Square' is proposed for the precinct, a feature of Panasonic's FSST project. The Wellness SQUARE is designed and implemented to increase social interactions and includes a range of social and medical-related services. Community health is also a consideration in the development of the precinct and includes a health & wellness centre providing traditional medicine, along with the best in alternative healthcare and health education. The community health centre is promoted as being at the "intersection of wellness, mobility and technology"⁷⁵.

Natural

The masterplan stipulates that all areas, excluding parking space, shall be landscaped with a minimum of one tree and 6 shrubs per

55 m². As discussed above, publicly accessible open spaces make the station reachable to pedestrian and bicycles. To the west of the precinct is the Rocky Mountain Arsenal National Wildlife Refuge, 15,000 acres of reclaimed weapons factory land that will provide additional open spaces for Peña Station NEXT residents' access.

Efficient

The inclusion of Panasonic in the project consortium is central to the precinct's energy efficiency systems. Precinct-wide efficiency initiatives include solar generation and extensive battery systems, IoT enabled systems management and LED streetlights. Buildings within the precinct will use heat-pump hot water services, energy-saving air conditioning, sensor controlled lighting and smart home energy management systems (HEMS).

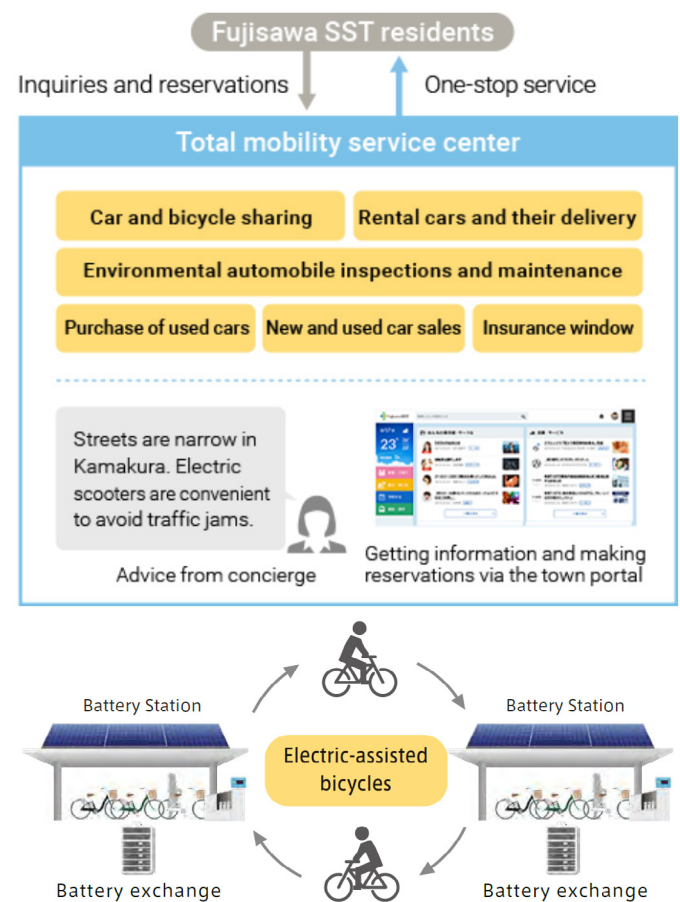


Figure 23: Mobility services, Peña Station Next. Source: <https://fujisawasst.com/EN/>

Renewable

Solar panels are installed in parking bays and at the train station to generate energy for homes, offices and other facilities in the Peña

Station NEXT project. All electricity required for homes, offices, businesses and other facilities are supplied using a Microgrid powered by renewable energy. A 1.6 MW solar photovoltaic system at the 61st and Peña rail station, and another 259 kW of solar photovoltaic on Panasonic's rooftop, help power Peña Station NEXT with renewable energy. Solar production is supported with a large on-site battery system owned and operated by Xcel Energy, forming a microgrid and providing a resilient, reliable and clean energy supply for the community. An extensive study on this system is reported as the Peña Station NEXT energy district master plan by US National Renewable Energy Lab which supports stability and reliability of the power generation and storage system⁷⁶.

The data collected through the systems installed in the precinct will enable the evaluation of business and technology models, providing the basis for improvements in subsequent developments.

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How it was done

In 2014, Panasonic decided to consolidate the operations of Panasonic Enterprise Solutions Company in Denver, Colorado, after receiving proposals from 20 U.S. cities⁷⁸. The main aspect of the Panasonic operations in Denver is CityNOW, whose mission is to introduce the smart city concept in the North America. The Denver location formed the basis for collaboration between the City and County of Denver, Denver International Airport, LC Fulerwider a local real-estate and property development company and Panasonic. The result of that collaboration has become the \$500 million Peña Station NEXT project.

The project is a public-private partnership. Stakeholders executed multilateral agreements regarding the design, ownership, and operation of the microgrid's assets, including a unique solar and storage microgrid for the station. Fulerwider Inc., the lead developer of Peña Station Next, negotiated with separate groups to develop more affordable for-sale and for-rent condos and townhouses than that of the Denver area. Housing units are expected to sell for \$300,000 and town homes \$400,000⁷⁹. KDC, a commercial development and investment company have partnered with Fulerwider Inc. to build

more than 93,000 m² of build-to-suit office space at the Peña Station Next project⁸⁰.

To increase community engagement, open discussions are initiated either publicly or individually via the city's website to hear citizens' feedback on what they would like to see in their city.

Application to Melbourne

Peña Station Next is a sample of future smart cities which will be shaped around a high level of technology. It shows how renewable energies and IoT technology can contribute to a sustainable precinct. Intelligent usage of rooftops in carport to install solar panels works efficiently in Melbourne metro train stations and other public parking. Reduction in electricity cost by running a renewable-based may also support for small businesses to start greener in post-COVID, reinforcing the transition to 20-minute living and green urban precincts.

When complete, Peña Station Next will be comparable in population and employment to Victoria's regional cities. The combination of 49,000 jobs, and house 81,000 residents is of a scale that would present a major out-of-centre development in Melbourne, indicating the advantage of having a major employer involved from the outset. In some respects, this can be seen as a contemporary version of the development of suburbs such as Sunshine, which was developed in the early 20th century to house workers for the H. V. McKay harvester factory. However, today it is less likely that people will live and work within the same precinct, but such a scale and density of multi-use precinct in outer areas of Melbourne aligns with the 20-minute city policy. In particular, the Suburban Rail Loop may provide opportunities for intensive, large-scale and multi-use precinct developments in conjunction with major employers.

Finally, the IoT-based information gathering infrastructure inside the city (including information about parking, cycling, etc.) provides a reliable data base for future planning and research. Using these data, urban management and planning can be performed reliably using updated information. It also provides valuable data for future research activities and design of precinct-scale systems. This can be supported by running the smart home energy management system (HEMS) in this project helps residents to get engaged in the efficiency improvement. Using this system, one can continuously monitor its power consumption, defines scenarios for controlled appliances and thus support efficiency energy supply storage and consumption in precinct-scale developments.

Figure 24: 1.9 MW carport rooftop solar generation at Peña rail station
Source: <https://www.namastesolar.com/portfolio/peña-station/>.





Vauban, Freiburg Germany

Overview

Vauban is a well-established “best-practice” example of a sustainable, precinct-scale brownfield redevelopment in the city of Freiburg, Germany, a city of approximately 230,000 people. The site enjoys good public transport access, with buses and a new tram line completed in 2006⁸¹. Trams run 8-10 times per hour at peak and offer access to the centre of Freiburg in under 20 minutes⁸².

The municipal government acquired the 38-hectare Vauban precinct in 1991. The site had been a French army base. The municipality ran a competition for planning proposals, which led to the development of a sustainable precinct between 1993 and 2006. Vauban has 5,000 residents at a density of 131 persons per hectare, as well as 600 jobs in a variety of small office and other businesses

Vauban has been successful in responding to the main goals set out for the development:

...a mix of housing and workplaces, alternative modes of transport, preservation of existing mature trees, protection of the green areas in the environs of an adjacent stream, a balanced relationship between external and internal spaces, and low-energy buildings⁸³

Today Vauban is exceptionally leafy, runs on renewable energy, and is a highly walkable, largely car-free neighbourhood. In many respects it shows how a sustainable 20-minute neighbourhood concept can be achieved.

What was achieved

Local

Vauban is a 'district of short distances', achieved through a combination of mixed land-use and active transport to enable localised lifestyles, and public transport services for going further afield.

The development is mostly car-free, which can be attributed to the high-quality public transport services in the city. Most dwellings provide only walk-up access, and the narrow roads are for pick-up and drop-off only, limited to only 5km/h with traffic calming measures throughout. Parking is provided at a rate of one space per two dwellings in two separate 'district parking' structures at the edge of the area, which are sold separately to houses. A local 'car-free association' encourages car-free lifestyles to promote low traffic and child-friendly streets⁸⁴. As a result, car ownership rates are very low, at approximately 170 per 1,000 residents⁸⁵. For comparison, Victoria's car ownership rate in 2020 was 770 per 1,000 residents⁸⁶.

The lack of space allocated to vehicles means significant space is available for cycling and walking; about two thirds of trips in Vauban are made on active transport⁸⁷. It is also important to the area's family-friendliness, as residential streets are safe for children to play in (Figure 25). This is likely to have resulted in the relatively high share of children in Vauban compared with the rest of the city (inhabitants below age 18: 28.1 per cent as compared to 16.2 per cent) and family households (36.3 per cent as compared to 17.3 per cent.)⁸⁸.

Vauban's successful implementation of its mixed land-use plan is evident in the 600 jobs located within the precinct. There are a range of shops in the area, as well as dedicated offices used by professional services firms, and a number of kindergartens and schools⁹⁰. Employment within the precinct consists of smaller offices, including the International Solar Energy Society, amongst other smaller organisations.



Figure 25: Children use Vauban's streets as play spaces
Source: Minh, 2016⁸⁹



Figure 26: Energy plus houses.
Source: Coates, 2013⁹²

Renewable

Renewable energy supply has been integral to the development of Vauban as a green urban precinct: 80 per cent of the electricity needs of Vauban's buildings is generated by a combination of solar photovoltaic cells on rooftops (3.2 kW on peak) and a local combined natural gas heat and power (CHP) station (12kW on peak)⁹¹. Vauban's CHP station, with an efficiency of approximately 96 per cent, provides an environmentally friendly heating supply across the precinct via a 14 km long local heating grid. Rooftop solar hot water heaters combined with hot water from the CHP system provide all of the space and water heating for the buildings. In addition, bioenergy can be used with the CHP machines, which were originally designed to burn natural gas. Similar energy generation systems are used to supply the entire city of Freiburg.

In addition to standards for low energy construction, new 'passive house' and 'plus energy' paradigms are also included in some residential and office buildings. The 'solar ship' and 'solar settlement' sections of the precinct include 58 two- and three-storey 'plus energy' houses behind a commercial block which includes retailers, grocery stores and a pharmacy (Figure 26).

Efficient

The design competition required that homes in Vauban achieve German low energy standards for energy efficiency (maximum 65kWh/sqm). This baseline was met, but some developments went further, with achievement of the extremely efficient Passivhaus standard in some buildings (15kWh/sqm). The buildings are all equipped with photovoltaic rooftop panels and produce more energy than they need. The excess energy is sold to the local grid operator based on a feed-in tariff. One sub-precinct, the 'solar settlement', generates more energy than it consumes⁹³.

As a result of the energy systems and reliance on active and public

transport, the average Vauban resident produces 0.5 tonnes of CO₂ annually, compared with the city average of 8.5 tonnes/capita/annum⁹⁴ and 15.5 for Australia⁹⁵.

Natural

The overall vision for Vauban's redesign was one of an 'urban garden'. The use of a design competition to realise this vision, as well as co-design of Vauban by residents, has resulted in a number of features that collectively give Vauban extensive urban greenery. The area's residential streetscapes, being pedestrian-priority areas with no on-street parking, have ample space for trees and understorey planting⁹⁶.

Beyond the district's streetscapes, the site also includes five resident-designed parks, as well as rooftop and façade greening, and greening of the tram tracks with a bioswale (Figure 27 and 28). The creek that forms the southern boundary of the site has been retained in fairly natural condition and is lined by large canopy trees⁹⁸.

The greening of the area was partly driven by two key principles of its development: all rainwater had to be captured and retained on site by ecological means, and all existing trees had to be retained as part of any future design proposals. Green standards were set in the design competition:

All proposals were required to preserve existing trees and other natural features including the creek running at the edge of the southern boundary of the site. Finally, the designs for Vauban were required to have an ecologically based system for catching and retaining rainwater on site. Altogether, the vision was for Vauban to be developed as an 'urban garden'⁹⁹.



Figure 27: Tram tracks set beside a bioswale⁹⁷

Vauban's extensive greenery has been attributed to the influence of its residents on the design process:

Residents were closely involved in the design of these areas, with emphasis on maintaining a maximum proportion of soft surfaces, rehabilitating a system of natural creeks, swales and wetlands for balancing local water cycles, and using native vegetation to encourage the emergence of complex ecological niches and wildlife corridors. A small number of shared open spaces are cultivated for small-scale food production under permaculture principles¹⁰⁰

How it was done

A number of key governance decisions were made through the planning process, which were both atypical and key to the project's unique and exemplary outcomes as a green urban precinct.



Figure 28: View of Vauban.
Source: Google Earth 2020

Grassroots Movements

The development of the precinct was initiated by grassroots movements under a model of citizen participation and participatory planning. After the French military vacated the site around the end of the Cold War two key groups began to contest the site for housing, which was scarce in Freiburg at the time: Freiburg University students, and an alternative housing community called the 'Independent Settlement Initiative' which was squatting in the barracks buildings and planning further expansion¹⁰¹.

While these groups ultimately purchased separate land parcels and were not active participants in Vauban's redevelopment, the initial contestation of the site meant that the Freiburg government was negotiating with ambitious, environmentally minded grassroots organisations from day one. This ultimately led to the creation of 'Forum Vauban' at the end of 1994, a not-for-profit group with five staff that represented the future community's interests and mediated between planning authorities and future residents. Forum Vauban united a wide range of different interest groups: from approaches of squatting, living in trailer homes, communal living approaches to creative milieus of craftsmen as well as middle-class, educated families looking for a healthy neighbourhood to raise their children¹⁰². Forum Vauban demanded transparency from the municipal government and came to be a closely included part of the project team, working alongside a city council committee dedicated to the development of the site. The Forum played a central role in many of the precinct's most innovative initiatives, such as advocating the 'car-free district' concept, which ultimately was so novel that it required the municipality to modify its legal frameworks¹⁰³. On the other hand, it is possible that the success of Vauban is a result of the unique composition of the community that formed Forum Vauban, that the process may not necessarily be as successful in other locations and with different residents.

Forum Vauban played a crucial role in finding future residents as well. During 1996, with most sustainability initiatives still at the early conceptual stage, Forum Vauban conducted a major publicity campaign funded by the city council, with brochures, advertisements, information stalls and public meetings to present the concept of the new district to the people of Freiburg. Considerable media attention accompanied the campaign. By the end of that year, some 1,500 households had registered serious interest in building or renting a home in Vauban¹⁰⁴.

Planning and design

In addition to the community engagement, Vauban can be seen a result of the stringent design standards that guided the precinct design and development¹⁰⁵

All proposals were required to preserve existing trees and other natural features including the creek running at the edge of the southern boundary of the site. Finally, the designs for Vauban were required to have an ecologically based system for catching and retaining rainwater on site. Altogether, the vision was for Vauban to be developed as an 'urban garden' (p.268) .

Another factor was that the alliance of design firms that won the initial contest to design the site included a landscape architect, who could respond to the community demands and design guidelines for the precinct's open space and contribute to cohesive precinct design rather than a collection of buildings.

Participatory planning

As discussed above, the development of the precinct was initiated by grassroots movements under a model of citizen participation and participatory planning. After the French military vacated the site around the end of the Cold War two key groups began to contest the site for housing, which was scarce in Freiburg at the time: Freiburg University students, and an alternative housing community called the 'Independent Settlement Initiative' which was squatting in the barracks buildings and planning further expansion¹⁰⁶.

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Design standards

Instead of a market-led design generally guided by concerns of risk management, marketability and cost minimisation, the Freiburg city government set a very ambitious set of criteria for the Vauban's redesign, reflecting community demands. A design competition was held in 1995, and in addition to the greening and energy efficient mechanisms cited above:

All entrants were to provide a master plan for a high-density housing district that would include spaces for small businesses as well as public services infrastructure including schools, kindergartens and recreational areas. Bicycle paths and sidewalks were to be given priority over automobiles and the city's light rail line was to be extended into the heart of the community to link the district to the city center (p.103)¹¹⁰.

The competition was won by the Stuttgart-based multi-disciplinary team of Kohlhoff and Kohlhoff, architects, Luz and Partners, landscape architects, and Hans Billinger, transportation planner. The project team formed the focal point for citizen involvement in the finer details of the development.

Co-development

Co-development was the main mechanism by which land was developed – termed Baugruppen (building groups) in German. Properties were bought and developed by small cooperatives of owner-occupiers, each comprising between 3 and 21 households¹¹¹. Rent seeking was averted by the city declaring land values up-front and enabled the formation of Baugruppen in the knowledge of the future housing costs, that is “the city evaluated the ability of the various Baugruppen to successfully meet the lofty sustainability goals of the district”¹¹².

Community groups continue to guide development in Vauban, the Quartiersarbeit:

...continues to organize meetings to discuss the further design and development, as well as topics such as the situation of families and elderly people or working with refugees. There is other evidence of strong community within the precinct, with cheap spaces to rent to hold community activities and lower rates of violence than the rest of Freiburg¹¹³.

The Baugruppen are an essential part of the Vauban story, providing the nexus between green and inclusive development objectives.

Renewable energy

Buildings with solar photovoltaic rooftop can sell their excess energy to the local grid operator based on a feed-in tariff. National legislation has provided a guarantee to buy this excess electricity generated from renewables at a fixed price, much higher than standard tariff, for 20 years. The regional power supply company also offers a subsidy to customers to install photovoltaic panels, and households are paid based on their supply to the grid and are provided price certainty by offering long-term contracts.

Challenges

One of the main challenges is the age of the project. There is a view amongst the community that the passion for community engagement has diminished, and developers are moving into the city looking to profit from sustainable development¹¹⁴. While this can be seen as a diminution of Vauban as an exemplar in a contemporary setting, it can also be seen as a positive if high-standard green precincts such as Vauban can be profitably repeated. Also, the mixed-use aspects of the precinct were not entirely a success:

The provision of non-residential uses within small owner cooperatives has shown a mixed picture. While some successful examples exist - particularly where members of the cooperative were ready to start a business as they moved in - interest for the sites lining the central avenue, where ground floor non-residential uses are mandatory, was initially quite slow. Consequently, most of these lots were bought by commercial developers who provided conventional rental housing above the shops¹¹⁵.

Application to Melbourne

Identifying and enabling a community of future residents early and giving it significant planning decision powers can significantly improve sustainability outcomes. Forum Vauban's role in coordination, advocacy and recruitment of a future community was critical in Vauban. However, it's important to see Vauban as an expression of the values and knowledge of its residents; the highly engaged cohort of environmentally minded residents chose this outcome. In the absence of these ready-made circumstances, we must enable these values by creating an authorising environment and by fostering capabilities in communities of future residents.

Vauban also shows that energy autonomy is possible in precinct developments, using renewables. A small central renewable electricity generation plant for the district combined with local rooftop solar can generate a large portion of electricity required in the district. This will support small businesses with a cheaper energy and protect local residence with affordable bills. The generation plant can be in the form of solar panels installed on the roof of larger buildings - they do not need to be everywhere. It can also be combined with a bio-mass plant and use organic waste to generate electricity, based on the potential of the district.

Design competitions can result in high-quality precinct outcomes, if well-specified. This draws on the notion of innovation through competition, finding the limits of possible. Also, the resulting multi-disciplinary project team can be seen as a factor in the success of the project, as it included transport, building and landscape specialists.

Urban design fundamentals are critical. Innovation and novelty are exciting, but getting the basics right is essential, and should be a major focus of the project. Build medium-density midrise, near a rail station, with district parking, without drive-to-door access, landscape heavily, mix in shops and offices, and use the landscaping to manage stormwater. You may need to vary rules (e.g. parking requirements) to allow these things, but with the right deliberative processes you will have the social license to do so.

Vauban also highlights that green urban precincts do not occur in isolation. The precinct benefits from the high standard of public transport provision within wider Freiburg, as well as a social and political support for the sustainable goals that were central to the project's development.



Vulkan, Oslo Norway

Overview

The Vulkan precinct on central Oslo is an example of the redevelopment of an industrial precinct, drawing together social, economic and green objectives and outcomes through a commitment to inclusion and sharing. The 39.5-acre precinct was redeveloped between 2004 and 2010 at an estimated cost of \$250 million¹⁶, retaining the Vulkan name of the mechanical works and iron foundry that began operating on the site in the 1870s. Vulkan is located in the centre of the city on the west bank of the Aker River (Figure 29). The project was instigated and undertaken as a public-private partnership, drawing on previous projects that had revitalised the river precinct, as well as the emergence of a post-industrial creative-focused Oslo in the early years of the 21st century.

The Vulkan site is approximately one kilometre north of central Oslo, on the west bank. The site has been developed to take advantage of a fine-grained mixed-use precinct, including offices, hospitality and retail, public open space, a hotel, cultural facilities and residences. As explained in detail below, this enables the precinct to be socially inclusive, as well as draw on the different energy requirements within and between buildings to improve energy efficiency. Vulkan is also home to one of the largest electric vehicle charging station in Europe, and is 80 per cent energy self-sufficient, relying solar, heat pumps, geothermal wells and the excess heat generated by the buildings. The underlying philosophy is that the infrastructure is shared between the site's residents and tenants, enabling the combination of appropriate technologies to mutual benefit.

The case study provides insights for the redevelopment of Melbourne's many underused or derelict industrial sites. Vulkan is a profitable, private sector led project that has succeeded through the focus on green principles, rather than in spite of them.

What was achieved

The redevelopment of Vulkan from an underused industrial space has attracted acclaim for its innovative approach to sustainability. The total area of the precinct is 1.6 hectares, and the redevelopment includes approximately 10,000 m² of office space, 14,000 m² of retail space, restaurants, 12 acres of public open space, two schools with 700 students, university campuses, a hotel certified class A for energy efficiency and 147 residential units¹¹⁷. The inclusion of national government facilities is seen as a factor in the success of the precinct, due to "the presence of the state as a form of guarantor that is willing to sign long leasing contracts for national institutions"¹¹⁸. Sustainable transport options are also an important aspect of Vulkan, including substantial electric vehicle recharging stations, 650 bicycle parks, and shared pathways through the site, that regularly break out in public squares.



Figure 29: View of the Vulkan Precinct, Oslo.
Source: Google Earth, 2020

Local

The Aker River has been a social divide in Oslo, with the suburbs to the west providing workers for the factories on the riverbanks. As the city's economy has transitioned away from heavy industry, the divide has become less pronounced and a park has been created along the banks of the river. Vulkan has designed to be permeable, to allow access and thoroughfare and to draw people in to the social and shared spaces within. The central pedestrian



Figure 30: Pedestrian thoroughfare and outdoor dining - Vulkan, Oslo.
Source: Tale Hendnes, Wikimedia Commons, used under Creative Commons Attribution-Share Alike 4.0 International.

route through Vulkan breaks out into squares for communal activities and includes bench spaces and terraces to invite people to linger and socialise within the spaces¹¹⁹. The planning for the redevelopment of the Vulkan precinct encouraged porosity, it allows for:

... different functions and interests to coexist, ensured here through a combination of creatively oriented learning institutions, cultural institutions, offices, restaurants and shops. In the southern part of Vulkan, you find apart from the Dance College, the entrance to a deli market, a bar, a hair salon, an art gallery and offices ... (p.185)¹²⁰



Figure 31: Westerdals School of Arts, Communication and Technology - Vulkan, Oslo
Source: Helge Høifødt, Wikimedia Commons, used under Creative Commons Attribution-Share Alike 4.0 International.

The northern part of the precinct was still under construction at the time of this observation, but activity related to schools (Figure 31), health facilities and sports clubs was observed.

It is also of note that there are now more jobs located in the Vulkan precinct than when it was in its industrial prime in the 1960s¹²¹. A major employer in the precinct is the Bellona Group, a global NGO that focuses on environmental issues.

Natural

Urban greening has been a major part of the transformation of the Vulkan site from an industrial complex to a green, urban multi-use precinct. The process of greening the Aker River and its surrounds has been a long-term process, with land purchases for environmental purposes commencing in the 1920s and an intensification of the greening process occurring from the 1980s to establish the Akerselva Environment Park¹²². The Vulkan project has made use of the amenity provided by the river, and a salmon staircase has been constructed, to promote fish spawning.

Attracting bees to the precinct is a prominent outcome of the

greening process. The architecturally designed beehives on top of the Dansens Hus provide a link in Oslo's bee highway to conserve bees in Norway as well as to promote pollination in the gardens in the vicinity of the precinct. A particular highlight is the 270 kilos of Vulkanhoney produced and sold in the local market at summertime¹²³. Another of the rooftops is used for residents' gardens and there is also a spice garden which provides produce for a restaurant within the precinct. The quality of urban greening was cited as a reason for Vulkan being a '2016 Global Awards for Excellence Finalist' by the Urban Land Institute of the Americas¹²⁴.

Efficient

The Vulkan precinct generates approximately 80 per cent of its power requirements. A major component of achieving this energy efficiency has been through systems design, such as using the excess heat generated by the food hall's cold storage systems for heating water for use in the precinct (Figure 32). As the developers describe, mixed-use and shared systems were crucial to the design:

Fundamental for the Vulkan area's environmental thinking is sharing and mixing of functionality. The sharing of resources such as land, services and energy creates significant environmental benefits as well as contributing to increased benefits for stakeholders. Mono-functional office parks would likely have the difficulty utilising excess heat in summer, because there is no need for this energy. An area which additionally has hotels and residences will need heat (for water) in the warmer season; when there is much excess heat from for example cooling of office spaces¹²⁵.

All buildings within the precinct have class A or B energy efficiency, the two highest classifications in the European Commission's classification system¹²⁶. At the time of construction, the hotel and office buildings in the precinct were the only class A certified buildings of their type in Norway. The class A-rated Bellonahuset provides the Bellona Group's offices as well as shops and restaurants on the ground level and is of a high standard of environmental design, reflecting the organisation's work on environmental issues¹²⁷. In addition to the efficient operations, the materials used in the Bellonahuset were selected for low carbon footprints¹²⁸.

Renewable

Vulkan has been regenerated in a sustainable and environmentally friendly way being 80 per cent self-sufficient with energy for cooling



Figure 32: Mathallen food hall, with precinct power supply underneath - Vulkan, Oslo.
Source: Helge Høifødt, Wikimedia Commons, used under Creative Commons Attribution-Share Alike 4.0 International.

and heating the buildings. As discussed above, this is possible thanks to Vulkan's common power plant which distributes heating and cooling according to the needs of precincts' buildings. The central energy supply plant is located under the Mathallen, the precinct food market in one of the repurposed foundry buildings. The plant produces ice water, and the excess heat is used, along with the heat produced within the buildings. Bellona House has solar collectors for heating water, as part of extensive solar energy systems throughout the precinct. A system of pipes distributes hot and cold water to the buildings within the precinct. Supply is also generated through the geothermal wells, 300m below the surface, as a source of reserve power for the site¹²⁹.

Vulkan is also home to one of the largest parking garages for charging electric vehicles in Europe, SEEV4-City, with 104 charging plugs. The provision of a large charging facility reflects the extraordinary uptake of electric vehicles in the city: in March 2019, almost 80 per cent of new car sales in Oslo were zero emission vehicles. The energy from the charging station is not from the precinct supply systems, however the grid that supplies the station and Oslo more broadly is 98 per cent hydro-generated and another 1 per cent is wind-powered¹³⁰.

How it was done

Much like Melbourne's Yarra River, the riverbanks were lined with factories as industrialisation took hold in the 19th century, resulting in contamination and environmental degradation. Employment and economic activity in the industrial sector had gone into decline in the 1980s, an experience shared with many other cities, leaving the area ripe for redevelopment. An important early development for the river and its environs was the contamination of the river and the associated health concerns resulting from the heavy industry. From the 1920s on, governments purchased land adjoining the river to create the Akerselva Environment Park, setting in train a long-term path for redevelopment taking advantage of the river and its environs¹³¹. Vulkan was included within the wider Akerselva Environment Park and only

became a seen as a separate development when the Oslo property development firm Aspelin Ramm purchased the site in the early 2000s, a company with previous experience in the redevelopment of industrial sites along the Aker River.

Norway had undergone a shift towards market liberalism in the 1980s, and the more corporatist planning and development functionality of the state meant that financial viability was a central consideration for urban transformations¹³². The project management and governance also reflects Norwegian planning system at that time, whereby:

A close dialogue with the commercial sector has been established at an early stage, aimed at achieving a common understanding of the needs and potential of urban centres, and at negotiating solutions as to how to implement and finance urban transformation¹³³.

This distinction between policy settings by government and detailed implementation by developers is similar to the guidelines for Precinct Structure Plan process in Victoria¹³⁴.

The potential for development profits were not only related to its low economic value for industrial use, but also the prospects of creating a high-value precinct suitable for the emerging creative industries sector in Oslo. The potential for extracting profits from the improvements resulted from the improved amenity due to the Akerselva Environment Park project (Figure 33), the proximity to central Oslo, and the appeal of industrial heritage-built form for use as studios and creative spaces¹³⁵.

Design competitions were held, with proposals for the reuse of the two main red brick industrial buildings a necessary inclusion in submission and were later afforded heritage protections. The chosen design by LPO Architects included:

... objectives of culture, food, education and housing, based on the reuse of existing buildings and new construction. Through new urban planning and zoning, the area would be linked to the surrounding city¹³⁶

The overarching Akerselva Environment Park project is considered an example of network governance, managed by a small group of bureaucrats, "who work well with each other, who share the same values, who have pretty much the same professional background, and who know how to extract resources from different public sources"¹³⁷. The director of Aspelin Ramm at the time had been an executive in the Nydalens Companie, which in the 1980s transitioned from spinning mills to property development along the Aker River, and



thus had built relationships with the government planners and had connections into the network prior to the Vulkan redevelopment¹³⁸. The project was not one guided by bottom-up and inclusive planning processes, which may reflect that the site did not have a constituency at the time, but as with other Akerselva projects it was guided by:

... interdepartmental cooperation involving culture, higher education and trade was promoted, and the municipality was strongly engaged in large parts of the building processes through the city antiquarian¹³⁹.

Government agencies also played a crucial role in the early phases of the projects, as public tenancies provided a guaranteed early income stream to the development by entering long-term leasing contracts¹⁴⁰. This also alludes to the staging of the development, with the southern areas redeveloped first.

An executive with a property development firm connected to Vulkan, or similar case studies, suggested three important factors in generating economic profits out of industrial precinct redevelopments:

- the density of the newly built areas at the site has to be high;
- old and new building stocks in the areas have to be attractive to an audience with a great purchasing power; and
- social, cultural and environmental responsibility can end up as something that is primarily taken in order to brand a redeveloped area commercially¹⁴¹.

Brand development has been part of Vulkan, by creating a visual identity both within the precinct and supported by a dedicated website that promotes cultural and culinary experiences, events and new developments¹⁴². The branding, which runs through signage, newspaper advertisements and the website, has been used to create a sense of place, a distinct location in the city where “it is the cultural diversity and the variety of possibilities to be found there that is marketed”¹⁴³.

Figure 33: Akerselva River, north of Vulkan at the Oslo suburb of Kjelsås
Source: *Algkalv* (2009), *Wikimedia Commons*, used under Creative Commons Attribution-Share Alike 3.0 unported.

Application to Melbourne

The Vulkan example offers insights for precinct development of Melbourne, for the innovative approach to shared infrastructure, and in how government can work with the development sector to foster green precinct development.

Mixed Usage and Sharing Infrastructure

The shared infrastructure to generate power within the Vulkan precinct is central to its sustainability and green outcomes. The capture and use of heat generated through other processes within the precinct, the central generation facility under the Mathallen food market and the geothermal wells indicate a benefit to considering how different uses can interact to mutual benefit. This notion of sharing also extends to the design of the open space, which has had an underlying design principle of inclusion. Precinct scale developments that include mixed uses present opportunities for innovative infrastructure planning and provision for efficient and green outcomes.

Historically, Australians could be seen as a country of people who regarded their home as their domain, as reflected in Robert Menzies' strategy for social stability and participation through widespread homeownership in the post-war years. However, Vulkan-style communal energy production presents a shift from mega-scale generation to mesa-scale, rather than reducing individual household autonomy. Also, there has been some shift in the type of housing demanded in Melbourne, due to factors such as high rates of international migration, the delaying of family formation in demographic groups such as millennials and increasing environmental concerns.

A more telling insight, in terms of green development, is how the mix of uses within the precinct, and within the buildings, enable greater energy efficiency. The example provided by the developers of reusing excess heat produced by office blocks in summer, cited above, as well as the heat produced by the cool storage mechanisms used for hot water supplies indicates the benefits of this approach.

Risk, Innovation and Property Development

Vulkan clearly provides an example of innovative commercial property development. Property developers are generally seen as risk-averse, unwilling to innovate due to the risk of substantial financial losses for failed projects. As the Vulkan example points out, it is possible to gain financial returns from innovative development, and value can be created by highlighting environmental and cultural attributes within the design. It also indicates how government can act to

support innovative developments, in the case of Vulkan through early and long-term tenancies. Not all precinct developments can accommodate national dance or tertiary education facilities, but there may other mechanisms for government to mitigate market risks for innovative projects, as suggested by the Victorian Planning Authority's proposal for an Innovation Path for approvals discussed previously in this concept paper.

The profitability of the Vulkan redevelopment was also underpinned by the long-term commitment to revitalising the Aker River, and reducing the impact of decades of industrialisation. Public sector investment facilitating development returns is not a new insight¹⁴⁴, through either amenity improvements or infrastructure, but an implication of the Vulkan example is how the form of such public investments can serve to shape development outcomes. Furthermore, the leaders of the property development company had built connections with the small network of responsible government officers during previous projects undertaken in the Aker River area. Trust between developers and government officers has been seen as an important factor in the approvals for urban redevelopment in Australia, and is likely to be important in attaining approvals for innovative urban development.

The way forward for Melbourne

This final section of the concept paper provides the conclusions and recommendations for Melbourne as a result of the research. The first part outlines the benefits of implementing green urban precincts and highlights the role and agencies of local residents. The second part addresses the opportunities to translate the design and development aspects of the five cases into Melbourne's urban fabric, both for existing suburbs and for greenfield developments, and the obstacles for Melbourne. The third part sets out a roadmap to the types of experiments and developments that should be undertaken in Melbourne. A final section formulates concluding remarks on the role of green urban precincts in Melbourne green recovery.

The benefits of integrated precincts

The case study analysis indicates that there are benefits of urban development and redevelopment that are only achievable through integrated precinct-scale design and development. In particular, this review points to the benefits of considering the multiple and interconnected urban systems at the precinct-scale, although notably this reflected a criteria for selecting the case studies. Advantages of an integrated precinct approach are evident in the shared and co-dependent infrastructure systems in Vulkan, the drainage solution in Augustenborg and the state-of-the-art systems being installed at Peña Station NEXT. In each case-study, the integrated and precinct-scale approach demonstrated advantages over a siloed approach where specific elements of urban areas, such as road networks or electrical infrastructure, are tackled independently from one another.

Precinct-scale is similar to the 20-minute neighbourhood concept, but as a reminder, there is a key distinction between the '20-minute neighbourhood' and green urban precincts. Green urban precincts focus on realising greater benefits through achieving efficiencies through systems designs: 20-minute neighbourhoods in established areas are achieved through incremental development, adding green, medium-density buildings in appropriate locations. For greenfield sites, the Victorian Planning Authority's Precinct Structure Plans¹⁴⁵ in Victoria could potentially provide a vehicle for coordinate planning efforts in Melbourne's greenfield fringe areas and provide staging and delivery mechanisms for precinct and infrastructure development. Particularly directed at greenfield developments, the structure plans provide certainty for councils and developers, reduce timelines for the delivery of precincts and ensure precincts are place-based, co-produced and innovative. However, the example of Augustenborg

indicates that retrofitting infrastructure can occur within established precincts, albeit in that case a publicly owned site.

Overall, there are three main benefits to adopting an integrated approach while developing green urban precincts whether in brownfield, established or greenfield developments:

First, a systemic approach to infrastructure delivers more efficient and widespread outcomes. In particular, precinct-scale design for energy efficiencies provides better results than a suburb with energy-performant buildings in it. This applies to green-, brown- and grey-field developments. Water management has been identified as a key issue to consider in relation to other urban systems. There are also opportunities for multiple use of by-products and mixed social activities, as demonstrated in Vulkan and Paris Rive Gauche.

Second, considering the 'greenness' of how people live around their dwelling, rather than the housing infrastructure they inhabit, affords other health, well-being and environmental benefits. All case-study analysis showed that climate-adapted, biodiverse neighbourhoods are also high-amenity neighbourhoods. Trees, parks and greening makes a number of our case study sites attractive, with rooftop and vertical greening enhancing this further in a few sites, particularly in the densely built context of Paris Rive Gauche. Flood mitigation and cooling are likely even more important in urban areas particularly affected by more heat extremes and intensive rainfall events. These outcomes are only possible when significant space is allocated to managing and reusing resources efficiently and sustainably; and need to be a priority given the mitigation and adaptation required in the face of a changing climate.

Third, integrating multiple urban systems in the planning of green precincts is the most time-efficient approach at a time when cities are facing critical environmental pressures. When concentrated efforts are required to combat climate change hazards, integrated precincts allow several aims to be achieved at once and enable a more rapid delivery of outcomes. It also unlocks innovative solutions such as edge-of-precinct parking, which creates additional public open space in activity centres, or water flows and drainage systems. Yet the integration of these systems must be guided by the matching set of policies and regulations. For instance, mobility sharing policies and regulations must for instance be clarified for e-bikes and electrical vehicles.

Urban contexts and design principles matter

Place-based and urban design and close attention to the wider urban context in which the precinct is situated was another commonality between the case-study precincts. Design principles with positive outcomes included the selection of the site, the early delivery of social infrastructure, and the innovative responses to urban challenges as a result of well-specified design competitions.

All five precincts were planned with a focus on a human-scale delivery of infrastructure and spaces. Built form and population density was forefront in each green urban precinct design, and significant mixed land use created opportunities for a diversity of practices and interaction, fostering vibrant and safe (through passive surveillance) streetscapes. Modal hierarchy prioritising public and active transport, with related spatial allocations, was also present in all five case studies. Street trees and open spaces are particularly prioritised around high-density housing, as demonstrated in Augustenborg. Importantly, the adoption of core site principles was initiated from the start, and green objectives 'baked-in' from the outset rather than added later in most case-study precincts. The experience of Paris Rive Gauche in responding to changing requirements over the duration of the project indicates a need to be progressive in approaches to standards in long-term projects, as well as to be flexible enough to cater for policy and social changes.

Green urban precincts are not only successful as a result of the design and development within the site, the wider urban environment is also critical, as shown in the Vauban example. However, if site selection is important, it infers that a precinct-scale development might not be suitable in all locations in Melbourne. The importance of surrounding infrastructure, services and amenities that form the context for the case studies indicates broader changes are required if Melbourne is to replicate these forms of development, such as the increase of access to public transport, particularly in residential growth areas. The precincts were also progressive in

promoting emerging and alternative modes of transport such as shared electrical vehicles and micro-mobility options, while also providing adequate provisions for walking and safe cycling. This was particularly exemplified in Vauban, Vulkan and Paris Rive Gauche.

The role and agencies of local residents

The case-studies emphasise the positive results of empowering local residents, in guiding projects forward, the key role of participatory planning and in establishing and coproducing the project. This is reinforced by the opposite effect, where the capacity of local groups and activists, equipped with professional-like legal and planning expertise, can oppose aspects of developments that are not seen as socially beneficial. The initial plans to redevelop the Frigos refrigerated warehouse in Paris Rive Gauche is an example of this.

It is crucial to involve the future community of residents in the master planning and design of public spaces or buildings to foster a sense of pride and a sense of belonging, and to help enduring the negative effects of everyday life in a redevelopment site. In Augustenborg, this engagement was performed in a genuinely inclusive way with CALD (culturally and linguistically diverse) residents involved in the design process. Initial urban design decisions can be strongly informed by residents, and more likely to be socially accepted and understood. More broadly, the role of local residents in driving change is also crucial in shifting discourses and practices towards walkable, car-free and midrise urban living. The importance of including a great diversity of social groups throughout all development stages was evident in all case-studies. Social media and digital engagements can be a tool for recruiting residents to guide housing developments such as co-development and Baugruppen initiatives.

In Melbourne, green urban precincts are a suitable opportunity to commit to just and inclusive goals across all areas. Plans for an early delivery of social infrastructure should be a priority outcome, as well as the provision of inclusive social, cultural and educational spaces. This not only creates destinations to which local residents can walk, it also creates a vibrant and liveable place that will attract a wide range of people. Infrastructure and public spaces should be made accessible through multiple connections to public transport networks and links to activity centres, as well as through sustainable transport including cycling and walking options. Also, there has been a tendency for precinct-scale developments to be exclusive, such as master-planned estates: Vulkan shows that precincts can have both a distinct urban identity as well as be inviting to allcomers.

In the provision of housing in green urban precincts, key measures such as inclusionary zoning, the supply of new social housing units and of diverse housing typologies should be prioritised to support

more affordable housing options and facilitate change in growth areas. Housing diversity, including the provision of four- and five-bedroom apartments in medium-density developments, provides adaptable homes for changing households and blended families. These measures have already been set out by the Home for Victorians plan but needs to be actioned at the precinct scale, particularly to keep long-term and economically disadvantaged residents. This can be supported either by building social housing units or by retrofitting and/or enhancing existing units. Finally, our case-study analysis also shows that energy efficiency and renewable energy can be made inclusive and affordable, if accompanied by financial incentives and regulations.

Energy, efficiency and mobility

Green energy has been in the main focus of case-studies, for electricity and heating supply. Solar panels play the main role in electricity generation, with support from biomass in Augustenborg, heat reuse and geothermal systems in Vulkan and biomass experimentation in Paris Rive Gauche. The new Pena Station NEXT proposes a microgrid by combining extensive solar panel installations with batteries. This is a high technology solution for increasing self-sufficiency inside a district. The precinct-scale infrastructure systems enabled Vauban and Pena Station NEXT to consolidate solar panels within the precinct to reduce technical issues. The precinct examples also provide evidence of the benefits of wider systems approaches to energy supply: Vauban, Vulkan and Augustenborg have responded to the opportunities presented by the conditions and uses within their precincts to develop connected systems of energy supply.

The case-studies also provide examples of e-mobility charging and sharing infrastructure, which is important as electric vehicle uptake is expected to increase which need an infrastructure for getting charges/discharged. Oslo has been an early adopter of electric vehicles, with 80 per cent of new vehicles being zero emissions in 2019. As demand has increased, Vulkan has included one of the largest recharging stations in Europe. Panasonic's implementation of e-bike sharing in Fujisawa, Japan has been successful and provides a good solution for moving from car-based precincts to mixed car-bike ones. As e-mobility has a big impact on the distribution power grid, tariff policies for charging and discharging in the precinct-scale need to be issues.

Internet of things data gathering infrastructure can improve efficiencies in both residential and precinct-scales. For example, sensors for cycling and traffic management, weather monitoring, security and lighting can be installed in precincts to provide updated data for urban planners, as well as researchers, to inform policy and development. Householders can get detailed information

about their energy generation and consumption and plan to increase efficiency. A simple case of this customer-engagement method is being run in Australia, called Powerpal, which can be the base of further advanced systems. Privacy policies for this information should be clearly defined considering success and failure in world-wide case studies (such as San Diego, US).

Public transport and access to employment

Two related factors in the success of green urban precincts were the quality of public transport provision and the access to employment, which were key features that enabled car free environments. The success of Vauban is in part a result of the high-quality public transport provision, with tram services running through the centre that provides access to Freiburg's employment hubs. Paris Rive Gauche is in part built on top of a railway station, which connects this sector of Paris and employment to neighbouring and more distant suburban municipalities. More importantly, the Paris Rive Gauche project was initiated with the opening of the first self-driving subway line in the capital, which efficiently linked this eastern and southern precinct to the northern and western neighbourhoods of Paris in 6 stops and 9 minutes, with a 5-minute frequency. Paris Rive Gauche was intended to become an affordable residential area – although median real-estate prices in this neighbourhood remains much higher than the rest of the metropolitan region¹⁴⁷ – as well as a new major employment and activity hub. Vulkan is on a bus route and is less than 25 minutes' walk from central Oslo. In addition to the substantial employment provided by Panasonic's offices, Peña Station NEXT is an example of a precinct development that has public transport provision at its core, with the train station allowing ready access to employment and services at the airport and in Denver's central business district. Access to the train services is to be provided through either active transport or the autonomous shuttle bus service.

Outer suburban development in Melbourne has typically been highly car-dependent and have limited employment opportunities, which has created demands for infrastructure investment¹⁴⁸. There is a move towards decentralising employment in Melbourne, with the development of suburban employment hubs part of the justification for the Suburban Rail Loop project¹⁴⁹. For Melbourne, successful green urban precincts require locations well serviced by public transport and ready access to employment, and therefore if they are to be implemented across the city, investment in services and the redistribution of services is required.

Policy recommendations

- Create a systemic approach to infrastructure in order to deliver more efficient and widespread outcomes.
- Consider opportunities for multiple use of by-products and mixed social activities in well-served precincts.
- Explicitly promote climate-adapted, biodiverse neighbourhoods to foster high-amenity neighbourhoods.
- Guide innovative solutions in green urban precincts with a set of relevant policies and regulations such as tariff policy in battery-dominant region and regulations for technological information gathering through internet of things.
- Plan for an early delivery of social infrastructure, with a focus on inclusive cultural, social and educational spaces
- Involve local residents in the design of the precinct and keep them informed at every stages.
- Inclusionary zoning, the supply of new social housing units and of diverse housing typologies should be prioritised to retain long-term residents in the precinct.

Opportunities and obstacles for Melbourne

Opportunities

The pandemic and lockdowns are seen as an impetus for the change in the way cities operate. People have experienced working from home, and while it is not likely to replace commuting to the office entirely, it is likely that there will be an increase in teleworking and subsequently a devaluation of central business district property. As the examples of Paris Rive Gauche and Vulkan show in particular, changes to the structure and subsequently the geography of economic activity opens up space for the creation of new wealth as existing use values decline. These processes or post-industrial redevelopment have also been prominent in Melbourne, such as Docklands, the warehouse and factory conversions in inner city suburbs and recently, the suburb-scale development at the Australian Paper Mill site in Alphington. Project 3000 commenced in 1992, with a focus on bringing life to Melbourne's central business district, in part through repurposing underused sites for housing¹⁵¹. COVID-19 has been an ordeal, and a source of financial as well as other forms of hardship, but it is important to also see it as creating opportunities for change¹⁵².

In Vulkan, the opportunity for private developers to profitably undertake a green urban precinct project was underpinned by the Norway government in two important ways. First, the Akerselva Environment Park project improved the amenity of the industrial zone, and the river quality in particular, providing an appropriate context for a redevelopment. Second, the government provided financial support for the project through taking early and long-term leases within the precinct. The opportunity is for government to facilitate private investment through targeted infrastructure, urban amenity and financial support processes as processes of change in the way the city operates take hold. However, the frequent tram services in Vauban, and throughout Freiburg, are a further example of government roles in supported green urban precincts.

Obstacles

The process of identifying the case studies for this concept paper resulted in five precincts developed in countries of the Global North – Sweden, France, Germany, Norway and the United States. With the exception of Paris, the metropolitan areas in which the precincts are located in are much smaller than Melbourne as well, comparable in population to Geelong (Malmö and Freiburg) or Canberra (Denver and Oslo) and are much more densely built and populated, with the exception of Denver. This implies that there are aspects of Melbourne that present barriers to the development of green urban precincts.

Melbourne is monocentric, with a strong concentration of employment and institutions located in the inner city serviced by a predominantly hub and spoke, rather than networked, public transport system. Melbourne also sprawls, historically to the east and south but also north and west in recent years, with the outer suburbs particularly low density, car-dependent and removed from both public transport and employment¹⁵³. The Plan Melbourne Ministerial Advisory Committee noted the different challenges across the city:

Much of inner Melbourne most likely already delivers a '20-minute city'. The real challenge we see is how the middle and outer suburbs of Melbourne can be adapted to provide more services closer to people, and better access to those services that are already there¹⁵⁴.

For the many outer areas of Melbourne that do not have access to high frequency public transport services, such as light rail service every seven minutes in Freiburg, or proximity to employment hubs, significant interventions would be required as pre-conditions for the implementation of green urban precincts.

In this regard, the distinction between inner-city Melbourne and the middle and outer suburbs is more important for the prospect of

green urban precinct development than distinctions between green-, grey- and brownfield sites, albeit with the higher costs associated with retro-fitting infrastructure. Given the right balance between site development costs and willing purchasers, precinct developments could occur in type of site, but networks of tram, train and bus services and employment density are mainly available in inner Melbourne. The problem this presents is that the parts of Melbourne that could most benefit from green urban precinct development and redevelopment are also the most difficult and costly to implement.

This also elucidates the difference between green buildings, which may attract high star ratings for the efficiency of their systems¹⁵⁵, and more holistic considerations of green ways of living. In addition to the precinct-scale design advantages discussed above, are out of precinct considerations need to be included, such as access to employment and services such as health, education and essential retail. Such a shift in focus from sustainable buildings to building and development that allows people to live sustainably, has implications for government and industry. For government, residential rezoning processes and authorisations, the provision of infrastructure and efficiency ratings systems would need to be revisited, while the development industry, as well as consumers, would need to reconsider their ongoing attachment to detached houses and land packages. A more market-orientated approach to this issue would be to mandate more information for housing purchases, including typical transport costs and other expenses and impacts associated with housing.

The policies recommended in Climate Change Mitigation & Adaptation in Suburban Melbourne provide detail on land use, transport, water, energy and waste, that need to be taken into account in facilitating the development of green urban precincts in Melbourne's middle and outer suburbs. This includes access to public and active transport, increased urban densities and better access to employment and service hubs¹⁵⁶.

Policy recommendations

- Strategic investments in amenity and infrastructure can guide the development of a greener, more inclusive post-COVID city.
- Supplement housing standards with assessments of the efficiencies of living in place, as well as better information for potential purchasers on cost and sustainability impacts of housing choices.
- Green urban precincts, and greener suburbs in general, require greater emphasis on efficient and integrated land use, transport and infrastructure planning.

The role of government, community and commercial actors in implementation

The five case studies included in this concept paper are results of urban experimentation and innovations, in form and structure, as well as implementation and project governance. Augustenborg is the result of the efforts of three project champions to improve the lives of social housing residents. Paris Rive Gauche has been led by the municipality and SEMAPA, with increasing engagement with the community as the project progressed. The innovations at Peña Station NEXT are a result of the inclusion of a multi-national corporation in the project consortium, alongside local developers and agencies. Vauban empowered the community to shape a precinct that responded to their requirements, and as a result is widely recognised as an exemplar of what can be achieved if development prioritises sustainability. Vulkan is was privately led, but undertaken with support from and strong connections to government. The outcomes of these varied project structures do not look alike and were achieved through different means, but all share a commitment to innovative approaches to sustainability.

The interaction of demand, supply and policy

The challenge for Melbourne is to consider how to foster innovation and creative solutions for the city's existing middle and outer ring suburbs and guide new development to better social and environmental outcomes. A 2011 study of the prospects of 20-minute neighbourhoods in Melbourne indicated that there were obstacles related to government, the development industry and housing demand¹⁵⁷, while a more recent study indicates that the spate of high-rise developments in inner Melbourne is a result of the interaction between government policy and economic concerns, suppliers and demand for housing¹⁵⁸. These studies, along with policy recommendations for addressing climate change in Melbourne's suburbs, inform the simplified framework of urban development in Figure 34, below. The implication is that what gets built is the intersection of supply and demand within the constraints applied by government and finance. Therefore, if green urban precincts, or any other urban innovations, are not currently being built in Melbourne then the implication is that it is an issue with one or more of the elements of the framework.

The framework indicates that if housing in Melbourne is to change, for both new and existing homes, how the market and institutions interact and provide barriers to and opportunities for different types of development needs to be taken into account. While the design and precinct structure outcomes are an important conclusion for this research, changing 'what gets built' is a more substantial issue.

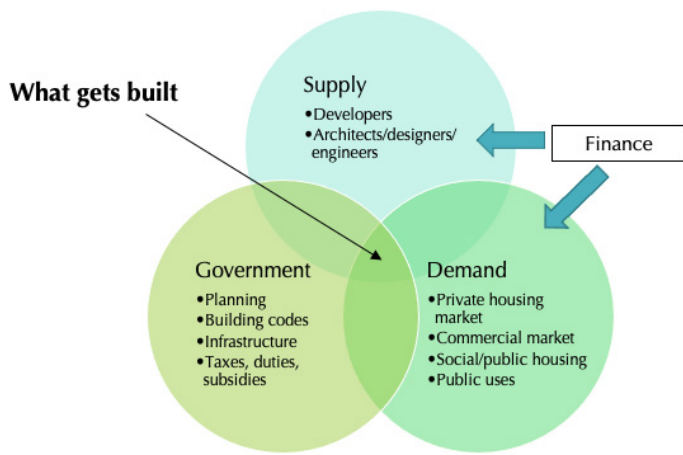


Figure 34: Framework of key stakeholders and levers in urban development.
Source: Authors, Moreland Energy Foundation, 2011¹⁵⁹, Nethercote, 2018¹⁶⁰, Scheurer et al. 2020¹⁶¹.

The case studies indicate that reducing the level of risk taken on by developers of innovative urban precincts may also increase these types of development. This includes early and deep engagement with government stakeholders, as reflected in the ‘innovation stream’, the staged transfer of public land to reduce developer exposure as occurred in Paris Rive Gauche, and the tenancies within the Vulkan precinct. By making such support contingent upon high standards of sustainability, as well as inclusion, government can facilitate green urban precincts and other experiments on greenfield sites as well within the existing suburbs.

In Victoria, these changes are starting to occur. The ongoing series of Nightingale apartments indicates a sustainable connection between developers and the market in Melbourne¹⁶², and the recent draft precinct structure planning guidelines in Victoria include the ‘innovation stream’ to provide additional support for projects that align with wider social and government goals. A shift from transfer-based stamp duties to a broad-based land tax may also engender change in urban development and property markets¹⁶³, as is occurring in New South Wales. Comparisons can be made to the transport sector. The Victorian Government has experience in mitigating project risk for the private sector in infrastructure development, such as availability payments. Also, like individual’s transport choices, housing choices also have externalities and wider impacts on public welfare through emissions and pollution, congestion and public expenditure.

While these are positive developments, the changes are small in the context of the Melbourne’s housing and development market, even if the city experiences the expected downturn in international migration and population growth. Further research on the barriers to urban innovation is required if such shifts are to occur, and the following section takes up experiments and interventions that can elicit changes to the supply of houses in Melbourne.

Experiments and Interventions

There are actions that can be undertaken in the short-term that can provide impetus for the development of green urban precincts. These recommendations also reflect the urban development framework discussed above, providing insights into aspects of the development industry and housing supply in Melbourne. The 20-minute neighbourhood pilot projects underway in Melbourne suburbs, as well as future greenfield experiments, indicate a willingness to progress and change urban development.

The Grattan Institute undertook stated preference experiments in 2011, to develop an understanding of the willingness to pay for different types of housing, and the trade-offs between form and location¹⁶⁴. Similar experiments would provide insights into the demand for housing in green urban precincts and provide confidence to developers in undertaking innovative and sustainable developments in Melbourne. Developing an understanding of the market for such housing options may also inform the development and intensification of land use around the proposed station locations for the Suburban Rail Loop. Similar experiments may also be used to determine if there is a market for office and other commercial developments as part of mixed-use green urban precincts. Objective, public-funded research is likely to have greater benefit than private-sector led research in this instance.

The recent announcement of State Government investment in social housing¹⁶⁵ provides an opportunity for precinct-scale design experimentation, drawing on the examples of Augustenborg and Paris Rive Gauche in particular. Given the designs are likely to respond to a budget allocation rather than a profit motive, there is an opportunity to promote innovative responses that are assessed on green outcomes achieved, rather than meeting mandated standards. In addition to improving the lives of residents and reducing the costs of occupancy, there is an opportunity to showcase new ways of addressing urban problems and as such instil greater confidence in the development industry.

An additional, related, opportunity is to draw on the example of Baugruppen in Vauban, that were instrumental in the design of the precinct. While undoubtedly a success in the Vauban example, in other instances the results have been less remarkable, a reflection of the distinct community residing in Vauban at the time of the project. The opportunity is therefore to develop communities of shared interest, using social media for example, that can form Baugruppen-like urban development collectives. As an experiment in urban development, social housing initiatives may provide a suitable vehicle.

Governments can mitigate risk through guaranteed income streams, but it is the outcome that is important, not the method of long-term

rentals by public organisations as occurred in Vulkan. If housing was reframed as infrastructure, similar to transport projects with dimensions of private and public good and an understanding of the benefits of facilitating interventions that contribute to a better city, then there is an argument for extending similar financial arrangements to the housing sector. While public-private partnerships are not without their critics, they are a standard method of project delivery in Victoria.

Policy recommendations

- Consider the interaction of markets and policies and the prospects for transforming Melbourne's housing and development industries, as implementation rather than design is the main barrier to green urban precincts and other urban innovations.
- Undertake stated preference experiments to test property markets and instil confidence in developer innovations.
- Make use of major government interventions in housing and the transport to leverage urban experiments.
- Governments should consider ways to mitigate developer risks to support green urban precincts, reflecting the public benefit of better housing provision.

Can precinct-scale urban interventions leave Melbourne greener and Melbournians closer to nature, as well as potentially more prosperous, happier and with more free time?

This concept paper has provided evidence of the benefits of well-planned and designed precinct-scale urban interventions from Europe and the United States. While the built form and the resulting inclusive and sustainable places to live and work provide examples for Melbourne in implementation of green urban precincts, these urban case studies have also responded to the cities and sites they are located in. Therefore, if Melbournians are to have housing choices that allow them to live closer to nature, and to be more prosperous, happier and with more free time, then the guiding principles that underpin renowned and award-winning examples of green urban precinct developments such as Vauban, Vulkan and Paris Rive Gauche are more important than their specific urban forms.

The case studies present evidence of the benefits of considering urban projects at precinct scales, in green- brown- and greyfield settings. Infrastructure and urban design undertaken with a focus on achieving efficiencies can provide better outcomes than collections of efficient buildings. The changes underway in the city, including social housing investments, the Suburban Rail Loop (amongst other infrastructure projects) and the likely shift to more working from home indicate that there are opportunities for green urban precincts in Melbourne, that provide efficient, green and inclusive homes and workplaces for the city's residents.

There is not a single pathway to implementing green urban precincts, but that there are benefits in strong interactions between government, society and the private sector. The notion of trust is a recurring theme: trusting the residents of Vauban to have a central role in the development; the trust established between the developers and public servants in previous projects in Vauban; and the need to engender trust in the Paris Rive Gauche community in response to early proposals for inappropriate developments. Trust is also important as innovation and experimentation also brings risk, which can be substantial given the finances associated with precinct development and the impact of urban environments on people's lives.

The challenge for Melbourne is in the observation that the case study projects have responded to the urban contexts and policy settings that they are sited in. Green urban precinct developments in Melbourne need to respond to the prevailing conditions within the city, or in many of the low-density suburbs with poor public transport and remote for activity centres, the prevailing conditions need to substantially change before green urban precincts can be developed. The required shifts in infrastructure provision, urban structures, and the development industry indicates that the wide adoption of green urban precincts as a development paradigm in Melbourne requires a process of transformation to be realised. Melbourne's policy makers and its development industry must be encouraged to embark on program of urban experimentation and innovation that is closely evaluated and monitored as the resulting outcomes of innovative design and development that respond to these conclusions may result in different solutions when shaped by the Melbourne's urban forms. The VPA's innovation pathway is an important indicator of this need for experimentation¹⁶⁶.

While this concept paper has focused on the role of green urban precincts in Melbourne, the conclusions are also relevant to the growth and urban form of Victoria's regional cities¹⁶⁷. The extensive expansion of Geelong in the Armstrong Creek area towards the surf coast raises similar concerns to the outer fringe developments in Melbourne, and urban sprawl has been recognised as an emerging

problem in Ballarat as the city grows to the west¹⁶⁸. Regional population growth is may increase as a result of COVID-19¹⁶⁹ and also as a result of high-speed rail to Geelong¹⁷⁰, further highlighting the importance of these conclusion for regional Victoria.

Concluding remarks

The telling conclusion for Melbourne arises from the observation that with the exception of Peña Station NEXT, the case studies included in this concept paper all commenced more than a decade ago, and in the case of Vauban, three decades ago. The underlying design

principles are also well-known: community consultation, human-scale urban form, prioritising active transport and public transport access, sustainable housing and greenery. The State Government has been promoting the 20-minute neighbourhood concept, including it within metropolitan planning strategies since 2014. Green urban precincts extends this concept by providing better places for sustainable living. A prosperous, progressive and design-capable city such as Melbourne with a global reputation for being 'liveable' has an opportunity to provide world class innovative examples of green urban precincts that respond to the city's structures and demands. The challenge is not what to build, but how to get it built with committed and long-term bipartisan political will.

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