



Business models for enabling sustainable precincts

Research Report
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Net Balance and Green Spark Consulting

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Executive summary

Sustainability Victoria's (SV) Sustainable Precincts Program aims to stimulate the development of sustainable precincts and neighbourhoods across Victoria, through:

- facilitating demonstration sites
- promoting the business case for sustainable precincts
- building industry capacity through the dissemination of knowledge and information on how sustainable precinct solutions can be applied.

Through the release of this report, SV is seeking to demonstrate the use of innovative business models for the delivery of precinct level sustainability initiatives.

This report documents research into innovative business models that have been used to finance, deliver, manage and operate infrastructure and services in sustainable precincts. The report focuses on both local and international models specifically relating to energy, water, waste and transport. These models overcome market, regulatory and technical barriers and have a positive triple bottom line outcome. The research utilised an 'innovation framework' to explore the maturity of the business models used to deliver sustainable precincts.

The research was undertaken by Moreland Energy Foundation Ltd (MEFL), Net Balance and Green Spark Consulting. It included a combination of desktop research, interviews, focus groups, and reviews of business models/plans, strategies and financial information. Forty-three projects in 12 countries were analysed, 16 of which were selected for deeper analysis based on meeting sustainability, innovation and potential-to-replicate criteria.

Six detailed case studies of real-world examples of business models used to deliver sustainable precincts have also been produced to accompany this report.

The research found many and diverse examples of sustainable precincts that have delivered a range of benefits – environmental, financial, social and economic. Innovation and government support – in project design, business model and/or approach to implementation – was important to the success of most projects. Many also faced market and regulatory challenges. Most projects were reasonably high risk when initiated and the project proponents for the majority of projects had a strong commitment to sustainability and sought more than financial returns.

Few were found to be at a mainstream commercial stage; that is, projects which incur no risk premium and offer fully commercial rates of return. Further, the more mainstream the projects were, the fewer sustainability features or outcomes they displayed. For a range of market, innovation, regulatory and other reasons, most projects which display truly innovative features, major sustainability status, and address important social and economic objectives, require at least initial support from government or 'angel investors', if only to prove up innovation and demand.

The research showed that many sustainable precinct projects have the potential to be replicated in Victoria.

In summary, the research found:

- There are many projects around the world that are showcase examples of sustainable precincts, but the market for such projects remains small.

- There are a range of business models that can apply to sustainable precincts, but no clear business model to guarantee success. This is to be expected of projects that are often 'first of a kind'.
- Innovation and support, including financial incentives and positive policy frameworks, are essential to the viability of projects.
- A number of pioneering precincts in Victoria and Australia have already implemented sustainability solutions, particularly around energy efficiency, small on-site energy generation, and water efficiency, treatment and reuse.
- International best practice can be adopted in future Victorian precincts, with particular opportunities in super-efficient buildings, on-site energy generation, car-free development, organic waste treatment, and broader 'estates management'.¹

¹ 'Estates management' refers to the ongoing management of a precinct development. Traditional roles in infrastructure operation and maintenance have the potential to be revised and extended to include a broader sustainability and lifestyle focus.

1. Introduction

Sustainability Victoria's (SV) Sustainable Precincts Program aims to stimulate the development of sustainable precincts/neighbourhoods across Victoria, through facilitating demonstration sites, promoting the business case for sustainable precincts and building industry capacity through the dissemination of knowledge and information on how sustainable precinct solutions can be applied. Through the release of this report, SV is seeking to demonstrate and facilitate the use of innovative business models for the delivery of precinct level sustainability initiatives.

This report documents innovative business models that have been used to finance, deliver, manage and operate infrastructure and services in sustainable precincts, specifically relating to energy, water, waste and transport. This report provides:

- a source of knowledge, analysing 43 projects in 12 countries for their innovative business and delivery models, and models of managing the risk across the triple bottom line
- specific real-world initiatives/examples (internationally and locally) as a demonstration of where approaches have worked before, their benefits and key barriers that had to be overcome to ensure success
- information on the commercial, social and environmental benefits/business case for each initiative.

Six detailed case studies of real-world examples of business models used to deliver sustainable precincts have also been produced to accompany this report.

The intended audience for this report is developers, investors, local councils, government departments and, potentially, the wider community.

1.1 Structure of this report

The structure of this report largely follows that of the research and analysis work undertaken for this research project.

Section 1 introduces the research report, outlines the structure and acknowledges the contributions that made the research possible.

Sections 2 and 3 cover the research project's context and outline the research methodology. Detail is provided on national and international trends in sustainability, the links to precinct development, and the potential value proposition to government and commercial developers for sustainable precincts.

Sections 4 to 7 cover the specific outputs of the project's research and analysis. Section four provides an introduction to the high-level elements of a business model which guided the research. This section also outlines the innovation framework used to analyse business models selected for inclusion in the project.

Sections 5 and 6 provide a detailed overview of the sustainable precinct projects included in the research. Section five focuses on the business models used and the levels of commercial innovation and government support required to deliver the project. Section six examines the set of sustainability opportunities available to developers working at the precinct level.

1.2 Acknowledgements

Sustainability Victoria, Moreland Energy Foundation, Net Balance and Green Spark Consulting wish to acknowledge the time and knowledge contributed by the case study informants and other industry experts, through telephone or in-person interviews and focus group sessions. A list of contributors is provided in Appendix I. We would also like to thank the members of the Reference Committee who oversaw the development of the project, including key technical staff from Sustainability Victoria and:

- Department of Transport
- Department of Planning and Community Development
- Department of Treasury and Finance.

2. Project context

Sustainability Victoria's Sustainable Precincts Program aims to stimulate the development of sustainable precincts/neighbourhoods across Victoria, through demonstration, partnerships, funding support, business case development, research, technical advice and leading thinking.

This approach is supported by research from one of the world's leading climate change research centres, UK's Tyndall Centre², which suggests that a focus on local and community scales – that is, precinct style – is more likely to engage the community in sustainability initiatives and broad behaviour change.³ Community interest in sustainability has grown, and with it, growing demand for approaches to sustainable lifestyles. New businesses and new business models have emerged to meet the increasing demand for green products and services.

Global trends also support a focus on precinct-level innovation. Increased urbanisation means that an increasing proportion of the world's population lives in cities.

Precincts provide a good scale for sustainability innovation because they are large enough to pool resources and share services, but small enough to allow experimentation and to risk innovations that would not be possible in more traditional, capital-intensive, centralised approaches for delivering energy, water and waste services to communities. At precinct level, sustainability initiatives can be integrated across energy, water, waste and transport, as well as building social capital, that is often more difficult to achieve in smaller or larger scale projects and strategies.

Among the additional triple bottom line benefits – environmental, social and economic – that sustainable precincts can deliver are sustainable transport, community interaction, health benefits, affordable and diverse lifestyles, local employment, and the development and delivery of infrastructure which is environmentally friendly and economically viable across its life cycle.

Innovations examined in the course of this research combine greenhouse gas emission reduction, energy-efficient design, water and waste minimisation, and food production, with urban regeneration, local investment, job creation, community building, place-making and business diversification.

Nidumolu *et al* (2009) concluded that sustainability is now the key driver of innovation.⁴ A focus on sustainability can open up new markets and provide new impetus for innovation that reduces costs, usually through increased efficiency or finding new inputs.⁵

However, there is no 'silver bullet' for innovation and sustainability outcomes, and sustainability requires changes in our business-as-usual approaches to just about everything we do, from energy generation, transport, water and waste management, to urban design and conventional models of running a successful business.

Emissions trading schemes, energy efficiency standards and renewable-energy requirements are all useful tools. Each is also a 'top-down' policy instrument, which can be complemented

² <http://www.tyndall.ac.uk/>

³ Shackley, S., et al, 2002, Low carbon spaces: a place based approach to CO₂ reduction, a report to the Sustainable Development Commission, UK Government, DEFRA, London.

⁴ Nidumolu, R., et al, 2009, 'Why sustainability is now the key driver of innovation', Harvard Business Review, September.

⁵ Ibid

with 'bottom-up' sustainable development. The difficulties in putting national- and state-level top-down instruments into action, both in Australia and internationally, suggest that bottom-up innovation and action led at local and regional levels, including through sustainable precincts, will be vital to the shift to a more sustainable society.⁶

⁶ Shackley, S. and Green, K., 2007, A conceptual framework for exploring transitions to decarbonised energy systems in the United Kingdom, *Energy* 32.

3. Methodology

3.1 Selecting the sample of precincts

There are a number of innovative business models that can be used to finance, deliver, manage and operate infrastructure and services in sustainable precincts, specifically relating to energy, water, waste and transport. These business models overcome market, regulatory and technical barriers and have a positive triple bottom line outcome.

Precincts can be defined as greenfield developments, brownfield developments, infill developments, or revitalisation/retrofitting of existing sites/neighbourhoods which cover a range of activities/land uses, such as residential, retail, commercial and industrial. In selecting projects to analyse for this report, the research drew from a large sample of existing national and international precinct projects that were either completed or underway.

The project attempted to cover a wide range of land uses including residential, retail, commercial and mixed use, and a wide range of sustainability infrastructure including energy, water, waste, transport and place-making or community development.

The selection process also aimed to represent significant diversity. Each project had to respond to a different set of variables and challenges – geographic, regulatory and economic – with different links to existing transport, energy, water and waste infrastructure. Importantly, the projects needed to include a broad range of business and funding models, and to represent different stages of commercial maturity.

Using these broad criteria, more than 40 potential candidates were identified for inclusion in the study from desktop research, international contacts and the results of a study tour into sustainable precincts undertaken by Moreland Energy Foundation Ltd (MEFL) in 2009. From this group, 16 projects that met the following criteria were selected for deeper analysis of the business models and enabling mechanisms used to deliver them:

1. **Sustainability** – precincts where substantial work had been undertaken to reduce the environmental impacts of energy, water, waste and/or transport systems and, where possible, place-making initiatives were also designed to increase social capital.
2. **Innovation** – precincts where the delivery of sustainable outcomes was combined with business model innovation (innovation was often directed at managing project risk, opening new markets, involving diverse stakeholders, accessing finance or redefining project goals more broadly than purely commercial outcomes).
3. **Potential to replicate** – business, finance, risk and governance mechanisms that could be replicated in a commercial setting in Victoria, to deliver sustainable precincts with potential to generate long-term, local economic value and/or broad knowledge and information sharing.

3.2 Collecting and analysing data

Three primary methods were used for collecting data: desktop research; one-on-one telephone and in-person interviews with precinct project representatives; and focus groups with Australian stakeholders working in various aspects of sustainable infrastructure. The research conducted by desktop review and key informant interviews revealed more than 40 examples of sustainable precincts, most of which have been developed in the last five years. The examples selected for case studies use a range of technologies addressing energy, water, waste and transport solutions at different scales of development.

3.3 Limitations and boundaries

In addition to publicly available information, the research sought access to information about individual projects that was not in the public domain. However, this information was not always made available, particularly in relation to financial arrangements. This restricted the scope of the analysis somewhat; however, most project key informants were willing to share a wide range of other information so that some understanding of the key elements of the business model used was achieved in most cases.

The research could not ensure that every precinct project with best practice sustainability outcomes around the world was considered. Undoubtedly, there are many other projects worthy of similar analysis; the sample chosen represents a distinct range of features and approaches that together made them most valuable for detailed analysis.

4. Business models

4.1 Introduction – business models and the creation of value

A business model shows how a business will make and sustain revenue streams greater than its costs over time. This is true whether the primary purpose is to make profits or provide a service while remaining economically viable.

A business model encompasses:

- economic elements (such as revenue sources, pricing strategies, cost structures, margins),
- operational elements (such as administrative processes, knowledge management, logistical decisions, staffing), and
- strategic elements (such as market positioning, networks, alliances, market differentiation, value creation).

There is no one business model to guarantee the success of a sustainable precinct. This is not surprising for a product that remains relatively new and reliant on niche markets and government support. In fact, it is very common with innovations at this stage in their maturity to have business models and rationale that vary greatly. This often allows private and community-sector entrepreneurs to experiment with a wide range of possible approaches, some of which may become the mainstream approach in future.

It is also clear that the more often an innovative approach or technology is taken up, the more likely that perceived risks and unit costs will decrease. This, in turn, is likely to lead to more widespread uptake due to greater economies of scale. Other factors that assist the diffusion of new technologies include:

- effects of increased learning by doing, where those designing, building or manufacturing the technology find more efficient ways to deliver the product,
- more confidence from investors and implementers in total project costs and risks (demonstration projects that provide evidence for costs and risks are particularly useful to increase investor confidence), and
- the network effects that come from increased market penetration and a growing expectation that sustainability can be incorporated into business-as-usual operations.

The results of this research also made it clear that the success of many sustainable precinct projects relied on choices made by parties to the precinct development to forego more certain short-term commercial gains for more uncertain longer term returns or value. These parties included state and local governments, developers, investors, community organisations and not-for-profit project proponents.

In a number of cases, uncertainty about future returns included a reasonable chance that the future value of the project would never achieve the financial value commensurate with the risks to which the project was exposed.

Values beyond financial return motivated those involved in these projects, including a broad commitment to sustainability, and a commitment to providing demonstration projects that would increase the overall social and market learning by doing, which increase the likelihood of future, commercially successful sustainable precincts.

The research also examined, therefore, how value was created, how markets were targeted, and the competence and competitive positioning of project proponents, as well as their economic strategies, operational strategies, ambitions and ownership structures.

This led the research team to examine the business models used by the sample of sustainable precinct developments in the context of an 'innovation framework' developed for this research project.

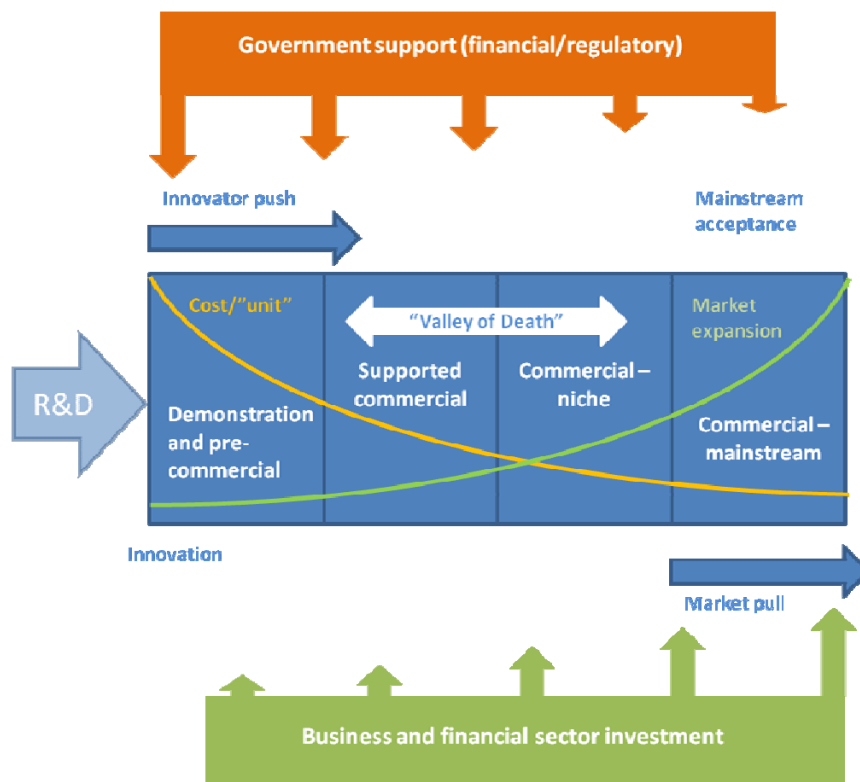
4.2 Innovation framework

The classic pattern for innovation across most economic sectors is for the first projects or products to be delivered by small, niche firms, sometimes supported by government. Successful innovations can grow, eventually displacing previously dominant designs, technologies or approaches and becoming 'mainstream'.

Depending on the economic sector, government support may remain important, even when the product has become mainstream. This is particularly true for sectors that require substantial up-front capital investment and where benefits for consumers may only be realised in the long term. Other market failures may also justify ongoing government intervention either through regulation or financial incentives.

Initial research revealed that sustainable precinct developments appeared to be following this classic innovation pathway. Consequently, this research drew on accepted approaches to the study of innovation to develop an innovation framework that examined and categorised the levels of innovation and commercial viability of each project. This framework is outlined in Figure 1.

Figure 1: Innovation framework⁷



⁷ Adapted from: Grubb, M., 2004, 'Technology Innovation and Climate Change Policy: and overview of issues and options', Keio Journal of Economics 41.

There are four stages in the innovation framework. These are:

1. Demonstration and pre-commercial

These projects are often 'first of a kind' for their location or for their level of innovation, for example, managing black water in a small-scale precinct in an inner city suburb. These projects are usually only delivered with substantial government support or at a significant loss by a committed entrepreneur who recognises other value beyond financial.

2. Supported commercial

These are projects which usually still require significant government or committed investor support, but where a greater proportion of the funding comes from the business opportunity captured by the project. Skills to implement the project remain difficult to find and contractors may impose significant risk premiums to cover their own learning by doing. Commercial finance may have been provided as an investment in innovation that may be on the verge of becoming commercial, with investors seeking to learn and gain a first-mover advantage.

3. Commercial – niche

These projects are commercial and require minimal levels of government support to be viable. They offer commercial rates of return, although they may not offer rates totally commensurate with their risks, but investors and developers focus on other values often arising from a long-term commitment to sustainability. Skills may remain difficult to obtain to implement the project. The market for these projects, however, remains a niche and they only succeed in certain geographical areas or with certain demographics.

4. Commercial – mainstream

These projects have mainstream market appeal and viability. They require little special justification, incur no risk premium and offer close to commercial rates of return. The skills required for their implementation are more readily available on the open market. Government support may be provided, however, it would usually be expected to be partially or wholly recovered over the lifetime of the project.

In the early stages of innovation, innovators and entrepreneurs are often the major drivers of change. They 'push' an innovation by building demonstration versions and seeking financial support from governments or interested 'angel investors'. This requires significant resolve and usually access to some form of financial support.

Research into innovation processes suggests that a 'valley of death' exists between the demonstration of an innovation and its full market uptake, even where a proven return can be demonstrated. This is most visible as innovations move from supported commercial status to finding an adequate commercial niche. The 'valley of death' is often a timing issue for innovations, whereby financial support disappears before it has developed an adequate market. In some cases, the innovation survives, but remains as a government-supported project because of a broader public policy commitment.⁸

⁸ Murphy L. and Edwards, P., 2003, Bridging the Valley of Death: Transitioning from Public to Private Sector Financing, National Renewable Energy Laboratory, Golden, Colorado.

5. Project studies

5.1 Introduction

The research considered 43 different precinct projects in 12 countries.

From this broader group, a set of 16 were selected for detailed analysis. The projects referred to in detail in the report have been categorised according to their position in the innovation framework and summarised below (Table 1).

Table 1: Sustainable precinct projects identified for detailed analysis

Project	Sustainability focus (energy, waste, water, transport, all)	Nature of development, use and scale, and defining characteristic	Target market	Proponent and partners
Demonstration and pre-commercial stage	Projects that are often 'first of a kind' for their location or for their level of innovation. These projects are usually only delivered with substantial government support or at a significant loss by a committed entrepreneur who recognises other values beyond pure financial return.			
BedZED, London, UK	All	Urban regeneration. Largely residential, with some office space. 100 dwellings. Showcase of sustainable community-oriented development.	Mixture commercial, housing and social housing.	BioRegional in partnership with the Peabody Trust.
Western Harbour Redevelopment, Malmö, Sweden	All	Brownfield. Mixed – residential, education, commercial, retail. 160 hectares: Stage 1 is 25 hectares. 1,000 dwellings. Housing expo project, featuring 100% renewable energy produced on-site or near site.	High-end housing product.	City of Malmö was the key proponent. Developed by multiple private developers.
Hammarby, Stockholm, Sweden	All	204 hectares. 10,400 dwellings. 200,000m ² of office space. City-owned land redeveloped as showcase new suburb.	Middle- to high-end housing product.	Stockholm City. Various private developers. Tengbom Architects.
Supported commercial stage	Projects which usually still require significant government or committed investor support, but where a greater proportion of the funding comes from the business opportunity captured by the project. Commercial finance may have been provided as an investment in a technology innovation that may be on the verge of becoming commercial, with investors seeking to learn and gain a first-mover advantage.			
Docklands, Melbourne	Water, energy efficiency	Brownfield. Mixed – residential, commercial, retail. 200 hectares. Dockside industrial land redeveloped by government authority.	High-end, inner-city apartment market.	VicUrban and various developers.

Project	Sustainability focus (energy, waste, water, transport, all)	Nature of development, use and scale, and defining characteristic	Target market	Proponent and partners
Subi Centro, Perth	Transport	Brownfield. Mixed – housing, parkland, commercial and retail. 80 hectares. 1,500 dwellings. 120,000m ² of new commercial retail space. Development focused around new major public transport infrastructure.	Predominantly commercial, 10–15% dedicated to social or affordable housing.	Subiaco Redevelopment Authority, private developers.
Hepburn Community Wind Park, Leonards Hill, Victoria	Energy (renewable)	Community-owned, renewable-energy facility.	Community.	Future Energy Pty Ltd, Hepburn Community Wind Park Co-operative Ltd.
Woking, UK	Energy (distributed generation)	Retrofitting suburban centre. Mixed – residential and business. Population of 90,500. Innovative approach to local low-carbon energy generation, driven by local government climate change policy.	Residents of existing suburban centre faced with fuel poverty issues.	Woking Borough Council, Xergi, Thamesway ESCo.
Portland Streetcar, Portland, Oregon USA	Transport	Part of brownfield regeneration. Public transport. Runs along 4-mile alignment. Developer-funded public transport.	Public, with a focus on occasional public transport users.	City of Portland, Portland Development Commission, Portland Streetcar Inc (not-for-profit).
Vauban, Freiburg, Germany	Transport, energy	Brownfield (disused army barracks). Predominantly residential with some retail. 38 hectares. About 2,000 dwellings. Community-driven best practice in environmental and social sustainability.	10% social housing, remainder aimed at middle market with a high proportion of owner occupiers.	Many key stakeholders and proponents: Freiburg City, Forum Vauban (community not-for-profit), co-housing groups, private developers, local energy services company, Car Free Association Vauban.

Project	Sustainability focus (energy, waste, water, transport, all)	Nature of development, use and scale, and defining characteristic	Target market	Proponent and partners
Royal Seaport, Stockholm, Sweden	All	Brownfield site. Mixed – residential, retail and commercial. 236 hectares. 10,000 dwellings. 30,000 new office spaces. Clinton Climate Initiative project, building on experience of Hammarby.	Planned to include a range of housing types for both purchase and rental, along with community facilities and mixed use.	Stockholm City is the landowner, and will closely control the development of the site in partnership with multiple private developers.
Dockside Green, British Columbia, Canada	Energy (district heating)	Brownfield site. Mixed – residential, commercial, retail, light industrial uses. 15 acres. 26 buildings totalling 1.3 million square feet. Home to 2,500 people. City council driven project, delivered by private developers.	N/A	City of Victoria, Windmill Developments, and VanCity Enterprises.
Elephant and Castle, South London, UK	All	Regeneration. Mixed – residential, commercial and retail town centre, green spaces. 70 acres. 75,000m ² of retail space. 5,200 new and replacement homes. Regeneration project driven by local government. Looking to bundle energy, water and data services to deliver innovative service offering.	N/A	Southwark Council and the London Development Agency.
Commercial – niche stage	Projects that are commercial and require minimal levels of government support to be viable. They offer commercial rates of return, although they may not offer rates totally commensurate with their risks, but investors and developers focus on other values often arising from a long-term commitment to sustainability. Skills may remain difficult to obtain to implement the project. The market for these projects, however, remains a niche and they often only succeed in certain geographical areas or with certain demographics.			
One Brighton, London, UK	All	Urban regeneration (site formerly a car park and workshops). Largely residential, with some retail and community space. 172 apartments. 2,000 m ² retail/community space. Commercially successful project delivering high-level sustainability outcomes.	Middle-market housing.	BioRegional Quintain, in partnership with major housing developers Crest Nicholson and Quintain Properties.

Project	Sustainability focus (energy, waste, water, transport, all)	Nature of development, use and scale, and defining characteristic	Target market	Proponent and partners
Ecovillage at Currumbin, Gold Coast	Energy, water and materials	Semi-rural greenfield. Predominantly residential with some commercial and retail. 110 hectares. 144 homes. Fully private, strong focus on community development and ecological protection.	Includes a range of pricing levels, however, overall, relatively high end.	Land Matters Currumbin Valley.
Christie Walk, Adelaide	All	Inner-city infill development. Residential. 2,000m ² . 27 dwellings. Interpretation of co-housing development model, focusing on community creation and resource conservation.	Initially built for those directly involved in the cooperative, but has broadened to target those looking for an inner-city development with a sense of community.	Small cooperative committed to eco city development.
Flexicar, Melbourne and Sydney	Transport	Car-share provider.	Various, focusing on residents and businesses in city and inner suburbs.	Flexicar.
WestWyck, Melbourne	All	Regeneration of disused school building. Residential. 30 townhouses/ apartments (when complete). Small, grassroots development showcasing design, technology and community cohesion.	Premium housing product.	WestWyck (private developer).
Commercial – mainstream stage	Projects with mainstream market appeal and viability. They require little special justification, incur no risk premium and offer close to commercial rates of return. The skills required for their implementation are more readily available on the open market. Government support may be provided, however, it would usually be expected to be partially or wholly recovered over the lifetime of the project.			
Aurora, Melbourne	All; recycled water is landmark outcome	Greenfield. Predominantly residential with some commercial and retail. 630 hectares. 8,000 homes. Project showcasing mass-market housing with higher energy and water performance. Innovative use of covenants to deliver sustainability outcomes.	Standard market for suburban development.	VicUrban (state government developer).

5.2 Project business models

The business models used by the project proponents were highly varied. They ranged from conventional build-sell models used in the property sector, to more innovative approaches that sought to create a long-term revenue stream from delivery of a service, as well as some hybrid models that mixed conventional development with innovation at a precinct scale.

The following section explores the projects in more detail, according to their position on the innovation framework and the key success factors of the risk, ownership, finance mechanisms and value created in their delivery of sustainability outcomes.

5.2.1 Projects at demonstration and pre-commercial stage

Subsidised projects

While various developments achieved high-level sustainability outcomes, many followed typical development business models to achieve this, with any additional costs associated with sustainability features covered through public subsidy/grants/funding. These projects often sought to showcase new technologies, progressive design and other technical innovation, without seeking a new approach in project delivery. Such projects often demonstrate the technical viability of new construction techniques, various sustainability infrastructure items and market interest in sustainable urban development. Through doing so, they have contributed significantly to the knowledge and acceptance of sustainability in the development and construction industries.

Reliance on government subsidies and grants, however, can affect the replication possibilities of a project's business model and delivery approach. When viewed within the innovation framework, projects which are heavily reliant on subsidies tend to sit in the 'experimental' or 'demonstration' phases. This noted, lessons from these projects often help future projects devise a more efficient delivery approach and a viable business model, and so progress to higher levels of maturity when viewed through the innovation framework.

An example of this can be seen in the experiences of UK sustainability group BioRegional. BioRegional's fundamental function is to develop business solutions to sustainability problems, and they have delivered a number of urban development projects. The approach taken at **BedZED**, their first sustainable precinct, was heavily reliant on funding from a housing trust and, they reported, would not have been realised as a commercial proposition. The philanthropic nature of the housing trust involved meant that value was derived from the groundbreaking social and environmental outcomes of the project, rather than achieving commercial rates of return.

It was, however, a huge success in demonstrating how far building design and construction could go towards

BioRegional, UK

Co-founder of BioRegional, Pooran Desai, stressed the importance of subsidised projects such as **BedZED** as an opportunity to test design and technology as well as market interest.

The experience allowed BioRegional to identify opportunities to reduce the cost of sustainable development (for example, through supply chain education, smarter design and material use, car parking reduction), and increase the mainstream market appeal of the product.

These lessons formed the basis for establishing its own property development company and attracting a London Stock Exchange listed company, Quintain Estates and Development plc, as its financial backer.¹⁰

achieving self-sufficiency in space heating, and promoting high-level social outcomes for residents.⁹

The sustainability lessons from this experience were then applied at the BioRegional Quintain Ltd partnership project **One Brighton** (discussed in more detail later in this report) to create a business model that delivered best practice sustainability outcomes without public funding and within a conventional development cost envelope, while maintaining a satisfactory commercial return of 15%.¹⁰

Other projects that relied heavily on public subsidies include:

- **Western Harbour Redevelopment**, Malmö, Sweden – developed as a demonstration project for a major housing exposition and, as such, attracted a high level of subsidy from both the Swedish government and European Union.¹¹
- **Hammarby**, Stockholm, Sweden – demonstration project which attracted subsidy funding for up to 30% of total infrastructure investment.¹²

5.2.2 Projects at supported commercial stage

Public partnership/leadership

Another approach, utilised broadly in the examples analysed, involves a project being led by a government entity, such as a local government or development authority. In these examples, private developers may be given an incentive to buy part, or all, of the site on the condition that they build to a strict set of environmental standards set by the public entity.

This includes a range of approaches from environmentally sustainable design (ESD) guidelines and statutory requirements, to individual deals with developers. Examples of this include Melbourne's **Docklands** precinct, **Subi Centro**¹³ in Perth and BioRegional Quintain's planned project **Middlehaven** in the UK. Advantages of this approach include:

- the ability of the developer to balance the additional costs associated with building best practice outcomes, with cost savings on land and greater certainty in the planning process,
- an opportunity for public entities such as local government to significantly influence urban development outcomes, with sale contracts and covenants in many cases providing greater certainty than the planning process, and

Subi Centro, Perth, Western Australia

The establishment of a public authority to facilitate the delivery of an urban renewal project has been critical to the success of a number of projects studied.

Subiaco Redevelopment Authority (SRA) was established to coordinate the delivery of this important urban renewal project in Western Australia, including the sale of public land and associated development agreements. It also acted as the planning authority for the project.

Geoff Glass, Director Development Services at the City of Subiaco, noted that a separate authority was vital to the success of the project, partially to separate the development process from the volatility of local politics and interests.¹³

⁹ Desai, P., 2010, *One Planet Communities: A real-life guide to sustainable living*, Wiley & Sons, London.

¹⁰ Pooran Desai (BioRegional), 3 May 2010, personal communication (interview)

¹¹ Michael O'Hare (E.ON), 11 May 2010, personal communication (interview)

¹² Ingmarie Ahlberg (Stockholm City Council), 18 May 2010, personal communication (interview)

¹³ Glass, G., 2005, 'Honey, I've sunk the railway line. Do you want me to tidy up the rest of the town?', paper presented at Transit Oriented Development Conference Fremantle, July 2005, Western Australia.

- a more cooperative planning and development process, with both private and public participants working towards a mutually beneficial outcome.

Where agreement to address sustainability more comprehensively leads to greater certainty around other aspects of the planning process, developers can justify increased capital cost against decreased risk and uncertainty.

Partial subsidy as part of an innovative business model

A number of projects demonstrated genuine business model innovation, whilst still relying on subsidies in some form. Subsidisation is often required to offset the risk of innovation and can lead to a concept being ‘proved’, giving confidence to private investors, which may lead to full privatisation of future projects. It is important to note that full privatisation is not necessarily the desired model, or the only one that benefits the public purse. In many cases, these projects include functions that a public entity would partially fund regardless of ownership (for example, public transport services), and so innovation may actually lead to a reduction in the public contribution required (as the **Portland Streetcar** project demonstrates).

Hepburn Community Wind Park was developed as a grassroots approach to medium-scale, renewable-energy development. The project demonstrates the potential of a community-ownership model to deliver best practice sustainability outcomes for deployment as part of a precinct development. As Australia’s first community-owned wind park, the project was successful in obtaining \$975,000 and \$750,000 from the Victorian Government’s Renewable Energy Support Fund and Regional Infrastructure Development Fund respectively, towards a total project cost of \$12.9 million.

Conceived and developed by private firm Future Energy and community group Hepburn Renewable Energy Association, as planned, ownership was eventually transferred to a trading cooperative (Hepburn Community Wind Park Co-operative Ltd) and shares sold in the venture via a share offer, specifically targeting local residents as investors.¹⁴

Hepburn Community Wind Park, Victoria

David Shapero, Managing Director at Future Energy, highlighted the importance of the company being involved in the first community-owned wind farm in Australia. Having seen the potential of such projects in countries such as Denmark, Future Energy identified the valuable experience that could be gained from delivering such a project here. By being the first, the company could develop a distinct competitive advantage in this business area.¹⁴

The fundamental aim of the project was to develop a community-owned, renewable-energy project that would provide sustainable energy for Hepburn Shire. The key project driver has been community interest in developing a renewable-energy project to provide for the region. The community-ownership structure, based around a public share offering to raise capital, has been a critical success factor for a range of reasons, including:

- contributing to attracting broad community support for the project, particularly given the often controversial nature of wind-energy facilities in rural areas, and
- local residents’ ability to see value in a local, community-driven project to address climate change, even if financial return may not have been viewed as sufficiently attractive by a commercial entity.

There has been a strong response to the share offer, which was in its final stages at the time of writing. Hepburn Wind expects applications to exceed the value of the share offering. More than half of the applicants are local to the Hepburn area. The public share offer has secured over \$7,800,000 in investment. Remaining costs will largely be paid through a \$3,100,000 financing facility from the Bendigo and Adelaide Bank.

¹⁴ David Shapero (Future Energy), 14 May 2010, personal communication (interview)

Woking Borough Council, driven by internal climate change and fuel poverty policies, has developed a business utilising the energy services concept that focuses on providing an energy *service* such as heating or lighting rather than simply supplying the gas or electricity *products*. Energy services companies (ESCOs) can capture the long-term benefits of managing energy costs in the context of uncertain energy cost futures. The ESCo usually provides the capital for investment in low-emissions energy supply options as well as undertaking energy efficiency work. Setting up an ESCo also allowed the Council to offset the high up-front capital cost of the equipment, to guarantee a return on investment and to manage the risk associated with the time commitment and need for qualified operation and maintenance staff to manage distribution generation infrastructure. In **Woking's** case, the ESCo was also an attractive vehicle to:

- manage the long-term risks of increases in energy costs,
- meet their stated commitment to significant emissions reductions at a council level, and
- provide a mechanism to hypothecate savings from Council's energy expenditure for delivering solutions to fuel poverty in the Woking area.

The ESCo customer is able to shift the risk of investments in an area where it does not have the skills to optimise long-term performance, while the ESCo benefits from economies of scale and scope. **Woking** Borough Council identified this model as having significant potential in both increasing uptake of local, low-carbon energy generation, and providing a long-term revenue stream to allow it to invest more in other carbon mitigation strategies such as energy efficiency and renewable energy (particularly with a focus on combating fuel poverty). The council established Thameswey Ltd., an energy and environment services company, with the aim of delivering sustainable energy solutions through public/private joint ventures in the Woking area and beyond.^{15 16}

Thameswey ESCo, Woking, UK

Woking Borough Council's approach to the energy services model demonstrates the proactive role local government can play in decarbonising the energy supply.

According to John Thorp, Managing Director of Thameswey, **Woking** Council took advantage of an opportunity many private entities would not have been able to make viable. Access to discounted finance through central government, as well as fundamentally different measures of success that include sustainability outcomes, have allowed the scheme to provide significant returns for reinvestment in local greenhouse gas reduction programs.¹⁵

ESCO – Snapshot

An energy services company (ESCO) is a company created to offer a range of energy *services* to replace traditional energy *products* such as electricity and gas. This is often delivered through an energy services contract which recognises the fact that most organisations are not focused on purchasing energy such as electricity as part of their core business. In most instances, energy is purchased as a way of supplying particular services that enable them to operate (for example, a supply of heat, light and the power to run air conditioning, computers and other equipment). With this basic premise in mind, many organisations are now interested in the potential to reduce the financial and environmental cost of the provision of energy services by outsourcing the supply to an expert third party.

¹⁵ John Thorp, 11 May 2010, personal communication (interview)

¹⁶ Thompson, B., 2007, Decentralised Energy – In the Victorian Context, report for the Brian Robinson Fellowship, 2007–2008.

Outsourcing energy services allows a specialist ESCo to realise efficiencies in energy use and greenhouse gas emissions for an agreed cost. That is, the energy service provider continues to supply the services (lights, heat and power) but finds more efficient (and therefore cheaper and less greenhouse-gas intensive) means of providing the service. These efficiencies in service delivery provide direct benefit to the organisation in environmental and financial costs and enable the ESCo to make a return.

Portland Streetcar exemplifies the reinterpretation of public service provision. In this case, public transport in the form of a streetcar or tram route was made possible through a contribution from the private sector, which stood to benefit financially from its deployment.

The City of Portland in the United States has instituted a range of measures since the 1960s aimed at controlling suburban sprawl and maintaining vitality in the city centre. A key element of this has been development-oriented transit, and the Portland Streetcar is a landmark project adopting this approach.

The City of Portland established increased development densities on a large tract of underdeveloped land close to the city centre, and linked these densities to public improvements, including the streetcar. Through this mechanism, land holdings adjacent to the planned route of the streetcar were assessed and levied according to the expected value they could capture, due to accommodating higher density residential development close to the streetcar link.

Developer contributions collected in this manner contributed US\$19.4 million of a total project cost of US\$103.15 million, providing close to 20% of the project cost. Private finance totalling US\$3.5 billion has been invested within two blocks of the streetcar route since its construction.^{17 18}

Managed market

The concept of a 'managed market' approach to precinct-scale development demonstrates a way for government to leverage the benefits of private sector involvement in projects, while maintaining control over outcomes. Government usually uses a regulatory mechanism, perhaps combined with funding awarded on a competitive basis, to set the boundaries of the outcomes to be delivered. It then allows the market to deliver the identified outcomes.

In the projects that exemplified this approach, there was an overseeing body, generally a city council or similar, that set the direction, boundaries and outcomes of the project. The project was subsequently delivered by a range of private and public entities operating within this framework. This demonstrates innovation at two levels: where a public body is setting the scene for best practice development in the precincts (often regulating and incentivising in

Portland Streetcar, USA

Rick Gustafson, Executive Director of Portland Streetcar Inc., noted that developers were "falling over themselves" to agree to the levy proposed by the City of Portland. Because the benefit was so clearly commercial, investors were able to see the direct benefit they would derive from their proximity to a streetcar route, through its provision of high-quality access to the area.¹⁸

The streetcar has provided significant environmental benefit through reducing private car use; the broader social and economic benefits to the area are arguably the greatest success of the project.

¹⁷ E. D. Hovee & Company, LLC, 2008, Streetcar-Development Linkage: The Portland Streetcar Loop, report prepared for City of Portland Office of Transportation, Portland, Oregon.

¹⁸ Rick Gustafson (Portland Streetcar Incorporated), 19 May 2010, personal communication (interview)

order to do so), and other entities are innovating to deliver the components of this high-level ambition.

The urban regeneration suburb of **Vauban** in Germany is an example of multi-faceted innovation. Here, several public and private sector stakeholders redefined traditional roles and developed an overall delivery model that achieved an integrated best practice environmental, social and economic outcome (see Figure 2). With strong community participation, delivered through a not-for-profit engagement organisation, Forum Vauban, the city council closely managed the sale and redevelopment of the land by clearly setting requirements, boundaries and incentives to ensure best practice environmental sustainability and social outcomes.¹⁹

Figure 2: Vauban managed market

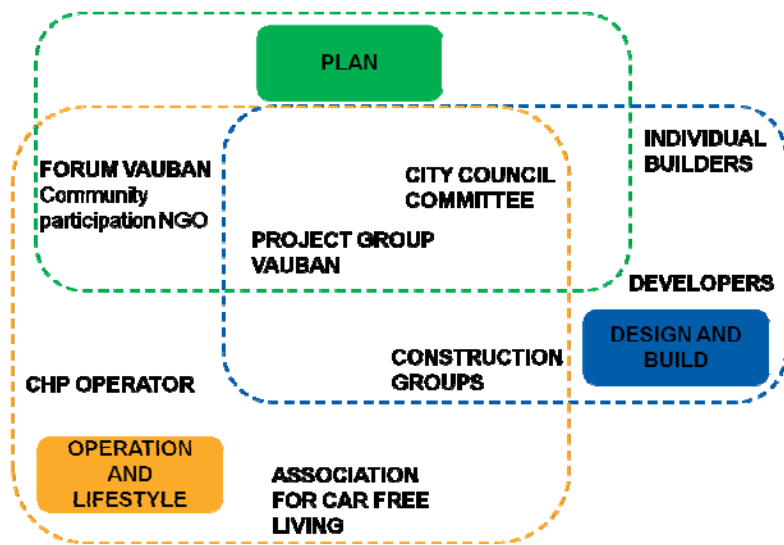
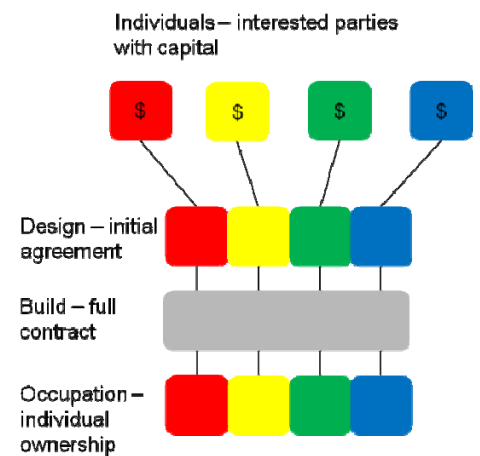


Figure 3: Construction community development model²⁰



Two key elements of this innovation include:

- Construction communities (see Figure 3): Based on the co-housing concept (see text box), construction communities involve a group of individuals with a common vision for living forming a cooperative to develop an apartment building on their terms. Through the master planning process, the local council prescribed that a large number of the sites within the broader **Vauban** development would be reserved for construction community projects. These communities form either organically or in a structured manner, facilitated by a project management body. A formal cooperative is established by the group, to be responsible for financing, project management, cost control and for the accounts of the project. The approach combines owner-building with

Co-housing

A concept gaining popularity in Germany and the United States, co-housing provides an opportunity for individuals to pool resources to develop medium-density housing, rather than purchasing 'off-the-shelf' housing products. Bypassing a traditional developer allows the groups to build their needs into design, create a sense of community and, for some projects, achieve capital cost savings.

¹⁹ Scheurer, J. and Newman, P., 2009, Vauban: A European Model Bridging the Green and Brown Agendas, case study prepared for Revisiting Urban Planning: Global Report on Human Settlements 2009.

²⁰ Adapted from: Schwander, www.innovation-academy.de

medium-density housing, and has a variety of potential financial, social and sustainability benefits. These include reduced tax on land acquisition, improved sense of community within the building and a higher likelihood of going beyond minimum building standards.²¹

- **Car-free living:** Another central component of the success of **Vauban** as a model of sustainability has been car parking management. Car parking has been separated from the individual housing unit both physically, by providing a number of centralised garages (see Figure 4 below), and financially, by establishing a separate organisation to manage the sale and upkeep of spaces in these garages. Residents with cars purchase a car park and pay an annual fee for maintenance of the garage. This has made the cost of car parking an up-front, separate and optional expense to residents. The Association for Car Free Living, a not-for-profit group established for the purpose, manages this aspect of the development, removing the developer and local government from the financial risk of this system.²²

Vauban, Freiburg, Germany

Meinhard Hansen, PassivHaus architect and resident of **Vauban**, was involved in some of the first of **Vauban's** 'construction communities'. One of the critical lessons he took from this was the importance of a robust governance structure and appropriate technical expertise. Identifying a business opportunity in this, he set up a project management company tailored to the needs of groups wishing to build their own apartment building. This has led to a more streamlined development process, a reduced chance of dissatisfaction amongst the membership of the co-housing groups, along with a new area of business.²¹

Figure 4: Vauban development plan



²¹ Meinhard Hansen, 12 May 2010, personal communication (interview)

²² Andreas Delleske (Forum Vauban), 22 April 2010, personal communication (email)

The success of **Vauban** was defined by the ability of the city council to create a managed market made up of boundaries and regulations, supported by infrastructure provision and incentives. This enabled commercial interests to be managed while social, environmental and broader economic outcomes were delivered by a range of stakeholders.

Other examples of the managed market approach include:

- **Royal Seaport**, Stockholm – Stockholm City is managing the redevelopment of a 236-hectare piece of ex-industrial land, owned by the city. The project is to be part of the Clinton Climate Initiative, with the city ensuring a best practice sustainability outcome through both regulation and collaboration with developers.²³
- **Elephant and Castle**, London – Southwark Council, in partnership with the London Development Agency, is embarking on a major urban renewal project. The project includes a commitment to best practice environmental sustainability outcomes, and will ensure both private and public sector stakeholders work to achieve this through governance and statutory mechanisms. An important innovation is the establishment of a multi utility services company (MUSCo), which will build on the energy services model by adding water and information services to deliver a fully integrated offering.²⁴

5.2.3 Projects at commercial – niche stage

Projects in this stage of the innovation framework demonstrated relative commercial viability by capitalising on a niche. In many cases, they have been delivered through a genuine commitment to achieving best practice in sustainability and have been willing to sacrifice, or are not driven by the need for, a commercial return to achieve this, noting other social and environmental benefits/value. Some of these projects have had a minimal level of government involvement; however, this involvement has not usually been the final determining factor in project success or failure.

However, some proponents also highlighted that, with the benefits of hindsight and a subsequent improvement to the development process, their projects could have achieved a greater return, particularly through reduced planning and build time. This indicates potential for broader market adoption of projects currently considered niche. It also illustrates that the process of demonstration to commercial transition is always difficult and that it is in delivering projects that substantial learning by doing occurs. The lessons of initial demonstration projects can provide later projects and investors with lowered risk and cost savings.

These niche projects also demonstrated a variety of business model innovations, largely designed to manage the additional costs associated with achieving best practice. These are characterised by the following:

Increased yield

Some projects, including **One Brighton**, innovated by essentially spreading the additional cost over a greater number of units and changing the product offering. When the project's joint venture partnership, Crest Nicholson BioRegional Quintain LLP, secured the option on the Brighton site, there was an existing development permit for 80 residential units. Through a variety of measures, including reducing on-site car parking to almost zero as part of the project's sustainable transport plan, the final yield was increased to 172 units plus a small amount of community space. This not only provided more units to sell, but improved the

²³ Ingmarie Ahlberg (Stockholm City Council), 18 May 2010, personal communication (interview)

²⁴ Moseley, T., 2005, Elephant and Castle Regeneration Project – Sustainable Infrastructure, presentation Southwark Council, UK.

viability of key sustainability infrastructure, such as the biomass boiler, by delivering greater demand for services. While the project included many other important innovations and factors, this simple shift was critical in making the project viable. In fact, the project achieved an internal rate of return of around 15%, matching standard commercial returns for business-as-usual or standard development.

Importantly, the project was given permission for the increase in unit numbers *because* of its sustainability features, highlighting the potential for planning authorities and developers to see mutual benefit in sustainability solutions. It is also important to note that the developer did not add a 'sustainability premium' to the housing product sold at **One Brighton**, so this was not the mechanism used to recoup costs, although this approach is discussed later in this section.²⁵

Separation of up-front and ongoing cost and risk of sustainability infrastructure

While a critical element of **One Brighton's** success was the ability to increase yield from the site, the developer also recognised the need to separate the ongoing risk of major infrastructure items. The development model did not look to capture financial value over the long term; while up-front infrastructure costs were largely absorbed into the overall build cost, the issue of ongoing management was resolved through the establishment of an ESCo and a community management company. This allowed an ownership and governance arrangement for key infrastructure items, such as the biomass boiler and solar photovoltaic (PV) system that posed no long-term risk to the developer but ensured the ongoing sustainability of the project.²⁵

Ecovillage at Currumbin, a semi-rural subdivision in Queensland, took a similar approach to governance and ongoing management of sustainability infrastructure by establishing a two-tiered body corporate system and a separate company: the Ecovillage Community Company.

This company, established by the developer and owned by the residents, owns and manages elements of common property infrastructure with potential to generate a long-term income stream, including the fibre optic network. This arrangement provides a mechanism for the community to recover costs associated with sustainability infrastructure and reinvest in additional common property.²⁶

Sustainability price premium

Some sustainability projects are able to recoup costs by applying a price premium to the additional sustainability features, or attaching a monetary value to the high level of sustainability built into a building or precinct.

While this approach has worked well in some examples, including **WestWyck** in Melbourne, it is often only one component of a broader strategy to make the project viable, and there are

One Brighton, UK

Creating a robust ongoing governance model for **One Brighton** was a key goal for BioRegional Quintain. Establishing a variety of separate entities, including the Energy Services Company, Community Management Company and Community Interest Company, was a key element for ensuring the project would remain sustainable in operation as well as design. Additionally, these entities assumed the responsibility for the operation and maintenance of key infrastructure, allowing the developer to extricate itself from the operational risks of the project.

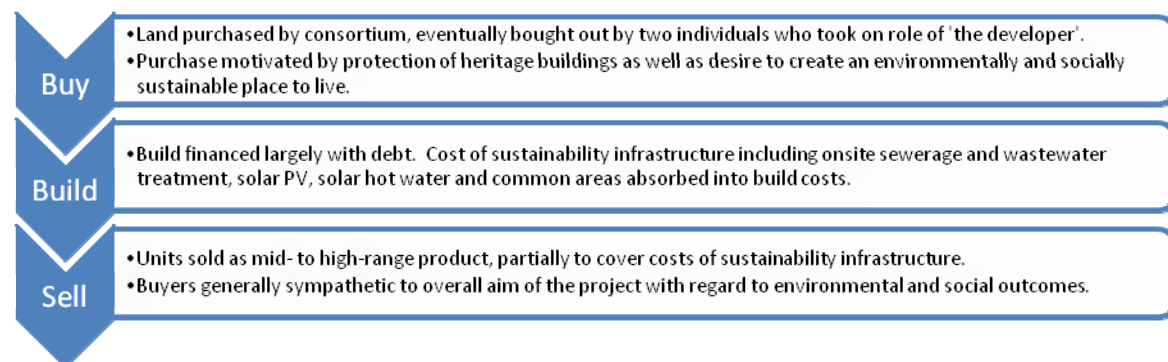
²⁵ Pooran Desai (BioRegional), 3 May 2010, personal communication (interview)

²⁶ Kerry Shepherd (Landmatters Pty Ltd), personal communication (interview)

questions about its ability to be applied in the mainstream market, particularly with housing affordability continuing to emerge as a major public concern.

A ‘work of love’ developed over 16 years, **WestWyck**’s developers see the project as an opportunity to demonstrate the possibilities for environmental sustainability, heritage protection and social cohesion through a housing development. At a small scale, the site shows that, with a strong commitment, on-site sustainability infrastructure can be made viable through slightly smaller dwellings and a small up-front price premium on the product (see Figure 5). The developer of this project noted that the willingness of buyers to pay this premium was driven as much by the high-quality design and finish of the product as the sustainability ‘features’.²⁷

Figure 5: WestWyck development process



Christie Walk emerged from the commitment of a small cooperative to the concept of sustainable urban living. Frustrated by the lack of government and market progress, the group elected to build its own eco-village to demonstrate what could be achieved. The project achieved high-level sustainability outcomes, coupled with a particular sense of community. It was delivered by a cooperative business model, similar to the co-housing groups in **Vauban**. While the group paid a higher cost than they would have for a business-as-usual housing product, indicating a form of sustainability cost premium, in retrospect they feel they could have developed the precinct at no additional cost or even with a cost saving. This indicates that while early mover disadvantage can be a barrier, the lessons of demonstration projects have the potential to reveal commercially viable approaches from which future projects can learn.²⁸

Niche market

Flexicar is a leading example of business model innovation. The company reinterpreted the traditional car ownership model, to provide a *service* rather than a *product*. **Flexicar** provides use of a car for transport as a service, without the capital costs and ongoing maintenance costs of car ownership. The model allows members to book and use a car at an hourly rate rather than having to pay for and look after their own cars. The business received initial support in the form of a small government grant; however, it has ultimately proved to be a viable model that continues to create a profit without ongoing subsidy. The success of this business is attributed to its ability to provide an affordable, convenient and environmentally

²⁷ Lorna Pitt and Mike Hill (WestWyck), 11 May 2010, personal communication (interview)

²⁸ Paul Downton (Ecopolis Architects Pty Ltd), 14 May 2010, personal communication (interview)

friendly alternative to traditional car ownership. It relies heavily on its ability to manage and stage expansion on the basis of market demand indicators in different geographic regions.

Flexicar founder, Monique Conheady, noted that while a car-share company restricted to a single precinct would be more difficult to make viable, success of the model is strongly supported by mixed-use precincts with good access to public transport.²⁹

5.2.4 Projects at commercial – mainstream stage

There are few (if any) examples of sustainable precincts that exist in the commercial mainstream. The closest example is perhaps **Aurora**, a major commercial housing development in Melbourne designed to demonstrate the feasibility of sustainable urban development on a large scale, providing a housing product with mass-market appeal and integration of social and environmental sustainability.

Aurora is Australia's largest 6-star energy designed development. Scheduled for completion around 2025, it will have approximately 8,000 dwellings for 25,000 people and a wide range of community infrastructure.

Aurora has been developed by VicUrban, the Victorian Government's urban land development agency, using a managed market approach, primarily delivered through a sustainability covenant that requires 6-star energy design and limits the number of builders who can offer housing in the precinct. This covenant is a binding statutory commitment between the Environment Protection Authority (EPA Victoria), VicUrban, Yarra Valley Water and Whittlesea Council. This ensures that risk, governance and financial returns are actually managed, regulated and enforced.

The covenant also defines the timing within which houses must be built and the broader sustainability standards in housing design. This governance structure, particularly the limiting of the market for provision of building services to approved partner builders, required approval from the Australian Competition and Consumer Commission.

Aurora is a highly successful development and, while a commercial approach has been taken, it still relies on minor government intervention through the involvement of a government agency. It is also a demonstration of balance between the standards set for sustainability features in the precinct, the ability of commercial builders to provide these features and the acceptance of such features by mainstream consumers.

5.3 Discussion

The majority of the sustainable precinct developments analysed in this research faced significant challenges. Whether in energy, water, waste or transport, business-as-usual approaches have all the benefits of incumbency. This means that the skills, levels of risk tolerance and methods of project appraisal needed to build and finance the sustainable features in precinct developments are all currently oriented towards conventional approaches to precinct design. Conventional approaches are therefore cheaper to build and perceived as less risky by project financiers, developers and contractors.

Market supply and demand factors across the countries, and locations within countries where projects were initiated, also had a strong influence on the business models chosen for the sustainable precinct projects, and the commercial success of the projects. For example, the commercial success of **One Brighton** can arguably be partially attributed to the demographics of Brighton and the state of the local property market, as well as to its

²⁹ Monique Conheady (Flexicar), 13 May 2010, personal communication (interview)

successful incorporation of the sustainability features into its broader 21st century lifestyle offering. Brighton has one of the tightest property markets of any UK city, with a low supply of housing relative to demand. Brighton's building rate for new housing is 55% below the UK's national average. This, combined with the city's demography, its business growth and high student population, makes it one of the most popular locations for investment properties aimed at the rental market in the UK.^{30 31}

On the whole, market signals related to the value that may be captured through the incorporation of sustainable features, remain relatively weak and confused. However, they are stronger in some countries than others. ,

A key area where uncertain market signals are challenging the viability of sustainable precincts is the future pricing of externalities (for example, greenhouse gas emissions, biodiversity loss, watershed pollution, non-renewable resource depletion), and the impact of such future pricing on long-term operations and maintenance costs. In the context of weak and uncertain market signals, the increased up-front costs often associated with the introduction of sustainability features are harder to justify on purely commercial grounds.

Consequently, sustainable precincts face many of the same types of challenges as the process of innovation for new products or technological change. Incorporating sustainability features at a precinct scale remains a relatively new and niche phenomenon. This increases both the real risks to developers and the perceptions of risk to project financiers. Reducing these risks, both real and perceived, requires practical demonstration of the benefits of sustainability features at a precinct scale.

The approximated position of the projects researched on the innovation framework was a strong indicator of:

- the level of support provided by government or angel investors who take high risks or suffer financial loss as a result of their commitment to sustainability, which drives an appreciation of other values that might be derived from the project (for example, a demonstration of what is possible that will encourage future investors)
- the level of innovation in the business model (for example, the move to selling services rather than products in an attempt to capture the potential long-term value generated by sustainability features in the face of uncertain energy and carbon markets)
- the extent, or 'depth', of sustainability features incorporated in the precinct development.

In almost all cases, there was a strong, negative correlation between the position on the innovation framework and each of the above elements of developments' business models and incorporation of sustainability features. That is, projects closer to the demonstration end of the framework were more likely to have deeper sustainability outcomes and rely on financial, policy or regulatory support from government and/or financial support from angel investors.

This noted, it may be concluded that seeking to establish a consistent correlation between sustainability, innovation and commercial profitability is likely to be asking the wrong question. The failure to establish a positive correlation between profits and sustainability for precinct-scale developments does not mean that there is not always a business case for sustainability or that government support is always required. Rather, it suggests that the causal links between successful sustainable precinct developments and their business models needs to

³⁰ Gibb, K., et al, 2008, Home Economics: How Housing Shapes City Economies, Centre for Cities. (The Centre for Cities is a highly regarded independent policy think tank focusing on cities in the UK.)

³¹ Aldred, T., 2010, Arrested Development: Are we building houses in the right places, Cities Outlook 2010, Centre for Cities.

be nuanced and cautious. Sustainability is likely to make “business sense for some firms in specific circumstances”, and these circumstances may not always be easily transferable between locations, even within the one country.³² This is certainly the case for precinct projects where much of the value of the project cannot be demonstrated in purely financial terms. Many precinct developers or proponents were motivated by a broader commitment to sustainability and sought to demonstrate what was possible at a precinct level, use the development exercise as a learning experience or deliver a clearly sustainable outcome as a matter of principle.

There is no ‘silver bullet’ in business model innovation

There is no clear business model to guarantee the success of a sustainable precinct. The research examined how value was created, how markets were targeted, and the competence and competitive positioning of project proponents, as well as their economic strategies, ambitions and ownership structures. The business models used by proponents for the projects studied were highly varied across all these elements. They can, however, be grouped into three basic types as in the table below:

Business Model Group	Precinct Project Examples
Adding sustainability to a standard business model.	WestWyck One Brighton
Delivering more sustainable outcomes using new business models (for example, moving from selling a product to selling a service and from build-sell models to build-own-operate models; the other visible innovation here is new community ownership structures).	Portland Streetcar Flexicar Woking Hepburn Community Wind Park Elephant and Castle Dockside Green
Clustering different business models together for a hybrid solution.	Vauban

The rationale for investment in sustainability innovation at the precinct level was equally varied. The table below outlines some of the possible rationales.

Rationale	Precinct Project Examples
Commitment to demonstrating sustainability principles at a precinct level and establishing what works through learning by doing.	WestWyck Christie Walk BedZED
Experimenting with sustainability as a driver for innovation and increasing learning by doing.	One Brighton Aurora
Capturing an emerging niche market by creating innovative business models, importing innovations into a new geographical area or establishing leadership in an area.	Flexicar Woking ESCo

³² Vogel, D., 2005, The Market for Virtue: The Potential and Limits of Corporate Social Responsibility, p.45, Brookings Institution, Washington.

6. Precinct sustainability opportunities

The research analysed projects to understand both the opportunities in business model innovation, discussed in the previous section, as well as the sustainability opportunities captured through this innovation. The following section details the nature of the sustainability opportunities identified and captured. This also illustrates the opportunities available for the development of sustainable precincts in Victoria.

Some opportunities are easily transferable to the Victorian context. Others are constrained by climate, technical, regulatory, cultural or urban development characteristics.

Figure 6 below captures the high-level opportunity set for sustainable precincts.

Figure 6: Opportunity set for sustainable precincts



6.1 Energy

On-site renewable or low-carbon energy generation is often highlighted as a key element of 'showcase' sustainable precincts; however, this is one element in an often more comprehensive system of energy-demand management and supply. The context of a project, including the carbon intensity of the relevant regional and national energy supply, has an important bearing; additionally, such projects are subject to myriad regulatory conditions that vary between countries, and often between regions within countries.

The findings of the research suggest that there are two key opportunities in creating sustainable energy systems at a precinct scale: demand-side reduction and management (energy efficiency), and supply-side decarbonisation (energy supply).

6.1.1 Energy efficiency

Most western nations now accept the importance of energy efficiency, but recognition of the need for regulation to achieve this varies significantly. The issue of 'split incentives' (discussed further in Section 7) is a big challenge to achieving broad uptake of energy efficiency opportunities, however, almost all of the projects studied recognised the need to

build in efficiency as the first step. While the optimum level of efficiency, both in terms of environmental performance and up-front financial investment, can be debated, a number of developments showcase the opportunities and issues:

- Statutory planning provisions in **Vauban** required developers to achieve a very high standard of efficiency, going beyond an already progressive national standard. Some individuals and developers went still further, building to the European standard of *PassivHaus* – essentially meaning that almost no energy is consumed for space heating or cooling.
- Standards of the **Western Harbour Redevelopment** project in Malmo were less ambitious than **Vauban**, but still represented national best practice. Attempting to enforce these standards demonstrated the importance of proper planning and integration as, in some cases, developers failed to meet the required standard, either due to poor design or build quality.
- **BedZED** was designed to demonstrate how close a building could come to being self-sufficient in heating and cooling, and invested much additional capital expenditure to achieve this. **One Brighton** achieved very high energy efficiency but diverted investment elsewhere in the project when net environmental benefit or ‘sustainability return on investment’ became more attractive there.
- **Parkville Gardens**, a residential development in Melbourne, promoted energy efficiency as a key element of its overall approach to sustainability. Now, five years later, the 6-star³³ energy rating achieved by the project is soon to be adopted nationally as the minimum regulatory standard in the Building Code of Australia. This illustrates the role of innovative projects in demonstrating sustainability to encourage mainstream adoption and/or improved regulation.

6.1.2 Energy supply

On-site energy generation, whether from renewable or low-carbon sources, is perhaps the most broadly acknowledged opportunity in sustainable precinct development.

Opportunities in sustainable energy supply identified through the research include:

- Small-scale, on-site generation from cogeneration, tri-generation (gas or biomass fuelled), and renewable-energy technologies such as solar photovoltaic (PV) systems and micro-wind. Projects such as **BedZED**, **One Brighton**, **Western Harbour Redevelopment** and **Dockside Green** all capture this broad opportunity. The energy services company (ESCo) model works in a number of these projects to deliver an energy service rather than just electricity and gas products. This model has demonstrated its potential to ‘lock in’ a low- or no-carbon energy supply for precinct projects, and manage the ongoing governance and risk associated with this approach.
- Community-funded renewable energy has been a key aim of a number of projects, including **Hepburn Community Wind Park** and **Victorian Solar Cities**. At a smaller scale, both **Christie Walk** and **WestWyck** established shared ownership for solar PV as part of the development, with each household owning a share of both the infrastructure and the energy generated. This meant that the solar panels could be purchased in bulk and installed in the optimum location, lowering capital costs and increasing the efficiency and potential income of the system.

³³ For example, *minimum* building standards equivalent to more than 7 stars have been in place for many years in parts of Europe and the U.S with similar climates to Victoria. This is significantly higher than best practice in Australia. Horne, R.E., et al, 2005, International comparison of building energy performance standards, prepared for Australian Greenhouse Office, Department of Environment and Heritage, Canberra.

- In **Woking**, Thamesway ESCo undertakes commercial activities which provide revenue for the council to reinvest in energy efficiency, renewable energy and to tackle fuel poverty within Woking. The Thamesway model provides financing for projects such as housing stock improvements, large-scale public solar PV and heating system retrofits for low-income families.
- Use of local, renewable-energy fuel stock, such as municipal tree waste, has been trialled in **BedZED** and is planned to replace wood pellets in **One Brighton**'s biomass boiler. **Dockside Green** also sources local wood waste for its 2 MW thermal gasification system.
- District heating and cooling has achieved broad penetration in many European developments. **Dockside Green** in Canada has implemented a district heating network linked to a biomass-fuelled thermal gasification system. District heating is also seen in **Western Harbour Redevelopment, Hammarby** and **Woking**.

6.2 Water

Like energy, opportunities for addressing water at the precinct scale are essentially divided between demand and supply. On-site waste-water treatment options also experience similar issues to decentralised energy systems related to scale and associated viability. Decentralised energy and water systems can add significantly to the up-front capital costs of a project and do not deliver the economies of scale found in larger centralised systems. In Australia, decentralised energy and waste-water systems also face a number of regulatory challenges in the context of regulatory regimes where large-scale, centralised management of waste-water or energy generation are the norm.

Opportunities within these broad areas can be characterised by the following:

- Sustainable water features through infrastructure such as rainwater tanks, third pipe systems and efficient appliance selection is commonplace in precinct-scale development. Projects such as **Aurora** and **One Brighton** have a strong focus on this approach. These approaches have less impact on the overall costs of the project and are often easier to justify from a commercial perspective. They also tend to deliver fewer sustainability benefits than the more ambitious approaches discussed below.
- On-site waste-water treatment is a more complex opportunity, with projects needing to address health and safety issues, particularly if the project seeks to treat sewage through a blackwater treatment process. Projects such as **WestWyck** and **Dockside Green**, have demonstrated the technical feasibility, though the costs and regulatory challenges may limit uptake in the short term, particularly in Australia.
- Some projects have sought to achieve self-sufficiency in water management. **Ecovillage at Currumbin** achieved this goal and no longer uses mains water. The Currumbin solution was achieved through an integrated approach to efficiency, rainwater collection, waste-water treatment and a comprehensive management system overseen by the site's owners' corporation.

6.3 Waste

The objective for sustainable waste management at a precinct level is often seen as disposing of zero waste to landfill. While self-sufficiency is common for energy and water supply, it is not so often seen as an achievable goal for waste.

Waste is typically handled at large-scale, centralised facilities. Focus groups' discussions with industry experts indicated this is primarily because waste management requires scale in order to be financially viable. There are very few precincts of the magnitude required to justify a

dedicated waste management facility. The exception to this is organics processing, which can be financially viable at smaller scale.

With waste management, therefore, the opportunities for precincts are in materials selection, beneficial reuse of waste and on-site organics processing to reduce the amount of waste being sent to landfill.

- Most developments aimed to reuse and recycle materials during the design and construction phase. **One Brighton** required its contractors to develop a sustainable waste management plan for reducing construction waste to landfill and adopting construction techniques that were efficient in the use of materials. At **Westwyck**, the original old school building was retained, building and site materials were harvested and reapplied and reused in the overall development. Building materials utilised were screened for their health impact as well as their embodied energy. All waste not reused or recycled was audited as it went to landfill.
- A precinct- and systems-wide approach can create opportunities where problems previously existed. The **Industrial Symbiosis** network in Kalundborg, Denmark, is a mechanism for industrial neighbours to utilise each others' residual and by-products on a commercial basis, rather than waste being disposed to landfill. While the driver for this work was a commitment to sustainability, it created a commercial opportunity.
- A number of developments (**Hammarby**, **Wembley City**, potentially **Elephant and Castle**) have installed an Envac system, an automated vacuum waste collection system that can significantly improve waste separation. Envac also reduces vehicle movements in the development, thereby improving amenity.
- **WestWyck** has introduced underground worm farms to handle organic waste on-site. **One Brighton** introduced communal composting facilities and used the compost on the communal gardens as part of a closed-loop food supply chain. Such small-scale organics solutions require committed users for their success, as they require more time and effort from users than conventional waste management approaches.
- While using waste streams to generate energy is another potential opportunity, there are still many questions around viability at the precinct scale. Projects such as **Hammarby** link in to a regional waste-to-energy facility, and this represents the greatest opportunity for waste-to-energy at present. However, such waste-to-energy projects require significant scales to be viable and the majority of precinct-level developments are unlikely to provide the scale alone. This noted, a pilot technology in India has been developed to convert household food waste into biogas.³⁴

³⁴ Deshmukh, V., 2006, Compact biogas plant making waves, <http://www.indiatogether.org/2006/jul/env-karve.htm> (accessed 20 July 2010).

6.4 Transport

Opportunities for sustainable transport systems at a precinct scale often centre on reducing car use and therefore significantly reducing greenhouse gas emissions and household expenditure on transport. Car use can be reduced through urban design, infrastructure provision, incentives for alternative transport, disincentives and innovation related to the way car ownership and use is viewed.

The key opportunities identified through the research include:

- Developer-funded public transport can represent a major infrastructure solution, as well as a different view of transport provision. Traditionally, public transport infrastructure has been provided entirely through government finance; projects such as **Portland Streetcar** recognised the benefit that landowners and developers would gain from having good local public transport, and so levied them to provide funding for the major infrastructure.
- The provision of car parking can impact strongly on transport behaviour in a precinct. The developers of **One Brighton** were able to reduce car parking on-site to almost zero through an on-site car-share scheme and links to nearby public transport. The reinterpretation of the car as a service rather than a product has helped **Flexicar** to provide an attractive alternative to car ownership.
- Many of the projects studied have demonstrated a desire to create a mix of uses and services within the precinct to allow residents to live, work and socialise locally, thus reducing the need for excessive travel. This approach supports the creation of an attractive lifestyle concept for a development, an important element in creating value in the final product. Projects including **Vauban**, **One Brighton** with its '5-minute living' concept and **Ecovillage at Currumbin** exemplify this approach.
- Integrating a variety of these solutions can be part of an overall sustainable transport solution. **Vauban** is often referred to as the car-free suburb due to an integrated approach combining streets that favour walking and cycling over driving, its unique approach to the provision of car parking, and high-quality public transport. This integrated approach has led to around 64% of all trips in **Vauban** being made by walking or cycling, compared with the city-wide average for Freiburg of 49%.³⁵ Metropolitan Melbourne's average is around 15%.³⁶

6.5 Broader benefits and values

Many aspects of addressing environmental sustainability at a precinct scale can often be closely aligned with broader social aims and a wider set of values than the purely commercial. For example, encouraging active forms of transport such as cycling and walking has important health benefits and increases social interaction. Not all of these values can be expressed in monetary terms and many sustainable developments do not establish formal evaluation frameworks to quantify all the benefits they deliver. Rather, the research made clear that a commitment to introducing sustainability at a precinct level was often associated with a focus on delivering broad, qualitative change to the way people live in the precinct and with the values of place-making.

³⁵ Scheurer, J. and Newman, P., 2009, Vauban: A European Model Bridging the Green and Brown Agendas, case study prepared for Revisiting Urban Planning: Global Report on Human Settlements 2009.

³⁶ Victorian Department of Transport, 2007, Victorian Integrated Survey of Transport and Activity (VISTA), Melbourne.

All projects studied aimed to create good social and economic outcomes along with their focus on sustainability, utilising a range of measures such as:

- Establishing specific 'community infrastructure', such as the Community Interest Companies created at **One Brighton** and **Ecovillage at Currumbin**. These companies provide an organisation to promote social interaction, manage resources that provide community benefit, and engage residents and businesses within the precinct with those in the surrounding area.
- Many precincts were designed with a focus on common areas as an important location for social interaction. Projects such as **WestWyck**, **One Brighton** and **Vauban** all have a strong focus on promoting incidental social interaction and have worked to facilitate this through design.
- Precinct-scale sustainability holds great potential economic benefits through the creation of new business opportunities. Projects that innovated to turn products into services, exemplified by **Woking**'s energy services approach, demonstrate that precincts present a variety of ongoing business opportunities. Broader estates management is also a concept with great potential, combining a maintenance function with social and environmental services. **One Brighton**'s 'green caretaker' indicates the possibilities in this space.

6.6 Integration

Taking an integrated approach has been shown to greatly benefit the overall sustainability outcome as well as assist the developer to create a viable overall business model. This approach presents the opportunity to provide a range of services, which individually might have low margins but amalgamated make a viable business case. Research data suggests that few projects have managed to capitalise on this potential opportunity. This may be due to a number of reasons, including:

- technical issues, for example the low uptake of waste-to-energy facilities at the precinct scale because in many cases the precinct level may be too small to cost-effectively use waste-to-energy approaches,
- high initial capital cost associated with a comprehensive approach to sustainability. Many projects had a stronger focus on one of the key resource waste streams as a 'headline', and subsequently focused their investment in this area, lowering the capital available for other sustainability features, and
- difficulty in establishing a workable governance or legal structure to manage an integrated approach, particularly given the business-as-usual approaches of managing energy, waste, water and transport independently.

Elephant and Castle, a major urban regeneration project planned for the south London borough with a best practice sustainability goal for all elements of the site, has developed a concept that builds on the ESCo model (see page 22 for overview of this model), termed the multi utility services company (MUSCo). This entity will provide energy, water and information technology services to the site. If successful, it may provide a mechanism for providing economies of scale to deliver lower cost sustainability outcomes to both developers and residents.

7. Barriers and solutions

This section provides an overview of how market barriers to precinct-scale sustainable developments were overcome, and a brief summary of the regulatory barriers that may affect the future transferability of these business model solutions to Victoria.³⁷

The traditional market barriers associated with sustainable development include up-front cost and split incentives, as well as information barriers influencing consumer demand and the availability of skills in the development sector. In addition to these traditional market barriers, the challenge of innovation itself often created delays. This increased the opportunity cost of the project because the ordinary development process had to adjust to a new approach, which diverged from business as usual. This is typical of projects in the early stages of the innovation framework.

Not surprisingly, the barriers to sustainable development present in international markets are also present in Victoria. The examination of whether these business model solutions are transferable to Victoria is informed by the Victorian policy context as well as local market trends, which are influenced by community expectations.

7.1 Market failure and the sustainability premium

The lack of market support for sustainable precincts can be described as the failure of developers and consumers to value the sustainability premium in financial terms.

Mainstream developers interviewed for this research commented that there was not a sustainability premium in the same way that there was a clear premium available for high-quality design or certain lifestyle precincts. The sustainability premium concept is a quasi-qualitative measure of the consumer's willingness to pay for sustainability features. It involves an evaluation of both real and perceived benefits of measureable items, such as energy bill savings, as well as difficult-to-measure benefits such as the prestige of sustainable features, or the value to the consumer of reducing environmental impact. The sustainability premium is influenced by the availability of market research into consumer preferences and the accessibility of that information to both consumers and developers. Marketing campaigns are both influenced by, and influence, these consumer preferences.

In general, the research showed that where sustainability features reinforced lifestyle benefits, they were being promoted as part of the marketing campaign; otherwise they were not promoted as a consumer benefit. This was the case for international examples such as the **One Brighton** development, as well as local examples such as the **Aurora** development.

Another example of this approach can be seen in a number of greenfield developments in Victoria, where the benefit of 'endless' water supply due to the availability of recycled water or rainwater tanks is strongly promoted in marketing campaigns. This effectively amounts to the skilled promotion of regulatory requirements rather than deeper innovation for sustainability. Because the sustainability premium is not strongly supported by the market due to information and other barriers described in the following sections, mainstream developers can promote minimal sustainability features to satisfy consumer demand for sustainable precincts. This market dynamic is likely to change with more consumer awareness about the future impacts of climate change, including water shortages and increasing energy prices.

³⁷ Unless stated otherwise, the information referred to in this section was provided in the key informant interviews and focus groups conducted as part of this research project.

7.2 Market and regulatory barriers

A market barrier or market failure is a barrier to an activity that would make economic sense but is not occurring due to other factors influencing the decision. For example, it makes economic sense for householders to install energy-efficient appliances because these appliances produce lower energy bills. However, many energy-inefficient appliances are still being sold. This specific example of market failure applies to many aspects of sustainable precincts, and often these other barriers interact with each other, making innovation very difficult for project proponents. This is a major reason why sustainable precincts have not already been taken up by the mainstream.

7.2.1 Information barriers

- Low awareness of the benefits of sustainable precincts amongst consumers and contractors leads to a lack of market demand. Because developers don't experience this market demand for sustainability, they don't build for it.
- Lack of trust in new energy, water, waste and transport technologies leads to apprehension in adopting them and less willingness to pay for them.
- Lack of information for consumers to distinguish between genuinely sustainable precincts, versus precincts with minor innovations, allows for marketing of developments with minor innovations to out-compete developments with fundamental innovation. This acts as a disincentive to the developer in adopting more ambitious sustainability measures.

The solutions used to overcome these barriers in the projects studied included:

- Independent investor/owner-builder groups were formed to drive the development in the cases of **BedZED**, **Vauban**, **Christie Walk** and **WestWyck**. This locked in a market for the sustainability premium.
- Specialist energy services companies (ESCOs) and project management companies specialising in sustainable infrastructure were established in the cases of **Vauban**, **One Brighton** and **Woking**. This approach concentrated expertise in delivering sustainable infrastructure. This overcame the lack of trust in new technology on the industry side and improved consumer confidence by providing an ongoing infrastructure management service.
- Developers chose *not* to focus on the sustainability premium in marketing, offering other features consumers currently value within the commercial cost envelope. This was the solution used at **One Brighton** and the **Aurora** development.
- Informing and educating building contractors of the technology involved reduced the cost premiums that would otherwise be added to the project by builders unfamiliar with the sustainability requirements. In the case of **One Brighton**, the tender process was undertaken three separate times before it was successful. In the final attempt, the shortlisted contractor was flown to Germany to be familiarised with the proposed bio-energy technology in an effort to reduce costs. This experience shows the additional effort needed to overcome the information barriers to new technology. Given this experience, it is not surprising that the **Dandenong Central Services Hub** proposed by VicUrban was not able to finalise the tender process in the current Australian market in the first attempt. This example illustrates the challenge in moving from 'demonstration pre-commercial' to 'commercial mainstream' in the innovation framework.
- Previous pilot projects and demonstration sites were used to familiarise builders and other contractors with the sustainability technology and building techniques used.

7.2.2 Opportunity cost

The opportunity cost is the additional time, effort and funds needed for a business to take advantage of an opportunity.

- Sustainable infrastructure can have higher up-front capital costs; this acts as a barrier in itself and a barrier to finance.
- The time and effort involved in delivering sustainable precincts, and innovation in general, can be higher, and/or perceived as higher by developers, builders, planners and infrastructure providers.
- Innovative development can be higher risk due to unforeseen delays in installing new equipment or gaining approvals. This delay can lead to financial loss as developers may need to pay interest on land held until the final product is delivered to the consumer.
- Providing evidence on viability of innovative options can require extra research and data collection.

The solutions used to overcome these barriers in the projects studied included:

- Some of the projects received direct subsidies from government. The **Royal Seaport** project in Sweden benefited from the public donation of land as well as project funds provided by a European Union greenhouse reduction grant. The **Woking** Borough Council project benefits directly from low-cost credit available to local governments from the UK central Government.
- Indirect subsidies, such as feed-in tariffs, benefited the **Vauban** and **Royal Seaport** projects. Other indirect subsidies, such as tax credits were used to support research and development (R&D) at **BedZED** and **One Brighton**. **BedZED** also benefited indirectly from tax benefits to housing trusts involved as investors in the project.
- Accelerated or streamlined planning processes (reducing holding costs and the time value of money) were part of the solution where local governments were project proponents such as the **Woking** and **Western Harbour Redevelopment** case studies. Elsewhere, this remained a significant barrier.
- Some projects were based on public-private partnership models, including levies from private landholders. The **Portland Streetcar** case study used a voluntary development levy to fund public transport. Developers contributed to the levy because it was recognised that access to public transport would increase property prices for the development.
- In many cases, sustainability objectives were set as enforceable conditions for the development of public land. This was the case for the **Western Harbour Redevelopment**, **Royal Seaport** and **Aurora** developments. This effectively generated demand certainty for the sustainability premium associated with the development.
- The **One Brighton** development benefited from the partnership of a very large development company, which used **One Brighton** as a demonstration project to stay 'ahead of the curve' for an emerging trend in sustainable development. For this reason, the developer was tolerant of higher opportunity costs for the development, including marginally higher capital costs and risk of delays in approval for sustainability infrastructure.

7.2.3 Split incentives

In many cases, sustainable infrastructure reduces the operational costs of energy, water, waste or transport; however, developers do not have access to these benefits unless they have an ongoing role in the development. This is called a split incentive. In some cases, the

solutions to overcome the opportunity costs also address split incentives. The solutions in the projects studied used to overcome the split-incentives barrier included:

- Some developments used build, own and operate models that allow capturing of longer term revenue streams. For example, **Woking** developed an energy services model with broad social and environmental policy objectives. The business model enabled the local government to invest in sustainable energy infrastructure and to attract a return on the investment by selling electricity and hot water to residents. By taking on this role, **Woking** overcame the split incentive that applies to developers who are not paid an ongoing service fee for providing solar panels or a cogeneration plant as part of a development.
- A number of developments made use of active owners' corporations to manage and sell sustainable infrastructure. For example, at **Vauban**, residents had the opportunity to invest in a separate solar panel company which was formed to sell solar energy to residents as part of the development. This meant that residents who invested in the up-front cost of renewable energy also benefited from the revenue available from feed-in tariffs. This return on investment was not affected if the property was rented.
- A number of developments sold ongoing *services*, not one-off *products*. Both the energy services companies at **Woking** and **Vauban**, as well as the **Flexicar** car-share company, are examples of this approach. Car-share schemes were included at the **Vauban**, **One Brighton**, **BedZED** and **Christie Walk** developments.

7.2.4 Institutional barriers

Business systems, cultural attitudes and organisational processes can be a substantial hurdle to sustainable precincts. These institutional barriers have been recognised by the Australian Productivity Commission in relation to sustainable buildings, and similarly apply to developments at the precinct scale.³⁸ These factors influence the decision-making processes of developers, builders, subcontractors and infrastructure providers, as well as financiers.

For example, the decision-making tools used to evaluate proposals have usually been developed for traditional, centralised infrastructure and can be biased against decentralised sustainable infrastructure. This can result in a perception of increased risk, increased cost, or a poor fit between the infrastructure proposed and the development model. This leads to a risk premium being applied by all parties, which increases the cost of the project and can even make it unviable. Often, project proponents do not have the in-house expertise to reduce the perception of risk or to find ways to reduce costs.

Planning and government approvals processes are also geared towards business-as-usual infrastructure provision. Proposals that include innovative sustainability features require more time from government officials to assess. In some cases, sustainable technology is disadvantaged by traditional cost-benefit methodology, which doesn't adequately account for non-monetised (or externalised) sustainability benefits.

The solutions used to overcome this barrier in the projects studied included:

- triple bottom line analysis of benefits and costs, which demonstrated community-wide economic, social and environmental benefits
- establishing a specialised project management company to concentrate on the particular challenges of sustainable infrastructure. This approach was used at **Vauban**, **BedZED** and **One Brighton**. This allowed specialist knowledge in technical and regulatory

³⁸ Productivity Commission (2005) The Private Cost Effectiveness of Improving Energy Efficiency, Australian Government.

requirements to be readily available to regulators and increased the developer's familiarity with regulatory and planning requirements

- additional research into the technical aspects of the sustainability infrastructure to assist the approvals process. For example, the connection of embedded generation usually requires the project proponent to prove the generator complies with air quality, noise and electricity grid fault protection requirements before it can gain approval. This approach was taken at **One Brighton** and was assisted by an R&D grant
- establishing a close working relationship with government planners at the start of a project. Public support early on is also beneficial.

7.2.5 Additional challenges of innovation

Meeting approval requirements for innovative sustainability technology can take extra time because of a lack of precedent, and in some cases new policy or regulation needs to be developed. This is sometimes known as the first-mover disadvantage. Developers who wait for others to take the lead are benefited by not having to pioneer the lengthy approvals process. This acts as a disincentive for innovation.

Tender processes for innovative developments can be hampered by lack of confidence and familiarity with sustainable technologies and practices in the market. The pool of skilled workers can also be more limited for new technologies and this affects project proponents of sustainable precincts more than traditional skills shortages.

The BioRegional Quintain development team for the **One Brighton** project found a way to address this by taking more time with the tender process and flying the best applicant to Germany to become familiar with the technology proposed. This reduced the cost of the project by managing the risk premium presented by project subcontractors.

The solutions to this innovation barrier are also included in the points already discussed, as the barriers usually interact. In most cases, the additional challenges of innovation were addressed with the following solutions:

- The development of specialist energy services and facilities management companies reduced the risks associated with the ongoing management of non-traditional infrastructure. This approach was taken at **Vauban** and **Woking**.
- Additional technical, financial and market research brought stakeholders on board, including investors, developers, builders, government planners and consumers. This approach was taken in every case study examined as part of this research.
- The delays produced by this extra burden of research increased the risk and cost of the project. This was addressed by the additional commitment and resolve of project proponents and investors. Long-term support from the public and private sector in underwriting risk, and an explicit commitment to broader sustainability objectives, were important drivers of this additional commitment in each case study. In some cases, such as **Vauban**, **Christie Walk** and **WestWyck**, the additional commitment came from residential investors; in other cases such as **Western Harbour Redevelopment**, **BedZED**, **Royal Seaport** and **Aurora**, the commitment came from governments. For **One Brighton** and **Portland Streetcar**, long-term commitment was provided by the private sector.

7.2.6 Technology barriers

The research suggests that there are very few actual technology barriers to the broad uptake of sustainable precincts. There are a wide range of energy, water, waste and transport

technologies, which can technically be deployed to sustainable precincts, and the projects highlighted in this research demonstrate this.

Perception of technology barriers and lack of familiarity with new technology is a more prevalent barrier/risk. This is particularly the case with the integration of sustainable technologies with traditional infrastructure, such as the electricity grid or water supply. Lack of familiarity with sustainable technologies amongst developers also leads to them adding a cost premium in applying these technologies and a limited market choice of product suppliers/developers in the tender processes for sustainable precincts. The solutions to these information barriers have been outlined in Section 7.1.1.

7.2.7 Policy and regulatory barriers

In addition to market barriers, the project proponents of each case study had to navigate regulation specific to the technologies used. Because many of the sustainable technologies have not been commercially or widely adopted, there is often a lack of precedent for government officers to make approval and licensing decisions. However, in most of the case studies, there was considerable government support, which in some cases provided additional assistance with approvals processes.

The solutions used to overcome this barrier included:

- support from government agencies in navigating regulatory processes by setting up cross-government working groups, funding additional technical research and developing guidelines for the approvals of new technology.

7.3 The role of broader sustainability goals

In most cases, broader sustainability policy at local, regional/state and national levels has played an important role in supporting innovation at the precinct scale. These policies have been driven by government commitments to address climate change and other environmental challenges.

In each case, sustainability policy has contributed to the success of projects by encouraging market transition to new sustainable technology, providing policy certainty and market signals for investors, as well as decreasing the risks associated with innovation. Direct financial support was also provided for a number of the case studies through European Union greenhouse reduction grants.

Examples of policies with substantial influence on the success of sustainable precincts include the European emissions trading scheme³⁹ and gross feed-in tariff, which applies in many European countries where the international case studies were located.⁴⁰ These policies assist the business case for investment in precinct-scale, renewable-energy infrastructure by providing a price for carbon and a premium price for renewable energy, so that the return on investment for the up-front cost of sustainable-energy infrastructure increases.

Similarly, higher waste management charges in most European countries have assisted the uptake of waste-to-energy technology. Other policies have played a role in increasing market awareness of sustainable technologies as a flow-on effect of minimum standards. An example of this is the UK Government requirement that all new houses achieve zero-net carbon emissions by 2016.⁴¹ The minimum standard has addressed the information, split-

³⁹ Background on the EU Emissions Trading Scheme can be found at http://ec.europa.eu/environment/climat/emission/history_en.htm

⁴⁰ Federal Ministry for Environment, Nature Conservation and Nuclear Safety, Germany, <http://www.erneuerbare-energien.de/inhalt/42720/main/>

⁴¹ UK Government, June 2008, Strategy for Sustainable Construction, London.

incentive and opportunity cost barriers. The regulation also provided a strong incentive for the development of the knowledge and skills in the building industry, which are needed to construct energy-efficient buildings, and this has transformed the market. Government procurement policies for office buildings and public housing have also played an important role in transforming the market by providing a demand for buildings with sustainability features.

At the local, regional and state level, environmental and social goals have also contributed to the viability of sustainable precincts. For example, the Borough of **Woking** established its ESCo to show leadership on climate change at the local government level while addressing fuel poverty, an issue which leaves many elderly residents unable to afford heating bills in winter. Similarly, the **BedZED** development attracted investment from a UK housing trust, which was motivated by its goal to support affordable housing. Several case studies, including **Royal Seaport**, were examples of urban renewal projects where sustainability was used to revitalise industrial areas.

Interestingly, several precincts benefited from long-term private investors also motivated by environmental and social goals. Investors in the **One Brighton** development were committed to demonstrating best practice environmental design, as it contributed to broader reputational benefits for the company. The growing awareness of environmental pressures and the affects of increasing electricity and petrol prices on affordability may contribute to increased support for private sector investment in sustainable development.

8. Conclusion

The findings from this research highlight that private sector investment in innovative residential or commercial developments is dominated by the aim of receiving above-average rates of return to offset added risk. The higher the perceived risk, the greater return demanded. Market signals for the current or expected future value of sustainability investments in property remain relatively weak and confused. This is likely to continue to deter widespread investment in sustainable precincts and slow the diffusion of the innovations examined here from demonstration to mainstream.

Sustainable precincts remain at the point in their commercial maturity where the majority are not viable without government financial or regulatory support, or the significant commitment of an investor and a willingness to persevere (even while losing money) because of a broader commitment to sustainability. Where commercial opportunities do exist, they remain relatively niche. Nearly all precincts examined were in the first three categories of the innovation framework: either demonstration, supported commercial, or commercial – niche.

Accelerating the take-up of sustainable precinct development in Victoria will require contributions from both governments and developers. The combined efforts of the financial sector, developers, legislators and urban planners will be required to capture the opportunity set identified through this research.

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One Brighton, BedZED and Middlehaven	<p>Pooran Desai (BioRegional), 3 May 2010, personal communication (interview)</p>	Rick Gustafson (Portland Streetcar Incorporated), 19 May 2010, personal communication (interview)
Portland Streetcar	<p>Meinhard Hansen, 12 May 2010, personal communication (interview)</p> <p>Andreas Delleske (Forum Vauban), 22 April 2010, personal communication (email)</p>	
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Project	Desktop Review References	Personal Communications
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Royal Seaport	Stockholm City 2010, Stockholm Royal Seaport, viewed 14 May 2010, < http://www.stockholmroyalseaport.com/ >	Ingmarie Ahlberg (Stockholm City Council), 18 May 2010, personal communication (interview)
Elephant and Castle	Moseley, T., 2005, presentation 'Elephant and Castle Regeneration Project – Sustainable Infrastructure', Southwark Council. Southwark Council, n.d., 'Pre-qualification Questionnaire – MUSCO', Southwark Council.	

Appendix I: Stakeholder engagement summary

SECTOR-SPECIFIC CONSULTATION

Theme	Attendees	Organisation
Waste	John Nolan	Nolan Consulting
	Max Spedding	Veolia
	Carlos Rodriguez	Sustainability Victoria
Energy	David Shapero	Future Energy
	Rodney Bray	Jemena
	Liz Hamilton	Department of Primary Industries
Transport	Rhys Freeman	CERES (Centre for Education and Research in Environmental Strategies)
	Kristian Handberg	Department of Transport
	Stephen Herbert	Department of Transport
	Stephen Ingrouille	Going Solar
	Monique Conheady	Flexicar
Development and finance	Jon Purcell	Equiset
	Rohan Dowland	mecu
	Vikas Ahuja	GHD
Water	Francis Paminger	Yarra Valley Water
Energy	Steven Peters	VicUrban
Urban development	Peter Newman	Curtin University

INTERVIEWS WITH PROJECT INFORMANTS

Project	Project informant	Organisation
Christie Walk	Dr Paul Downton	Ecopolis Architects Pty Ltd
Royal Seaport	Ingmarie Ahlberg	Stockholm City Council
Malmo	Michael O'Hare	E.ON and Cities for People
One Brighton (UK)	Pooran Desai	BioRegional
WestWyck	Mike Hill and Lorna Pitt	WestWyck
Vauban	Meinhard Hansen	
Vauban	Andreas Delleske	Private project participant
Ecovillage at Currumbin	Kerry Shepherd	Landmatters Currumbin Valley P/L
Aurora	Brian Marshall	VicUrban
Woking	John Thorp	Thameswey
Portland Streetcar	Rick Gustafson	Portland Streetcar Inc
Flexicar	Monique Conheady	Flexicar
Hepburn Community Wind Park	David Shapero	Future Energy
Docklands	Simon Wilson	VicUrban

Appendix II

Overview of projects not chosen for full analysis

Project	Location	Status of project (planned, construction, built)	Sustainability focus	Nature of development (greenfield, infill, revitalisation)	Use	Target market	Scale
Officer	Melbourne	Planned. A tender process is planned for late 2010 to select developers	All	Greenfield	Mixed	Broad housing market	340 hectares, homes for 15,000 people
Newington	Sydney	Built	All, consistent with Sydney's commitment to be the Green Games.	Brownfield	Mixed - residential, retail and business precinct	Broad housing market	90 hectares, suburb for 5000 residents
Thames Gateway	East London, UK	Planned, ongoing feasibility assessment	All in part, but a strong focus on developing a 'green economy'	Brownfield, large tracts of it publicly owned	Mixed - education, residential, commercial, industrial park, tourism	N/A	Unknown
Armstrong Creek	Geelong, Victoria	Planned	All	Greenfield	Mixed - residential, commercial and industrial	Broad housing market	2,687 hectares, of which 2,350 hectares is developable, 2000 homes
BedZED (UK)	South London, UK	Built	All	Urban regeneration.	Mixed - residential and office	50% niche housing market, 25% key worker housing and 25% social housing	Unknown
Hammarby (Sweden)	Stockholm, Sweden	Half built	All	Brownfield sites consisting of ports, oil depot, gas plant and container terminal.	Mixed - residential, commercial, retail	Middle to high end housing market	204 hectares, 10,400 new flats and 200,000m ² of office space
Lochiel Park	Adelaide	Due for completion in 2011	All	Former education institution	Residential	Broad housing market	15 hectares, 100 homes
Sonoma Mountain Village	40 miles north of San Francisco, USA	Commercial built. Residential construction to commence in early 2001 and completion in 2025	All, OPL principles	Brownfield - vacated business campus	Mixed - residential, retail, commercial, 25% affordable housing.	Mix, homes will range from \$300,000 upward to \$3 million	200 acres, 1400 homes
Barangaroo, Sydney	Sydney harbour waterfront	Planned	All	Brownfield I think	Mixed-residential, commercial, retail, tourism and community.	Unknown	22 hectares
Parkville Gardens (Cwith Games Village)	Parkville, Melbourne	Built	Energy and water efficient house design.	Renewal	Residential	Broad housing market	1000 dwellings
Mawson's Lake	Adelaide	Final stage under construction	Water and energy	Greenfield	Mixed	Broad housing market	600 hectares, 4,000 homes
Glenfield	Sydney	Built	Energy	Unknown	Residential	Unknown	16 homes
Vaxjo	Sweden	Built	Energy (district heating)	City scale	N/A	N/A	Vaxjo is a city of approximately 60,000
Central Victoria Solar City	Central Victoria	Built	Renewable (solar) energy	Transforming existing communities	Mixed	N/A	14 municipalities across Central Vic, open to 2500 households or businesses
Masdar City, Abu Dhabi	Abu Dhabi	Construction started in 2008, largely unbuilt	All, but strongest focus on renewable energy and clean technologies to reflect business tenants, and waste	Greenfield	Mixed - education, residential, business parks, commercial, retail	Unknown	6km ²
Wembley City	West London, UK	Built	Waste - Envac system	Brownfield	residential, retail, leisure and entertainment	Premium, apartments described as luxury	85 acres, 4200 apartments
Fawkner Smart Energy Zones	Fawkner, Melbourne	Planned	Energy	Retrofit of Council facilities to be supplied by onsite energy	Leisure	N/A	N/A
Industrial Symbiosis	Kalundborg, Denmark (105 kms from Copenhagen)	Operating network	Waste, industrial ecology	N/A	Industrial	N/A	N/A
Kwinana Industries Council	Kwinana, WA	Operating network	Waste, industrial ecology	N/A	Industrial	N/A	2400 hectares
Dongtan Eco City	China, on an island off Shanghai	Stalled	All	Greenfield	Mixed use	Unknown	500,000 by 2050
Central Park	Sydney	Very early construction	All	Brownfield redevelopment of former CUB site	Mixed - commercial, residential and retail	Broad housing market, with the developer supporting local affordable housing development	6 hectares
Bicing	Barcelona, Spain	Operating	Transport	Bike share scheme	N/A	N/A	N/A
Velib bike scheme	Paris	Operating	Transport	Bike share scheme	N/A	N/A	N/A
Better Place electric car infrastructure	Global company with Australia arm. Intend to provide an infrastructure network.	Business is preparing in order to be ready when electric vehicles are taken up	Transport	Electric car infrastructure			
Small scale municipal waste treatment	Dhaka, Bangladesh	Operating	Waste	Waste treatment facility	N/A	N/A	N/A
Alternative waste treatment facility	Eastern Creek Sydney	Operating	Waste	Waste treatment facility	N/A	N/A	N/A
1000 Green Supers	New York	Operating	Energy	Project to equip building superintendents (caretakers) with knowledge of sustainability and its importance in building maintenance	Residential and commercial	N/A	N/A