The Viability of Constructing Social Housing Infrastructure Using Relocatable Modular Housing on Temporarily Vacant Public Land

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Executive Summary

This report assesses the viability of constructing social housing infrastructure using relocatable modular housing on temporarily vacant public land. It finds that relocatable modular housing should not be placed on temporarily vacant public land to respond to the current undersupply in social housing infrastructure. Without further research such land should only be used in the unlikely situation that no other land is available.

There is a large need for additional social housing infrastructure now and into the future. In 2011, 22,000 Victorians were known to be homeless; in 2016, 247 'rough sleepers' were counted on the streets of Melbourne. An estimated 75,000 to 100,000 Victorians are currently experiencing rental stress and require greater access to affordable housing. Furthermore, an additional 36,960 public housing dwellings are believed to be required by 2031 and 79,444 by 2051. Lastly, Victoria has an average of 42 unmet requests for crisis accommodation a day.

This report finds that modular construction techniques are a viable method of providing relocatable social housing infrastructure. Modular construction utilises factory machinery to produce fully relocatable detachable houses and low- to medium-rise apparent complexes. If the project is managed well, modular methods can construct quality houses at a rate considerably faster than conventional methods. Moreover, these houses can also be constructed relatively inexpensively due to the factory prefabrication process.

The international examples of constructing social housing infrastructure with modular housing all utilised this method of construction to respond to an emergency situation. The accelerated building times of modular constructions allowed for a faster response to these emergencies. In Ireland and England, modular constructions were used to quickly rehouse homeless families previously in subsidised bed and breakfast accommodation. In Canada, modular housing has been used to provide shelter to some of the 539 homeless sleeping on the streets of Vancouver. Only the English and Canadian examples were constructed on temporarily vacant land. Currently it is unknown where these units will be relocated to. The quality of the accommodation in all cases has been acceptable. However, the cost had varied significantly.

Temporarily vacant public land is land that has been banked by the government for future infrastructure. This report finds that without further research modular housing should not be constructed on this land. Justifications for using this land that focus on the economics of housing supply, or providing a cost effective method of constructing social housing are unsatisfactory. Only in an emergency situation and in the unlikely event that no other land is available, should this be an acceptable solution.

1 Introduction

1.1 Context of the Report

Relocatable modular housing on temporarily vacant public land has been suggested as a method of providing social housing infrastructure. The possibility of using such land for housing was recently proposed in Australia by Launch Housing. Although Launch Housing's program has not yet been implemented, 57 one-bedroom modular town houses are planned to occupy 9 parcels of land in Maidstone and Footscray (Sparkes, 2017; Millar, 2017). This land is held by VicRoads for the future extension of Ballarat Road, and will be leased for 5 years at a nominal fee if the project is implemented (Sparkes, 2017; Millar, 2017). Despite Launch Housing's proposal, there has not been any research conducted on the viability of constructing social housing infrastructure using relocatable modular housing on temporarily vacant public land.

1.2 Definitions

1.2.1 Social Housing

Social housing is housing provided for people who are effected by disadvantage or who have low incomes. Social housing has 2 subcategories (ADO, 2016):

1. *Public housing*: housing owned by the state and managed by the Minister for Housing (ADO, 2016).
2. *Community housing*: housing owned by non-governmental housing organisations known as community housing organisations (ADO, 2016).

1.2.2 Modular Housing

Modular construction is the prefabrication of three-dimensional housing units using factory machinery (Lawson, Ogden, & Goodier, 2014). This process allows for detachable houses and even low- to medium-rise apartment complexes to be fully relocatable (Lawson, Ogden, & Goodier, 2014). The units can be transported to a suitable site and assembled to a foundation for the completion of whole or major parts of buildings (Lawson, Ogden, & Goodier, 2014; Haas et al., 2000).

1.2.3 Temporarily Vacant Public Land

Temporarily vacant public land is that that has been held by the government for the purposes of future infrastructure, such as roads or railways (VGLP 2015).

1.3 Structure of the report

This report assesses the viability of using modular housing on temporarily vacant public land to provide social housing infrastructure. The report is broken into 6 sections:

1. Introduction.

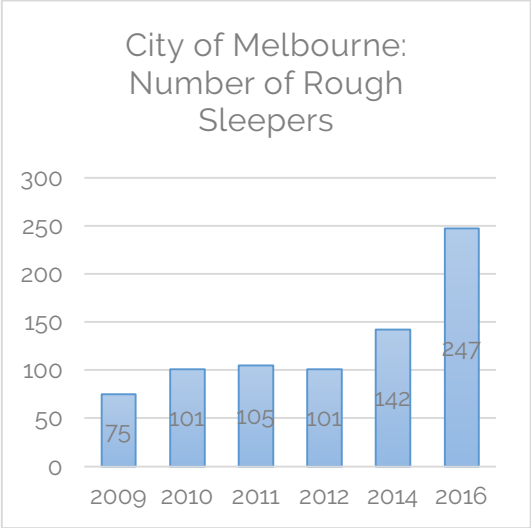
2. Current and future need for social housing infrastructure.
3. Modular housing.
4. Analysis of international examples.
5. Evaluation of justifications for using temporarily vacant public land.
6. Conclusions.

2 Current and Future Need for Social Housing Infrastructure

2.1 Homelessness Rates

From 2011 Australian Bureau of Statistics (ABS) data, it was estimated that around 22,789 Victorians experience homeless on a given night (ABS, 2011). This is a rise of 20.7% in the number of homeless people since 2006 (ABS, 2011).

In the city of Melbourne specifically, it was estimated that 1,232 persons were homeless in 2011 (City of Melbourne, 2014). Although 2016 ABS data is not yet available, Melbourne's 'Streetcount' – a survey tallying the number 'rough sleepers' on the streets of Melbourne – indicates homelessness has grown significantly (Dow, 2014; Witte, 2017; Wright, 2016). In 2016, 247 homeless persons were found sleeping on the streets, an increase of 135% from 2011 (ADO, 2016; City of Melbourne, 2014; Witte, 2017; Wright, 2016).



Source: City of Melbourne, 2014

2.2 The Causes of Homelessness

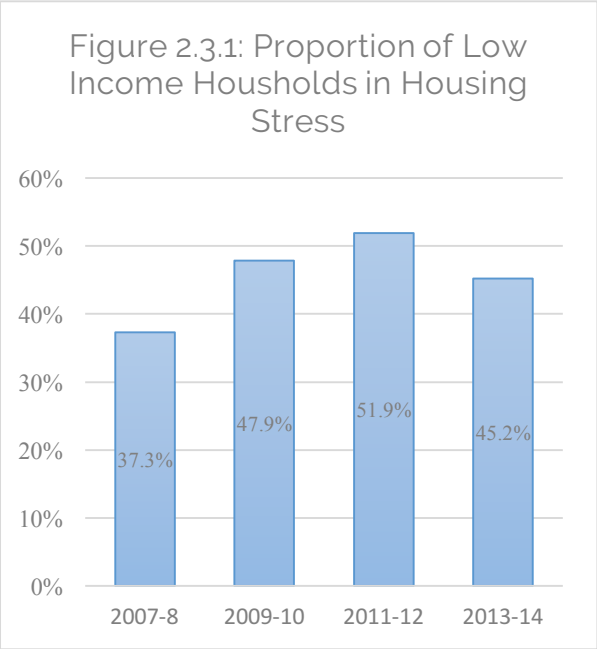
Research has overwhelmingly shown that homelessness is produced by an interaction between between unfavourable structural conditions and individual risk factors. Structural conditions ultimately determine the extent to which the overall population is susceptible to homelessness (Fitzpatrick et al., 2000; Kennett & Marsh, 1999; Pleace & Quilgars, 2003; Robson & Poustie, 1996). These conditions include, but are not limited to, housing affordability, social housing stock, and crisis housing stock (Fitzpatrick et al., 2000; Pleace & Quilgars, 2003). Under unfavourable structural conditions, individual circumstances increase the vulnerability of particular groups (Koegel & Burnam, 1988; Sosin et al., 1990; Anderson, 1923; Bahr & Caplow, 1973; Rossi, 1989). These circumstances include mental illness, disability, family violence, and drug abuse (Koegel & Burnam, 1988; Sosin et al., 1990; Anderson, 1923; Bahr & Caplow, 1973; Rossi, 1989).

Social Housing infrastructure is needed to improve the structural conditions that contribute to causing homelessness (ADO, 2016). According to Infrastructure Victoria (2016), social housing infrastructure is split into three main categories:

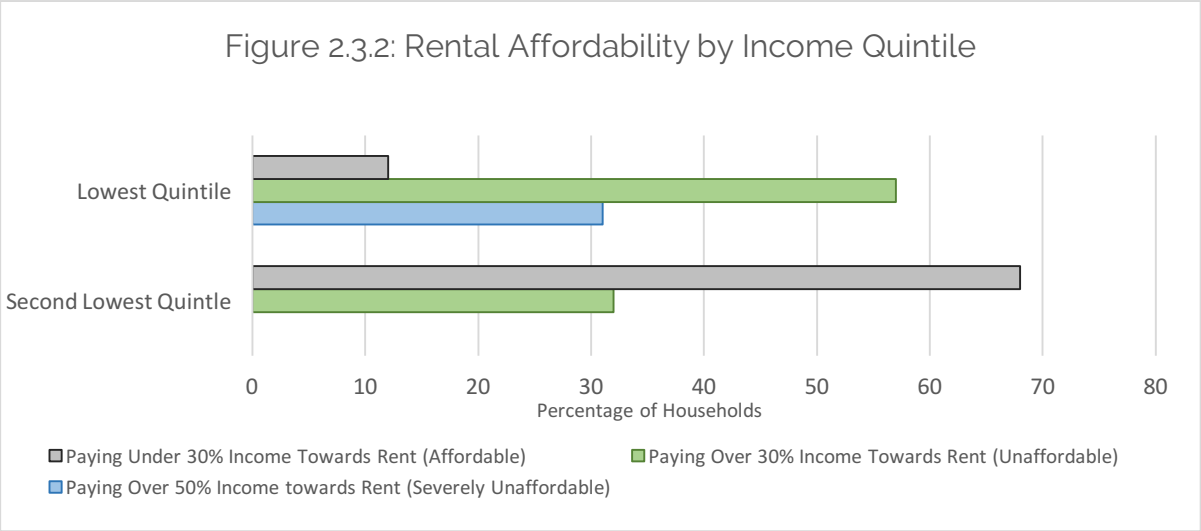
1. Affordable housing
2. Public housing
3. Crisis housing

2.3 Affordable Housing Need

Affordable housing can either be provided by private market forces or by community housing organisations (Hulse, Reynolds & Yates, 2014). In 2016 it was estimated that between 75,000 and 100,000 low income households were in rental stress and required better access to affordable housing (ADO, 2016). 'Low income households in rental stress' is defined as the proportion of households within lowest 2 quintiles (lowest 40%) of the city's income distribution who pay more than 30% of their gross household income on rent (SGRGSP, 2017; Hulse, Reynolds & Yates, 2014; ADO, 2016). From 2007-8 to 2011-12, the proportion of Melbourne's low income households in housing stress rose from 37.3% to 51.9% (SGRGSP, 2017). Although this number dropped to 45.2% in 2013-14, it is expected to have increased (SGRGSP 2017). Of those in the lowest quintile in 2011, 88% of households were paying over 30% of their income towards rent; of these households, 35% were paying over 50% (Hulse, Reynolds & Yates, 2014). Contrastingly, only 32% of households in the second lowest quintile were in housing stress, although this is still a substantial proportion (ADO 2016; Hulse, Reynolds & Yates, 2014).



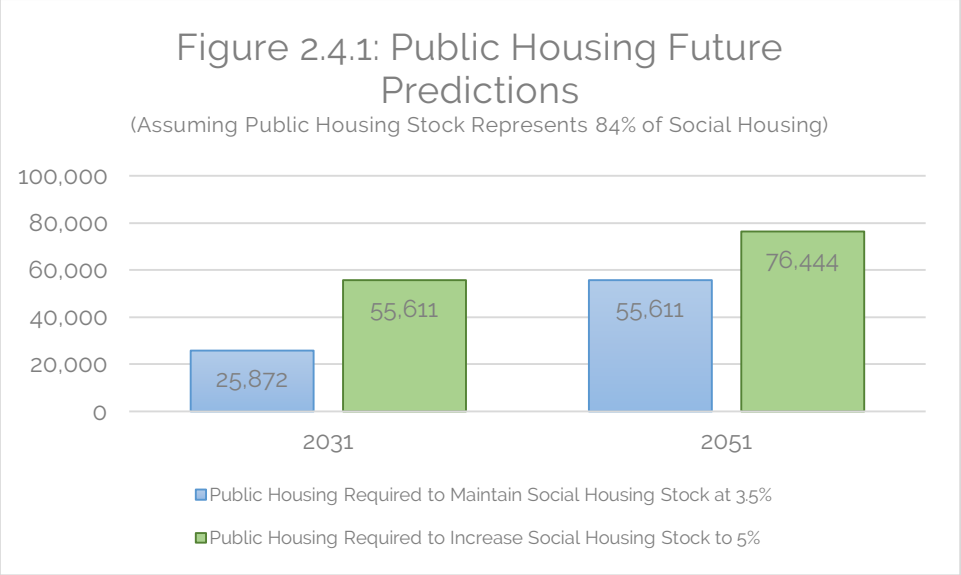
Source: Hulse, Reynolds, & Yates, 2014



Source: Hulse, Reynolds & Yates, 2014

2.4 Public Housing Need

In March 2016, over 32,000 households approved for public housing were on the waiting list (ADO, 2016). Public housing demand is expected to rise by 38% in Melbourne, and 26% for the rest of Victoria by 2024 (CHVC, 2014). Social housing stock represents 3.5% of all households in Victoria, 84% of this is public housing (Burke, 2016). To accommodate for this increase in demand, social housing stock will need to grow to between 5% and 6.5% of all housing stock by 2030 (Jacobs et al., 2010, McDonald & Temple, 2008, Burke et al., 2013). Maintaining 3.5% of total housing stock will require an additional 25,872 public housing dwellings by 2031 and 55,611 by 2051 (Burke, 2016; ADO, 2016).[1] For social housing stock to represent 5% of total housing stock an additional 36,960 public housing dwellings will be needed by 2031 and 79,444 by 2051 (Burke, 2016).



Source: Burke, 2016

2.5 Crisis Housing Need

Across Victoria, 105,287 persons accessed homelessness services from 2015-16 (AIHW, 2016). This accounts for a rise of 22% from 2011-12 (AIHW, 2016). Of the requests for crisis accommodation, 28.8% were unmet, representing an average of 42 unmet requests per day (AIHW, 2016). Although there are 4,065 crisis housing[2] units available in Victoria, there is still a substantial amount of need for this type of accommodation (ADO, 2016; Witte, 2016; Hulse, Reynolds, & Yates, 2014).

[1] This is based on the assumption that public housing remains at 84% of social housing.
[2] This number is accounted for by around 3,365 units in the public housing stock and 700 properties rented from private landlords (ADO 2016).

2.6 Conclusion

There is a substantial need for social housing infrastructure. This is represented by a specific need for affordable housing, public housing and crisis housing.

Table 2.6.1: Unmet Need in Social Housing Infrastructure

Social Housing Infrastructure Type	**Unmet Need**
Affordable housing	75,000 to 100,000 households in rental stress.
Public housing	32,000 households approved and waiting for public housing. A need for 25,872 public housing dwellings by 2031 and 55,611 by 2051.
Crisis housing	On average, 42 unmet requests for crisis housing daily.

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3 Modular Housing

3.1 Introduction

This section of the report evaluates modular construction as a method of providing housing infrastructure. It concludes that modular construction techniques can manufacture fully relocatable detachable houses and low- to medium-rise complexes. Furthermore, if managed correctly, modular housing can be constructed extremely expeditiously and cost effectively.

3.2 Modular Design

3.2.1 Transportability and Versatility

Modular constructions can be designed as fully relocatable accommodation units (Lawson, Ogden, & Goodier, 2014). Although the volumetric nature of modular constructions can constrain the versatility of their design, these units can range from single detachable houses to low- or medium-rise apartment complexes (Lawson, Ogden, & Goodier 2014. However, modular units have a limit to the height they can be built to (Stinson, 2016). In 2014, B2 BKLYN, a 32-story apartment development designed by SHoP Architects, was planned to be the tallest modular construction ever built (Volner, 2014). However, the modules were found not to be structurally stable after a certain height, and resultant design faults necessitated it be finished using conventional techniques (Stinson, 2016). Nevertheless, whole apartment complexes can still be relocated at a fraction of the cost of constructing a new building (Lawson, Ogden, & Goodier, 2014).

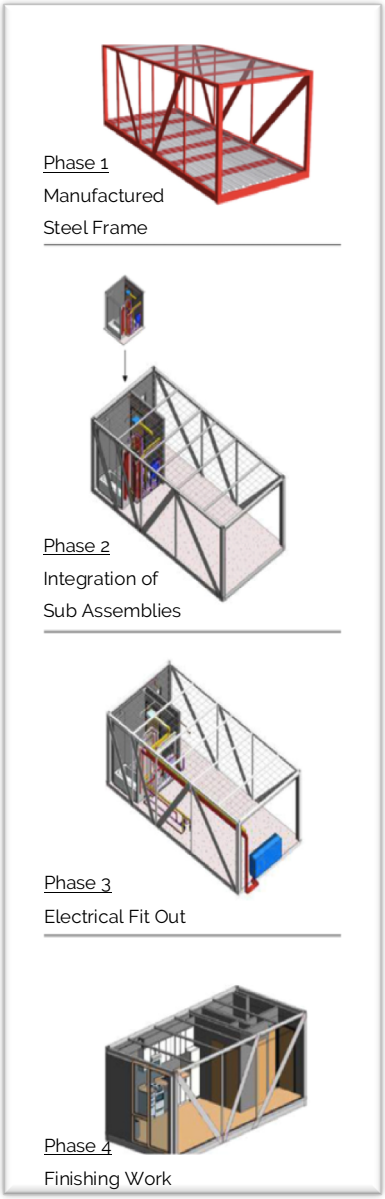


Figure 3.2.1: Generic Modular Process – Source: BC Housing, 2014.

3.2.2 Aesthetic

Although, modular constructions allow for accommodation to be designed for full relocation, this comes at the expense of a 'pre-fab' aesthetic (Molavi & Barral, 2016). This aesthetic makes them easily distinguishable from conventional buildings (BC Housing, 2014; Kamali & Hewage, 2016). Nevertheless, modular constructions should not be confused with flat-packed disaster relief units used for the shelter of dislocated persons during environmental disasters (BC Housing, 2014; Kamali & Hewage, 2016).

Figure 3.2.2.1 Relocatable Modular Housing, Vancouver - Source: Hodson, 2016.

Figure 3.2.2.2 Relocatable Modular Housing, London – Source: Roger Strik Harbour & Partners, 2016.

3.2.3 Quality

Modularisation can produce constructions of a similar quality to conventional construction techniques. This is because the factory production process allows for a high level of control over the finished product (BC Housing, 2014; Cartz & Crosby, 2007; Kamali & Hewage, 2016). During factory prefabrication, modules are often prototyped, subsequently checked for their consistency and quality, and then replicated at a high level of precision (O'Connor et al. 2000; Rogan, Lawson, & Bates-Brkljac, 2000; Cartz & Crosby, 2007; Kamali & Hewage, 2016). The McGraw Institute's (2011) surveys of 800 architects, engineers and contractors in the United States, showed that those who found no other compelling reason to use the method, often chose it because it produced a consistent quality.

3.3 Construction Time Reduction

A central reason modular buildings are manufactured is because the construction method allows for an extremely accelerated building process. Depending on the idiosyncrasies of the project, modular construction can reduce the build time of traditional methods by 40%-60%, (Mah, 2011; Lawson & Ogden. 2010; Smith, 2011; MBI, 2012). In 2008, the average construction time – defined as the time between first on-site building activity and full completion – for a detached house in Victoria was 7.5 months (Dalton, Wakefield, & Horne, 2011). By contrast, construction times for a detached modular home in Australia can take as little as 12-16 weeks from the beginning of factory construction to full completion (Raikes, 2017).

In December 2016 China Triumph International Engineering Co released plans to build five modular factories across the United Kingdom (UK) (Bury, 2016). These plans were guided by the UK Government to meet their insufficient housing supply growth (Bury, 2016). The factories are expected to create 25,000 homes per year for the next five years (Bury, 2016).

These extremely fast construction times are made possible by the high production speed of factory machinery (Lawson, Ogden, & Goodier 2014). Factory construction also allows units to be

constructed off-site, and hence on-site preparation and construction can take place simultaneously (Kawecki, 2010; O'Connor et al. 2000). This further expedites the process.

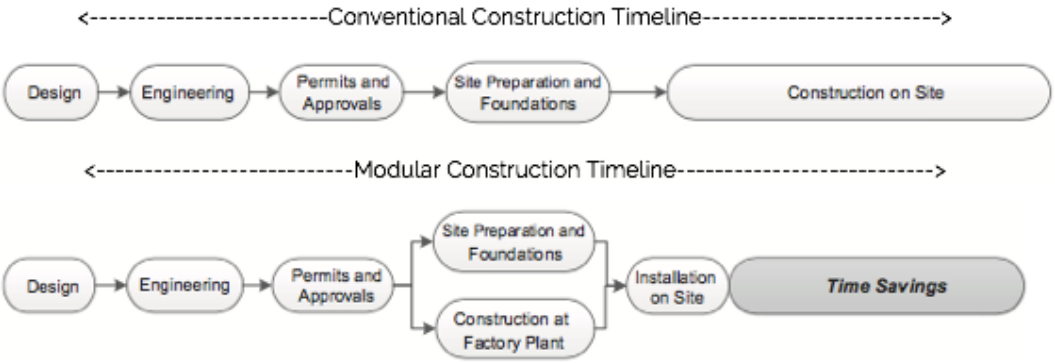


Figure 3.2.1.1: Relative Time Savings for Construction Methods – Source: Kamil & Hewage 2016

3.4 Challenges for Design and Construction Time Reduction

3.4.1 Increased Complexity of Apartment Complexes

Ramaji and Memari (2015) claim that modular projects with multiple stories can decrease time savings due to increased levels of complexity. However, construction time savings still remain significant lower for low- and medium-rise complexes (Kamali & Hewage 2016). Cratz and Crosby's (2007) analysis of the tallest modular building to be constructed before 2007 concluded the construction time still remained shorter than if it were conventionally built.

3.4.2 Design Precision

The pre-construction design must be conducted more precisely than for conventional construction. This is because the process of factory standardisation makes modular units harder to modify during the on-site construction phase (Celine, 2009; Haas & Fagerlund, 2002; Lu, 2009; Jaillon & Poon, 2010). Hence, precise pre-planning and detailed coordination between the project architect, the on-site general manager, and the manufacturer is essential (Akagi et al., 2002; Jameson, 2007; Tam et al., 2007).

For example, in the fabrication process of a modular house on a Western Australian coastal site, the China-based factory overlooked Australian requirements for the electrics and hydraulic plumbing (Ham & Luther, 2014). This necessitated that some units be entirely remade, reducing the construction time considerably (Ham & Luther, 2014).

3.5 Cost Reduction

In comparison to conventional methods, prefabricated modular housing can significantly reduce costs. From the McGraw Hill (2011) modular construction survey, 65% of respondents reported cost

savings on their projects when using modular construction. Of these respondents, 41% reported a saving of 6% or more, and 5% reported a saving of more than 20% (McGraw Hill, 2011).

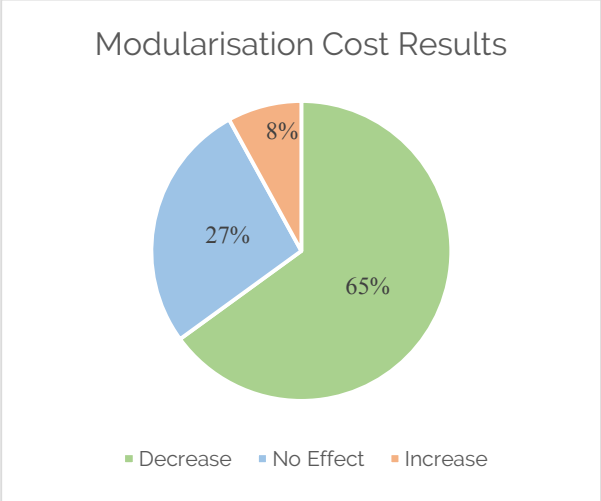


Figure3.5.1 Source: McGraw Hill, 2011

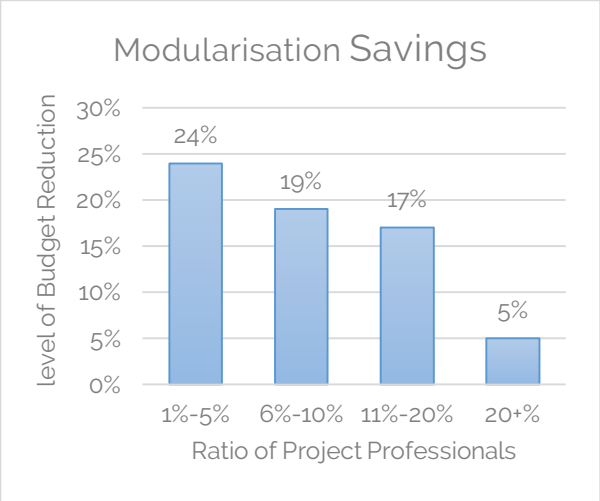


Figure 3.5.2 Source: McGraw Hill, 2011

3.5.1 Production Output Savings

For suppliers, the capital investment for manufacturing modular constructions is higher than that required for conventional construction, however several factors still facilitate a cheaper product for consumers. (Lawson, Ogden, & Goodier, 2014). To enter the modular housing industry, factory space, machinery, and other fixed facilities incur substantial costs. Nevertheless, the aforementioned increased speed of production lowers the fixed costs per-unit (Lawson, Ogden, & Goodier, 2014; Barlow et al., 2003; Kalami & Hewage, 2016). So long as production output stays high, this reduces the product's price and recoups capital investment at a faster rate (Lawson, Ogden, & Goodier 2014; Barlow et al., 2003; Kalami & Hewage 2016). Furthermore, by expeditiously manufacturing a standardised product, materials can be ordered in bulk further reducing prices (Quale, 2012; Chiu, 2012).

3.5.2 Labour Cost Savings

Fagerlund (2002) believes modular construction techniques can result in a 25% cost reduction for on-site labour costs, as reduced construction time decreases the labour effort needed. Because Australian labour costs are high, especially in the construction industry, this can generate considerable savings (Lawson, Ogden, & Goodier 2014; Ham & Luther 2014; Kalami & Hewage 2016; Fagerlund 2002). Furthermore, the on-site construction of modular units is less technical, which decreases the amount of vocationally skilled workmen (Blismas, Pasquire, & Gibb 2006; Gibb & Isack, 2003; MBI 2012).

3.6 Challenges to Cost Reduction

3.6.1 Transportation

Transportation is the most significant factor that can influence increased costs (Lawson, Ogden, & Goodier 2014; Schoenborn 2012). The central difficulty for full volumetric modules is that transportation essentially involves moving large empty volumes of space (Schoenborn 2012). Lopez and Froese's (2016) analysis of cases in Canada found that modular construction was only marginally cheaper than methods that involved planar construction. Planar construction is a method of factory prefabrication, but one that does not produce a volumetric product (Lopez & Froese, 2016). However, it was stressed that the idiosyncrasies of the construction sites, their proximity to the manufacturer, and the complexity of the project could make modular construction much more expensive than using conventional construction methods (Lopez & Froese, 2016). Hence, to capitalise on cost efficiency, it is important to consider the project's specific context and the way it effects the cost (Schoenborn, 2012; Jameson, 2007).

3.6.2 Design Customisation

Although design work is often standardised, higher levels of customisation can significantly increase the cost. When modules are standardised, the fixed cost of their design can be spread over multiple clients (Barlow et. al. 2016). Higher levels of customisation incur a higher design cost and reduce the advantage of factory iterations (Schoenborn 2012). Barlow et. al.'s (2016) analysis of Japanese modular construction practices showed that this was universally true across the industry. Ultimately, projects must find the right compromise between timespan, cost, and level of customisation to be financially successful (Jameson 2007).

3.7 Conclusions – Advantages and Disadvantages

As a method of providing relocatable housing infrastructure, modular construction can provide a quality, cost effective, and expeditiously constructed and product. However, there are many disadvantages that can mitigate these benefits as summarised below:

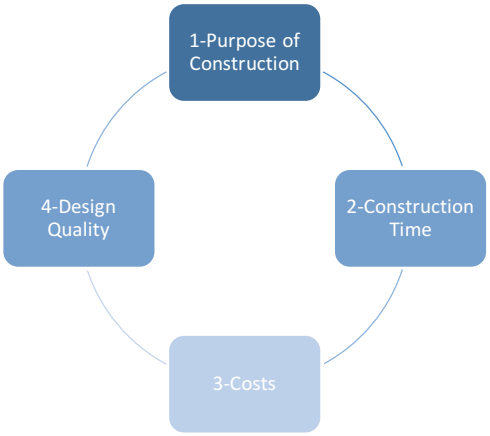
Table 3.7.1 Modular Construction: Advantages and Disadvantages

Advantages	Disadvantages
• Modules can build detachable houses and low-medium rise complexes to be fully transportable.	• When modules are transportable, they retain a 'prefab' aesthetic and potentially have a lower life-span.
• Extremely expedited construction process	• Expeditiousness can be mitigated by poor design management • Constructions with multiple stories slow the process
• Cost effective method of building	• Poor transportation management can mitigate this saving • Over ambitious design customisation can mitigate this saving

4 Analysis of International Examples

4.1 Framework

Based on on the following framework, three international cases of using modular housing to address homelessness from Ireland, England, and Canada are analysed:



All examples utilised modular housing to expeditiously respond to emergency situations while permanent dwellings were procured. However, only the English and Canadian examples were built on temporarily available public land. The Irish case used land that is permanently surplus. All examples were constructed extremely expeditiously with designs of a suitable quality. The costs were kept very low in the Canadian example, but were relatively higher in the Irish and English examples.

4.2 Ireland, Dublin Case Study

4.2.1 Purpose

Ireland currently suffers from a huge shortage in social housing and affordable private housing (Gleeson, 2016). This forced the government to place many families in bed and breakfast accommodation on an emergency basis (Gleeson, 2016).[3] However, this form of accommodation is both unsuitable and extremely costly (Gleeson, 2016). Ireland's Rapid-Build Housing Program is intended to address this by quickly increasing social housing supply using modular housing (GoI, 2016). One aspect of this plan is the construction of modular units for emergency transitional accommodation on underutilised public land (GoI, 2016). It should be noted that the modular houses are not on temporarily vacant public land but permanently surplus land (Kelly, 2017). The Dublin City Council has planned to build 153 homes on 5 different sites (DCC, 2015). The first of these sites to be finished was located in Ballymun, where 22 houses were constructed (Kelly, 2017).

[3] It should be noted from the outset of these case studies that the narrative is constructed from news paper articles, not academic studies. Unfortunately, the novelty of the case mean that rigorous studies has not been conducted.

4.2.2 Construction Time

Planning began in December 2015 and was completed in May 2016, totalling 7 months (DCC, 2015; Kelly, 2017). After the planning stage, it took only 16 weeks to construct the 22 houses (O'Doherty, 2016). Although the project skipped the phase of community consultation usually required, modular construction proved to be a very expeditious process of construction, with up to 100 more houses due by July 2017 (O'Doherty, 2016).

4.2.4 Cost

The construction work was contracted to Western Building Systems (WBS) after a bidding process (Gleeson 2016). However, on the completion of the houses, the Council and WBS fell into dispute over the contracted cost (Kapila, 2016). Eventually the parties agreed on a figure of €180,000 per house (Gleeson 2016). From the Council's perspective, this cost exceeded their expectations as buying existing permanent houses in Ballymun would have cost less than the modular houses (Gleeson, 2016; O'Doherty, 2016).

4.2.3 Design Quality

Each of the 22 houses at Ballymun is a 2-storey, 3-bedroom house on 96.5 square meters, with separate living and kitchen areas, solar panels, and triple glazed windows (Holland, 2016). Furthermore, Irish quality regulations for temporary modular housing are the same as those for permeant housing, acting as a safeguard for what was a high-quality result (Oppermann, 2016; Cummins, 2015).

Figure 4.2.3.1: Exterior of Modular Houses at Ballymun – Source Kelly, 2017

Figure 4.2.3.2: Interior of Modular Houses at Ballymun – Source: Kelly, 2017

4.3 England, Lewisham Case Study

4.3.1 Purpose

House prices in Lewisham, south-east London have grown by 15% over 2015-16 (Osborne & Norris, 2016). The Lewisham Council's public housing waiting list has 9,135 households on it, and 540 of them in bed and breakfasts. (Osborne & Norris, 2016). For the re-housing of those in bed and breakfasts, the council constructed 24 modular 2-bedroom temporary affordable housing units on the site a recently demolished leisure centre (Roger Strik Harbour & Partners, 2016). Since 2014, this site has been left vacant while redevelopment plans take place (Roger Strik Harbour & Partners, 2016). The apartments will remain there for 1-4 years and then be deconstructed and moved to a currently unknown location (Osborne & Norris, 2017). Their express purpose is to house these families while the council "develop(s) new–build and estate regeneration programmes" (Roger Strik Harbour & Partners, 2016:2). The rental prices will be set between market and social rates, and will be payed through the government's housing benefit (Osborne & Norris, 2016).

4.3.2 Construction time

The construction time for this project was incredibly expeditious. Starting in November 2015, the work was completed by March 2016, totalling little more than 6 months (Osborne & Norris, 2016).

4.3.3 Cost

The contract cost was £4.98 million, averaging at £207,500 per unit (Roger Strik Harbour & Partners, 2016). Unfortunately, the breakdown of this cost in unavailable for further analysis.

4.3.4 Design Quality

The modular building won the *Mayor of London's Prize, New London Architecture* and *Temporary Building Award, New London Architecture* (Roger Strik Harbour & Partners, 2016). The units exceed London's standard space requirements for 2-bedroom apartments by 10% and are fitted out with a separated living area, kitchen, and bathroom (Osborne & Norris, 2016). However, there have been reports from local residence who dislike the building's design (Osborne & Norris, 2016).

Figure 4.3.4.1: Exterior of Modular Houses at Lewisham – Osborne & Norris, 2016

Figure 4.3.4.2: Interior of Modular Houses at Lewisham – Osborne & Norris, 2016

4.4 Canada, Vancouver Case Study

4.4.1 Purpose

Vancouver is experiencing an affordable housing and homelessness crisis. In 2016, the Vancouver Homelessness Count identified 539 unsheltered individuals (Thomson, 2016). The Vancouver City Council has offered 20 sites of city-owned land worth $25 million for the creation of more than 3,500 affordable housing units (City of Vancouver, 2016). However, in the interim, the City Council with the Vancouver Affordable Housing Agency (VAHA) deemed it necessary to construct a temporary modular complex that would act as short-term housing at 220 Terminal Ave (City of Vancouver, 2016). The land was previously a community garden and is pending redevelopment in 3-5 years (City of Vancouver, 2016). No land has yet been identified for its relocation.

4.4.2 Construction Speed

In May 2016 the VAHA requested five shortlisted firms to submit designs for the modular complex (City of Vancouver, 2016). Horizon North won the design bid and completed the building in February 2017, totalling 10 months (Hodson, 2016). The construction phase took only 2 months to complete.

4.4.4 Cost

The project cost $3-3.5 million, totalling $75,000 to $87,500 per accommodation unit (Denis 2017a; Thomson 2016). The management cost of the complex is $280,000 per annum (Denis 2017b).

4.4.3 Design Quality

The 40 single occupancy units are built entirely self-contained, with a living space, bathroom and kitchen (Hodson, 2016). There are is a communal indoor and outdoor amenity space, and four of the suits have been designed with accessibility requirements (Hodson, 2016).

Exterior of Modular Housing in Vancouver – Source: Hodson 2016

Interior of Modular Housing in Vancouver – Source: Hodson 2016

4.5 Conclusions

Every example used modular construction techniques to expeditiously respond to emergency situations while permanent dwellings were procured. Their temporarily vacant land was utilised in the English and Canadian examples. However, how the relocation of these units will take place is yet to be known. The examples were all constructed extremely quickly, and to a suitable quality. The costs were kept low in the Canadian example, but in the Irish and English examples were relatively high.

County	Purpose	Construction time	Design	Cost
Ireland	Accelerated re-housing of 22 families currently in bed and breakfast accommodation until permanent housing is procured.	Planning started in December 2015. The houses were completed in May 2016, totalling 7 months.	2-storey, 3-bedroom house on, with separate living and kitchen areas, solar panels, and triple glazed windows	Total: €3,960,000 Per house: €180,000
England	Accelerated re-housing of 24 families currently in bed and breakfast accommodation until permanent housing is procured.	Planning started in November 2015. The complex was completed in March 2016, totalling 6 months.	Exceed London's standard space requirements for 2-bedroom apartments by 10%	Total: £4.98 million. Per Unit: £207,500
Canada	Accelerated provision of housing for 40 of the 539 homeless until permanent housing is procured.	Planning started in May 2016. The complex was completed in February 2017, totalling 13 months.	Entirely self-contained single occupancy units built with a living space, bathroom, and kitchen.	Total: $3,000,000 to $3,5000,000 Per apartment: $75,000 to $87,500

5 Evaluating the Justifications for Using Temporarily Vacant Public Land

5.1 Introduction

Vacant land can be held by the government for the purposes of providing future infrastructure under Section 2(a)(ii)(a) of the *Victorian Government Landholding Policy* (VGLP) (2015). This land does not typically attract any infrastructural development because of the impermanent nature of its vacancy. With modular housing, this land can be temporarily occupied under Section 2(a)(ii)(c) of the VGLP, which allows occupancy for the purposes of community benefit.

There are three *possible* justifications for using temporarily vacant land:

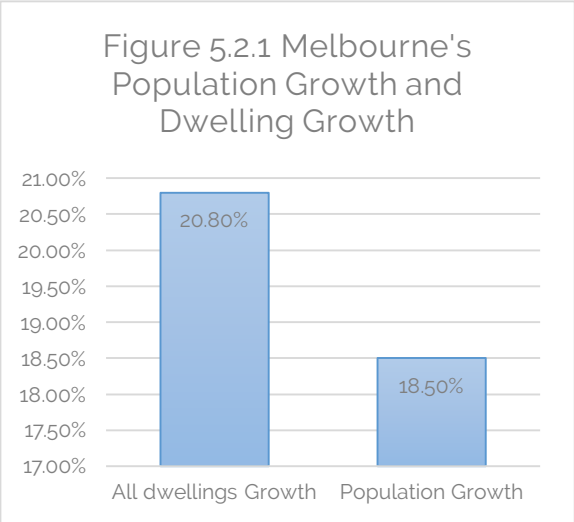
1. **To increase the supply of dwellings**: if the growth in supply of dwellings is not keeping pace with population growth, more land will need to be utilised for the provision of a larger supply growth.
2. **To provide social housing infrastructure at a reduced capital cost**: the cost of acquiring land from the private market is high. Therefore, using land owned by the state reduces the capital cost of providing social housing infrastructure.
3. **To provide dwellings in an emergency:** if temporarily vacant land is available, it can be utilised without delay.

This section assesses these justifications and concludes that increasing the total supply of dwellings, and providing dwellings at a reduced capital cost are not sufficient justifications for utilising temporarily vacant public land. On assessment of the justification to provide dwellings in the event of an emergency, this section concludes that temporarily vacant land should only be used in the unlikely event that no other vacant land is available.

5.2 Increasing the Supply of Dwellings

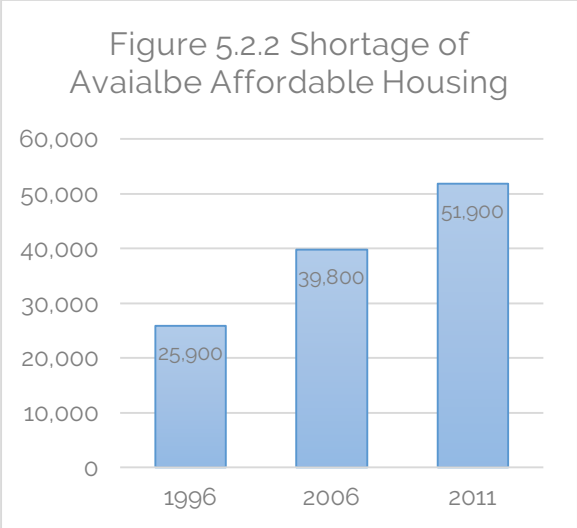
Using modular housing on temporarily vacant land to supply new social housing infrastructure would bolster the supply of total dwellings. This is because temporarily vacant land would otherwise not be utilised for the period of its vacancy. Bolstering the supply of total dwellings may be sensible if population growth were out-pacing dwelling supply growth. This is because the shortfall in supply would force people into homelessness. However, the supply growth of total dwellings is actually outpacing population growth, and hence a justification cannot be made on this basis (Hulse, Reynolds and Yates 2014; Ong et al 2017).

Insufficient supply growth of total dwellings is not a central structural cause of homelessness in Victoria. From 2005-06 to 2013-14, Melbourne's population has grown by 18.5% and the number of dwellings has grown by 20.8% (Ong et al., 2017). This is because the central driver of demand is not domestic population, but the factors that incentivise existing homeowners to 'up-grade' and invest in residential property as a low-risk long-term asset that generates return by way of capital gain (Hulse, Reynolds, &Yates, 2014; Meen, 2016; PoA, 2017).



Source: Hulse, Reynolds, and Yates 2014

Conversely, the diminished supply growth of affordable dwellings is a predominant structural cause of homelessness (Hulse, Reynolds, & Yates, 2014; Ong et al., 2017; Meen, 2016). Nationally, investment demand for properties has meant less than 5% of building approvals have been in the bottom 20% of dwelling real price distribution (Ong et al., 2017). In Melbourne, the effects of this have meant that the shortage in available housing stock for those in the lowest quintile worsened from -25,900 in 1996 to -51,900 2011 (Hulse, Reynolds, &Yates, 2014).



Source: Hulse, Reynolds, and Yates 2014

Housing affordability policies that focus on the supply of total dwellings do not address this central issue. Crucial to these policies is the assumption that increasing total dwelling supply eases market pressures through a trickle-down effect (Ong et al., 2017). This is the process whereby households buying new dwellings create vacancies in the existing housing stock and enable low income households to move in at lower prices (Ong et al., 2017). However, literature both nationally and internationally show that a general increase of housing supply would have to be unattainably large for the production of more than a very modest increase of trickle-down affordable dwelling supply (Berry et al., 2004; Lawson et al., 2012; Milligan et al., 2009; Milligan & Pinnegar, 2010; Meen, 2016).

The supply of dwellings on temporarily underutilised land may increase the total supply of houses. However, this will have little to no effect on addressing the structural causes that create homelessness. Hence, a justification for the use of temporarily vacant land cannot be made on this basis.

5.3 Providing Dwellings at a Reduced Cost

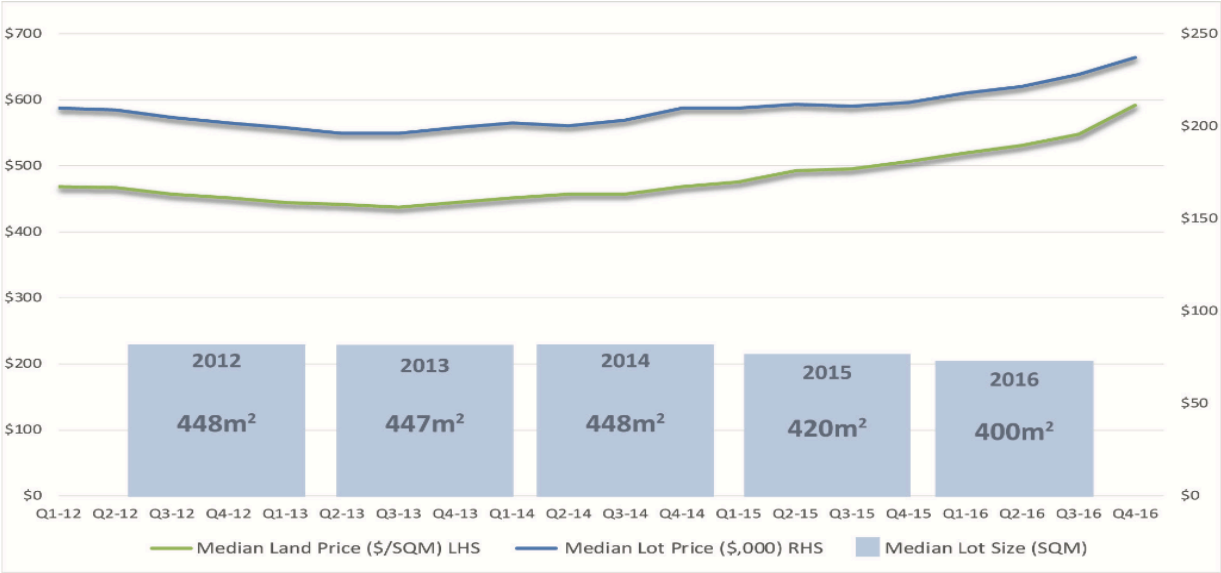
5.3.1 The High Cost of Land

Utilising modular housing on temporarily vacant land would deliver new social housing infrastructure at a reduced capital cost. However, the overall cost effectiveness of this strategy and the viability of its longevity is ultimately unknown. Hence, without significant further research new social housing supply on temporarily vacant land should not be implemented on this basis.

For the provision of new social housing, central to the capital cost of construction is the cost of acquiring land (CHFV, 2017). Hence, the Community Housing Federation of Victoria May 2017 Industry Forum Report, "strongly encouraged" the Government to think about the development of surplus public land (CHFV, 2017:7).[4]

Last year, Melbourne land prices increased by 17% per square meter, a growth rate of more than double that of 2015 (UDIA 2017). Melbourne's median lot price rose 11.3% to $237,000, the highest annual increase since 2010 (UDIA 2017). These increases over the past decade mean land values can exceed housing and construction prices by a significant proportion (Ham and Luther 2014).

Figure 5.3.1.1 Lot and Land Price Change 2012-2016



Source: UDIA 2107

In urban environments, land value growth is driven by development restraints on land and a large population growth. In Victoria, the population is expected to reach 7.7 million by 2031 and 10.1 million in 2051; this will require an additional 2.2 million dwellings by 2051 (DELWP, 2016). The central policy that contains this population to an urban core and incentivises higher density

[4] This publication is not yet available on the Community Housing Federation of Victoria website but can received from the author on request.

development is the Urban Growth Boundary (McLaughin, 2011; Ball et al., 2014). Immediately after the implementation of this policy, land prices on the urban fringe increased by 65% and have continued to rise (Ball et al., 2014). The construction of new social housing infrastructure on temporarily vacant land does reduce the initial capital cost of this provision. However, there are likely to be additional costs that might outweigh this saving.

5.3.2 Additional Costs

Additional costs can be incurred from the periodic relocation of modular units on temporarily vacant land to new land of the same nature. A program that utilised temporarily vacant land would have to rest on the assumption there are an infinite number of relocations the housing units could go through, continually benefitting off vacant land. Each relocation, would necessitate a that a new foundation be laid and that utility services be reconnected to the house or complex (Lawson, Ogden, & Goodier, 2014). According to the National Audit Report (2005), this work typically accounts for 13% of the total building cost. The extent to which these costs are incurred is highly dependent on the idiosyncrasies of the sites and the number of relocations that take place (Lawson, Ogden, & Goodier, 2014). Sites that are not already connected to central utilities or require other additional preparation are likely to increase the cost (Lawson, Ogden, & Goodier, 2014). Moreover, the human resources necessary to manage the periodic transportation of this infrastructure is also expected to incur additional costs. Ultimately, there is no research that evaluates the full extent of these additional costs. Therefore, housing should not be placed on temporarily vacant land when the accumulative costs of using such land may actually outweigh the cost of acquiring permanent land in the first place.

5.3.3 An Unknowable Future

Even if it were deemed financially advantageous to use temporarily vacant land on a periodic basis, the longevity of such a program is ultimately unknowable and hence unadvisable without significant further research. As aforementioned, continually using temporarily vacant land rests on the assumption there an infinite number of relocations can take place. This assumption *might* be sound for a small stock of modular houses. However, there is a lacuna in the research on the amount of temporarily vacant land that could be used. Such research would have to involve a comprehensive analysis of vacant land in the past and present, and then use this information to model a future projection. Without such data, it would not be recommended to expand a program when its future is dependent on this land existing even 60 years from now.

5.4 Providing Dwellings in an Emergency

Only in an emergency situation should the provision of modular housing on temporarily vacant land be considered. As the construction times are significantly quicker than conventional construction, it could be deemed useful to utilise modular constructions to respond to an emergency crisis. However, this does not necessitate that modular housing be used on temporary land. The aforementioned problems with using temporarily vacant land require that it only be used when:

1. When no permanently surplus government land is unavailable, and
2. No land can be acquired from the private market.

The international uses of modular housing on temporarily vacant land were both in response to a crisis situation. In the Canadian case, it was to immediately re-house a proportion of the 539 unsheltered homeless individuals. In the English case, it acted as transitional housing for 24 families in bed and breakfast accommodation. In both cases, the housing acted as crisis accommodation while permanent housing was being procured.

As aforementioned in Section 2, there is an immediate need for housing for the estimated 247 'rough sleepers' and 42 daily unmet requests for emergency accommodation. Modular housing could be used to address this need. Nevertheless, it is out of the scope of this report to assess whether this is appropriate. Even if it were appropriate, the use of modular housing does not necessitate that it be put on temporarily vacant land.

5.4.2 Permanent Surplus Public Land

Annually, opportunities can arise for the provision of permanent housing on surplus government land. As prescribed by the VGLP (2015), agencies annually review their landholdings and report justifications for retaining land parcels to the Department of Treasury and Finance. This process allows for surplus government land to be considered by other departments for community use, or for an alternative public service need before it is released for sale on the open market (VGLP, 2015). This process means that all government land in Melbourne has a defined use and is ranked according to the extent that it is utilised (VGLP, 2015). Hence, if land is available, it will be known by the Department of Treasury and Finance.

A recent example of this is the Department of Defence's (2017) declaration of the Maribyrnong defence site as surplus land. The 127.8 hectares of land is enough to hold over 6,000 homes (Lucas, 2017; Department of Defect, 2017). Although there is no clear provision for social housing on this land yet, it is expected that some will be used to provide affordable and public housing (Lucas, 2017).

5.4.1 Acquiring Land from the Private Market

In accordance with the *Land Acquisition and Compensation Act 1986*, any private land may be acquired for the use of a public service. However, if land is acquired it must be compensated at its full market value. A *Notice of Intention to Acquire* must be served, but land can be acquired two months after this process (*Land Acquisition and Compensation Act,* 1986). This is frequently done by VicRoads for the provision of transportation infrastructure (VicRoads, 2013). Hence, in an emergency situation, land from the private market could be acquired with no significant delay.

5.5 Conclusions

Holistically, there is a lacuna in the research regarding the use of temporarily vacant land for social housing in Victoria. However, some conclusions can be drawn:

1. There is not a justification for using temporarily vacant public land on the basis that it increases the total supply of dwellings.
2. Without additional research, it cannot be known whether it is more advantageous to use temporarily vacant land or acquire private land on a cost basis,
3. It is also unknown whether using such land will even be possible into the future.
4. To avoid the complications of using temporarily vacant public land without relevant research, even in an emergency it should only be used if no other land is available. However, it is likely land from the private market or permanently surplus government land is available.

6.0 Conclusions

This report finds that the use of relocatable modular housing on temporarily vacant public land is not currently a viable method of providing social housing infrastructure. There is a substantial need for social housing infrastructure. Furthermore, modular housing can be utilised to provide this infrastructure and has the ability to be fully relocatable. The central advantage of this construction method is that it has an extremely accelerated construction process. The Irish, English, and Canadian case studies showed that modular housing was used to respond to emergency situations by taking advantage of this construction speed. However, the continued use of temporarily vacant public land is currently not recommended. Without the presence of further research that reveals the full ramification of using such land on a continuous basis, it should only be used in an emergency. However, even in an emergency this land should only be used in the unlikely event that no other land is available.

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