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# **Myths and Realities of Reconstruction Workers' Accommodation**

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## EXECUTIVE SUMMARY

Christchurch and Canterbury suffered significant housing losses due to the earthquakes. Estimates from the Earthquake Commission (EQC) (2011) suggest that over 150,000 homes (around three quarters of Christchurch housing stock) sustained damage from the earthquakes. Some areas of Christchurch have been declared not suitable for rebuilding, affecting more than 7,500 residential properties.

There are multiple pressures likely to come on to housing availability over the next few years:

- Red zoned residents are looking for replacement housing,
- Residents of damaged housing will be looking for temporary accommodation while their houses are repaired or rebuilt, and
- Out-of-town workers coming in to support the rebuild (and their families) will be looking for either temporary or permanent housing.

International experience, together with Christchurch case studies, has suggested the above pressures may create the following ripple effects in Christchurch:

- A lack of accommodation for construction workers is likely to be a major constraint to the rebuilding of Christchurch. The construction sector may experience difficulties sourcing temporary accommodation for out-of-town workers in suitable and affordable solutions, which could ultimately slow the rebuild.
- Competing demand/ demand surge for temporary accommodation is likely to contribute to post-disaster inflation. If post-disaster inflation gets too high, it can hinder economic recovery.
- Demand for housing from construction workers is likely to compound the shortage of houses available to residents displaced by the earthquakes.

Case studies from a range of organisations involved in the Canterbury rebuild have shown that hiring strategies have changed the landscape of workforce demographics, as construction companies look overseas for skilled workers. To accommodate new and relocated/seconded employees from outside Christchurch, a number of accommodation options have been used, including:

- Workers on short-term relocation/secondment (e.g. weekly or fortnightly fly in and out) are likely to stay in apartments, townhouses, motel and hotel rooms, Bed & Breakfast and home stays.
- Staff on longer relocation and/or secondment are often housed in rental properties and company-owned houses.
- For those recruited from overseas on a short-term or permanent basis, as well as staff on permanent transfer, companies tend to provide relocation assistance as part of their employment package; This often involves providing temporary

accommodation for a short period till they find their own temporary or permanent housing solutions. Most employees who relocated from overseas preferred to find permanent housing.

- In most cases, companies had found they needed to secure accommodation of various types on a longer lease and have at least one HR person dedicated to assisting staff in finding their own temporary or permanent housing solutions. Some companies secured the services of letting agencies to help fast track staff and their families into private rental properties, and to assist in property purchase if required.

Other key findings include:

- The need for single-stay accommodation of temporary workers has largely been met by Christchurch's hotel and motel facilities, as well as other types of boarding houses;
- Housing individual workers has been manageable to many case study organisations, but costly;
- The real concern to the case study organisations is the availability of suitable and affordable housing for workers with families.

Conclusions that are drawn are specific to these selected organisations, but can be used to understand the complexity that arises from the temporary accommodation issues. This report suggests that there is a need for increased supply of affordable rental properties and a more flexible design of interim housing solutions, which can be closely linked with other economic activities and generate a sense of stability to speed up disaster recovery.

International experience of providing interim housing for a targeted population (as shown in Appendix) demonstrates how varied materials, financing models, organisational designs and procurement methods can be used in a housing initiative to achieve its interim purpose. To some extent, these experiences can be transferrable to the situation in Canterbury. Interim housing examples in Indonesia, China and the U.S. illustrate that the feasibility and practicality of a housing programme for accommodating construction workers largely relies on how the program is designed and its second life intention.

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<sup>1</sup> The case study interviewees and their associated organisations are named in Resilient Organisations report “Resourcing of the Canterbury rebuild: Case studies of construction organisations, January 2013”

# 1. INTRODUCTION

The scale of the housing losses due to the Canterbury earthquakes is staggering. The recent *Economic Recovery Programme for Greater Christchurch* has made it clear that housing is the single greatest component of all losses in terms of estimated cost of recovery (CERA, 2012).

There are multiple pressures likely to come on to housing availability over the next few years:

- Red zoned residents are looking for replacement housing,
- Residents of damaged housing will be looking for temporary accommodation while their houses are repaired or rebuilt, and
- Out-of-town workers coming in to support the rebuild (and their families) will be looking for either temporary or permanent housing.

Following the 22 February 2011 earthquake, rental prices in Canterbury have risen significantly (Parker and Steenkamp, 2012). At the time of writing this report, the increase in the average weekly private rent in several Christchurch suburbs was 20% or more for the three months ending January 2013, compared to the same period the previous year (MBIE, 2013). The issue of temporary accommodation for housing construction workers has been under debate over the last year of the Canterbury rebuild. The temporary accommodation issue has become prominent as competing demands emerged between the reconstruction workforce, who were from outside Christchurch, and displaced residents, including red-zone residents and those whose houses are subject to repairs.

At this point, medium-term assessments of housing needs in Canterbury (e.g. the Greater Christchurch Urban Development Strategy (UDS)<sup>2</sup> and the UDS submission to the Productivity Commission's housing affordability inquiry (2012)) have started to inform housing investment strategies at the regional level. Amendments to Christchurch City Council's District Plan<sup>3</sup> allowed construction of temporary buildings in the Central City, and there have been subsequent proposals put forward for building temporary accommodation for construction workers. Concern has emerged however about the nature, capacity and quality of these planned housing units, their associated problems and impacts on local community wellbeing.

By drawing on case studies of 15 construction organisations currently operating in Christchurch, this report examines the temporary accommodation issues for construction workers in Christchurch. The report starts by offering insight into the potential impacts of a shortage of temporary accommodation on reconstruction trends, community recovery, and longer-term social and economic development that have

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<sup>2</sup> <http://www.greaterchristchurch.org.nz>

<sup>3</sup> Published in July 2012 by Canterbury Earthquake Recovery Authority (CERA), [www.cera.govt.nz](http://www.cera.govt.nz)

been seen in other disaster events around the world. The report then explores, for the Christchurch context, the types of housing likely to be needed. The report finally defines how different options of housing solutions might be considered by relevant stakeholders to minimise potential impacts in Christchurch.

## **2. INFORMATION SOURCES**

Using a qualitative approach, this research employs a multiple case study design. The material included in this report draws on case study data that was captured through in-depth interviews with representatives of 15 selected construction organisations between October and December 2012. Data on past disaster recovery experiences draw from longitudinal studies conducted by Resilient Organisations in countries like Indonesia, Australia, China, and Japan as they recover from natural disasters. Information on the post-disaster reconstruction of Hurricane Katrina in New Orleans was provided by American academics who have been involved in relevant research.

## **3. HOW THE SHORTAGE OF TEMPORARY HOUSING MIGHT IMPACT CHRISTCHURCH**

### **3.1 The Hurricane Katrina, 2005**

Hurricane Katrina in 2005 damaged 70% of 188,000 housing units in New Orleans, the U.S., causing an immediate escalation in home prices and rental rates for the remaining habitable housing (FEMA, 2006). Housing costs for renters spiked higher than for homeowners, rising by 27% from 2004 to 2008 (Plyer et al., 2009). The increase was greatest in Orleans Parish where rents rose by 41 % after controlling for inflation<sup>4</sup>. By 2008, rental costs in Jefferson, Orleans and St. Tammany were well above similar cities such as Baltimore, Memphis and Milwaukee<sup>5</sup>.

The massive rebuilding effort in New Orleans created new demands for building materials and construction workers, already in short supply because of strong home-building activity around the rest of the country (NAHB, 2005). In a survey of construction workers rebuilding the City of New Orleans, Fletcher et al. (2007) found that 70% of surveyed workers were U.S. citizens, and most of them came from other states such as Texas and Florida. The remainder were from other countries including Mexico, Honduras, and El Salvador; the majority were Latino.

Among those surveyed workers, half of them lived in houses and apartments, with many sharing accommodation with other construction workers (with an average of five people per housing unit) (Fletcher et al., 2007). A few workers lived in cars or at

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<sup>4</sup> The Greater New Orleans Community Data Center (GNOCDC) analysis of U.S. Census Bureau data from American Community Survey 2004 and 2008, <http://www.gnocdc.org>

<sup>5</sup> The Greater New Orleans Community Data Center (GNOCDC) analysis of U.S. Census Bureau data from American Community Survey 2008, <http://www.gnocdc.org>

the construction site. Plyer et al. (2009a) found that to a large extent, high demand of rental properties from the reconstruction workforce had contributed to rent escalation, with many displaced households and low-income renters being priced out of the market. Plyer et al. (2009a) also found that high housing costs had limited the region's ability to attract and retain workforce that is essential for a healthy economy.

### **3.2 Great East Japan Earthquake and Tsunami, 2011**

Similar effects of a lack of temporary accommodation for construction workers were observed in some prefectures of Tohoku ravaged by the March 11, 2011 Great East Japan Earthquake and Tsunami. The loss estimates indicated that there were 107,000 buildings collapsed and another 111,000 partially collapsed (National Police Agency of Japan, 2011). This region is now facing significant issues around provision of temporary housing, financing for permanent housing, land use and debris clean-up and disposal (EERI, 2011).

A construction boom in areas devastated by the tsunami is expected by both the public and private sectors. Six months after the event, there were signs of surging demand for construction work to build new homes, repair damaged houses and remove debris in disaster-hit prefectures<sup>6</sup>. Local construction businesses were struggling to keep up with increased building activities. Some companies had temporarily transferred employees from Kansai and other parts of Japan to support their understaffed operations in the Tohoku region. General contractors from Tokyo, Osaka and other major cities had started coming in and playing a central role in building temporary homes. Since these builders mainly used their own affiliates as subcontractors, temporary housing construction sites were dominated by firms from other prefectures.

The provision of temporary housing was emerging as a significant challenge on many levels. The availability of such housing and of suitable land on which temporary housing could be placed was problematic. Displaced home owners who had places to stay, with family or friends, inside or outside the impact region, were not living in temporary housing. Ishinomaki City, for instance, provided financial assistance for people to live in rental housing, but finding housing has been difficult. The siting of temporary housing facilities has been challenging since public space on which to locate them was in short supply (EERI, 2011). Therefore, many disaster victims were left in the private rental market, competing for limited housing resources with a large number of construction workers coming for the rebuild.

Many construction companies operating in the Tohoku region, however, were able to find housing in Sendai, which is about 90 minutes away by car or bus. Some out of town workers had located and secured their own apartments on a longer-term lease. Some stayed in hotels or ryokans (Japanese type of hotel) in nearby cities. As the transport network is highly convenient across the country, most of those who stay at a

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<sup>6</sup> Asia and Japan Watch, <http://ajw.asahi.com/article/0311disaster/analysis/AJ201107042846>

distance travel to work by train or high-speed Shinkansen (bullet train) on a daily basis.

Specialist tradespeople such as carpenters and roofers were in a severe short supply. Builders thus had to bring in these people for home repairs. The relocation of those construction workers had, particularly, triggered a special demand surge for temporary accommodation in adjacent areas of Tohoku. In many respects, the convenience of public transportation in Japan makes commuting an affordable option for construction workers, however these indirect cost – increased rents and travel fares – are inevitably passed onto home owners.

The full extent of the impact of the housing shortage in Tohoku on the overall economy is still unclear, but higher costs for construction goods and workers were visible. Higher rents affected the entire housing market, putting at a disadvantage those without transportation or the ability to negotiate the tight housing environment on their own. There may be economic decline and out-migration from the most severely affected communities as the lack of accommodation hampers the rebuild. This situation is similar to what has been documented following the Kobe earthquake in 1995 (e.g. (Comerio, 1997), (Hirayama, 2000), (Olshansky et al., 2005)).

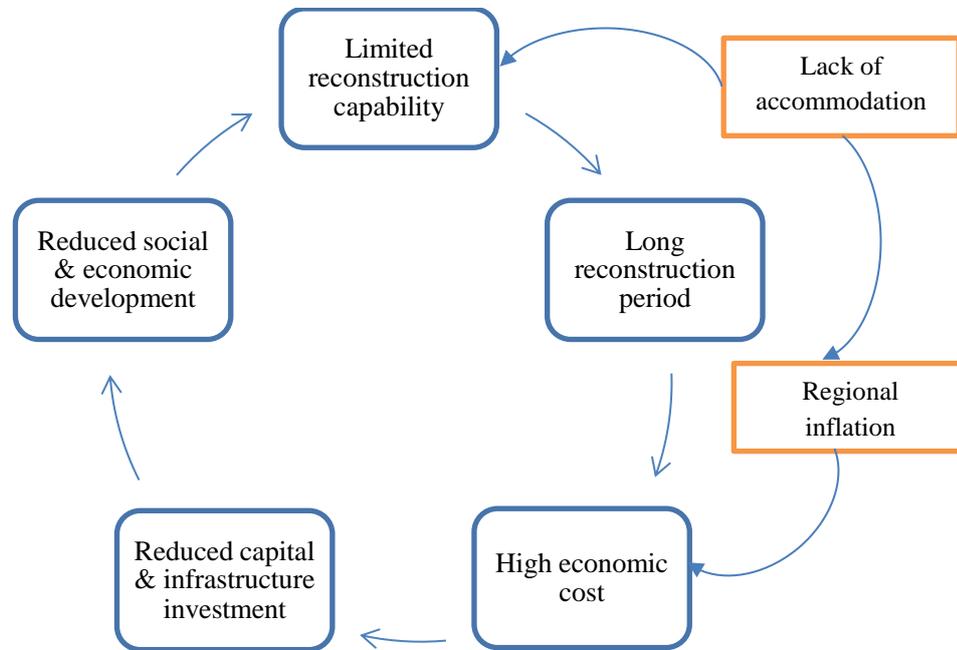
### **3.3 What can be learned from similar events?**

There are many examples of housing costs and rental rates skyrocketing after large-scale disasters, not only in New Orleans and Tohoku as described above. Often, decision-makers wonder whether additional policy interventions, for instance subsidising low-income rental housing, are needed to help take the pressure off the rental market. The above two examples provide some basis for projecting how the lack of accommodation for construction workers could affect the reconstruction capability in Christchurch, and create ripple effects on communities, market and economy in disaster affected areas.

The lessons learned are summarised as follows:

- A lack of accommodation for construction workers is likely to be a major constraint to the rebuilding of Christchurch. The construction sector may experience difficulties sourcing temporary accommodation for out-of-town workers in suitable and affordable solutions, which could ultimately slow the rebuild.
- Competing demand/ demand surge for temporary accommodation is likely to contribute to post-disaster inflation. If post-disaster inflation gets too high, it can hinder economic recovery.
- Demand for housing from construction workers is likely to compound the shortage of houses available to residents displaced by the earthquakes.

Such effects are illustrated in Figure 1 below. Feedback within the system can be amplified by other long term mechanisms, such as changes in risk perception that reduces investments in the affected regions, and reduced services that make qualified workers leave the region. Because of these mechanisms, the impact of accommodation shortages may last much longer than what is considered the recovery and reconstruction period.



**Figure 1: Amplified feedback loop due to a lack of temporary accommodation**

## 4. TEMPORARY ACCOMMODATION: PERSPECTIVES OF CONSTRUCTION ORGANISATIONS

### 4.1 Housing solutions sought by case study organisations

A shortage of temporary accommodation is a pressing issue for many of the case study organisations interviewed as part of this research. It is considered a significant disincentive for potential staff to move to Christchurch, and also a likely leverage point for competitor companies to poach staff. The solutions used by case study organisations to temporary accommodation arrangements include:

- Workers on short-term relocation/secondment<sup>7</sup> are likely to stay in apartments, townhouses, motel and hotel rooms, Bed & Breakfast and home stays.
- Staff on longer relocation and/or secondment are often housed in rental properties and company-owned houses.

<sup>7</sup> Fly in and out on a regular basis (weekly, fortnightly, etc.)

- For those recruited from overseas on a short-term or permanent basis, as well as staff on permanent transfer, companies tend to provide relocation assistance as part of their employment package. This often involves providing temporary accommodation for a short period till they find their own temporary or permanent housing solutions. Most employees who had relocated from overseas preferred to find permanent housing.
- In most cases, companies had found they needed to secure accommodation options of various types on a longer lease and have at least one HR person dedicated to assisting staff in finding their own temporary or permanent housing solutions. Some companies secured the services of letting agencies to help fast track staff and their families into private rental properties, and to assist in property purchase if required.

The case study organisations reported that the need for most single-stay accommodation has been met by Christchurch’s hotel and motel facilities, as well as other types of boarding houses. Housing individual workers has been manageable, but costly. The real concern to the case study organisations is the availability of suitable and affordable housing for workers with families.

As the rebuild increases in pace over 2013, additional pressure is likely to be placed on housing availability and therefore further inflation of rental and housing costs in Christchurch can be expected.

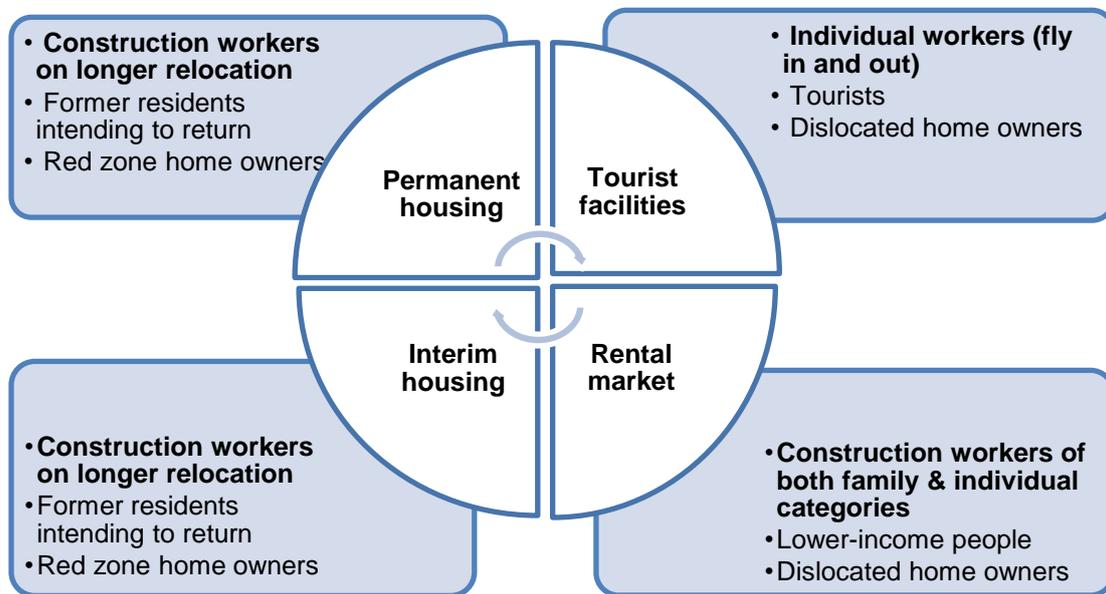
#### 4.2 Topology of housing needs from construction workers

Intentions to use migrants grew strongly over the past year, with construction companies looking overseas to address skill shortages, in engineers, management and other technical job categories. In line with Resilient Organisations’ previous findings (Chang-Richards et al., 2012), case studies of construction organisations have shown that two categories of construction workers, namely civil/structural engineers and construction professionals (such as project management, site engineers, supervisors and quantity surveyors) continue to be the largest inbound demographic group involved with the rebuild in Christchurch (See Table 1).

**Table 1: Demographic attributes of incoming workers in Christchurch**

	Civil/structural engineers	Construction professionals
<b>Country</b>	Earthquake-prone countries(e.g. US, Italy, Chile) or Australia, UK	UK, Ireland
<b>Age category</b>	Young, 25-35: many of them are not married	More family category Variations between 30 and 50 year olds
<b>Years of experience</b>	New graduates or more than 2 years experience	At least 5-10 years plus experience

Accommodation issues in Canterbury span a range of sectors including tourism, hospitality, rental market, temporary housing, and new housing development (Figure 2).



**Figure 2: Topology of housing needs from construction workers**

A concentration of housing losses in a particular market sector is a much more important indicator of a possible housing crisis than the number of housing units lost (Comerio, 1997). In Christchurch we are seeing competition for inhabitable permanent houses and interim solutions such as apartments and town houses between red zone home owners, former residents who want to return to the city, and migrant skilled workers from outside of Christchurch (the left side of the matrix in Figure 2).

Anecdotal evidence indicates that people from lower income groups are experiencing fewer options in certain suburban areas. This lower income group of people are the one who are likely to be affected most and displaced from inflated rental market (the right side of matrix in Figure 2).

Many inbound skilled workers have families and are inclined to seek single family, permanent houses. Their choice of housing is largely based on the structure (space, amenities, architecture), location (neighbourhood, schools, proximity to work and land conditions) and financial potential (appreciation and cash value). Other workers on longer-term secondment/relocation preferred interim housing solutions including rental houses, apartments and town houses.

As for renters, the current rental market seems unable to deliver housing at a lower cost for a large number of workers in Christchurch. High cost burdened rates among those construction workers indicate strong demand for more affordable rental

properties and interim units. Nonetheless, any increase in supply intending to take the pressure off the rental market needs to be implemented with caution. The increased costs of insurance and utilities post-Canterbury earthquakes may be permanent in Christchurch. Factoring this cost in, if market rates fail to cover the overall costs of running interim housing, investors may give up their investment.

As for permanent housing solutions, homeownership is a key factor. In Christchurch, Selwyn and Waimakariri, private developers have purchased groups of building lots for the construction of condominiums or rental housing for middle- to high-income households. However, if homeownership-related costs, such as taxes, insurance and utilities increase and residents' incomes fail to rise, homeowners may struggle to maintain their homes. High housing costs could lead to increased outmigration and reduce the attractiveness of Christchurch city to skilled workers needed for the rebuild.

By contrast, investors in housing for short-term purposes, such as workers camp, rental units, mobile homes etc., have a different set of concerns. Unlike the permanent housing development, investors have an incentive to invest in interim housing only to the extent that the short-term operations directly enhance cash flows or the housing units have a second lifespan that can generate economic return. Therefore, large-scale temporary housing is likely to be a promising solution provided that the tenancy and rent base is ensured.

## **5. OPTIONS EMBEDDED IN HOUSING NEEDS TOPOLOGY**

### **5.1 Past interim housing examples**

An analysis is provided in the Appendix of different interim housing options employed in past disasters around the world. The interim housing examples presented are derived from complex contexts in terms of the social, political and economic conditions in which various housing solutions were sought for a particular temporary purpose.

Cases of the 2004 Indian Ocean tsunami in Banda Aceh, Indonesia, the 2008 Wenchuan earthquake in Sichuan, China and the 2005 Hurricane Katrina in New Orleans, the U.S. show the differing 1) financing model, 2) organisational design, 3) targeted population and, 4) outcomes of interim housing options. Each case describes:

- the event and its context (summarised in Table 2);
- the housing solution for temporary usage and its overall lifespan, including the organisations involved and its operation process (summarised in Table 3); and
- the outcomes of the temporary housing solution.

**Table 2: Synopsis of the event, housing type and targeted population for each case**

Country	Indonesia	China	The U.S.
<b>Event</b>	Indian Ocean tsunami, 2004	Wenchuan Earthquake, 2008	Hurricane Katrina, 2005
<b>Group targeted</b>	Reconstruction professionals employed by NGOs	Construction companies' workers rebuilding the quake damaged cities	Victims of Hurricane Katrina
<b>Housing type</b>	Guest house	Prefabricated workers complex	Movable homes
<b>Duration of temporary usage</b>	On-going as interim accommodation for NGOs and tourists	Construction duration depending on projects	June 2007 – March 2009

**Table 3: Synopsis of the temporary housing for each case**

Housing type	Green Paradise Guest House	Workers Camp in Sichuan	Mississippi Cottages
<b>Financing model</b>	Public and Private Partnership	Private	Public
<b>Primary organisations involved</b>	Business owner, international donors, Malaysian and Indonesian governments	Construction companies, clients, local governments	FEMA, MEMA
<b>Building type</b>	Permanent concrete building complex	Prefabricated units	Modular housing units
<b>2<sup>nd</sup> life</b>	<ul style="list-style-type: none"> <li>• Guest house for tourists</li> <li>• Partial funding source for a local orphanage</li> <li>• Interim housing and conference venue for NGOs</li> </ul>	<ul style="list-style-type: none"> <li>• Other construction projects</li> <li>• Emergency shelters of local governments</li> <li>• Use of public facilities such as schools and hospitals</li> </ul>	<ul style="list-style-type: none"> <li>• Permanent homes for occupants</li> <li>• State housing for local low-income people</li> <li>• Holiday homes</li> <li>• Modified homes in new development</li> <li>• Use of NGOs and local governments</li> </ul>

The three cases are instructive for their organisational designs. In the Green Paradise Guest House example, the structure of the participating organisations was simple, with clear lines of ownership and beneficiaries. In the Mississippi's project, the organisational structure was similar to the Temporary Accommodation Villages in Christchurch, with the public sector playing a more significant role. In contrast, the Workers Camp in Sichuan after the Wenchuan earthquake demonstrated that constructing workers' complex has been a common practice used by construction companies for housing their workers, which proved to be efficient and cost-effective.

The three cases clearly show the importance of understanding the organisational design of the programme and of the second life purpose. In other words, technical design for interim housing – although smart – is not sufficient. It is important for interim housing solutions to be designed to generate longer-term, wider social and economic benefits.

## 5.2 Considerations in the Christchurch context

Information from the case studies of construction organisations highlighted that the housing needs for construction workers exist primarily in the permanent housing market and temporary rental market. To address these needs, however, the issues of accommodation need to be considered against the broader context of accommodation solutions, as shown in Figure 2. This report suggests the following considerations to help shape the thinking around housing solutions for construction workers.

- There is a need for increased supply of affordable rental properties and a more flexible design of interim housing solutions, which can be closely linked with other social and economic activities, such as investment in the tourism sector, encouraging private capital into social housing development, and increasing housing affordability in the region;
- A housing intervention, through public policy, or public and private partnership, or pure business behaviour, will affect longer-term housing provision; experience from other disasters, as described in the Appendix, indicates that temporary solutions could be temporary for a targeted population and become permanent for other beneficiaries;
- Workers camps, as one type of interim housing solution, should have sufficient flexibility in the design to ensure that structures can be adapted and moulded to meet a variety of needs and expectations;
- Also by design, the interim housing can be of varied types, such as mobile homes, tourist facilities, modular houses or permanent boarding rooms, intended to provide basic shelter and minimum amenities suitable for a temporary living situation for construction workers. The second-life purpose should be a top priority in the design (See examples in Appendix);
- If people have been led to believe that the interim housing will be temporary, they may be opposed to a later change of focus. The second life span should be included in the initial design. The design of a workers' complex should be well communicated to local communities to seek community acceptance;
- Interim housing programmes can be fast tracked through increased efficiencies and enhanced coordination with other interagency partners and stakeholders including such as Christchurch City Housing, Housing New Zealand Corporation (HNZC). Construction of temporary housing for reconstruction workers might be a substitute for private rental housing for lower income groups at a later stage; and
- A taskforce with mandate on interim housing solutions will help increase construction companies buy-in and acceptance of interim housing solutions. The taskforce can develop housing plans as well as quickly convene all stakeholders to decide on mutually agreeable housing solutions.

## 6. CONCLUSION

The lack of accommodation of varied types, for both disaster victims and the rebuild workforce, increases the cost of available housing units, causing regional inflation, and adding indirect economic costs to the recovery. Sourcing temporary accommodation has become a core activity of construction organisations involved with the Canterbury rebuild. Of major concern to the case study organisations involved in this research was the availability of housing for workers' families.

The competing demands for skilled workers and accommodation are becoming more significant as the commercial and residential rebuilding programmes accelerate. There is a need for increased supply of affordable rental properties and a more flexible design of interim housing solutions. Innovative interim housing solutions can be used to relieve this burden and reduce the associated costs to employers and the public by producing additional housing affordable for construction workers, while at the same time linking with wider economic concerns.

At a practical level, developing a large temporary housing programme for workers can be complex, expensive, technical, and there may be significant logistical, legal and political hurdles. Interim housing examples in Indonesia, China and the U.S. as shown in Appendix illustrate that the feasibility and practicality of a housing programme for accommodating construction workers largely relies on how the program is designed and the very concept of its second life intention.

As addressing housing affordability has become a priority on Government's agenda, flexibility around approach, implementation, financing, legality and the extent of private sector participation and management of housing supply can be built in the current recovery programmes. There is a need to continually balance the expediency needed to meet the needs of reconstruction sectors with the need to identify non-proprietary solutions.

Interim solutions need to be fast, cost-effective and benefiting other groups of people throughout its lifecycle. This is, however, what is needed in Christchurch. The imminent need for construction workers to support the rebuild means that interim housing and affordable rental properties are needed as soon as possible. Any housing solutions developed should consider their potential second-life use right from the start of the design process.

## **APPENDIX: PAST EXPERIENCES OF INTERIM HOUSING**

### **Case 1: Banda Aceh Guest House - Green Paradise**

#### *The disaster and its context*

On December 26, 2004, Boxing Day, an earthquake with a magnitude measuring 9.0 on the Richter scale occurred and caused tsunami waves to strike the coastal areas of northern Indonesia, Thailand, and reaching further to India, Sri Lanka, The Maldives, and some parts of the coast of Somalia in Africa. Indonesia was one of the countries worst affected by the tsunami. The epicentre of the 2004 Indian Ocean earthquake was 250 kilometres off the coast of Banda Aceh, the capital city of Indonesia's Aceh Province. Across the city, 17,219 housing units were heavily damaged and 4,193 partly damaged (Nurdin, 2006).

#### *Green Paradise for reconstruction workers in Banda Aceh*

The 2004 Indian Ocean tsunami drew a significant global attention. The response of international donors was remarkably quick and overwhelming. The United Nations, non-government organisations (NGOs) and international non-government organisations (INGOs) mobilised emergency assistance on a massive scale. In 2006, there were approximately 290 NGOs and donor organisations in Aceh and Nias, managing 828 recovery and reconstruction projects (BRR, 2006). Finding accommodation was particularly challenging for a large number of reconstruction staff coming from other countries.

In January 2005, a community group led by Mr. Dr Fuad from Johor, Malaysia visited the tsunami devastated areas in Banda Aceh. The team came up with an idea to build an orphanage to accommodate the many orphans whose parents were lost in the tsunami. This idea was soon translated into a dormitory project with monetary donations from the Malaysian Government and 'Johor community'. The land where the dormitory was built on was donated by a local Acehnese couple Adamy's family. With the rest of the land, the Adamy's family started building a guest house, named as 'Green Paradise', to accommodate the international relief and reconstruction workers. In February 2005 the family started construction of both the Green Paradise and orphanage dormitory.

Green Paradise is located in the corner of Banda Aceh, 15 minutes' drive to the central city, and 20 minutes' drive to the airport. It was planned as a residence compound to provide fully-catered services for reconstruction staff working for NGOs. In total 41 units of multiple types were built, which could house more than 100 people. The guest house comes with two large swimming pools, meeting rooms, common kitchen, gym, library and reading rooms (see Figure 3 and Figure 4). All the rooms have a bathroom, cable TV, wireless internet, air conditioner, fridge, dressing table and writing desk.



**Figure 3: Swimming pool and reading rooms**



**Figure 4: Standard single units**

The whole complex is nice but not luxurious by any stretch. The rooms are fairly spacious but adequate. The TV has about 15 channels including BBC Worldwide for news, a couple of movie channels, and at least one sports channel. The bed is made every day and the towel changed. Laundry will be taken away, washed, ironed and returned in two days with no charge. Each morning there's a simple, serve-yourself breakfast, which is included in the room charge. They have cereal, toast, fruit and a varied selection of things to put on the toast plus instant coffee. The unit types and rate charge are shown in Table 3 below.

**Table 4: Unit type and rate in Green Paradise<sup>1</sup>**

No	Room Type	Green Rate US dollars	Facilities	No. of Units
1	Standard	20.7	TV Cable, A/C, Hot & Cold Shower,	17
2	Deluxe 1	31.0	TV Cable, A/C, Hot & Cold Shower, Small kitchen	6
3	Deluxe 2	36.2	TV Cable, A/C, Hot & Cold Shower, Small kitchen	7
4	Deluxe 3	46.5	TV Cable, A/C, Hot & Cold Shower, Breakfast, Small kitchen	3
5	VIP 1	67.2	TV Cable, A/C, Hot & Cold Shower, Small kitchen, Guest space	7
6	VIP 2	77.5	TV Cable, A/C, Hot & Cold Shower, Small kitchen, Guest space	1

Note 1: The information in Table 3 was provided by the Adamy's family

The Green Paradise guest house is managed by Adamy's family as affordable rental housing for both tourists and reconstruction-related workers. Together with their Malaysian donors, Adamy's family manages the operations of orphanage and secures funding for it. The orphanage has 50 boys who are cared by 8 ladies and 6 social workers. Adamy's family has launched a series of campaigns with many international guests who have stayed in Green Paradise to raise funds worldwide in support of the orphanage. Green Paradise still runs well, and guests always come back to stay. In March 2013 Green Paradise will hold a half-month international meeting for NGOs currently operating in Banda Aceh.

### ***Outcomes of the guest house***

As is mentioned above, Adamy's family manages both the Green Paradise and the orphanage, which meant that the two purposes were closely integrated. Green Paradise combines recognised hospitality services with a strong commitment to charity and the support of local tsunami-orphans. This ethos has led to the contribution of many international guests and made Green Paradise a unique place to stay. As Asrul Adamy, the Operation Manager of Green Paradise sums up as follows:

*'From my experience maybe it's more useful if we could make something like home industry for continuity for these orphans' future life'.*

Green Paradise has been regarded by NGOs as a decent and economical means to house people while carrying out reconstruction works. More importantly, most guests had a clear understanding of what their stay contributes to – not only boosting the local economy, but also benefiting the Green Paradise adopted orphans. Now Green Paradise is widely considered to be one of the best examples of guest houses in the country.

## **Case 2: Sichuan Prefabricated Complex**

### ***The disaster and its context***

On May 12, 2008, an earthquake measuring 8.0 on the Richter scale struck Western China's Sichuan Province and its neighbouring provinces, causing significant human losses and widespread destruction to buildings and infrastructure. Housing was the single greatest component of all losses in terms of economic value and buildings damaged. Around 7,789,000 housing units collapsed and 24,590,000 were damaged during the earthquake (Paterson et al., 2008). The city of Mianzhu which is located 30 kilometres from the earthquake epicentre of Wenchuan County suffered severe damage. In rural areas, approximately 133,800 house units were damaged or collapsed. In urban areas, 61,000 housing units were damaged or destroyed. Only 8% of housing units cross the city remained habitable after the earthquake.

### ***Prefabricated houses for construction workers in Sichuan***

Prefabricated temporary houses were commonly used by construction companies to house construction workers rebuilding the earthquake damaged cities in Sichuan. In Mianzhu, for instance, factory-made prefabricated panels and components were bought by construction contractors from local manufacturers to build a complex of modular houses close to the construction site. From the outset, the design and site plan of a workers' accommodation complex was considered by both clients and bidding contractors in the procurement process and was also included in the contractors' bidding documents.

All prefabricated houses were built on lands close to the projects under construction. This decision allowed the government to provide much needed land and also to support the prefabricating industries in China. The complex provides a combination of unit types to suit different needs of workforce group. The design of the units considered the need that the units can be quickly dispatched, transferred to other parts of China and installed at a new site.

In Mianzhu, the unit designs varied from project to project, depending on the specifications set by the contractor. While most units had a bathroom, some units were more rudimentary and did not include this facility; meanwhile, other units offered more deluxe accommodations with two and/or three bedrooms and laundry, kitchen, and bathroom facilities. In most cases, the prefabricated complex has sports utilities such as basketball court, table tennis room and gym equipment. Management and maintenance of units were contracted to local facility management companies. Examples of such prefabricated houses in Mianzhu are shown in Figure 5 and Figure 6 below.



**Figure 5: Double storey prefabricated units**



**Figure 6: Prefabricated single units**

Following the earthquake, in November 2008 the Chinese Government launched a RMB4 trillion (approximately US\$600 billion) investment programme aimed at boosting the economy. Investment funds were used for the construction of railways and airport infrastructure. The demand for continued use of quake-related temporary housing was strong in other construction projects across the country. In Mianzhu, the physical structure of these temporary houses was still functional long after their intended use of two years.

For those of good quality, the contractor dismantled them and transported the units to other sites for reuse in next project or to be donated to the local government for the future emergency uses. For the units that were not in good condition, contractors demolished and sold the parts and materials. Reuse of the units for other community functions was also undertaken in Sichuan where the units were donated to schools, community centres and hospitals for their ‘second lifespan’.

### ***Outcomes of prefabricated houses***

Significant housing losses in Sichuan meant that there was no immediate solution to the housing shortage. The public buildings could not provide adequate shelter even for earthquake victims in the medium term. Living in such a complex helped construction workers focus more on regular work as it helps saving the cost and time of transportation.

The prefabricated system proved easy for the local contractors to master, and the aim of providing housing rapidly was met. The design also allowed contractors to expand the complex to accommodate more people if needed. The key disadvantage was that the division walls between units were made of light-weight prefabricated panels and were not sound proof. The recent techniques have been developed in China to address this shortcoming of prefabricated solution. Generally, some contractors consider it to be an optimal housing idea under an unusual circumstance, like a disaster, while for others it is a fact of economic necessity.

### **Case 3: FEMA's Transitional Housing - Mississippi's Cottage**

#### *The disaster and its context*

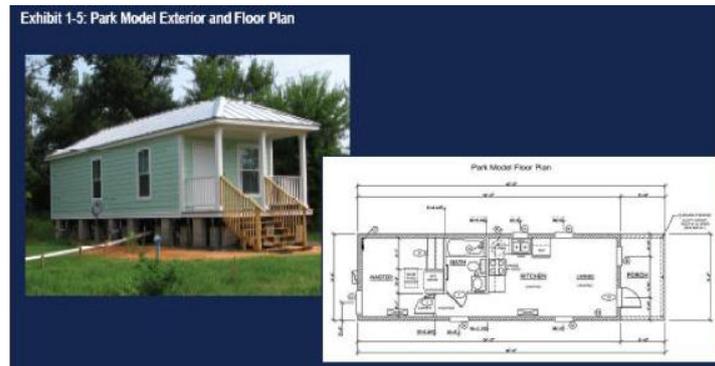
On August 29, 2005, shortly after Hurricane Katrina struck the Louisiana coast, the storm surge breached several sections of the New Orleans levee system and flooded 80% of the city (Louisiana Recovery Authority, 2006). In the coastal areas of the State of Mississippi, more than 1 million people were displaced and over 220,000 homes were damaged or destroyed (Maly and Shiozaki, 2012). In the city of New Orleans, approximately 70% of 188,000 housing units were damaged by the storm and subsequent flood (FEMA, 2006). The Federal Emergency Management Agency (FEMA) has the responsibility for providing emergency shelter after disaster. Following Hurricane Katrina, the main forms of temporary housing that was provided were mobile homes and travel trailers.

#### *The Mississippi Alternative Housing Program (MAHP)*

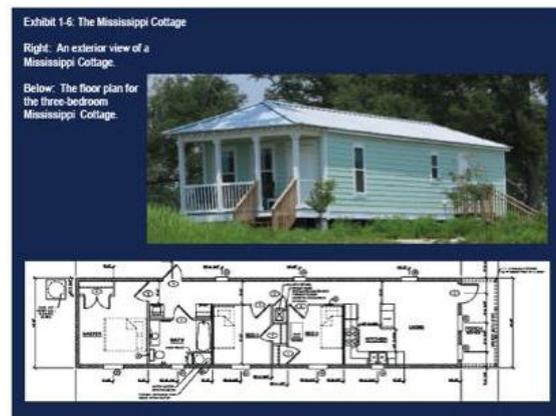
Mississippi was one of four states to receive funding under a FEMA pilot program to develop and test alternatives to FEMA travel trailers and mobile homes for housing disaster survivors. In the MAHP program, the Mississippi Emergency Management Agency (MEMA) and its contractors designed, built and installed manufactured housing units for over 2,800 households who were living in FEMA travel trailers and mobile homes two years after Hurricane Katrina. The units were intended to provide temporary housing until the occupants obtain permanent housing or until March 2009, the targeted end of the program.

The goal in designing the MAHP units was to develop a more liveable disaster housing unit which could easily be transitioned to permanent housing. Two unit types were predominantly used: one-bedroom Park Model (Figure 7) and two- and three-bedroom Mississippi Cottages (Figure 8) (Abt Associates Inc., 2009). Unlike the travel trailers, the Cottages (in this report refer to both models) have a separate bedroom and

full-size bathroom and kitchen. The design of Cottages met the construction codes for manufactured housing and the International Residential Code (IRC).



**Figure 7: Park Model**



**Figure 8: Cottage model**

The Mississippi Cottage project started on April 1, 2007 and the first house was occupied in June 2007. In total, 3075 units were built, housing more than 2,900 households between 2007 and 2011 (U.S. Department of Homeland Security, 2011). The Cottage program was open to renters and owners, and not restricted by income. These units were also designed to fit in with the architectural traditions of the Mississippi gulf coast.

The implementation of the Cottages was problematic for renters as MAHP did not provide land and renters had to ‘identify a family member, friend, or independent landlord willing to allow them to place the MAHP unit on their land, whether the land was provided for free or rent’. Although there were planned group sites, installation of these units received strong resistance and rejection from local jurisdictions. By the end of 2008, more than 80% of Cottage occupants still lived there, while the rest moved out. Among those who moved out, most had their permanent housing rebuilt. Others did so because of declared damage due to Hurricane Gustav in September 2008 (U.S. Department of Homeland Security, 2011).

There were varied methods used to decommission the Cottages after the temporary housing phase. In March 2009, MEMA demobilised some Cottages and transferred them to residents, non-profit organisations and local governments. The last two options were more preferred and prioritised as affordable housing to a wider group of people. As the use of the Cottage was no longer restricted to disaster victims, local governments used them as affordable rental housing in the local area.

A large number of units were also sold at public auction and there was no limit to how many units one can purchase. The original design of the Cottage allowed for modification in terms of the size of units to comply with local codes. There was a case that modification was carried out by a private developer who elevated Cottages within a new development in Pass Christian as permanent homes. The Government estimated that as many as 2000 Cottages have the potential to become permanent homes for low-income residents (U.S. Department of Homeland Security, 2011). Table 5 summarises the number of units demobilised as of March 22, 2011 and their second life intention.

**Table 5: Demobilised Mississippi Cottage units (Maly and Shiozaki, 2012)**

Second life use	Number of units
Sold to occupants who were Hurricane victims	1068
In the process of occupants acquiring land	242
Transferred to non-profit organisations or governments	451
Plan to transfer to non-profit organisations or governments	143
Auctioned off	710
Waiting for decision about disposition	206
Had already been decommissioned due to Hurricane Gustaf in 2008	225

### ***Outcomes of transitional housing projects***

The Mississippi Cottages provided residents with some degree of control over their housing choices, including location which depended on approval for land use and acceptance by local jurisdictions. Because the units are movable, they provide flexibility, especially as a transitional housing between temporary use for disaster victims and permanent use for other people. The target population can be a combination of temporary and permanent, renters and owners. The ownership can belong to individual households, or non-profit organisations or developers and government agencies.

The units are installed as interim housing and subsequently as permanent units, thereby fulfilling two different although related roles. Although the transitional housing programme in Mississippi was set out to provide temporary accommodation for disaster victims, its second life usage had more intangible benefits to community and economic recovery. The flexibility and possibility of ownership transfer that were

considered in the initial design had a positive effect on the long-term supply of affordable housing in the disaster area.

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