



# Barriers to Developing Sustainable Housing in Palmerston North

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*Report Prepared for the Palmerston North City Council*

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## **Executive Summary**

Through its Sustainable City Strategy (SCS) the Palmerston North City Council has identified a series of drivers in realising the city's aspiration to become more sustainable, and in doing so has highlighted some key points of intervention (specifically in relation to housing), as well as a range of potential barriers to the realisation of a more sustainable future. This report contributes to the process of trying to develop answers to the questions that the SCS has posed in relation to sustainable housing. To do this the report specifically focuses on exploring the barriers identified by the existing international research literature in the context of Palmerston North.

The report provides a review of the international research literature that examines definitions of sustainable housing, and the benefits and the barriers that have been identified to the adoption of sustainable housing measures. The report then draws on a series of key informant interviews undertaken during early 2013. These qualitative interviews targeted a range of individuals involved in the housing sector in Palmerston North, and included planners, real estate agents and builders.

The literature review identified four broad clusters of barriers to the adoption of sustainability features in housing: knowledge gaps, legacy, costs and benefits and fragmentation. The analysis of our interviewees, in the context of Palmerston North, has found that in the case of knowledge gaps, legacy, and costs versus benefits that there is a correlation between what they articulated and what is evident in the international literature. Notwithstanding a growing desire for sustainability features, there are knowledge gaps throughout the commissioning, design and building process. In particular there are gaps in understanding the performance of new material and systems. The character of the existing stock of houses in Palmerston North did create both inertia and unevenness given the rate of new builds and renovations. Unsurprisingly costs were a significant issue in shaping the adoption of sustainability features. There was a focus on upfront costs rather than payback, and this was related to the nature of house tenure. In relation to the question of fragmentation, an issue that was identified was the gap between different facets of the design and building process. In part this was put down to the use of new materials and designs, and the inevitable delay in integrating these new features within the existing building code. Positively, beyond the issues with compliance noted above, it was widely felt that the PNCC was supportive of efforts to incorporate sustainability features.

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## **Part One: Introduction**

### **1.1 Sustainable Housing**

In the pursuit of sustainability the role of housing has become increasingly apparent. Internationally, buildings, including residential houses, have been shown to consume significant amounts of energy, both in terms of their day-to-day operation but also in their construction, renovation and demolition (Sev, 2011). In New Zealand, for example, analysis from the Ministry of Business, Innovation and Employment (MBIE) (2012) shows that the residential housing sector accounted for approximately 12 per cent of the country's total energy demand in 2011, and that this figure has been steadily rising since 1990. As a consequence both research and policy work has turned to explore the ways in which the environmental impacts of housing can be reduced as means of responding to issues such as climate change and resource depletion within the wider rubric of realising sustainability (Osmani and O'Reilly, 2009; Retzlaff, 2009; and Vale & Vale, 2000).

### **1.2 PNCC Sustainable City Strategy Context**

In June 2010 the Palmerston North City Council (PNCC) adopted a Sustainable City Strategy (SCS). The SCS identified 16 sustainability drivers grouped into three distinct themes: environmental, social and economic. In the context of housing the SCS explicitly identified two key drivers of sustainability which are influenced by the choices that people make about housing, as well as possible barriers to changes in the dynamics of these drivers.

Firstly, in relation to energy use the PNCC (2010), drawing on figures from the Energy Efficiency and Conservation Authority (EECA) concluded that approximately 41 per cent of Palmerston North's energy consumption could be accounted for by household use. Reducing energy consumption was consequently seen as a key way of realising sustainability, but the Strategy suggested that the issue of the cost of improving a house's energy efficiency were seen as the biggest barrier to any improvement. This cost barrier encompassed both new materials, but also beliefs about the difficulty of navigating planning processes to get consents for things such as solar power.

Second, the SCS identified affordable and healthy housing as a key driver of sustainability. It noted that since 2003 house prices in Palmerston North have increased at a greater rate than house prices nationally, and that this did have some implications for housing affordability. As with New Zealand's housing stock more generally, Palmerston

North's housing was of variable quality, but characterised by being both relatively cold and damp. The SCS recognised the link between poor housing and poor health, and identified that the greatest barrier to improving this link was cost, and in the case of rental properties the lack of incentives to invest in improving the quality of housing.

In this context the SCS argues that, 'Affordable housing is a key to attracting business and employees. Warm, dry housing is fundamental to people's health. Energy-efficient homes are critical to reducing greenhouse gas emissions. Housing is a key determinant of people's quality of life' (PNCC, 2010, p. 52). Within this envelope of concern the SCS advocates the need for a specific focus on ensuring that existing homes have more efficient, healthier heating sources and adequate insulation given the implications that rising energy costs will have on peoples' household budgets.

### **1.3 Report Focus**

The SCS identified a series of drivers in realising the city's aspiration to become more sustainable, and in doing so highlighted some key points of intervention (such as housing) as well as a range of potential barriers to the realisation of a more sustainable future. This report contributes to the process of trying to develop answers to the questions that the SCS has posed in relation to sustainable housing. This report's specific focus is on providing the PNCC with more information about the barriers to realising its sustainable housing aspirations in the context of Palmerston North.

### **1.4 Report Structure and Approach**

This research has two key dimensions. First, it provides a review of the international literature which examines the definition of sustainable housing, its benefits and the barriers that have been identified to the adoption of sustainable housing measures. This provides the report with a broad picture of international thinking about the realisation of sustainable housing. The second dimension of the report is based on a series of key informant interviews that were undertaken by the research group during early 2013. These qualitative interviews targeted a range of individuals involved in the housing sector in Palmerston North, and included planners, real estate agents and builders. The purpose of interviewing this range of individuals was to situate the claims made about the barriers to sustainability



in the international literature in the context of Palmerston North, and in doing so further develop an a more specific understanding of the barriers identified in the PNCC's SCS.

The report is structured around these two dimensions. Part 2 begins by providing some context to the issue of sustainable housing in New Zealand, specifically focusing on the planning context within which landuse decision are made and enabled. Part 3 reviews the literature that engages with the issue of sustainable housing. Debates about the definition of sustainable housing are explored, as are the individual and collective benefits of sustainable housing, the tools that have been developed to assess sustainable housing, the barriers to sustainable housing and the relevance of seeing sustainable housing through a planning lens. Part 4 outlines the research methodology that was utilised. Part 5 presents and discusses the key themes that emerged from the interviews that were undertaken as part of the research. Part 6 draws these elements together in a conclusion.

## **Part Two: Planning Context for Sustainable Housing in New Zealand**

The PNCC has primary responsibility under the Resource Management Act 1991 (RMA) and the Local Government Act 2002 (LGA) to promote the sustainable management of natural and physical resources and to enable democratic local decision-making and action to meet the current and future needs of communities for good-quality local infrastructure, local public services, in a cost-effective manner. This section provides details of the legislative basis for considering sustainable housing. Drawing on two of the drivers relating to sustainable housing, as contained in the SCS, this section also highlights a number of other institutions/agencies that have an interest in, or responsibility for, reducing household energy use and/or providing affordable and healthy housing. Following consideration of these legislative and institutional contexts this section concludes by acknowledging the complexities of planning for sustainable housing.

### **2.1 Legislative Background**

In its quest to become environmentally sustainable, the PNCC identified two drivers in its SCS that relate to sustainable housing, energy use and affordable and healthy housing. The Sustainable City Strategy is described as being a high-level 'route map' that points the future direction to achieve sustainability. It stems from Council's Long Term Plan, prepared under the Local Government Act 2002.

The purpose of Local Government, as stated in the Local Government Act 2002 (LGA), is to enable democratic local decision-making and action by, and on behalf of, communities; and to meet the current and future needs of communities for good-quality local infrastructure, local public services, and performance of regulatory functions in a way that is most cost-effective for households and businesses (Section 10(1), LGA, 2002). 'Good quality' is defined as meaning infrastructure, services, and performance that are efficient and effective, and appropriate to present and anticipated future circumstances (Section 10(2), LGA 2002).

Under the LGA, 2002 a local authority must have a long-term plan (Section 93), the purpose of which is to:

- (a) describe the activities of the local authority; and

- (b) describe the community outcomes of the local authority's district or region; and
- (c) provide integrated decision-making and co-ordination of the resources of the local authority; and
- (d) provide a long-term focus for the decisions and activities of the local authority; and
- (e) provide a basis for accountability of the local authority to the community; and
- (f) provide an opportunity for participation by the public in decision-making processes on activities to be undertaken by the local authority

(Section 93(6), LGA, 2002)

The PNCC's Long Term Plan contains the organisation's vision and goals (community outcomes). Its vision is for Palmerston North to be recognised as a vibrant, caring, innovative, and sustainable city. The City's goals include that:

- Palmerston North is a socially sustainable city where people want to live because of its safe and easy lifestyle and its many social, cultural and recreational opportunities;
- Palmerston North is a leading city in the quest to become environmentally sustainable; and
- Palmerston North is an economically sustainable city which attracts, fosters and retains businesses and jobs to create a prosperous community.

The SCS sets out how the city is working towards achieving these goals. Box One shows the key provisions within the SCS relating to sustainable dwellings. Delivering on these goals and drivers stated in the SCS can be achieved in part through the Long Term Plan, and associated annual plan process, and also through the Resource Management Act 1991 (RMA).

**Goal:** Palmerston North is a leading city in the quest to become environmentally sustainable

**Driver One:** Sustainable Energy Use at Home and Work

*Sub-drivers:*

- Decrease household energy use
- Increase local green energy production for local use
- Social and Cultural Sustainability:

**Driver Four:** A Safe and Healthy City

*Sub-drivers:*

- The City has affordable and healthy housing

**Box 1: Provisions within the Sustainable City Strategy relating to sustainable housing**

The purpose of the RMA is to promote the sustainable management of natural and physical resources (Section 5(1), RMA 1991). Sustainable management is defined as managing the use, development, and protection of natural and physical resources in a way, or at a rate, which enables people and communities to provide for their social, economic, and cultural well-being and for their health and safety while—

- (a) sustaining the potential of natural and physical resources (excluding minerals) to meet the reasonably foreseeable needs of future generations; and
- (b) safeguarding the life-supporting capacity of air, water, soil, and ecosystems; and
- (c) avoiding, remedying, or mitigating any adverse effects of activities on the environment.

(Section 5(2), RMA 1991).

A local authority is required to have a District Plan in place at all times to assist territorial authorities to carry out their functions under it, and to achieve the purpose of the RMA (Sections 72 and 73, RMA 1991). Sustainable housing is not explicitly mentioned in the RMA. However, in considering the two key drivers of in Council's SCS that relate to sustainable housing (energy use and affordable and healthy housing) and the role of the District Plan in achieving this, it is worth noting that the RMA requires local authorities, when exercising functions and powers under it, to have particular regard to:

- the efficient use and development of natural and physical resources;
  - the efficiency of the end use of energy;
  - the effects of climate change; and
  - the benefits to be derived from the use and development of renewable energy.
- (Section 7, RMA 1991).

The PNCC's District Plan is currently under review, and issues being considered include how to improve the sustainability of residential areas and houses. These matters, as outlined in Section 7 of the RMA, resonate with issues being addressed through planning internationally, and in particular the push for carbon-zero homes in England.

## **2.2 Other Agencies involved in sustainable housing (energy use and/or affordable and healthy housing)**

As noted above, PNCC is just one of a number of agencies with a remit to consider and provide aspects of sustainable housing. A brief overview of some of these other agencies, involved in reducing household energy use, and/or the provision of affordable and healthy housing, is provided below.

### **2.2.1 Affordability**

Housing New Zealand Corporation (HNZC) is the Government agency that provides access to housing solutions for New Zealanders with priority needs. Housing New Zealand manages state houses and tenancies, providing 'affordable houses for those in greatest need, for as long as they are in need' ([www.hnzc.co.nz](http://www.hnzc.co.nz)).

The Productivity Commission / Te Komihana Whai Hua o Aotearoa recently reported on housing affordability (The New Zealand Productivity Commission, 2012). The

Productivity Commission began operations in 2011 and their principal purpose, as established in the New Zealand Productivity Commission Act 2010 (NZPCA 2010), is to provide advice to the Government on improving productivity in a way that is directed to supporting the overall well-being of New Zealanders, having regard to a wide range of communities of interest and population groups in New Zealand society (Section 7, NZPCA 2010). In its recent report on Housing Affordability, the Productivity Commission endorsed the general direction of a report prepared by the Housing Shareholders' Advisory Group (a group set up in 2010 by the Ministers of Finance and Housing to provide independent advice to the Government on the effective and efficient delivery of state housing to those most in need) Heatley (2012). One option put forward by the HSAG was that non-government housing providers should be encouraged to provide social housing (Housing Shareholders Advisory Group, 2010).

The Social Housing Unit (SHU), Te Wāhanga Kāinga Pāpori, established as a result of the HSAG report (Heatley, 2012), works with organisations that provide social and affordable housing, including not-for-profit, iwi, and private sector providers (<http://www.socialhousingunit.govt.nz/>). The Unit allocates funding and facilitates partnerships including land transfers and sale or lease of surplus state housing stock (<http://www.socialhousingunit.govt.nz/>). Under the Social Housing Fund Allocation Plan 2012-2015, \$104.1 million has been allocated for this purpose (Social Housing Unit, 2012).

### **2.2.2 Housing and energy efficiency**

Many agencies have a particular role in addressing energy efficiency, but in relation to sustainable housing, the Energy Efficiency and Conservation Authority (EECA) has particular significance. EECA was established under the Energy Efficiency and Conservation Act 2000 to encourage, support and promote energy efficiency, energy conservation, and the use of renewable sources of energy. In its 'Statement of Intent 2012/13 - 2014/15' one of the outcomes sought is 'increased warm, dry and energy efficient homes with improved air quality to avoid ill health and lost productivity' (Outcome 1) (EECA, 2012).

As a means of achieving this, the Warm Up New Zealand: Heat Smart Programme aims to insulate homes and achieve a net emissions reduction of 90 tonnes of PM<sub>10</sub> (fine particulates) over the life of the heating programme (EECA, 2012). By the end of 2013/14

EECA expects to have retrofitted nearly a quarter of New Zealand's poorly insulated housing stock (EECA, 2012).

It is also noted that the purpose of the Climate Change Response Act 2002 is to enable New Zealand to meet international obligations to reduce greenhouse gases. Its focus however is largely on the implementation, operation and administration of an emissions trading scheme, and on levying specified synthetic greenhouse gases, and not on the effects of climate change on housing (or vice versa).

### **2.3 Conclusion**

The purpose of this section was to provide context to the issue of sustainable housing in New Zealand, specifically focusing on the planning context within which landuse decision are made and enabled. It has provided a background against which to compare the international literature on sustainable housing, and highlights that PNCC is just one of a number of agencies with a remit to consider both the role of energy use in houses, and the need for affordable and healthy homes. The literature review, which draws on planning literature as well as material relating to regulating for sustainable housing under building legislation, highlights these challenges and the need for an integrated approach to its implementation.

## Part Three: Literature Review

This chapter surveys the literature that engages with the issue of sustainable housing. In this section of the report we examine debates about the definition of sustainable housing, the individual and collective benefits of sustainable housing, the tools that have been developed to assess sustainable housing, the barriers to sustainable housing and the relevance of seeing sustainable housing through a planning lens.

Fostering sustainable housing is an issue concerning policy makers at many scales. On a global scale, buildings consume a great deal of energy and resources in both construction and operation (Sev, 2011). Reducing the environmental impacts of dwellings is of increasing interest as a means of realising sustainable development (Retzlaff, 2009) and as a response to major environmental issues such as climate change (Osmani & O'Reilly, 2009) and resource depletion (Vale & Vale, 2000). In New Zealand, the residential sector accounted for almost 12 percent of total energy demand in 2011 and had increased by 16 percent since 1990 (Ministry of Business, Innovation and Employment, 2012). Nationally, a high proportion of New Zealand's existing homes lack sufficient insulation (Amitrano, Kirk, & Page, 2006) and many older homes have inefficient heating (Auckland Regional Council, 2009), contributing to energy demand. At the local level, the PNCC is taking steps to promote sustainable dwellings. The Council has developed a sustainable city strategy which recognises the need for, and benefits of, sustainable dwellings: "Affordable, healthy housing will reduce energy consumption, improve people's health and support the local economy" (Palmerston North City Council, 2010, p. 3). The council has appointed an Eco Design Advisor to assist residents in making their homes warmer, drier and more energy efficient (Palmerston North City Council, n.d.) and is supporting the construction of the 6 Star House, an affordable and sustainable demonstration home (6 Star House, n.d.).

In this context literature on sustainable dwellings from New Zealand and many parts of the world has been reviewed in order to develop a richer understanding of this issue and explore some of the barriers and policy options which will inform subsequent work on this issue in Palmerston North. Particular attention has been paid to:

- The definitions of sustainable or eco-dwellings;
- Exploring Māori epistemology of sustainable dwellings;
- The relevance of sustainable dwellings to planning;



- Their individual and collective benefits;
- Identifying barriers to sustainable dwellings and methods of overcoming them;
- Exploring how residents value sustainable dwelling elements;
- Examining sustainability assessment tools and developing indicators of sustainable dwellings and
- Identifying international examples of regulatory and non-regulatory methods of fostering sustainable dwellings.

### 3.1 What is a sustainable dwelling - definition

In order to begin to explore the issues relating to the provision of sustainable dwellings it is first necessary to clarify the meaning of the phrase itself. Unfortunately a precise and widely accepted definition is elusive as there are many definitions of sustainable dwellings which emphasise different facets of sustainability. Sustainability is a broad concept, which is recognised internationally as having environmental, social and economic dimensions (Priemus, 2005). A fourth dimension, cultural sustainability, is also included in some works (Chiu, 2004). Lovell (2004) argues that in the United Kingdom the concept of sustainable housing originated in the 1970s amongst a range of people, such as environmentalists, who believed significant changes within society would be needed to achieve sustainability. But more recently government and corporate stakeholders have become increasingly interested in sustainable dwellings as a potential solution to contemporary policy issues such as climate change. Due to the divergence between grass roots concepts and the more recent government and corporate notions, Lovell (2004) argues that sustainable housing can only be loosely defined as housing that offers additional environmental and social benefits over and above what is required by current regulations.

Other researchers offer more specific definitions, some centring on a single aspect of sustainability. Priemus (2005, p. 6) focuses on the environmental aspects and defines sustainable dwellings as: "...housing with a minimum of negative environmental impacts in terms of climate change (greenhouse effect); the quality of air, water, and soil; noise; stench; the stock of non-renewable materials; and biodiversity". In defining sustainable dwellings Klunder (2004, p. 113) also expresses an environmentally-focused view, arguing that the key characteristics of a sustainable dwelling are "the minimisation of the environmental impacts of material use, energy consumption and water consumption during the whole

service life of the building”. Mobbs’ (1998) concept of a sustainable dwelling is based on self-sufficiency. His key goals in building a sustainable dwelling were producing energy on site, harvesting rainwater and reducing or eliminating outflows of storm water and wastewater. Expanding on the social elements of sustainable housing developments Winston (2010) defines them as including proximity to places of social interaction, the provision of affordable housing and creating attractive, safe and clean neighbourhoods.

Others have taken a broader approach. For example, Choguill (2007. p. 145) states that sustainable housing projects should be “economically viable, socially acceptable, technically feasible and environmentally compatible”. Similarly, Friedman (2012) advocates the “path of least negative impact” on the environment, society and the economy over both the short and long term. In New Zealand, many of these concepts have been encapsulated in the Smarter Homes campaign, which emphasises the sustainable use of energy, water, materials and other resources to create more environmentally-friendly homes which are healthy and comfortable and represent a sound investment (Smarter Homes, n.d.).

Whilst there is a divergence between those who focus on particular elements of sustainability and those who take a broader view, there are common elements. The key elements of sustainable dwellings are:

- A low environmental impact over the entire lifespan of the dwelling including reduced demands on external sources of energy, responsibly managed inflows and outflows of water and the use of environmentally sensitive building materials. Efforts should be made to reduce energy and resource use throughout the whole lifecycle of the house including construction and operation of the home
- A healthy and comfortable setting for occupants.
- Sensitivity to and compatibility with surrounding areas, including the natural and built environment.
- Financial viability via lowering operating costs and increasing overall value.

### **3.2 Māori epistemology of sustainable dwellings**

In the New Zealand context, the concept of sustainability takes on another dimension due to the unique perspectives and body of knowledge of Māori. No discussion of sustainable dwellings in New Zealand could therefore be complete without incorporating

Māori perspectives. Mātauranga Māori, or traditional Māori knowledge, can contribute contemporary efforts to achieve sustainable development as Māori have long-established methods for managing the natural environment (Thompson-Fawcett, 2010; Voyde & Morgan, 2012). But while many Māori are open to sharing mātauranga Māori, they also desire to keep control of the information and its use (Voyde & Morgan, 2012). Māori interactions with ecosystems are shaped by facets of Māori identity such as a conservatory ethic, a sense of guardianship, a holistic worldview and a spiritual connection to the land (Voyde & Morgan, 2012). Māori perspectives are more focused on ecological sustainability than many mainstream viewpoints, which are skewed toward economic sustainability. As such, they offer the opportunity to bolster the concept of sustainable development in New Zealand (Simon, 2003 in Voyde & Morgan, 2012). Awatere, Rolleston and Pauling (2010) argue that applying Māori urban design principles in papakāinga (Māori villages) could help demonstrate the benefits of more holistic and low impact approaches.

Mātauranga Māori has been used in contemporary efforts to make buildings more sustainable. An example is uku; earth walls strengthened with muka (prepared flax fibres). This building method was inspired by a method historically used in the construction of pā walls and draws on mātauranga Māori relating to the properties of earth and harakeke (flax). The contemporary method was developed to find a more affordable construction method in response to increasing timber prices. Structures built using these methods have a number of characteristics of sustainable building, such as efficient thermal performance, affordability and the use of locally-sourced and environmentally-friendly materials. They are also culturally appropriate for hapu as they are made of earth which their ancestors defended (Ngā Pae o te Māramatanga, 2012).

Māori spiritual beliefs and cultural practices can also support contemporary sustainable building practices. For example, some low impact design projects to manage storm-water more sustainably, such as living roofs and permeable hardstand areas, have been designed to reflect Māori beliefs. These beliefs include the importance of maintaining the mauri of water and ecosystems and managing rainwater, which is considered sacred until it has passed over Papatūānuku (earth mother) (Voyde & Morgan, 2012).

Mātauranga Māori therefore offers a unique perspective which can be utilised to bolster efforts to foster more sustainable dwellings. These insights offer opportunities to create dwellings which are not only environmentally sensitive, but reflect Māori culture and beliefs.

### 3.3 Individual and collective benefits of sustainable dwellings

Sustainable dwellings are argued to offer a range of benefits to homeowners and occupants. These include lower energy costs than conventional dwellings (Kruger & Seville, 2013; Mobbs, 1998), increased occupant satisfaction and comfort, fewer allergy problems, lower maintenance costs and the satisfaction of reducing their home's environmental impact (Kruger & Seville, 2013). More energy efficient homes are more affordable to keep warm. This may improve the health of vulnerable people such as the elderly and children who may be more likely to live in 'fuel poor' households (Horton, 2005). These factors make living in a sustainable dwelling attractive, affordable, comfortable and healthy for owners and occupants.

There is some international evidence to suggest that more sustainable dwellings attract higher prices than conventional dwellings. Research in the United States suggests that 'green' homes attract a small, but significant, price premium (Aroul & Hansz, 2012). 'Green' dwellings are becoming increasingly important because of "social, environmental, and ethical concerns" (Aroul & Hansz, 2012, p. 31). There is also evidence of increasing demand for lower energy homes in the United Kingdom (Lovell, 2005). However, while higher values benefit owners and developers, they also potentially make sustainable dwellings less affordable, which is a consideration in the overall sustainability of housing (Maliene & Malys, 2009).

Sustainable dwellings can also benefit the wider community. For example, collecting rainwater and re-using grey water may save energy and costs for public water reticulation systems. Excess energy generated by features such as photovoltaic solar panels could be used to benefit the wider community by powering street lighting (Friedman, 2012). Making dwellings more sustainable may also play a role in responding to or alleviating major global environmental issues such as climate change (Osmani & O'Reilly, 2009) and resource depletion (Vale & Vale, 2000) which have significant implications across all societies.

Sustainable dwellings are therefore argued to offer a range of individual and collective benefits. For owners and occupants the main benefits are lower operating costs, potential health benefits and increased comfort. Sustainable dwellings may also attract higher prices than conventional dwellings and benefit the wider community via a reduced draw on utilities and by helping to alleviate significant environmental issues.

### 3.4 How residents value sustainable dwelling elements

Public support is a necessary component in fostering sustainable dwellings, as this influences the demand for sustainable homes. There is a body of research assessing public attitudes towards sustainable dwellings. A British survey looking into the desirability of sustainable dwellings to residents and identifying methods to increase demand for them found that 92 per cent of the just over 500 respondents wanted to see sustainability features offered in new homes and nearly two thirds believed they should be compulsory (Sponge, 2006). Just over half reported they would be prepared to pay more for a home built to a high environmental standard (Sponge, 2006, pp. 2-3). A larger British survey of 6000 respondents found 73 per cent wanted the law to require all new houses or constructions to be powered by renewable energy (Energy Saving Trust, 2007, p. 12). Australian research has identified strong public support for making environmentally-friendly design elements compulsory in new dwellings and that people say they are willing to pay for fittings that are environmentally friendly or water or energy more efficiently, provided there are savings or economic benefits in return (Robinson & Edwards, 2009). Another Australian survey found that a majority of respondents would consider environmental performance to be highly relevant or relevant when considering moving to a new house (O'Leary, 2008). A New Zealand survey on household sustainability has found residents are also interested in sustainable features when building or renovating. Respondents who had recently built or renovated their homes were asked to what extent they had taken into account the sustainability of the products, features and services they purchased. One-third reported they had taken it into account for every item, while 52 per cent had considered it for some things (Johnson, Fryer, & Raggett, 2008).

However, despite the strong public support for sustainable dwellings and sustainable dwelling elements, uptake is often limited. The British survey cited above which found nearly three quarters of respondents supported making renewable energy generation compulsory in new homes also found that more than two-thirds had “never seriously considered” installing renewable energy measures in their homes (Energy Saving Trust, 2007, p. 12). Only 1.4 per cent of respondents had actually installed them (Energy Saving Trust, 2007, pp. 12-13). Australian research has identified high levels of public awareness of “environmental-sustainability issues”, but found that, “there was no significant association between a person's knowledge of environmental-sustainability issues and either the inclusion of [sustainable housing design] features or other environmentally aware

practices....” (Robinson & Edwards, 2009, p. 344). This phenomenon has been identified in other research: “Apparently, there is a gap, the so-called value–action gap, between what households perceive as ideologically correct behaviour as regards environmental issues and what they actually do” (Svensson, 2012, p. 370). So the apparently strong level of public support for sustainable dwellings and sustainable dwelling elements does not necessarily mean these desires will be put into practice.

Research has shown seemingly robust levels of public support for sustainable dwellings and sustainable dwelling elements. There is apparently strong support for making sustainable dwelling elements compulsory in new builds and many residents do consider sustainability, to some extent, when building or renovating. But despite this level of support, the actual implementation of sustainable dwelling elements is often limited.

### **3.5 The relevance of sustainable dwellings to planning**

Having explored the meaning of, benefits of and attitudes towards sustainable dwellings consideration must be given to the relevance of this topic to planning. The provision of sustainable dwellings is an issue of interest to planners for several reasons. Distilling the key themes from the literature cited above, sustainable dwellings should have a low environmental impact, be healthy and comfortable, fit well within their surroundings and financially benefit to owners and occupants. So fostering sustainable dwellings should be beneficial for the environment, occupants and the community. This aligns with many of the acknowledged goals of planning. For example, the American Planning Association (2013, para. 1 & 3) argues planning should aim “...to improve the welfare of people and their communities by creating more convenient, equitable, healthful, efficient, and attractive places for present and future generations” and to help “...create communities that offer better choices for where and how people live” while seeking to balance “new development and essential services, environmental protection, and innovative change”. Because planning should seek to create better, healthier and more attractive communities, improve residents’ wellbeing welfare and reduce the environmental impact of activities, fostering more sustainable dwellings is an appropriate planning goal.

The relevance of sustainable dwellings to planning is also identified in the literature. For example Maliene & Malys (2009, p. 426) argue that sustainable housing is “a key issue to consider in delivering healthy and attractive communities” as the provision of sustainable dwellings affects factors such as the economic, ecological and social wellbeing of

communities. Maliene & Malys (2009, p. 428) also argue sustainable housing can play a key role in urban regeneration, which is often a planning goal: “Sustainable housing stimulates physical, economic, environmental and social improvement, and the resulting enhancements in turn stimulate new investment and new opportunities”.

Fostering sustainable dwellings can also play a key role in achieving overall city-wide planning goals, such as reducing the overall environmental impact of cities (Crabtree, 2005). Newman, Beatley and Boyer (2009) discuss the need for cities to become more resilient to face the challenges of climate change and peak oil. They outline seven key elements of resilient cities, many of which relate to the provision of sustainable dwellings. They are:

- *Renewable energy city*: Urban areas will be powered by renewable energy technologies from the region to the building level;
- *Carbon neutral city*: Every home, neighbourhood and business will be carbon neutral;
- *Distributed city*: Cities will shift from large centralised power, water and waste systems to small-scale and neighbourhood based systems;
- *Photosynthetic city*: The potential to harness renewable energy and provide food and fiber locally will become part of urban green infrastructure;
- *Eco-efficient city*: Cities and regions will move from linear to circular or closed-loop systems, where substantial amounts of energy and their material needs are provided from waste streams;
- *Place-based city*: Cities and regions will understand renewable energy more generally as a way to build the local economy and nurture a unique and special sense of place; and
- *Sustainable transport city*: Cities, neighbourhoods and regions will be designed to use energy sparingly by offering walkable, transit-oriented options for all supplemented by electric vehicles (Newman, et al., 2009, pp. 55-56).

These elements suggest a significant linkage between sustainable dwellings and city-wide environmental goals and outcomes. It suggests that dwellings powered by renewable energy, with low emissions, low waste, on-site provision of services and food

production spaces can play an important role in making cities more resilient and better prepared to deal with significant future environmental challenges.

### 3.6 Barriers to sustainable housing initiatives & methods to overcome them

Despite the literature establishing the environmental benefits of sustainable dwellings – both to individuals and communities, along with research indicating that residents place a high value on sustainable dwellings, there are several barriers which have inhibited the growth of sustainable housing internationally. As we have already seen the concept of sustainability itself is murky van Bueren (2001). It is a broad concept with many, and sometimes conflicting, facets. Sustainable building is further complicated by the wide range of actors involved, their interdependencies and competing views on sustainability. Within this context the key barriers identified in the literature are:

1. *Costs*: High costs has been cited as a barrier inhibiting the construction of sustainable dwellings (van Bueren, 2001), the uptake of particular sustainability features like micro energy generation systems (Energy Saving Trust, 2005) and inhibiting sustainable initiatives in existing homes (O'Leary, 2008). However research on the cost of 'green' buildings has identified only a slight cost increase of between 2 and 5 per cent compared to conventional buildings (Circo, 2008 in Dator, 2010). This is similar to research on building 'green' commercial buildings found them to cost approximately 2 per cent more than conventional options (Katz 2003, 2005 in Aroul & Hansz, 2012). It is also possible to build 'grass roots' style low impact dwellings at a very low cost(Seyfang, 2010).
2. *Administrative barriers*: Legal and administrative barriers such as certification processes (van Bueren, 2001) and problems attaining planning permission (Energy Saving Trust, 2005; Seyfang, 2010) have been cited as a barrier to fostering more sustainable dwellings. Seyfang (2010) argues that in the United Kingdom many planners are unfamiliar with low environmental impact niche building techniques, such as straw bale construction. This which makes it difficult to build dwellings using these techniques. "Indeed, one of the main barriers facing green sustainable housing niches is posed by planning regulations and building standards which were not designed with these building methods in mind" (Seyfang, 2010, p. 7631).
3. *Insufficient public knowledge*: Lack of knowledge about the opportunities, implementation or co-ordination of sustainable building projects has stymied them in some cases (van



Bueren, 2001). A British survey investigating the desirability of sustainable dwellings to residents and identifying methods to increase demand for them found that 70 per cent of the 501 respondents felt they knew little or nothing about sustainable homes (Sponge, 2006, p. 3). Lack of public knowledge may also be a factor in the slow uptake of micro energy generation systems in the United Kingdom (Energy Saving Trust, 2005). The public may also lack of awareness of initiatives to promote sustainable dwelling features, such as rebates and grants (O'Leary, 2008).

4. *Stigma*: Sustainable dwellings carry a stigma which is reflected in incorrect notions that sustainable dwellings are for 'alternative lifestyles', have limited resale appeal, are a high risk investment, have poor aesthetic appeal compared to traditional houses and concerns with security and safety (Buys, Barnett, Miller, & Bailey, 2005). This leads people to have 'image' concerns, such as fear of being painted as a 'radical ecologist' (van Bueren, 2001, p. 34).
5. *Fragmented construction process*: Another barrier to sustainable construction is the nature of the building process, which is made up of multiple actors and is highly fragmented. For example, sustainability measures incorporated into buildings can be ineffective if the end user does not utilise them properly. This is explained by van Bueren & Priemus (2002, p. 82): "Systems for reuse of water require a certain discipline from the residents. Not all wastewater can be allowed to go down the sink. And, in a well-insulated dwelling, the residents ought not to switch on the central heating or the air-conditioning with the window wide open". Also, the advantages and disadvantages of sustainable construction are unevenly spread amongst the actors. For example, the occupant may receive financial benefits from energy-saving features, but for the developer, these features can come at a high upfront cost (van Bueren & Priemus, 2002).
6. *Age of the housing stock*: Another barrier to more sustainable housing is the age of New Zealand's housing stock. Research in 2006 found that about two-thirds of New Zealand houses were built before 1979, when insulation became mandatory (Amitrano, et al., 2006). Many of these dwellings have no insulation or inadequate insulation by current standards, which is a barrier to increasing the sustainability of New Zealand's housing stock overall (Amitrano, et al., 2006). Older houses are also more likely to have mould, lack sunlight and utilise polluting sources of heat (Auckland Regional Council, 2009) and fall below the recommended minimum temperature in winter (Phipps, 2007 in Allen & Clarke Policy and Regulatory Specialists, Infometrics, Eco\$ense, Martin Jenkins, & Beacon Pathway Limited, 2007). Not only are older homes likely to be poor in terms of energy efficiency, the poor quality of the indoor environment in many older dwellings

has led to significant public health problems, such as asthma and other respiratory diseases (Allen & Clarke Policy and Regulatory Specialists, et al., 2007). Thus, the poor state of many older dwellings limits the environmental and social sustainability of New Zealand homes overall. Attempts to deal with this issue include the Warm Up New Zealand: Heat Smart funding programme, which supports the Government's target of retrofitting insulation in 230,000 older New Zealand houses (Energy Efficiency and Conservation Authority, n.d.).

There are several key barriers which inhibit the move towards more sustainable dwellings. These include administrative barriers, cost, and the fragmented nature of the house building industry, lack of public knowledge, image concerns and the age of New Zealand's existing housing stock.

### **3.7 Sustainability assessment tools to assess dwellings**

Fostering sustainable dwellings is an interest to policy makers in many different countries, but barriers, such as those identified previously, may stifle the provision of sustainable dwellings. This has prompted a range of regulatory and non-regulatory interventions in many different countries to promote sustainable dwellings.

#### **3.7.1 Eco-labelling and Awards Schemes**

Eco-labelling and award schemes are one non-regulatory method that has been employed. These methods support voluntary efforts to construct more sustainable dwellings which exceed minimum building code requirements through awards or labels which distinguish them from their conventional counterparts. They highlight the environmentally-friendly aspects of a building, some of which can otherwise be overlooked in the market (Blum, Deilmann, & Neubauer, 2001). This enables groups such as home buyers and tenants to more easily incorporate the environmental performance of a building into their decision making processes (Blum, 2001).

#### **3.7.2 Incentives and Subsidies**

Incentives and subsidies provide another non-regulatory technique to foster sustainable dwellings. Several cantons, or state governments, within Switzerland have made subsidies available for certified sustainable dwellings, and the country now has one of the

highest concentrations of certified sustainable buildings in the world (Salvi & Syz, 2011). However the subsidies have a limited impact on fostering sustainable dwellings because the average subsidy is small and there are other more important factors at work, such as income level and language and culture (Salvi & Syz, 2011).

### **3.7.3 Education**

Education is another non-regulatory mechanism of promoting sustainable dwellings which has been implemented internationally. In the United States, public libraries have been used as vehicles to increase public awareness and knowledge of 'green' building techniques (Barnes, 2012). Public buildings such as libraries constructed using 'green' techniques provide a space for residents to observe 'green' technology in action and consider how it could be applied to their own homes (Barnes, 2012). In addition to learning by observing and experiencing being in a sustainable structure, information can be made available to residents via displays, websites and publications (Barnes, 2012).

## **3.8 Sustainable dwelling indicators**

Schemes such as those identified above provide many of the key criteria of sustainable dwellings, particularly in terms of environmental performance. This process is assisted by the fact that areas of consensus can be identified between different schemes (Chen, Pitts, & Ward, 2008). Maliene and Malys' (2009) have summarised many of the characteristics of sustainable housing (Figure 1). The indicators presented here have been gathered from a range of sources, including some of the literature cited above about building environmental assessment tools, and broken down into the four key aspects of sustainability.

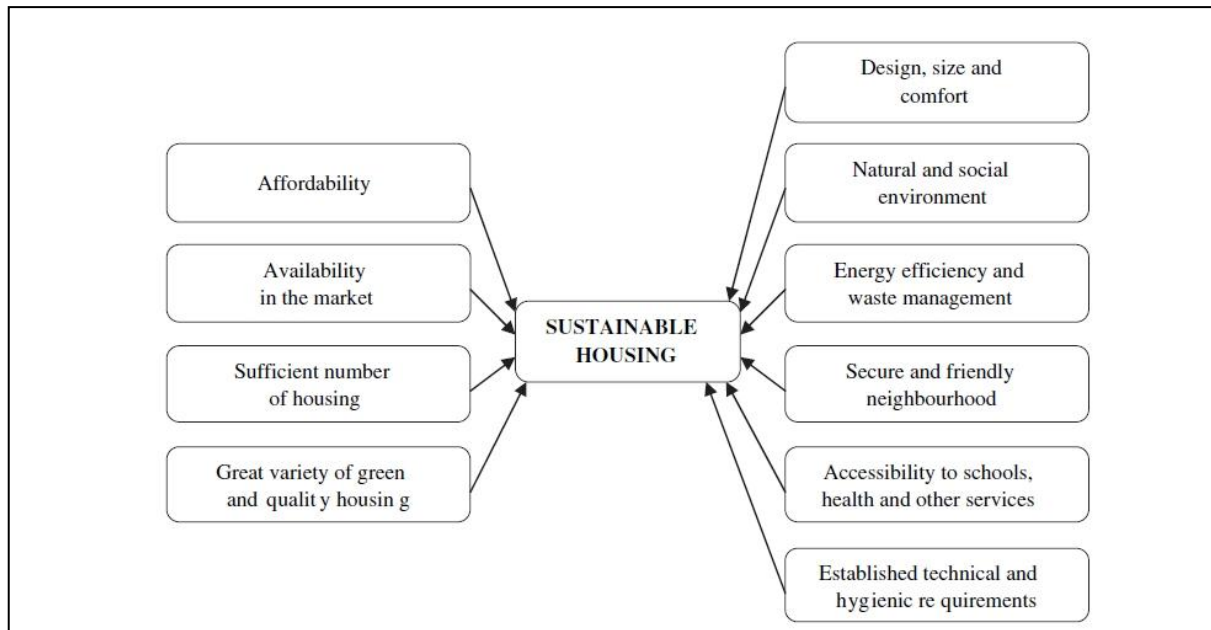


Figure 1: The key criteria of sustainable housing from Maliene and Malys (2009, p. 428)

### 3.8.1 Environmental sustainability

Much literature focuses on the environmental aspects of sustainable dwellings, enabling a detailed set of environmental indicators to be developed. Some indicators relate to the site of the dwelling itself, such as protecting its flora and fauna, landscape elements and natural drainage as much as possible (Friedman, 2012). Providing sufficient space for food production can reduce the home's ecological footprint (Haraldsson, Ranhagen, & Sverdrup, 2001). While the landscaping design and hardstand surfaces should reduce storm water runoff and promote infiltration (Rovers, 2008). The broader location of the dwelling is also a factor. An appropriate location should be selected in order to reduce environmental impacts, such as using brownfields sites as a more sustainable alternative to developing on greenfields (Winston & Eastaway, 2008). Locating new homes near to public transport services can encourage more sustainable travel (Friedman, 2012; Winston & Eastaway, 2008), while locating homes near to a mix of other activities can reduce travel needs (Friedman, 2012).

The design of the dwelling is also an important indicator. To save energy, sustainable dwellings should be positioned and designed for optimal passive solar performance, providing passive solar gain in the winter whilst regulating temperatures during the summer (Friedman, 2012). Smaller dwellings require fewer construction materials, take up less land and require less energy to run than larger houses (Friedman, 2012).

Materials are also an important consideration. Effective insulation can significantly reduce a dwelling's ecological footprint (Haraldsson, et al., 2001). Environmentally-friendly construction materials should be used, with consideration of the entire lifespan of these products, including the demolition phase. Examples include recycled or locally produced materials, those that require low amounts of energy and petrochemicals to produce, or materials which are biodegradable or can be recycled or re-used (Woolley and Kimmins, 2000 in Friedman, 2012). Construction waste should also be considered (Trotman, 2008).

Technologies which reduce the demand for energy and other resources such as water are also indicators of a dwelling's sustainability. This includes energy efficient heating systems (Rovers, 2008). Producing renewable energy on-site via methods such as wind turbines increases sustainability (Haraldsson, et al., 2001). Major international sustainability indicators also promote the use of energy efficient lighting and appliances (Chen, et al., 2008). Water saving fittings and appliances should also be used. Further water savings can be made via grey-water systems or rain-water capture (Friedman, 2012).

### **3.8.2 Social sustainability indicators**

Fulfilling the needs of owners and occupants is also an important consideration in the provision of sustainable dwellings. To this end, the connectivity of a dwelling to its community, and its proximity to social amenities such as education and healthcare facilities are also important indicator (Friedman, 2012). Sustainable dwellings should be flexible and adaptable enough to accommodate the needs of different occupants, such as people who work from home, elderly people and different types of families (Friedman, 2012). Essential amenities should be available in the home in working order and a basic living conditions should be acceptable and problems such as overcrowding should not be present (recognising that factors such as overcrowding may be culturally mediated) (GESIS - Leibniz Institute for the Social Sciences, n.d., in Winston & Eastaway, 2008). Residents should be satisfied with the amenities in their homes and their immediate neighbourhoods (Chiu, 2004).

Equity and community involvement in housing policy are also important issues. Lower income groups often have limited choices regarding the type of environment and housing in which they live, often resulting in them living in polluted areas, areas lacking green space. They also often lack the financial means to improve the sustainability of their homes (Winston & Eastaway, 2008). Chiu (2004) argues: "... equitable housing policies should maximise choices in housing services if so desired by home purchasers, enhance

housing mobility and avoid housing programs which, while benefiting some sections of the population, adversely affect the opportunities of others to obtain desirable and affordable housing” (p. 73). Lastly, the public should be able to be involved in the formulation of housing policy in order to help build consensus, or at least an understanding of different viewpoints in the sector. This also enables the public to express wants and needs (Chiu, 2004).

### **3.8.3 Economic sustainability indicators**

The economic indicators relate to housing market factors which influence the availability of sustainable dwellings. One measure of this is the affordability of sustainable dwellings themselves (Maliene & Malys, 2009), or individual products which enhance sustainability (Trotman, 2008). Consumer demand is another important indicator as the desirability of sustainability features to consumers will influence the building industry’s response (Trotman, 2008). Lastly, industry capacity is also important as it determines the availability of products and services to facilitate sustainable dwellings (Trotman, 2008). The popularity of one-off house designs in New Zealand (Page and Fung, 2011 in Svensson, 2012) may limit the industry’s capacity to deliver sustainable dwellings in sufficient volume and achieve economies of scale.

### **3.8.4 Cultural sustainability indicators**

Cultural indicators are less well defined, but nevertheless important. An important consideration is the degree to which dwellings can represent residents’ culture. The physical form of a house can be an expression of cultural and aesthetic values. “The design of residential buildings based on contemporary local cultural and aesthetic values mixed with those of the past enriches and sustains the cultural identity of a place” (Chiu, 2004, p. 75). Some cultures, including Māori, may also have particular views on the location of specific rooms within a dwelling, or the orientation of the dwelling (Hoskins, Te Nana, Rhodes, Guy, & Sage, 2002).

## **3.9 Planning for Sustainable Dwellings – international approaches**

Although a significant amount of literature exists relating to building regulations as a means of achieving elements of sustainability on an individual site/building basis, there is

an apparent gap in terms of literature describing planning approaches seeking to influence sustainable dwellings, and the effectiveness thereof. What has been written is directed largely at influencing future low carbon urban environments (Williams, 2012; Bale et al., 2012; Crawford and French, 2008). It has been suggested that the ‘triple threats of climate change, resource depletion and energy security have led to a need to re-think the way in which we build and regenerate our cities’ (Williams, in Walliser, et al., 2012, p. 131), and hence the role for planning. However, the concept of planning for low carbon futures is contested. As Crawford and French (2008, p. 4575) comment, planning systems have the ability to either slow or stifle innovation or conversely to “stimulate new lines of research and development, and new corporate and community endeavours in shaping the built environment”.

This section of the report, with an acknowledged over-reliance on a single author at times, provides an overview of several approaches, as described in the literature, with reference to current planning documents for information and comparison purposes. It also describes the strengths and weaknesses of planning as a tool for zero carbon development.

Despite a long history of sustainable housing taking into account social, environmental and economic factors (Lovell, 2004), the international examples, drawn from literature and discussed below, frame the issue of sustainable housing quite narrowly in terms of energy, which can be explained in part by the following statistics. In 2009, one researcher comments that buildings account for 40-45% of energy consumption in Europe and China, and about 30-40% world-wide (Day, Ogumka, Jones, & Dunsdon, 2009). Another states that the UK's 21 million homes are responsible for 27% of CO<sub>2</sub> emissions (Catto, 2008). Housing is a basic need and given the extent to which they use energy and contribute to emissions, Catto (2008) also suggests that revolutionising the way we build and design homes will be essential for a sustainable future. With the UK's focus on sustainable development, Planning has been described as being “one tool in the armoury” for delivering on this outcome through a strategic, regulative, or facilitative role (Williams, in Walliser, et al., 2012, p. 132).

It has been suggested, albeit with little evidence, that the key drivers that have shaped planning post WW2 will be replaced by a focus on carbon substitution (Crawford and French, 2008). They suggest that planning objectives shaped by carbon reduction commitments and climate change are appearing, and can be expected to continue, but that the nature of the planning system will be substantially affected by how governments choose

to respond to it (Crawford and French, 2008). They also suggest that there will be inevitable differences in planning systems depending on energy supply, and in particular whether it comes from a centralised nuclear power plant versus decentralised local power infrastructures (Crawford and French, 2008).

Writing about the complexities of the planning system Williams (2012) discusses the geography of low or zero carbon development, and how this varies from place to place given the diversity of physical (climate, topography, vegetation, relief, hydrology and geology), economic (land value, fiscal incentives and demand), human capital (knowledge, skills, competencies), policy and regulatory contexts.

A planning system that understands and responds to the local context will therefore be imperative. Young suggests that that a past reliance on fossil fuel has overpowered local differences, and that post-carbon a more acute understanding of the 'place' will be required (Young in Walliser, et al., 2012, p. 172), and that

Planning will be critical in making this transition both because of its general role in guiding social investment and because of the specific nature of the effort requiring, as Jo Williams notes, a detailed knowledge of local context including “physical form, resource availability, culture, social capital, institutions, political and economic systems.

The following subsections draw on specific literature and detail how planning has been used as a tool for sustainable development in two places – a specific development approach for a new neighbourhood in Freiburg, Germany, and other in the City of London. These examples were chosen on the basis that they were one of the few examples of which details were provided in the literature.

### **3.9.1 Vauban**

Williams (in Walliser, et al., 2012) compares and contrasts two different approaches to encouraging low carbon developments, one in Germany and the other in Stockholm. In the interests of space, this literature review looks specifically at the planning approach undertaken in Vauban, Freiburg (Germany), but also includes some of Williams' (2012) conclusions following her comparative analysis of the approaches in the two locations.



Vauban is a new neighbourhood planned for 5,000 inhabitants and 600 jobs, and is located four kilometres to the south of the town centre in Freiburg, Germany. Initially the municipality adopted a regulatory and facilitative approach to achieving localised high energy efficiency standards for buildings (Williams, in Walliser, et al., 2012).

The regulatory approach, which required buildings to be constructed to a specific standard were found to be “economically and technically feasible” (Williams, in Walliser, et al., 2012; p. 136). These standards, which were subsequently adopted in the local zoning plan for Freiburg, have informed developments elsewhere in Germany, and are influencing their federal building codes (Williams, in Walliser, et al., 2012; p. 136).

Williams (in Walliser, et al., 2012) writes that a facilitative approach also took place. This meant that the community was involved in visioning and design consultation exercises, which helped “raise public awareness of ecological and socially conscious design” (Williams, in Walliser, et al., 2012, p. 137) – so a benefit of sustainable dwellings – not specifically mentioned earlier, but a benefit nevertheless, was raised social capital.

In considering the context of this neighbourhood the cultural context was seemingly very influential in terms of the outcome. For example, Williams comments that within the community there was a high level of support for the green party of Vauban residents (60%); a number of “Baugemeinschaft” – citizen groups building their own accommodation, pioneered in Freiburg; and a proliferation of community led, small-scale renewable energy generation projects (Williams, in Walliser, et al., 2012, p. 138).

This community could be seen as the exception rather than the norm, and consequently it would “seem unlikely that this planning approach would bring about the same results in a different cultural context” partly because of the ‘enormous leap for the disengaged, passive and environmentally unaware individuals ... to become active energy citizens’ (Williams, in Walliser, et al., 2012, p. 138).

It is worth noting that the site being developed was owned by the municipality and thus gave the council “the leverage in needed to demand higher energy standards in buildings” (Williams, in Walliser, et al., 2012, p. 136). It is also worth noting that the ‘bottom-up, low carbon initiatives in Vauban (and Freiburg) have been supported by an array of federal and local subsidy schemes’ (Williams, in Walliser, et al., 2012, p. 137), thus potentially having an influence on some of the barriers discussed earlier in this chapter.

This project was described as being “extremely resource intensive, particularly for the municipality” (Williams, in Walliser, et al., 2012, p. 139). She comments that the large number of actors in the consultation process has “inevitably lengthened development timelines and increased the cost of development” (Williams, in Walliser, et al., 2012, p. 138). So again, connecting this approach with the barriers identified earlier in this report, this is evidence of administrative and cost type barriers. Williams writes that post completion the Municipality have adopted a more strategic approach towards the integration of land use and energy planning:

Carbon reduction targets inform the strategic plan, local policy and all planning decisions (Donn, 2011). The impacts [effectiveness] of planning decisions on carbon emissions are now monitored, and inform the strategic planning process (Williams, in Walliser, et al., 2012, p. 139).

Post development also saw the involvement of the regional energy company in the creation of the strategic plan (Williams, in Walliser, et al., 2012). It “provides planners with the information needed to determine the best approach to delivering a low carbon energy supply to the locality or to specific developments” (Williams, in Walliser, et al., 2012, p. 139).

This article also suggests an apparent lack of alignment between the regional and local planning agencies, with the regional authority (politicians) supporting the region’s nuclear capacity and preventing the development of wind farms in the region; while the municipal authority has positively promoted all forms of renewable energy within the city’s boundaries (Williams, in Walliser, et al., 2012). Although at the time this article was written, the author notes that there was a potential shift in politics to a greener agenda (Williams, in Walliser, et al., 2012).

### **3.9.2 The City of London**

The literature examining the experience of the City of London in relation to planning for low carbon development provides an example of one of the key benefits identified through the literature reviewed earlier, namely energy cost savings. Before delving into the specifics of the City of London’s approach, the background to the UK/England policy context is explored further.

In England, a suite of new regulations were put in place after the previous Labour Government's announcement in 2006 of an ambitious target that new homes will be 'carbon zero' by 2016 (Greenwood, 2012). This target was set in order to help meet the Government's overall goal of reducing the country's carbon dioxide emissions by 80% of their 1990 levels by 2050 (Seyfang, 2010). Subsequently, the building regulations relating to energy use in dwellings and the assessment procedure were revised in light of this target and a new Code for Sustainable Homes was introduced (Greenwood, 2012). Homes are assessed against the Code for Sustainable Homes and issued with a rating certificate:

The Code is intended as a single national standard to guide industry in the design and construction of sustainable homes. It is a means of driving continuous improvement, greater innovation and exemplary achievement in sustainable home building (Department for Communities and Local Government, 2006, p. 4).

Most recently, in England the National Planning Policy Framework sets out the Government's planning policies how these are expected to be applied. It states that,

Planning plays a key role in helping shape places to secure radical reductions in greenhouse gas emissions, minimising vulnerability and providing resilience to the impacts of climate change, and supporting the delivery of renewable and low carbon energy and associated infrastructure. (Department for Communities and Local Government, 2012, pp. 21-22).

In this Framework, the English government requires that to support the move to a low carbon future, local planning authorities should:

- plan for new development in locations and ways which reduce greenhouse gas emissions;
- actively support energy efficiency improvements to existing buildings; and
- when setting any local requirement for a building's sustainability, do so in a way consistent with the Government's zero carbon buildings policy and adopt nationally described standards (Department for Communities and Local Government, 2012, p. 22).

Despite on-going debate about what it means to be carbon-zero (Greenwood, 2012; Osmani & O'Reilly, 2009), the UK has long been encouraging the use of the planning system to promote the use of renewable resources and sustainability principles. Before the adoption of this National Planning Policy Framework, the use of renewables and sustainability principles were incorporated into earlier national planning policy statements and guidance notes which required local authorities to develop policies for mitigation of climate change, and give guidance to the implementation of low carbon technologies, but which did not set mandatory targets (Day, Ogumka, Jones and Dunsdon, 2009). The London Borough of Merton led the way in terms of incorporating renewable energy targets through planning policy (Day et al., 2009). In what became known as "the Merton Rule", the London Borough of Merton required that 10% of the energy consumed by a new development was to be generated by renewable sources on site (Williams, 2012; p. 358). This applied to new housing developments with ten or more units, or sites over 0.5 ha in area.

In a now largely out of date article describing the London Plan, Day et al., (2009) refer to the Merton Rule which became operative in 2003. They note that the Mayor of London introduced a similar policy in 2004 in the London Plan, with an expectation that all thirty-three London Boroughs would adopt the same practice, which sought to ensure that 'new and refurbished buildings are designed and constructed with energy efficiency as a high priority' (Day et al., 2009, p. 2017). Under this London Plan there was a requirement for applicants seeking planning permission for developments of 10 dwellings or more to submit an energy statement for their site, demonstrating how carbon savings are to be achieved (Day et al., 2009). They noted that in order to meet this requirement a number of individual measures could be adopted – such as using less energy, supplying energy efficiently, or using renewable energy (Day et al., 2009). If the proposal fell short of target requirements, negotiations were entered into, but there was a strong expectation on the part of the Planning Development Unit that the percentage renewable energy target should be met (Day et al., 2009).

Their research investigating the effectiveness of this earlier plan showed that the London plan could be responsible for providing a saving of energy above what could have been expected through building regulations, indicating success (Day et al., 2009). They also suggest that there was a difference in perception about the requirements – with developers considering that they are too prescriptive, and planners arguing that they need a pragmatic approach to delivering maximum carbon savings (Day et al., 2009).

The most recent provisions of the London Plan show a continuation of this policy approach (Appendix 2). Day et al (2009, p. 2021) and their research on the earlier version of this plan, they suggest that “such a policy may not yet be perfect but has the potential to lead the construction industry into a new era of innovation and carbon reduction’. Examples of how this policy translates to a local development plan (the City of London’s Draft Local Development Plan 2013) are also included for information (Appendix 3-5 ).

Although Day et al., (2009) suggest that the Lord Mayor’s expectation was that all thirty-three London Boroughs would adopt the same practice, Bulkeley (2006) comments that the use of targets was not widespread. She suggests this should perhaps not come as a surprise given the competing demands within the planning system, and given that the planning system,

has traditionally been geared towards control or prevention, rather than proactive planning in which some forms of development can be promoted over others, and, not least with an issue which causes much local controversy, the extent to which planning practitioners will wish to be perceived as ‘taking sides’ in the debate over renewables remains to be seen (Bulkeley, 2006, p. 208).

Williams (2012) broadens this discussion about planning for low or zero carbon development and discusses how urban form can affect energy consumption and CO<sub>2</sub> emissions, referring in particular to the role of mixed land uses, siting, density, layout and orientation on development (Williams, 2012, p. 264). She notes that 'the effectiveness of planning as a tool for delivering zero carbon development is contested' (Williams, 2012, p. 258), and her reasons are outlined further below.

### **3.9.3 The weaknesses of planning as a tool for zero carbon development**

A number of authors comment on the weaknesses of planning as a tool for low or zero carbon development and several key themes emerge and have remained consistent of much of the last decade. This sub section follows the literature chronologically to show this.

Bulkeley (2006) highlights challenges associated with the integration of climate protection and spatial planning. These are not specifically detailed here given the recent changes to regional spatial strategies in England, however it is useful to contemplate the challenges listed, which included the length of strategic timeframe, in comparison with the

potential urgency which climate change should be address (Bulkeley, 2006). She highlighted that despite high level goals supporting climate protection in spatial plans there was a lack of specific guidance about implementation address (Bulkeley, 2006). She also mentions the inherent tensions between groups in relation to climate change (Bulkeley, 2006).

Crawford and French (2008) also comment on the role of spatial planning to deliver low carbon futures. They suggest that leadership at the national level through clear national policy objectives, and which are capable of standing up to scrutiny if challenged by developers, will be essential (Crawford and French, 2008). They suggest that development plans should set ambitious, but achievable targets and that planners are need to be supported with locally specific information databases (Crawford and French, 2008). Crawford and French (2008) also mention the importance of place specific solutions.

Lowe and Oreszczyn (2008) also comment on the challenges of energy and environmental planning policy, and in particular the lack of clarity about goals and targets associated with climate change. They also query the regulatory confusion, for example the costs associated with zero-carbon targets which they suggest will “divert scarce financial and human resources from the crucial task of minimising energy use in new and existing housing, and in particular of improving the performance of the dwelling envelop and towards renewable energy in housing” (Lowe and Oreszczyn, 2008, p. 4476). Other concerns raised include the lack of explicit policies for energy supply (specifically heat), without which they argue effective policy for energy use cannot be undertaken (Lowe and Oreszczyn, 2008). They see the lack of data on energy performance of new and existing housing as a problem, amongst other matters and suggest that the way forward will require increased human capital and knowledge, building institutions and systems, building the supply chain, and clear leadership and appropriate resource for change (Lowe and Oreszczyn, 2008, p. 4479).

These areas for improvement are also reflected in Williams’s (2012) more recent comments in which she critically discusses the role of planning in the UK as a tool for zero carbon development following recent initiatives including the Code for Sustainable Homes. She suggests four problems with the approach taken to date, which include issues with interpretation and implementation of national policy guidance, the competing demands associated with planning practice, a lack of support and leadership, and a reliance on the public sector (refer Box 3.5, Appendix One).

### 3.9.4 The strengths of planning as a tool for zero carbon development

Williams (2012) critically comments on the strengths of planning as a tool for delivering zero carbon development, referring to both its strategic and development control roles (refer Box 3.6, Appendix One). She highlights the importance of strategic planning, and looking at the 'bigger picture' as opposed to building regulations which look at site specific buildings (Williams, 2012). Planning looks at the “wider community and region in which a development is set” (Williams, 2012, p. 275). In terms of strategic planning, Williams’ (2012) highlights the role of spatial planning, and the role that it has in decarbonisation of the energy supply, noting that “mapping renewable resources and potential distribution networks can help to inform both strategic resource and development plans” (Williams, 2012, pp. 257-258). With such information, planners can assess applications in light of the surrounding energy infrastructure; and can determine locations where zero carbon development is feasible or where assistance is needed (Williams, 2012, p. 275). In earlier work by Bulkeley (2006), it was suggested that spatial planning could address three areas as a means of addressing climate change - energy supply, energy demand and energy adaptation which could then direct policy development and implementation.

William's (2012) view supports, in part, Crawford and French (2008) who, although highlighting a number of tensions associated with spatial planning in the UK, suggested that new forms of low carbon development will require cooperation between, and engagement with stakeholders.

The development control functions of local authorities also have potential strengths in the delivery of zero carbon developments. For example:

- Prioritising zero carbon development through development control processes could also help reduce timelines and costs;
- rules could require that new development is linked to existing infrastructure; and
- urban form could be manipulated to influence and support the introduction and economic viability of low or zero carbon infrastructure; 'For example, in Stockholm the municipality enforced a policy which raised development densities to support the expansion of the existing district heating and public transport systems (Williams, 2012, p. 275).

Williams (2012) notes that the planning process can be used to provide leverage for zero carbon development and that planners have a significant role to play in achieving this. As well as strategic and development control opportunities for planning to be used as a tool in the delivery of low or zero carbon development, it also has a facilitative role. The planning system can raise awareness of the options within the community, and through multi-disciplinary and comprehensive consultation energy literacy can be improved.

### **3.9.5 Summary**

Achieving sustainable dwellings is more than just green architecture and low carbon technologies, and instead requires consideration of larger spatial planning practices. In the context of planning practice it's about urban density, land use, the role of green space, and effective public / active transport, amongst other things.

The international literature shows that planning for sustainable dwellings involves a complex assemblage of issues and should be quite contextually specific. While there are a number of potential benefits, there are also a number of challenges to its achievement, but there is an opportunity for planning innovation because the debate about sustainable cities can provide us with the spur to rethink more broadly the tools and practices that characterise contemporary urban planning.

## **3.9 Conclusion**

Sustainable dwellings may play a role in responding to or alleviating some of the major environmental challenges facing communities at all scales. There are multiple definitions of sustainable dwellings, reflecting the multi-faceted nature of sustainability. Māori knowledge and perspectives on can inform current efforts to foster sustainable housing. Dwellings that are more efficient and have lower environmental impacts benefit not just the owners/occupants, but also society as a whole. Sustainable dwellings are relevant to planning as they align with planning goals such as enhancing peoples' wellbeing, protecting the environment and creating more attractive communities. There is considerable public and consumer support for sustainable dwellings elements in New Zealand and overseas. However there are several barriers to the growth of sustainable dwellings, such as administrative barriers, cost, and the fragmented nature of the house building industry, lack of public knowledge, image concerns and the age of New Zealand's existing housing stock. Internationally, many building environmental assessment tools have



been developed, based either on examining key criteria, or calculating life cycle impacts. A number of regulatory and non-regulatory approaches to fostering more sustainable dwellings have been used internationally, such as labelling and award schemes to prescriptive and performance-based regulation. Most indicators of sustainable dwellings relate to environmental factors; however the other facets of sustainability are also important.

## Part Four: Methodology

The purpose of this report is to contribute to the information pool that exists in relation to the implementation of the PNCC's Sustainable City Strategy. The first dimension of this was the review of the research literature. The second dimension of the report was the use of semi-structured, in-depth interviews undertaken with a series of key stakeholders operating within the broad field of housing policy, regulation, construction and sale in Palmerston North. The purpose of doing these interviews was to try and situate the wider claims made about the adoption of sustainable housing in the specific context of Palmerston North. This part of the report briefly sketches the methodological framework adopted in relation to the use of the semi-structured interviews.

### 2.1 Qualitative Semi-structured Interviews

A number of possible approaches exist when seeking to gain information from key stakeholders ranging from quantitatively focused surveys through to more qualitatively orientated focus groups and semi and un-structured interviews. Given the purpose of the report and the range of potential informants involved in the field of housing in Palmerston North the researchers concluded that qualitative semi-structured series of interviews would provide a flexible and insightful, yet robust approach to trying to understand the range of opinions on the potential barriers to implementing sustainable housing.

As the literature review has highlighted the provision of sustainable dwellings is a complex topic. It is influenced by regulations and market forces and shaped by a range of key stakeholders with varying levels of knowledge and experience. Interviews are suited to research on complex phenomena and for gaining in-depth information from key players who have special knowledge (Denscombe, 2007). The key strength of undertaking a qualitative approach to interviewing includes the ability of the interviews to elicit a deeper understanding of participants views and opinions, and the ability to probe the ways in which they fashion their understandings of events and processes (Denscombe, 2007). As a sub-set of qualitative interviewing semi-structured interviews are built around a core set of themes that are common across the interviews, but within which there is scope to tailor specific lines of inquiry for particular interviewees (Denscombe, 2007). While this flexibility is useful it does mean that semi-structured interviews cannot be treated as standardised or as providing directly comparable results.

Semi-structured interviewing has been used in similar research examining the complex dimensions of sustainable housing. For example, Ancell and Thompson-Fawcett (2008) used semi-structured interviews to explore the social sustainability of medium density housing. They interviewed residents as well as council staff, property developers and an architect, and argued that that the process was robust and complemented the existing qualitative research in this area: “Taken as a whole, this qualitative methodology facilitated a deep and integrated understanding of the processes taking place...” (Ancell and Thompson-Fawcett, 2008: 430). Osmani and O’Reilly (2009) also used semi-structured interviews in their research on the feasibility of the English Government’s target of ‘carbon zero’ homes by 2016. They interviewed eight representatives of the home building industry to garner more detailed responses following an earlier questionnaire. Likewise Robinson and Edwards (2009) carried out interviews with housing industry professionals as part of their research on sustainable housing design in Sydney, Australia. In New Zealand Levy, Murphy and Lee (2008) used semi-structured interviews to explore the decision making processes of home buyers. What these other studies have shown is that semi-structured interviews with key stakeholders have proven to be an effective method for researching topics relating to the housing industry. On this basis semi-structured interviews were considered an appropriate forum to investigate the barriers to the uptake of sustainable housing initiatives in Palmerston North.

## 2.2 Identification of Key Stakeholders

Using this approach of key informant interviews the researchers started by identifying a series of potential key informants in the Palmerston North context. What the literature suggested was that the housing sector is characterised by a range of stakeholders, but that these stakeholders vary according to their level of engagement and knowledge. In this context the researchers identified six key stakeholder groups. These were:

- **Residential property developers and builders:** Developers’ and builders’ decisions shape the sustainability elements available in the houses they construct and sell.
- **Architects and architectural designers:** These professionals have an important role in the provision of sustainable dwellings by designing new houses, and renovations, and in advising clients on potential sustainability elements.

- **Home owners and buyers:** Consumer preferences influence the supply of new homes and the features they incorporate, however individual consumers typically have infrequent direct involvement in the housing sector.
- **Real estate agents:** Real estate agents market homes based on what they believe consumers will find appealing. They have knowledge of home buyers' decision making processes.
- **Tangata whenua:** Local iwi have detailed knowledge of sustainability and many Māori have an interest in environmental issues.
- **Council officers:** Council officers develop and implement building and planning regulations and have detailed knowledge on how they operate.

In identifying these broad groups the initial aim of the research was to try and get informants from each of the groups. It was quickly realised that given the relatively small scale of the research interviewing home owners and buyers (the largest group) would be problematic given that most have infrequent direct involvement in the housing sector. Consequently, we followed the lead of Levy et al (2008) who have argued that the experiences of real estate agents can be used as an effective proxy for home buyers' decision-making processes.

Potential participants were identified via a range of local media. Property developers were identified via internet searches, the telephone directory and local press articles. Builders, architects, architectural designers and real estate agents were identified via internet searches and the telephone directory. In particular, the New Zealand Green Building Council's website identified members who are based in Palmerston North or operate in the area ([www.nzgbc.co.nz](http://www.nzgbc.co.nz)). Local iwi organisations were identified in consultation with staff from the PNCC. Building supply retailers who specialize in environmentally-sensitive products and services were identified via Sustainable Manawatu's local business directory. From these searches, and consultation with the PNCC, an initial list of potential participants was developed.

Each of the potential participants was then contacted, first by letter and email, and then with a follow up phone call. At this stage many of the potential participants expressed an interest in the project, but a number of them indicated that given the project's time constraints that they would not be able to participate. Interviews were then arranged with those people who indicated a willingness to participate, and for each interviewee the

researchers compiled a separate interview schedule, based on themes from the literature, and calibrated to the particular role of the participant. The interviews were recorded and transcribed. As a matter of course the name of each individual interviewee has been kept confidential.

Originally, the project had intended to interview approximately 20 stakeholders, but ended up with ten interviews. These included individuals from the categories of: residential property developers and builders, architects and architectural designers, real estate agents, and council officers. As already explained we did not seek interviews from home owners and buyers.

### 2.3 Analysing the Interviews

The literature review that was carried out as part of this project identified clusters of barriers to the adoption of sustainability features in housing. Broadly these clusters were resolved down into four categories of barrier:

- *Knowledge gaps* (lack of knowledge about sustainability features, uncertainty about performance etc);
- *Legacy* (the inertia created by the current housing stock, the stigma attached to sustainable housing).
- *Fragmentation* (poor coordination among building authorities and other stakeholders in the building process);
- *Cost versus benefits* (the upfront cost of installing sustainability features versus the long term pay off, the distribution of costs versus benefits etc);

These four categories were used to code the responses in NVivo to the semi-structured interviews that were carried about with a range of actors in the building sector in Palmerston North. From this coding the researchers were able to collate and analyse a set of responses in relation to the clusters of barriers identified by the literature review. The results of these interviews are presented in Part 5.

### 2.4 Limitations of the Interviews

As with any research, there are always limitations and weaknesses in the selected methodology. Broadly speaking, semi-structured interviewing while having a number of

advantages also has several acknowledged disadvantages. These include the 'interviewer effect' where the physical presence and identity of the interviewer may influence what interviewees say (Denscombe, 2007). Interviewee co-operation and participation is essential (Marshall & Rossman, 2006). The reliability of the interview data can also be adversely affected because the presence of the interviewer, context and relationship between the interviewer and interviewee combine to create data that is unique to those circumstances (Denscombe, 2007). Analysis of interview transcripts can also be time-consuming and complex as individual interviewee responses are not provided in a straightforward pre-coded or standardised manner (Denscombe, 2007). In these contexts the themes developed out of the survey of the literature provides an important check on the interpretative process.

The research process is also inevitably selective as it was not possible to interview all the key stakeholders in the Palmerston North housing sector due to constraints on time and availability. While the researchers were able to secure interviews with individuals from most of the stakeholder categories there was a gap in terms of iwi representation. Here we found that there was a willingness to participate, however due to timing and other commitments the interviews did not occur. There was also limited breadth of involvement for some of the stakeholder categories. Most notably in the residential property developed and builder category all eventual interviewees represented relatively large building firms involved in new home construction, which meant that smaller builders were absent from the interviews.

## **2.5 Ethics Procedures**

The ethical dimensions of the project were reviewed with reference to Massey University's code of ethics. As a consequence of these discussions the project was evaluated as low risk, meaning that the project was not required to be formally reviewed by Massey University's Human Ethics Committee.

## **2.6 Conclusion**

The key empirical approach, alongside the literature review, adopted by the report has been the use of qualitative, semi-structured, key informant interviews. Semi-structured interviews provide a robust method of collecting detailed and meaningful qualitative data from key stakeholders in the Palmerston North housing sector about the provision of

sustainable dwellings. In thinking about the information generated by these interviews it is important not to assume that they provide standardised responses that can be directly compared. Rather the flexibility of the semi-structured interviews has allowed for the calibration of interviews based on the role of the individual interviewee, and a more in-depth examination of their thinking and position in relation to the barriers confronting the implementation of sustainable housing in Palmerston North. While the interviewees encompass a spread of roles there are gaps in relation to iwi and some elements of the building trade. This was unavoidable given the lack of availability and time constraints of interviewees and the research group. The interview results, do then have gaps, but they provide useful contextualising insights from a range of stakeholders involved in the broad field of sustainable housing in Palmerston North.

## Part Five: Interview Findings

The purpose of this section of the report is to highlight the key findings that emerged from the analysis of those interviews. It has a specific focus on exploring the responses of the interviews to questions about their experience and perception of the barriers to the development of sustainable housing in Palmerston North. Broadly these four categories were:

- *Knowledge gaps* (lack of knowledge about sustainability features, uncertainty about performance etc);
- *Legacy* (the inertia created by the current housing stock, and the stigma attached to sustainable housing).
- *Fragmentation* (poor coordination among building authorities and between different actors in the design and building sectors);
- *Cost versus benefits* (the upfront cost of installing sustainability features versus the long term pay off, the distribution of costs versus benefits etc).

Because of this focus the discussion in this section is organised thematically based on the categories that were fashioned from the literature review and which provide the analytical framework for the analysis of the interviews.

### 5.1 Knowledge Gaps

The interviewees were all asked a series of questions around the extent to which they felt that one of the barriers preventing greater interest in, and uptake of, sustainability features was a lack of knowledge about the options that were available.

The responses to this line of questioning broke down into a couple of key themes. Firstly there was a sense that people had a growing sensitivity to questions of sustainability and in particular energy efficiency. Consequently, there was a relatively general awareness of sustainability features such as lighting, insulation, double glazing and solar water heating, things that have been the subject of campaigns over the past few years. However, as one interviewee (Interviewee 1: design professional) argued, in a situation where there was so much going on, even the design professionals struggled to maintain a comprehensive



understanding of the range of systems and materials that were evolving. However, there was a strong feeling among the interviewees that beyond a general sensitivity to a relatively small range of sustainability features there was not a deeper understanding of how sustainability features might work in practice or interact with each other. Indeed there was a sense that there was a fixation on particular features or products rather than an understanding of sustainable houses as systems, or indeed how they fitted together a wider scale such as a neighbourhood. A common theme that emerged as interviewees reflected on the state of knowledge of the clients they were interacting with was that people didn't appreciate the complexity of implementing sustainability features and of tying those features into existing conventional systems. A particular feature of this complexity was that there was quite a bit of uncertainty about the performance of particular products, and more importantly, the integrated performance of sustainability systems vis-à-vis conventional practices.

Beyond this broad picture characterised by sensitivity to some forms of sustainability features, the interviewees did identify some pockets of deeper knowledge. In particular design professionals such as architects were identified as having a better understanding of various products and their use than other actors in the building sector. However, as Interviewee 1 (design professional) pointed out, the majority of houses are not designed by architects, and consequently in many cases there was not the time spent carefully thinking through the design of houses and/or the use of specialist expertise to give full effect to things such as passive solar heating. So even within the building sector the interviewees pointed to a continuum of knowledge and expertise.

On the client side of the equation the argument was made that most people wanted a better house in terms of warmth, light and ventilation, but that this did not necessarily flow through into a concern for a house that was better for the environment in a wider, city wider sense (Interviewee 1: design professional). Moreover, those people who were explicitly looking for a more sustainable house tended to be very much in the minority, and there was the sense that this concern with sustainability was also reflected in other values such as the desire for lifestyle blocks rather than in more traditional suburban houses.

In summary, rather than large knowledge gaps what emerged from the interviewees was the idea of an uneven distribution of knowledge. Generally, there was a broad appreciation of a range of sustainability features, but that this was not strongly related to a deeper sense of the complex practicalities of wrapping them into houses and

neighbourhoods. A feature here was levels of uncertainty about the performance of sustainability features. What was also apparent was that this unevenness included not only people commissioning and buying buildings, but also the range of professionals involved in the design and building of houses.

## 5.2 Legacy

Interviewees were asked to reflect on the impact of the legacy of the existing stock of houses in Palmerston North and also on the negative perceptions associated with sustainable houses.

In the context of the perceptions of sustainable houses the wider research literature pointed the widespread stigma associated with sustainable housing. Almost universally the interviewees agreed that there was some degree of stigma associated with sustainable housing, although this was changing. In part this stigma was manifested through perceptions about the characteristics of the house itself, the materials it was built from (for example straw bales) and the types of services embedded in the house (for example composting toilets). In part this stigma was also articulated through assumptions about the characteristics of the people who lived in, and advocated for, sustainable houses. Thus, for example a number of interviewees talked about the perceptions sustainable housing being a 'hippy' or 'greenie' thing as being a bit off-putting for some people. On the flipside, although one interviewee described sustainable housing as not being a 'mainstream' thing there was the sense from a number of interviewees that these negative associations were starting to change. In part this was down to the more widespread mainstreaming of particular sustainability features such as double glazing and rainwater capture systems, and the improving performance of those features which made them much less obviously different from more conventional features. There was also the idea that beyond a set of features or materials commonly associated with sustainable housing there were changes to building processes and practices that were occurring which had the effect of significantly improving sustainability in ways that went largely beneath the radar. On this score a telling comment from Interviewee 3 (builder) indicated that part of the process of selling sustainability to people was, 'making them aware that you can live in a house that is completely sustainable [but] that no one knows'.

We asked about the potential legacy issues stemming from the condition of the existing stock of housing a number of issues emerged. It has long been recognised that New

Zealand's housing is generally colder and damper than desirable, and one theme that emerged was a growing desire to improve this situation by renovating houses to include contemporary features such as double glazing and insulation. Interviewee 5 (real estate agent) argued that this desire stems in part from the relative attractiveness of new houses built post changes to the Building Act in 2008 vis-à-vis older homes. However, despite the desire, and indeed requirement, as Interviewee 4 (builder) argued, sometimes the renovation process could be difficult simply in terms of trying to physically marry different parts of a building designed under different regulations. It was also suggested that one effect of the renovation process, particularly as in most cases where people were operating to a budget, was the uneven application of features such as double glazing through a house. For example, an additional room might be double glazed because it was required to be, but that this might not be done throughout the whole house at the same time because of cost.

In summary, the interviewees identified two key ideas in relation to the issue of legacy. First, there was still a legacy of associating sustainable housing with degrees of oddity, material discomfort, 'hippies' and 'greenies'. However, it did seem for our interviewees that as sustainability features became more mainstreamed this stigma was decreasing. Second, changes to building regulations mandating the introduction of sustainability features such as double glazing in new houses has put some pressure on for these features to be included into older houses. But the incorporation of these features was seen as being quite uneven, even within a single house because of cost pressures.

### **5.3 Fragmentation**

Interviewees were questioned about their perception and experience of fragmentation as a barrier to the incorporation of sustainability features. Here the international literature framed fragmentation in terms of misalignments between owners, builders and designers in relation to wider statutory planning and building frameworks, and also in terms of misalignments within the building sector itself between designers, builders and suppliers.

At a broad level there was a clear consensus among the interviewees that the PNCC's District Plan, and building and planning processes did not per se constitute a significant barrier to the pursuit of more sustainable houses. However, what were seen as potentially problematic were issues to do with the compliance costs of trying to use systems or materials that were not mainstream. Interviewee 1 (design professional) talked about the

extent to which it was relatively straight forward to propose a solution as long as that solution fitted within the existing parameters of New Zealand's building code. Beyond that, however, 'if you want to design something that's not standard and you have to pay a specialist to design it, of course that costs money and the tests and things and the building consent process is also more complicated because you have to show it complies and there may be similar issues with resources consents as well' (Interviewee 1: design professional). These comments reflect the views of a number of the interviewees for whom demonstrating compliance with existing codes for new materials and systems represented more of a barrier than planning systems. Even so this barrier was not seen as being insurmountable, but was regarded as an inevitable consequence of trying to expand the envelope of possibilities.

Interestingly the question of fragmentation between different elements of the building industry came up in the context of the design aesthetics of new houses. Here for example, Interviewee 4 (builder) made the point that a lot of design effort was spent getting the exterior design of a house right, only then to have features such as solar water heating or solar panels attached to the roof, or air conditioning units attached to the side of the house. In this context, 'You've got to design around those air conditioning units on a house other than that they just become unsightly and ugly' (Interviewee 4: builder).

In summary the interviewees indicated that they felt that the building and planning processes of the PNCC did not constitute a significant barrier to the adoption of sustainability features. What was seen as a barrier, however, was the time and cost of ensuring that new materials and systems could be rendered compliant with existing building codes. This was seen as an almost inevitable result of introducing new ways of approaching the design and specification of buildings. There was also the sense that there was the potential for fragmentation at the design stage if sustainability features were not considered as an integral part of the design process rather than an add on after the design had been completed.

## **5.4 Costs and Benefits**

A clear finding from the literature review was that cost, perceived costs and the uneven distribution of benefits were strong barriers to the adoption of sustainability features in residential housing. Given this finding the interviewees were all asked about their experiences and perspective on the importance of the cost of sustainability features, and their potentially uneven distribution, as a barrier to their adoption.

Unsurprisingly, there was a strong consensus that the cost, and in particular the perceived cost of adopting sustainability features, was a barrier to their adoption. The interviewees suggested that in part this cost was reflected in the different range of material and technologies being potentially used, but also in the additional design work required to integrate these features into a working system. As consequence, as Interviewee 6 (design professional) indicated this can cause frustrations since, ‘the demand of a lot of people in the residential game is that they buy a block of land, they want their dream house and they want it now.... Some of these issues around sustainability can be a bit complex so they take time to nut through and people get a bit impatient with that and budgets’. Another issue was where the desire for sustainability features got inserted into the design process. Often what happened, indicated the interviewees, was that sustainability features beyond what was required by code were added in the last stages of the design process, and that this had the effect of pushing projects over budget. On this point Interviewee 6 (design professional) had the view that, ‘people have a set view or budget for their project and I don’t think sustainability has really been thought through and put into that budget so when, for argument’s sake, they may have \$400,000 to build and then you throw in some sustainability items and it comes out at \$450,000 well –you know there’s an issue’. There was still the strong idea then that sustainability features were add ons rather than integral to the designing and building of homes.

Interviewee 6’s comments point to one dimension of cost, the upfront amount that is required to incorporate sustainability features in a house. As other interviewees noted, however, this upfront cost needed to set aside the long term cost of running a house with, or without, sustainability features. People tended to focus on the upfront costs at the expense of the lifetime running costs, or payback period. Also as one interviewee remarked there was an irony insofar as people were quick to ask about payback periods for features such as solar water heating, but were simultaneously prepared to spend significant amounts of money on things such as kitchens without doing the same type of analysis. A difference which seemed in the minds of the interviewees to reflect contrasting cultural priorities, and which emphasised the idea that sustainability features still tended to be treated as the last features to be considered, and as a cost rather than a benefit.

One repeated reason for the concern with upfront cost was the mobility of people. Here, the observation was made that people didn’t expect to be in the same house over the five to seven year payback period, and that consequently they focused on features that would improve the house’s immediate saleability. This was not the case for all segments of

the housing market. At the top end of the market it was argued that people were often building with the intention of staying in those homes for a sustained period, and that consequently these were homes more likely to have sustainability features built into them (also because they were being built with a different set of budgetary calculations in mind). Conversely, with houses being built for quick sale and / or rental often the key driver in their design is the creation of an affordable house that can be put on the market, and that while they might incorporate some sustainability features, this was not a high priority (Interviewee 2: building material supplier).

Questions about the distribution of benefits from the incorporation of some features were also raised. For instance where features that might not have an obvious payback period, or where there was a gap between the person paying for the feature and the person benefiting from it. For example, Interviewee 2 (building materials supplier) noted in relation to one of his company's products, which incorporated a significant amount of recycled material but performed no differently than other conventional products, that it was the total community rather than individual consumers who were getting the benefits from the use of that project. In this case, Interviewee 2 (building materials supplier) indicated that, 'In general terms if there is no personal gain, no benefit to the owner or occupier of the building then it falls pretty low on the radar'. A similar argument was evident in relation to rental properties, where there was not a direct relationship between the house owner and probable buyer of any sustainability feature, and tenants who are the beneficiary of that feature. This was identified as a particular issue in Palmerston North because of the proportion of rental properties in the city.

In summary the interviewees identified that cost was a factor in people deciding to incorporate sustainability features or not. However, there were a number of dimensions to this. First, there was the belief that sustainability features were not necessarily incorporated at early stages of the design process, and that when treated as an add-on they tended to be among the first items dropped off in order to rein in budgets. There was the sense that people focus on the upfront cost of sustainability features rather than lifetime running cost, or payback period, of a feature. Simultaneously it was suggested that sustainability features and things such as kitchens were subject to different forms of economic calculation. The focus on upfront cost was related back to the mobility of home-owners, where apart from some cases, people were not expecting to stay in a house long enough to benefit from the payback period of sustainability features. Finally, there were questions about the

relationship between who paid the cost of sustainability features and who benefited. A question that was evident in the relationship between land-lords and tenants.

## 5.6 Conclusion

The survey of the international literature identified four broad clusters of barriers to the adoption of sustainability features in housing. The analysis of our interviewees, in the context of Palmerston North, has found that in the case of knowledge gaps, legacy, and costs versus benefits that there is a strong correlation between what they have been articulating and what is evident in the international literature. There is a growing desire for sustainability features, but there are knowledge gaps throughout the commissioning, design and building process. In particular there are gaps in understanding the performance of new materials and systems. Likewise the character of the existing stock of houses in Palmerston North did create a form of inertia, particularly given the rate of new builds and renovations. In this context of the latter it was suggested that what was emerging was quite an uneven geography of sustainability within the city, where even individual buildings would have an uneven mix of features given the timing of any renovations. Costs were a significant issue in the complex set of financial drivers that came together in decisions to build or renovate houses. There was a focus on upfront costs rather than payback, and this was related to the nature of house tenure. In relation to the question of fragmentation, there was an issue identified between different facets of the design and building process. In part this was put down to the use of new materials and design and the inevitable delay in integrating these within the existing building code. Positively, beyond the issues with compliance noted above it was universally felt that the PNCC was supportive of efforts to incorporate sustainability features.

## Part Six: Conclusions

The purpose of this report has been to situate claims made about the barriers to sustainability in the international literature in the context of Palmerston North, and in doing so further develop our understanding of the specific barriers identified in the PNCC's SCS. In concluding this report we highlight what we think are two key barriers, and drawing on the interview data suggest ideas about what might be done encourage the adoption of residential sustainability features.

In order to do this a review of the growing international literature relating to residential sustainability was prepared and then used as the basis for a series of key informant interviews with stakeholders in Palmerston North. In broad terms the review of the international literature found four clusters of barriers to the adoption of sustainability features in residential houses: knowledge gaps (lack of knowledge about sustainability features, uncertainty about performance etc); legacy concerns (the inertia created by the current housing stock, the stigma attached to sustainable housing); fragmentation (poor coordination among building authorities); and the uneven distribution of cost versus benefits (the upfront cost of installing sustainability features versus the long term pay off, the distribution of costs versus benefits etc).

When contextualised through the use of key informant interviews what was found was that to a degree these barriers are being replicated in Palmerston North, albeit in some uneven ways. In the first instance there was common agreement that the PNCC itself was not a barrier to home-owners wanting to incorporate sustainability features, beyond the inevitable consenting uncertainty associated with the use of non-mainstream designs, materials and processes. More of a barrier was the uneven level of understanding education around what features are available, their performance and how they interconnected. This unevenness was associated not only with home-owners but also with the range of professions involved in the design, planning and building of residential houses. Consequently, when asked about what the PNCC could do to help improve the adoption of sustainability features a common suggestion was that the PNCC could continue to take a lead role in educating home-owners, designs and builders about the possibilities of incorporating sustainability features in new designs and existing houses. Part of the remit for this role would be to try and promote the use of sustainability features at the design stage of building, while another related aspect would be try and help people negotiate the



often conflicting advice that exists around the use of sustainability features. Another part of the role could be to act as a liaison to try and help smooth out any consenting issues that may arise from the use of non-standard designs.

A second significant barrier that was identified lay in the uneven distribution of costs and benefits. This it was suggested was most evident in the disconnect in the rental market between the owners of houses and those occupiers who would benefit from any changes. The associated point that was made with this observation was that where people were incorporating sustainability features it tended to be in houses that were being designed as owner-occupier homes, and that furthermore these features tended to be in higher end homes and / or homes being built on lifestyle sections. To help try and remedy some of this unevenness it was suggested that rental houses be required to have a warrant of fitness that would contain a number of conditions that would need to be met before a house could be let. An approach that was extended by the suggestion that in the case of new subdivisions that the incorporation of sustainability features, such as rain water harvesting, could be made one of the criteria for approval. This points to a desire for both a concern with individual houses, but also a concern with the sustainability of the wider urban fabric within which houses are situated, but which individual homeowners, designers and builders cannot directly influence through their individual decisions about what particular suite of sustainability features that they might use. Seen at this wider scale what did become apparent from both the literature review and the interviews was that one of the most effective ways of ensuring the widespread adoption of sustainability features was their incorporation into building codes as want simply needed to be done rather than an add on.

In framing a response to the issue of the barriers constraining the adoption of sustainability features what has emerged from the literature and the contextualised interviews has been a dual set of strategies. There was the strong sense that the adoption of sustainability features would be aided by the PNCC continuing to take a lead role in educating people about the options that exist in relation to residential sustainability, and also by leading by example in the adoption of these measures. At the same time, however, it was argued that education could only go so far in persuading people about the adoption of sustainability features, and that in order to make their use more universal then they needed to be embedded into planning and building regulatory frameworks as part of mainstream business rather than the add on which still remain in many cases.

## Appendices

### Appendix 1 The Weakness of Planning as a Tool for Zero Carbon Development

#### **Interpretation and Implementation**

- variation in the interpretation of national planning guidance
- lack of clarity in government guidance as to priority of conflicting goals - e.g. between affordability; efficiency of process; and energy
- lack of staff training and/or expertise to determine zero carbon applications
- lack of political support

#### **Competing demands**

- deciding what conditions to place on planning permissions complicated by competing objectives of planning system (social, environmental, economic)
- Competition between authorities for large development projects - influences willingness for additional conditions relating to zero carbon
- length of time to process applications that have included renewable energy components longer

#### **Lack of expertise support and leadership amongst decision makers**

- lack of awareness amongst decision-makers not primary<sup>7</sup> problem for zero carbon developments but a lack of political support / leadership.
- public opposition to aesthetics (and other effects) of technologies proposed limited political support as did technological problems of new technologies affecting cost, quality and stability.
- positive correlation between energy champion and proactive approach towards Zero carbon development.

#### **Reliance on private sector to deliver zero carbon development**

- limited public resources to finance development of LCZ systems and lack of demand undermined willingness of industry to invest.

(Source: Williams, 2012)

## Appendix 2 Minimising Carbon Dioxide Emissions, Except from City of London Draft Local Plan 2013

### **POLICY 5.2 MINIMISING CARBON DIOXIDE EMISSIONS**

#### **Planning decisions**

**A** Development proposals should make the fullest contribution to minimising carbon dioxide emissions in accordance with the following energy hierarchy:

- Be lean: use less energy
- Be clean: supply energy efficiently
- Be green: use renewable energy

**B** The Mayor will work with boroughs and developers to ensure that major developments meet the following targets for carbon dioxide emissions reduction in buildings. These targets are expressed as minimum improvements over the Target Emission Rate (TER) outlined in the national Building Regulations leading to zero carbon residential buildings from 2016 and zero carbon non-domestic buildings from 2019.

#### **Residential buildings:**

<b>Year</b>	<b>Improvement on 2010 Building Regulations</b>
2010 – 2013	25 per cent (Code for Sustainable Homes level 4)
2013 – 2016	40 per cent
2016 – 2031	Zero carbon

**(Source: City of London Draft Local Plan 2013)**

## Appendix 3 Sustainable Development and Climate Change, Excerpt from City of London Draft Local Plan 2013

### **Core Strategic Policy CS15: Sustainable Development and Climate Change**

To enable City businesses and residents to make sustainable choices in their daily activities creating a more sustainable City, adapted to the changing climate, by:

1. Requiring all redevelopment proposals to demonstrate the highest feasible and viable sustainability standards in the design, construction, operation and "end of life" phases of development. Proposals for major development should aim to achieve a BREEAM rating of "excellent" or "outstanding". Residential development should aim to achieve a minimum standard of Code for Sustainable Homes level 4, rising to level 6 by 2016 or in line with government targets.
2. Requiring development to minimise carbon emissions and contribute to a City wide reduction in emissions:
  - (i) adopting energy-efficiency measures;
  - (ii) enabling the use of decentralised energy, including the safeguarded Citigen CCHP network, CCHP-ready designs in areas where CCHP networks are not yet available, and localised renewable energy technologies;
  - (iii) adopting offsetting measures to achieve the Government's zero carbon targets for buildings.

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(Source: City of London Draft Local Plan 2013)

## Appendix 4 Development Management Policies, Excerpt from London Draft Local Plan 2013

### DEVELOPMENT MANAGEMENT POLICIES

#### Policy DM 15.1 Sustainability requirements

- 1) Sustainability Statements must be submitted with all planning applications in order to ensure that sustainability is integrated into designs for all development.
- 2) For major development (including new development and refurbishment) the Sustainability Statement should include as a minimum:
  - BREEAM or Code for Sustainable Homes pre-assessment;
  - an energy statement in line with London Plan requirements;
  - demonstration of climate change resilience measures.
- 3) BREEAM or Code for Sustainable Homes assessments should demonstrate sustainability in aspects which are of particular significance in the City's high density urban environment. Developers should aim to achieve the maximum possible points to address the City's priorities.
- 4) Innovative sustainability solutions will be encouraged to ensure that the City's buildings remain at the forefront of sustainable building design. Details should be included in the Sustainability Statement.
- 5) Planning conditions will be used to ensure that Local Plan assessment targets are met and the development accords with them.

(Source: City of London Draft Local Plan 2013)

## Appendix 5 Energy and CO<sub>2</sub> Emissions Assessments, Excerpt from City of London Draft Local Plan 2013

### **Policy DM 15.2 Energy and CO<sub>2</sub> emissions assessments**

- 1) Development design must take account of location, building orientation, internal layouts and landscaping to reduce likely energy consumption.
- 2) For all major development energy assessments must be submitted with the application demonstrating:
  - energy efficiency – showing the maximum improvement over current Building Regulations to achieve the required Fabric Energy Efficiency Standards;
  - carbon compliance levels required to meet national targets for zero carbon development using low and zero-carbon technologies, where feasible;
  - where on-site carbon emission reduction is unviable, offsetting of residual CO<sub>2</sub> emissions through “allowable solutions” for the lifetime of the building to achieve national targets for zero-carbon homes and non-domestic buildings. Achievement of zero carbon buildings in advance of national target dates will be encouraged;
  - anticipated residual power loads and routes for supply.

(Source: City of London Draft Local Plan 2013)

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