SUSTAINABLE RETROFIT IN THE NEW ZEALAND RESIDENTIAL SECTOR

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ABSTRACT

A large proportion of New Zealand's existing housing stock performs poorly, particularly in terms of energy efficiency. As homeowners tend to be reluctant to invest in sustainable retrofit activities, policy interventions or initiatives are often introduced in an attempt to improve uptake.

The aim of this research was to identify a range of strategies that could be implemented to improve the uptake of sustainable retrofit activities in existing homes in New Zealand. Data was collected from government, industry and homeowners to establish each group's preferences for different types of sustainable retrofit strategies. The overall objective was to integrate these findings in an attempt to determine whether there was any consensus of opinion.

The findings indicate that there was no clear consensus of opinion. In terms of preference for different types of strategies, government appears to prefer market mechanisms and 'other' interventions; as evidenced by their support of initiatives such as the residential rating tool, the provision of information and the sponsorship of education and research. Industry believes that regulation and financial incentives have the most potential to improve uptake. Preferred strategies include minimum performance standards and mandatory environmental performance ratings; plus providing subsidies and interest free loans for homeowners undertaking sustainable retrofit. Homeowners appear to favour strategies that are not regulatory, onerous or inequitable. Preferred strategies include financial incentives like interest-free loans; and other initiatives such as fast-tracking building consent processes.

As government appears to be willing to let the market decide - and homeowners do not want to be burdened with additional cost - it will be 'business-as-usual' unless market transformation occurs. Ultimately, government needs to explicitly realise the benefits of sustainable retrofit, and then proceed to take extensive measures to incentivise it. Homeowners also need to be convinced that the benefits of sustainable retrofit can offset the costs of implementation. Only then will the uptake of sustainable retrofit activity really take off.

CONFIDENTIALITY STATEMENT

The author has agreed that all personal and company names of participants in this research will be kept confidential.

The following statement was issued to all survey participants at the commencement of the survey:

“Please note that your participation and contribution will be strictly confidential. The data collected will be seen only by the researcher and the supervisor of this project. All personally identifying features will be removed from any published material.”

Whereas company names or job titles *may* be mentioned, individual responses will not be able to be linked back to individuals nor organisations, and any specific reference to individual responses will be anonymous.

PUBLICATION AGREEMENT

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DEDICATION

This report is dedicated to my son, Connor Michael McKechnie, who was born soon after I began this research. May the work of all those championing sustainable development make your world a better place...now, and in the future.

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GLOSSARY

Incentive: Inducement or supplemental reward that serves as a motivational device for a desired action or behaviour.

Initiative: The first step in a process that, once taken, determines subsequent events; a plan or strategy designed to deal with a particular problem.

Intervention: A policy of intervening in the affairs of; the act of interposing one thing between or among others; provided to improve a situation.

Likert scale A psychometric scale commonly used in questionnaire where respondents specify their level of agreement to a statement. The term is often used interchangeably with *rating* scale even though the two are not synonymous.

Market Mechanism: A method or means of doing something using any of the products and services available in the market.

Regulation: An official rule, law, or order stating what may or may not be done or how something must be done; the adjusting, organizing, or controlling of something.

Retrofit: The provision of new components or systems in an existing dwelling directed to increasing the dwelling's resource performance and indoor environmental quality.

Strategy: Long-term plan for success esp. in business or politics; a plan of action intended to accomplish a specific goal.

Sustainable Retrofit: Sustaining the useful life and performance of the (existing) housing stock; ensuring the on-going functionality of the stock over the long-term; ensuring the dwelling's on-going social, health, environmental and economic performance.

LIST OF ABBREVIATIONS

ACC	Auckland City Council
BP	Beacon Pathway Ltd.
BRANZ	Building Research Association of New Zealand
CHRANZ	Centre for Housing Research Aotearoa New Zealand
DBH	Department of Building and Housing
DIY	Do it yourself
EECA	Energy Efficiency and Conservation Authority
HERS	Home Energy Rating System/Scheme
HNZC	Housing New Zealand Corporation
HSS	Household Sustainability Survey
MAUA	Multi-Attribute Utility Analysis
MfE	Ministry for the Environment
NZ	New Zealand
NZBC	New Zealand Building Code
NZBCSD	New Zealand Business Council for Sustainable Development
NZGBC	New Zealand Green Building Council
RMA	Resource Management Act
RTA	Residential Tenancies Act
SRS	Sustainable Retrofit Survey
WCC	Waitakere City Council

1 INTRODUCTION

1.1 Context and Rationale

1.1.1 Sustainable Development

Sustainable development is not merely a concept, but an action. According to the New Zealand Business Council for Sustainable Development (NZBCSD) it is "a strategy that requires the integration of economic growth, social equity, and environmental management".[1]

The potential for the built environment to negatively impact upon the environment is well researched and documented. According to the United Nations Environment Programme (UNEP), for example:

> "The negative environmental impacts of New Zealand's built environment are immense. Globally, 40 per cent of all energy and material resources are used to build and operate buildings, 40 per cent of greenhouse gas emissions come from building construction and operation, and 40 per cent of total waste results from construction and demolition activities"(UNEP, 2007 in MfE, 2009).

It is in these key areas of energy, materials, greenhouse gas emissions and waste that many sustainable development strategies within the built environment are focused. Policies have been implemented that address waste reduction (NZ Waste Strategy, Waste Minimisation Act). Similarly, there is a growing body of information developing relating to the 'sustainability' of materials (Green Build, BRANZ Research, Smarter Homes). However, it is in the areas of energy and greenhouse gas emissions, that there appears to be real opportunities for change.

According to the NZBCSD up to 85% of a building's total energy consumption and CO_2 emissions occur over the lifetime of the building in use. Targeting this area offers New Zealand (NZ) a "significant opportunity to reduce its energy efficiency and emissions reduction targets while maintaining economic growth" (NZBCSD,

[1] Retrieved from http://www.nzbcsd.org.nz/definition.asp

2008a). The Energy Efficiency and Conservation Authority also state that "Reducing energy consumption in the home is the one area where most New Zealanders can make a difference" (EECA, 2008).

1.1.2 The New Zealand Housing Market

The housing market in New Zealand can be segmented in many ways. New versus existing is one way of doing so. Using 'building consents issued' figures from Statistics New Zealand to proxy supply of new dwellings, the size of the 'new construction' market equates to approximately 22,000 houses per annum over the last five year period. In comparison, the current size of the existing homes market has been estimated to be over 1.6 million (various sources).

Furthermore it has been estimated that approximately 900,000 houses were built before minimal insulation requirements in the building standards were introduced in 1977. Of these, some 600,000 are either not insulated or inadequately insulated (NZBCSD, 2008b).

It is evident that a large proportion of New Zealand's existing housing stock performs poorly. They are ineffectively insulated, inefficiently heated and are prone to damp, cold, mould and rot. New homes however, are generally built to more exacting standards and tend to perform significantly better. Given these parameters, it is clear that the greatest potential for meeting energy and emissions targets, whilst also addressing the health and comfort of housing occupants is by improving the performance of our existing houses.

1.1.3 The Benefits of Sustainable Retrofit

The benefits of sustainable retrofit are significant, and the refurbishment of existing homes can meet the key sustainable development criteria of economic growth, social equity, and environmental management in a number of ways. The following table summarises some of the potential benefits of sustainable retrofit activities.

Table 1: The Benefits of Sustainable Retrofit

Environmental (conservation)	Reduction in construction & demolition waste to landfill. Increased materials re-use and recycling. Safeguarding green field sites from development.
Social (occupational)	Improved health and comfort benefits for occupants. Local economic development including job creation. Retention of community infrastructure, renewal and regeneration.
Economic (investment)	Lower building costs and reduced construction time. Potential for increased capital value & rental returns. Reduced operating and energy costs.

1.2 Purpose of Report

This research project examines sustainable retrofit within the existing homes sector of New Zealand. Its purpose is to identify and evaluate a number of strategies (initiatives and/or policies) that could encourage the uptake of retrofit activities; on the basis that retrofit activities can bring significant environmental, social and economic benefits.

1.2.1 Research Question

"What strategies could be implemented to improve the uptake of sustainable retrofit activities in the existing residential sector, in New Zealand?"

1.2.2 Research Aim and Objectives

The overall research aim is to determine which strategies are most likely to effectively and efficiently improve the uptake of sustainable retrofit activities in New Zealand, given the potentially incongruent views of the key stakeholders: government, industry and the householder.

The research objectives are defined as follows:

Table 2: Research Objectives

Primary Objective	to collect the *opinions* of the key stakeholders (government, industry and the householder) on a selection of sustainable retrofit strategies, that could improve the uptake of sustainable retrofit activities in New Zealand's residential sector
Secondary Objective	to determine each group's *preference* for different types of strategies
Overall Objective	to determine which (type of) strategies could most effectively improve the uptake of sustainable retrofit activities, in practice

1.2.3 Sustainable Retrofit

The definition of sustainable retrofit utilised in this report is based on Saville-Smith's discussion on renovation and retrofit activities. In this discussion she differentiates between *maintenance and repair*; which she defines as making good or "retaining the original standard, performance and amenity of a dwelling", and *renovation, refurbishment and rehabilitation*, which "is directed to enhancing the current performance and amenity of a dwelling, usually past its original specifications to the equivalent performance within more modern expectations" (Saville-Smith, 2008). Within this discussion, the term *retrofit* is said to fall within the category of renovation, but as a distinct subset:

"It is not simply the provision of something new. It is the provision of new components or systems in an existing dwelling directed to increasing the dwelling's resource performance and indoor environmental quality." (Saville-Smith, 2008)

The final section of the discussion relates these activities to a "sustainable dwelling stock." From this, a definition of **sustainable retrofit** is generated:

- sustaining the useful life and performance of the (existing) housing stock;
- ensuring the on-going functionality of the stock over the long-term;
- ensuring the dwelling's on-going social, health, environmental and economic performance

1.3 Limitations

- Application of strategies to the New Zealand context only.
- Application to existing buildings in the residential sector only.
- Strategies will be investigated in terms of their potential effectiveness at the policy or macro level only. Detailed or micro analysis of the potential feasibility of any strategies will not be undertaken.
- The research will focus on energy efficiency, health and comfort; but that does not preclude the potential for the strategies investigated to significantly influence the uptake of activities in other sustainability areas; such as water, materials and waste.
- Results, observations and conclusions will be based on qualitative and subjective data. This research does not propose to investigate the effectiveness of any strategies as actually implemented.
- This research does not claim to survey all possible strategies.

- This report will use the words retrofit, renovation and refurbishment interchangeably.
- Similarly, the words strategy and policy are often used interchangeably.

1.4 The Research Process

Although the research process is not linear, the following diagram was utilised to provide a framework for the overall process. This report has been set out in general accordance with this diagram; however it is important to note that the research question evolved throughout the process as information was collected.

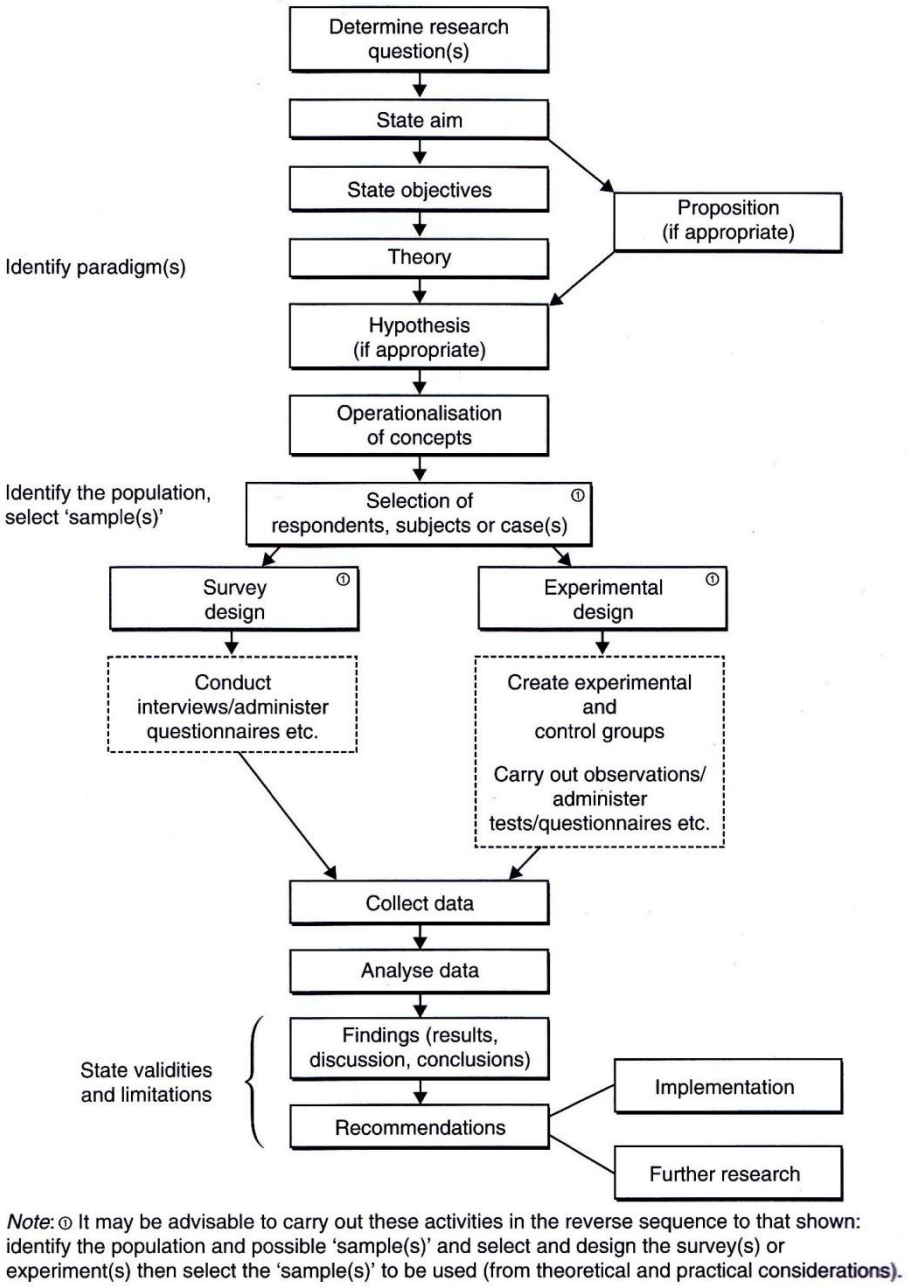


Figure 1: The Research Process (Fellows & Liu, 2008)

1.5 Structure of Report

This report is structured into six main chapters as follows:

1. **Introduction**
2. **Literature Review**
3. **Research Design**
4. **Data Collection**
5. **Data Analysis**
6. **Conclusion**

The **introduction** provides the context and rationale for the research, introduces the reader to the research question and provides key definitions.

The **literature review** investigates types of interventions, segmentation in the New Zealand housing market and identifies possible strategies for improving uptake.

The **research design** section explores the literature on research methodologies, data collection methods, and then describes the surveying and data collection strategies utilised in this research project.

The **data collection** chapter describes how the data was collected, how it was managed, and presents it in a 'raw' form.

The **data analysis** section analyses the data collected from the key participants, summarises the findings, and discusses the overall significance of the findings.

The **conclusion** includes a summary, recommendations for implementation and identifies areas for further research.

2 LITERATURE REVIEW

2.1 Background

The literature review was undertaken some time before the final research question was finalised. At the time, the primary intent was only to *identify* strategies being utilised to encourage the uptake of sustainable retrofit in the built environment. There was also an interest in understanding the different motivations of landlords versus owner-occupiers, and a focus on this differentiation is apparent.

Whereas the scope for review was generally restricted to strategies employed in New Zealand, within the residential sector and for existing buildings only; it was clear that research and development carried out in the broader building environment could be applicable as well. The review, therefore did not specifically exclude the investigation of strategies employed internationally, in the commercial sector or for new construction. In fact, much of the key literature draws upon international and commercial experience to provide a framework for the residential-existing sector.

Another aim was to focus on strategies that could be considered 'current'. As a result, publications selected for review generally fell in the period 2004 – 2009. This did not rule out the review of strategies employed prior to these dates however.

Literature was generally sourced online and - for the most part - included journals and research reports. Many important texts were sourced from NZ organisations such as the Building Research Association of New Zealand (BRANZ), the Ministry for the Environment (MfE), the New Zealand Business Council for Sustainable Development (NZBCSD) and the Centre for Housing Research Aotearoa New Zealand (CHRANZ).

Over the course of the review, a significant number of research reports were discovered that had been created for Beacon Pathway (BP): a NZ research consortium exploring "ways to make New Zealand homes more sustainable".[2] Many of these reports were - and are - highly applicable to this field of research.

[2] Retrieved from http://www.beaconpathway.co.nz/about-us

2.2 Structure of the Literature Review

This chapter has been organised according to a number of common themes that were discovered over the course of the review.

The first part of the review investigates the structure of the New Zealand housing market, how it is segmented (especially in terms of home ownership), and the barriers to uptake. The home owners (or consumers) present the demand-side of the equation.

The second section identifies the types of sustainable strategies or 'interventions' that are available for implementation within the built environment. These can also be considered as supply-side or top-down initiatives.

The third section investigates the strategies utilised in the international arena and the commercial sector. It then summarises a range of strategies that could be employed in the residential sector to improve uptake.

2.3 The New Zealand Housing Market

The existing housing sector has been identified as the market with the most opportunity for sustainable intervention. The size of the market and its generally poor performance - especially in terms of energy efficiency - are clear indicators. Furthermore, new homes are now being constructed in compliance with building codes with sustainability requirements built in, and with more advanced technologies and materials.

The supply-side of the building industry is generally hesitant to change practices or deliver services and products unless there is demonstrated demand (Saville-Smith, 2008). This implies that the refurbishment wants and needs of house owners must be clearly understood if retrofit packages (or interventions) can be effectively developed to improve the performance of the existing housing stock.

2.3.1 Market Segmentation

The housing market can be segmented a number of different ways. This allows for the identification of "opportunities to improve the sustainability of our housing stock

and to allow associated targeted strategies to be developed" (Amitrano, 2006). McChesney also points out that "segmentation provides insights for differentiation from an energy standpoint" (McChesney, 2006).

The literature analyses different ways to segment the housing market (Amitrano, 2006; Storey, 2004; Saville-Smith, 2008; McChesney, 2006). Asides from the differentiation of new versus existing, the market can also be segmented by physical characteristic such as location, age or type of building. Demographic characteristics such as age, income, ownership structure and type of energy user can also be used.

Amitrano (2006) makes the distinction between owner-occupiers and 'renters'. Owner-occupiers currently account for approximately 67% of the market, and rental properties make up the balance of approximately 33% (Statistics NZ). Although the owner occupied market is significantly larger, the current ownership trend in New Zealand is towards decreasing levels of home ownership. Saville-Smith (2008) notes that most rental stock is privately owned and that the balance owned by government organisations such as Housing New Zealand (HNZC) is already subject to modernisation programmes. This implies that landlords are increasingly likely to become more important players in the market; with the potential to significantly affect the future performance of the existing housing stock.

It is also interesting to note that Saville-Smith identifies additional segments within the owner occupier group including "recent movers" and "high energy users". The author indicates that recent movers provide a good "possible intervention point" as they tend to renovate within the first two years of home ownership. Similarly, high energy users account for between 15-25% of residential energy use (Saville-Smith, 2008); another segment of the market worth targeting.

2.3.2 Barriers to uptake

House owners are resistant to invest in retrofitting (Saville-Smith, 2008). Hargreaves notes a number of barriers in her exploration of a commercially viable model for retrofit; including the predominant reliance on government funding, New Zealand's DIY culture and the cost of advice (Hargreaves, 2005).

Inevitably, the barriers appear to be financial in nature. Storey suggests research needs to be undertaken on the investment payback periods for sustainability related retrofitting (Storey, 2004) and Saville-Smith reinforces this by suggesting that *the* primary barrier is expense; in conjunction with low levels of willingness to pay (Saville-Smith, 2008).

Owner occupiers appear willing to invest in retrofit as long as there is a direct link to occupancy comfort, health and reduced energy costs (Saville-Smith, 2008). The rental property segment remains the most challenging however, because the owners do not directly reap the benefits of sustainable retrofit (Amitrano, 2006). Saville-Smith's research indicates that landlords will only retrofit if the government provides assistance. A further 25% of landlords indicated that they were just "not interested" (Saville-Smith, 2008).

2.3.3 Summary

The NZBCSD states that the existing homes market is "...not well structured to facilitate market driven uptake of sustainability" (NZBCSD, 2008b).

In terms of segmentation, the owner-occupier *is* the decision maker, and will therefore benefit directly from any sustainable refurbishment undertaken. In the case of rental landlord the owner is *not* the occupier so there is a clear separation in motivation. Unless the landlord can realise his investment in sustainable refurbishment, either through improved rental income (short term) and/or increased capital value (long term), then he will have no incentive to invest.

Uptake will still depend however, on a number of factors including the householders' economic resources, and the available levels of information in the market (including their understanding of retrofit options and payback mechanisms).

It is evident that the householder plays a key role within the residential sector. The size of the existing homes market, the poor performance of many homes, plus their apparent reluctance to invest in sustainable retrofit suggests that that the case for intervention is strong.

2.4 Types of Interventions

It is generally understood that New Zealand is lagging behind other developed countries in improving household energy efficiency (McChesney, 2006). There are many reasons for this - especially on the demand side of the balance - and a number of these reasons will be investigated further in the next section (the New Zealand Housing Market). It is clear however that sustainable retrofit will not be routinely implemented just because research indicates that it is beneficial to do so.

This often necessitates the introduction of 'interventions' to stimulate demand for the uptake of sustainable strategies. An intervention can be understood as an act or an attempt to influence a situation in a predetermined way. The research has uncovered a number of such interventions.

Storey et al. (2004) identify the following interventions as part of their research: regulatory instruments, economic instruments, information tools and 'other' interventions (including 'greener' procurement and support for research). Similarly, McChesney et al. (2006) conducted research on the potential impact that market prices, incentives and regulatory requirements have on household energy efficiency.

2.4.1 Regulations

Regulations are the preferred method of intervention for governments (Storey, 2004). The reasons are seemingly apparent, and would include cost efficiency, greater ability to control and influence outcomes, and they create a relatively 'even playing field' for the householder. Whereas Storey argues that regulatory interventions "would have the biggest effect of all conceivable measures in improving sustainability standards in New Zealand" (Storey, 2004); he also notes that regulatory means are unlikely to be applied retrospectively to existing houses.

McChesney suggests that the application of regulations in New Zealand has been inconsistent, but that the development of Minimum Energy Performance Standards (MEPS) and the incorporation of sustainable principles into the New Zealand Building Code may indicate a more consistent effort is underway (McChesney, 2006).

2.4.2 Financial Incentives

The use of fiscal measures and other financial incentives to encourage energy efficiency and sustainability initiatives are being increasingly used around the globe (De Blaauw, 2008). Good current examples exist in New Zealand as initiated by the Energy Efficiency and Conservation Authority (EECA), for example. The Warm Up New Zealand programme provides government funding for households interested in insulating and installing clean and efficient heating within their homes.

Incentives are often provided by national or local government bodies. Within the UK context, Mansfield argues that the government "could do more to actively support sustainable refurbishment activity through direct and indirect initiatives" (Mansfield, 2009). McChesney notes that the historical use of incentives in New Zealand has been stop-start and will need to be applied more widely and intensively in order to achieve satisfactory outcomes (McChesney, 2006).

2.4.3 Market Mechanisms

The market is defined as a combination of energy efficiency products, services and prices (McChesney, 2006). Market mechanisms, therefore include any of the products and services available in the market and are subject to the economic laws of supply, demand, price and competition. Although McChesney notes that the market has been an effective driver in some segments of the population, it is still ultimately reliant on sufficient demand and other externalities such as adequate information and marketing.

Storey, on the other hand, argues that economic instruments (which include market mechanisms) are typically the most successful types of intervention in the existing house sector. He does, however note that "...often the most successful voluntary packages are accompanied by incentive or subsidy payments as well as having good information/advice backup systems" (Storey, 2004).

This indicates that the market may not provide complete 'encouragement' for sustainable uptake, but must be complemented with other interventions as well.

2.4.4 Other Initiatives

Other initiatives include information tools, green procurement strategies and ongoing support for research into sustainable initiatives (Storey, 2004). Such initiatives rarely operate in isolation, and often complement many of the preceding types of interventions.

Overall, asides from the existence of 'pure' market forces, the literature review reveals that the government has the most influential role as a supporter of sustainable development. Mansfield suggests that the government has a "multiplicity of roles"; it acts as a client for refurbishment works (as a property owner), is a legislator, and a regulator (Mansfield, 2009).

In this context the government is the most able body to provide support both directly via incentives and regulations, and indirectly as *the* exemplar client –and leading by example. This role has already been played out in the commercial sector where the New Zealand Government's demand for Green Star rated buildings has helped inspire the successful uptake of sustainable building in the commercial sector.

2.4.5 Summary

For the remainder of this report, the range of interventions available will be categorised as discussed above:

- Market Mechanisms, Financial Incentives, Regulations, Other Initiatives

One author summarises the challenge facing the industry succinctly:

> "Overseas experience, supported by the experiences in New Zealand to date, suggests that it is the mix of market mechanisms, incentives and regulations, supported by information and appropriate institutional responses working together and *targeting different parts of the market*, that provide the recipe for success" (McChesney, 2006).

This summary suggests that it will take more than a combination of different interventions to improve uptake. It will also require an overarching strategy; a collaborative approach; integration of the supply chain and 'tailor-made' retrofit packages that target the relevant stakeholders within the industry.

2.5 Retrofit Strategies

Interventions in the retrofit sector are extremely modest, in comparison with those found in the new build sector. Similarly, interventions in the energy sector significantly outnumber those in the other areas - such as materials and waste minimisation (Storey, 2004). However, with more research being undertaken in the area of sustainable retrofit, there is a growing body of evidence beginning to emerge.

2.5.1 International Experience

A comprehensive review of the literature relative to the international context is beyond the scope of this research; however overseas experience in incentivising the uptake of sustainable refurbishment offers invaluable guidance for the development of ways to encourage similar change in New Zealand. The following international "experiences" have been noted:

- Of all the interventions investigated relating to existing buildings, the Canadian Energuide programme appears to be the most successful, and seems to have the most to offer New Zealand's own programme (Storey, 2004).
- The use of fiscal measures and other financial measures to encourage energy efficiency and sustainability are increasingly being used on a global scale (De Blaauw, 2008).
- The valued added potential of rating systems is beginning to emerge from examples of mandatory disclosure of ratings at point of sale. Research on market effects (e.g. housing prices related to high energy efficiency ratings) indicates that that there is correlation between energy efficiency ratings and housing prices (NZBCSD, 2006).
- The US, UK and Australia have taken quite different approaches: the US has a strong electricity utility demand side orientation; the UK has a more government co-ordinated focus on CO2 emissions reductions; and Australia's recent emphasis has been on incentivising renewable energy systems. Overall, there are common elements to the approaches being taken, and some generic observations that are relevant to the New Zealand situation (CHRANZ, 2006).

The research indicates that success in New Zealand is likely to take the form of a multitude of hybrid intervention types.

2.5.2 Commercial Experience

As with the international context, it is beyond the scope of this report to extensively examine commercial initiatives in any great detail.

The emergence of the New Zealand Green Building Council (NZGBC), in conjunction with the Green Star rating tool (which measures the environmental performance of buildings), has undoubtedly pushed the sustainability agenda within the built environment forward. In direct contrast to the residential sector, where evidence suggests that home owners are reluctant to invest in sustainability, the commercial sector appears to have wholly embraced the concept of sustainable buildings; especially on the demand side of the equation. This rising demand has been partly inspired by the government's interest in the tool, both as a stakeholder, an owner-occupier, and as a tenant.

Although there appears to be a strong correlation between the environmental ratings of 'sustainable' new buildings and their capital and rental values (GBCA, 2008); the uptake in the retrofit market has yet to be fully tested, especially in New Zealand. As in the residential sector, where tenants pay for energy there is no real incentive for landlords to maintain or spend capital on sustainable features (NZBCSD, 2006).

2.5.3 Residential Retrofit

Opportunities clearly exist for implementing strategies that could improve the sustainability of New Zealand's existing housing stock. However due to the apparent reluctance of homeowners and landlords to invest in sustainable initiatives, interventions must be designed to target each segment of the housing market - holistically, but also specifically as well - if sustainable development is to influence the sector in a comprehensive way.

During the course of the literature review a multitude of potential strategies were discovered. Some are in existence, some have been utilised in the past, and others are currently in development.

The following table summarises some of the key strategies encountered. They have been grouped by type:

Table 3: Strategies that may encourage Sustainable Retrofit

Strategy	Type	Author(s)
Include minimum levels of sustainability in the Residential Tenancy Act (RTA)	Regulation	Amitrano
Requiring landlords to display a HERS rating when advertising houses for rent	Regulation	Amitrano
Provide regulatory interventions in legislation such as the Building Act, the NZBC and the RTA	Regulation	Storey, McChesney
Instigate mandatory retrofit programmes	Regulation	Storey
Clarify confusing policy at the regulatory level – linking it with practical outcomes	Regulation	O'Connell
Introduce a mandatory performance rating system (to add value to the hidden retrofit features)	Regulation	NZBCSD
Enable fast tracking (green tape) in the regulatory processes (such as the RMA and the NZBC) to eliminate prohibitive costs and delays in the consent process	Regulation	NZBCSD
Partially subsidise sustainable interventions to encourage uptake	Incentive	Amitrano
Provide 'green mortgage' assistance packages to incentivise homeowners to proceed with retrofit	Incentive	Hargreaves
Ensure incentives provided at the local government level are aligned with existing frameworks	Incentive	De Blaauw, McChesney
Implementation of the (voluntary) Home Energy Rating Scheme (HERS)	Market	Amitrano, Hargreaves
Devise cost effective, user friendly retrofit packages	Market	Storey, Saville-Smith
Connect retrofit to the renovation & investment decisions that house owners make	Market	Saville-Smith, NZBCSD

Strategy	Type	Author(s)
Integrate the supply chain to deliver retrofit solutions to the owner's explicit needs	Market	NZBCSD
Encourage government to 'set an example' by sustainably upgrading their properties	Other	Amitrano, Storey
Provide reliable information to home owners demonstrating the benefits of sustainable retrofit	Other	Amitrano, Storey, McChesney
Involve utility companies, mortgage lenders and insurance companies in the process	Other	Storey
Redirect expenditure away from 'cosmetic' renovations towards sustainable retrofit	Other	Saville-Smith
Devise coherent integrated programmes that consider all the types of intervention (incl. incentives & loans)	Other	McChesney
Develop a clear over-arching strategy between industry, local and central government	Other	NZBCSD

2.5.4 Summary

Although interventions in the residential retrofit sector may be modest in scope, the literature review has uncovered a significant range of strategies to choose from, as presented above. International experience suggests that uptake is very much based on the specific characteristics of the country. The key factor within the commercial context seems to be linking the value of sustainable retrofit with the market value of the property. In the residential sector resistance to invest appears to be the key hurdle.

The list presented above is comprehensive but by no means exhaustive. It also does not propose to suggest which strategies, if any, may be effectively implemented to stimulate uptake of retrofit activities in the existing homes sector. The question, then, is: which of the strategies identified above is most likely to improve the uptake of sustainable retrofit activities in the NZ residential buildings sector?

3 RESEARCH DESIGN

3.1 Introduction

The literature review assisted in the identification of a range of strategies which were then grouped into a number of 'type of intervention' categories:

- Market mechanisms
- Financial incentives
- Regulations
- Other initiatives

More importantly, it revealed a significant problem; that just because sustainable retrofit is deemed to be beneficial does not mean that there is a demand for it. This is typically reflected by the poor uptake of and investment in sustainable retrofit.

The initial research question was reworded slightly so that the research could be moved forward in a meaningful direction:

"What strategies could be implemented to improve the uptake of sustainable retrofit activities in the existing residential sector, in New Zealand?"

A basic theoretical framework was also formulated to shape the research design; i.e.

- the householder is resistant to invest in sustainable retrofit activities
- the government has the potential to be the primary driver for uptake
- 'industry' will ultimately be responsible for the provision of sustainable retrofit goods and services; and will most likely be the facilitator for improved uptake

Therefore the overall research aim was to determine which of the available strategies would be most likely to effectively and efficiently improve the uptake of sustainable retrofit activities in New Zealand. The outcome made uncertain given the potentially disparate views of the key stakeholders; government, industry and the householder.

A number of sub-questions include: What are the policy 'preferences' of each group? Can the householder's resistance to sustainable retrofit be overcome? Is the government doing enough to encourage it? And is it possible to find a unifying strategy that will appease all the stakeholders?

3.2 Research Methodologies

A number of academic texts were referred to as the research methodology was developed. The texts of Burns (2000), Denscombe (2007) and Fellows & Liu (2008) provided the academic background for this process.

Denscombe (2007) differentiates between research strategies (methodologies) and data collection styles (methods). Fellows & Liu (2008) describe research methodologies as approaches, and research methods as data collection techniques.

This (apparent) distinction between research *methodologies* (research strategies and approaches) and research *methods* (data collection styles and techniques) helped develop the structure of this chapter; and the research that followed.

3.2.1 Categories of Research

Exploratory Research

Fellows & Liu (2008) describe the exploratory approach as a type of research that attempts to "test or explore aspects of theory"; often using hypotheses which are then tested. Instead, this project defines exploratory research (in contradiction to *confirmatory* research) as a form of research that develops from a research question. It is investigative and not driven by a well defined theory or from a position of expert knowledge. Such an approach is evidenced by the evolving nature of the research question, which has been refined and redefined as knowledge is gained via the exploratory research process.

Applied Research

Another distinction can be made between *pure* and *applied* research. Pure research is typically undertaken to develop knowledge which may not necessarily have any practical application. This research project, however, can be classified as applied research. This is a problem solving type of research that attempts to answer or solve real-world practical problems.

Fellows & Liu (2008) further differentiate between closed-ended and open-ended problems. Closed problems are invariably simple, identifiable and will usually have a 'correct' solution. This research is proposing to investigate solutions for an open

ended problem, however. Such problems are complex, difficult to identify, dynamic, variable, have numerous potential solutions; and no one clear solution.

Empirical Research

One can also distinguish between empirical and rational research. Rationalism is a form of theoretical research whereby *truth* is ascertained through rational thought and reason. Empiricism, on the other hand, derives *knowledge* via observation, experience and experiment.

It is the intention of this research project to pursue the empirical approach; that is to collect data through observation only, in a clear attempt to eliminate any form of speculative, theoretical or deductive reasoning. In this respect, any conclusions drawn cannot be based on unfounded beliefs or assumptions.

Qualitative Research

The other key distinction in research approaches is the difference between quantitative and qualitative research. Fellows & Liu (2008) suggest that the quantitative approach adopts the "scientific method" and commences with theory and hypotheses with clear aims and objectives. Burns (2000) notes that this approach is deductive, experimental, involves statistical analysis, and the variables have to be clearly defined and measured. Importantly, the researchers themselves have to remain detached and objective at all times.

In contrast the qualitative approach, which is the approach to be pursued, is exploratory and builds theory by collecting data about people's perceptions. Qualitative research focuses on opinions, perceptions and meaning. It is subjective and the researcher is inextricably and personally involved in the process; often being the 'instrument' of data collection in the researcher/participant relationship. The qualitative approach – as a holistic research strategy – encompasses and relates to the previously identified categories: the empirical, exploratory and applied forms of research.

The intention of this research project is also to be *cross-sectional;* to collect data that is current and valid as at a specific point in time.

3.3 Research Methods

As noted in the preceding section, this research distinguishes between research *methodologies* and research *methods*. Research methods are defined as the styles or techniques available for data collection.

3.3.1 Research Styles

The following Table summarises a range of alternative styles with commentary regarding their suitability or applicability to this research project.

Table 4: Applicability of Research Styles to the Research Question

Research Style	Description	Applicability to Research Question
Action Research	Involves active participation by the researcher.	No.
Ethnographic	The (behavioural) study of races and culture.	No.
Surveys	Statistical sampling using questionnaires or interviews.	Potentially, but in a broader sense (i.e. including document and literature surveys)
Case study	In-depth investigation of particular instances. May employ a variety of methods (surveys, interviews, document analysis).	Potentially, but this research is not investigating an 'instance' per se.
Experiment	Tests relationships between identified variables.	No.

This simple form of analysis indicates that a survey or a case study may be the most appropriate research style to implement. However with further consideration of the research methodology discussed in the previous section, it is clear that a *survey* offers the most rational solution.

3.3.2 Surveys

Surveys allow a truly empirical approach to develop; one that is both exploratory and qualitative. This is not to suggest that a case study does not have these characteristics, however a case study will not feasibly answer the research question; nor will it allow adequate consideration of the research problem at the macro level. Denscombe (2007) validates this choice by summarising the "crucial characteristics" of a survey as:

- wide and inclusive coverage – "a breadth of view"
- at a specific point in time – "to bring things up to date"
- empirical research – "to look" i.e. to observe

3.3.2.1 Types of Surveys

Surveys can be categorised under a number of different 'types'. Both Denscombe (2007) and Fellows & Liu (2008) list the possibilities as:

- Observation
- Interviews
- Documents
- Questionnaires

Observation

Denscombe (2007) describes observation as "the practice of conducting a survey through observing events". This form of survey is more applicable to ethnography or social research. In this respect it is not appropriate for this research project.

Interviews

Interviews, although not inappropriate for this type of research, are more suitable for case studies i.e. research requiring the in-depth investigation of particular instances. Furthermore interviews are typically time and labour intensive. Such research will therefore be restricted in terms of the possible breadth and sample size of the proposed study.

Documents

Whereas the word survey inevitably conjures up the idea of surveying *people*, it is of course possible to survey documents as well. The survey of documents (or 'document analysis' as it is sometimes referred to), allows the researcher to utilise the "crucial characteristics" of empirical research. As with the literature review; it allows observation, wide and inclusive coverage, at a particular point in time. The document survey is therefore considered particularly conducive to this research.

Questionnaires

The other research method considered appropriate for this study is the questionnaire. In contrast to case studies and interviews, questionnaires allow for broad and shallow studies. They can be less time intensive than interviews, allowing for a greater sample size. And with careful design, they can return reasonably timely, accurate and meaningful information.

3.4 Research Design

The primary research objective was to collect the 'opinions' of the three key stakeholders (government, industry and the householder) on a range of sustainable retrofit strategies in the residential sector. The secondary objective was to determine which of the identified strategies each group appears to 'prefer'. Finally, the intent was to determine which of the available strategies would be most likely to effectively and efficiently improve the uptake of sustainable retrofit activities in the NZ residential sector.

The preceding sections have established that a survey in the form of a questionnaire and/or document analysis is the appropriate methodological approach to pursue.

3.4.1 Participant Selection

During the research process two documents were identified that were deemed to be indicative of both the government's and the householder's 'opinion' on the subject of sustainable retrofit in the NZ residential sector.

3.4.1.1 Government and Householder

The following table summarises the data collection approach for the opinion of the government and the householder. Both documents identified are publicly available and were collected early in the research process.

Table 5: Data Requirements (Government & Householder)

Data Requirements	**Data Identification**	**Research Method / Data Type**
Government 'opinion'	Speech given by Maurice Williamson (Minister of Building & Construction) at SB10	Discourse survey / primary & indirect data
Householder 'opinion'	2008 NZ Housing Survey by NZBCSD	Document survey / secondary data

Secondary data can be defined as data that has been produced for another purpose i.e. it has not been directly collected by the researcher specifically for the research project being undertaken.

Primary and indirect data is data that has been specifically collected for the purposes of this research, but was not obtained by the researcher directly.

3.4.1.2 Industry

The additional data identified and required is that of industry 'opinion'. Although it could be argued that by continuing with an in-depth analysis of the literature it would be possible to collect sufficient data to effectively express the opinion of industry on the topic, it is proposed that by approaching 'industry' directly, the research could uncover the required data more efficiently and with greater accuracy.

Importantly it would also allow for the collection of 'current' opinion in line with the objective to carry out contemporary and meaningful cross-sectional research.

The following table summarises the proposed surveying approach for the collection of industry opinion. The headings are based on Denscombe's chapter on surveys (2007).

Table 6: Survey Design

Heading	Proposal	Rationale
Type of survey	Questionnaire	Fast, cheap, allows contact in advance, potential for improved response rates.
Sampling method	Non-probability, purposive, judgemental	Participants are picked based on their 'expert opinion', there is potential for snowball sampling as well.
Sampling frame / participant selection	Selection of individuals within organisations with an interest in sustainable retrofit	Organisations including BP, BRANZ, NZGBC, MfE, WCC, HNZC, NZBCSD, EECA, and DBH (refer List of Abbreviations). Ensures reliability, validity and 'currency' of opinion obtained.
Sample size	Thirty (30)	Rules of thumb indicate 30+ for statistical analysis, however as probability sampling is not being undertaken there are no strict limits
Response rates	30-40% (i.e. 9-12)	Typical of large scale internet survey (Source: Tasman, 2008)

3.4.2 Questionnaire Design

Reference was made to the favoured academic texts – Burns (2000), Denscombe (2007) and Fellows & Liu (2008) – as the questionnaire was designed. Issues such as question type (open/closed), length of questionnaire, response scale types, wording and types of questions, piloting and response rates were all identified and considered during the questionnaire design process. Burns (2000) and Denscombe (2007) in particular, provided comprehensive direction in this respect. Shape NZ's research methodology which discussed population sampling, weighting and response rates was also referred to as the questionnaire was designed (Tasman, 2008).

The following table summarises the questionnaire design.

Table 7: Questionnaire Design

Heading	Proposal	Rationale
Type of questionnaire	Internet based i.e. SurveyMonkey™	Fast, cheap, convenient
Questionnaire design	Based on NZBCSD 2008 Housing Survey	Questionnaire designed by research experts, potentially allows for direct comparison of results between householder and industry
Types of questions	Open and closed	Allows for the collection of both qualitative and quantitative data. Open questions allow for the collection of unexpected and/or non-categorical data. Closed questions structure the required answers in accordance with the data collection requirements
Number of questions	No more than 20 if succinct. Only 5-7 if more 'wordy'	Key is to achieve good response rate with short and simple questionnaire
Pre-approval	Potential participants will be contacted in advance	Allows presentation of requisite information – like nature & extent of data and time required, plus informed consent
Piloting	3 professional colleagues	Allows testing of the questionnaire in terms of readability, length, technical issues etc.

3.4.3 Triangulation

Triangulation is "the practice of viewing things from more than one perspective" (Denscombe, 2007). This research project proposes to use the following forms of triangulation:

- **Methodological triangulation**: using the findings of one method to contrast against the findings of another method, for example using both qualitative and quantitative data collection methods and analysis techniques
- **Data triangulation**: using different sources of data i.e. Government, Household and Industry data for comparison. This is also known as informant triangulation (Denscombe, 2007).

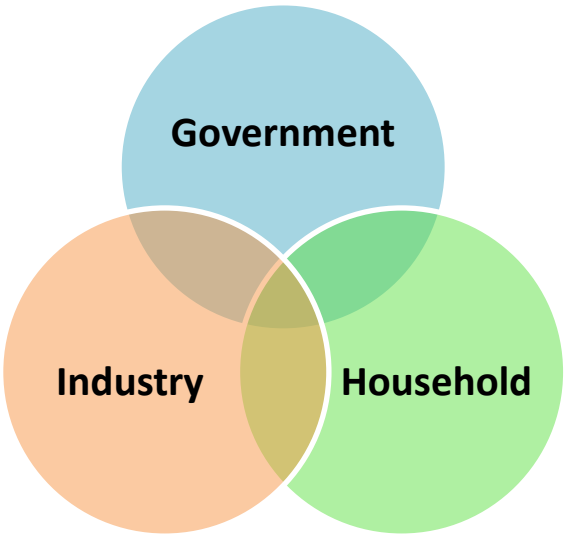


Figure 2: Integration of Findings

Although the advantages of triangulation can be considerable (improved accuracy and completeness of the findings), there are some significant disadvantages as well (more time-consuming, complexity of analysis and risk of producing contradictory results).

3.4.4 Other Concerns

- Wording of questions – will they be understood? Avoidance of jargon.
- Bias of participant selection – purposively chosen implies bias in favour of sustainable retrofit.
- Researcher bias – eliminating conflicts in interest. Possibility of subjective data analysis.
- Time constraints – large sample size will require extensive participant management in terms of correspondence and ongoing data management.
- Non-response – could negate proposal to carry out quantitative data analysis if response rates are poor.

3.4.5 Ethics

Prior to the commencement of the data collection phase, the following documents were approved by the research supervisor:

- Application for Ethics Approval
- Participant Consent Form
- Participant Information Form
- Draft Questionnaire Questions

Other general ethical principles (Unitec, 2010b) adhered during the course of the research included:

- Informed consent
- Confidentiality and anonymity
- Academic integrity
- Avoidance of conflict of interest
- No adverse consequences from non-participation

3.5 Data Analysis

As with research methodologies, data analysis can also be delineated into qualitative and quantitative approaches. Denscombe (2007) clearly differentiates between the two forms of analysis. As does Fellows & Liu (2008) who describes two different types of 'content' analysis:

Qualitative: An emphasis on the meaning of data.

Categories should be exclusive and exhaustive.

Quantitative: Yields numerical values from the categorised data, including ratings, frequencies and rankings.

Comparisons and hierarchies can then be generated.

The intent is to analyse the data both qualitatively and quantitatively.

3.5.1 Qualitative Analysis

The primary objective of the research is to collect the 'opinions' of industry; in conjunction with the 'preference' of government and the householder. A Likert scale will allow respondents to 'rate' their level of agreement with proposed strategies. There will also be the opportunity for respondents to provide open-ended qualitative responses to each question. This and other secondary data will be analysed qualitatively using content analysis.

Fellows & Liu (2008) note that the construction of typologies (establishing groups and relationships from the data collected) and qualitative coding (creating categories from interpretation of the data) as forms of qualitative data analysis.

3.5.2 Quantitative Analysis

Given the secondary objective to assign 'preference' to different types of strategies, the data will be analysed quantitatively (assuming a response rate exceeding 30). The Multi-Attribute Utility Analysis (MAUA) technique allows the calculation of a mean rating level for each question. This in turn can allow strategies to be ranked in order of preference.

4 DATA COLLECTION

4.1 Process Management

Data collection can be time and labour intensive. Managing a large group of participants and a reasonably long and complex questionnaire required the implementation of effective time and data management processes.

4.1.1 Schedule

Table 8: Data Collection Timeline

Week	Data Management	Participant Management	Questionnaire Management
Jul 26	Ethics apps. Begun	Participant selection & notification commences	Questionnaire design commences
Aug 02	Ethics apps. Submitted		Draft Questionnaire submitted
Aug 09			Converted to online format and refined
Aug 16			Piloting commenced
Aug 23			Piloting completed
Aug 30		Primary contact	Survey Commenced
Sept 06		Follow-up / reminder	
Sept 13	Data collection & analysis begun	Final notification/reminder	Survey Completed

Ethics applications and approvals were submitted and signed off well before the data collection process commenced. Copies are included in the Student Research File.

Participants were selected and approached for pre-approval in tandem with the questionnaire design, piloting and implementation process. This approach allowed for the condensation of the overall time frame. Similarly, the actual data collection phase – utilising the questionnaire – was restricted to a two week period, with a number of reminders sent to participants to encourage completion of the survey.

4.1.2 Process Management Tools

The following administrative tools were utilised in the management of the data collection process:

SurveyMonkey™: Questionnaire Design, Data Collection, Results generation.

Refer www.surveymonkey.com for details.

Microsoft Outlook: Participant Correspondence, Response Tracking, Reminders.

Microsoft Word: Questionnaire and Correspondence drafts, Process Management Schedules, Mail Merge tool.

Microsoft Excel: Data collation and results analysis.

4.1.3 Data Management Process

In essence, there were two sides to the data management process. On the one hand, the participants required management in terms of correspondence and response tracking. The online software SurveyMonkey™ allowed real time monitoring under its 'Analyze' function; which included information such as Number of Responses, Name of Respondents, Response Count, Total Completed Survey, Time of Response etcetera. This information was transcribed into custom designed schedules to monitor who had responded and when, in order to determine who needed to be reminded again to complete the questionnaire.

SurveyMonkey™ was also the predominant management tool for the questionnaire production, implementation and data collection processes. Draft questionnaires were set up and piloted using Microsoft Word documents prior to being converted into the final questionnaire in SurveyMonkey™. Once the survey design was complete, a monthly subscription to SurveyMonkey™ was purchased to allow full functionality and the commencement of the data collection phase proper.

4.2 Data Collection

This section compares the proposed methodology (elaborated upon in the previous section) with what was actually implemented during the data collection phase.

4.2.1 The Survey

The survey proceeded, in general, as intended. Significant differences included:

- Increased levels of snowballing and convenience sampling.
    - This was due, in part, to the positive response to the survey with respondents sharing contact details of other potential participants.
    - Concerns about non-response, and the desire to collect at least thirty responses also initiated the utilisation of some convenience sampling.
- The sampling frame was increased to pick up more potential respondents.
    - The original intention was to target three individuals from a number of primary organisations. This proved difficult in practice so a larger number of 'independent' experts were invited to participate.
- The sample size increased from thirty to forty, as a result of the actions noted above (to allow for potential non-responses).
- Actual response rates were far more positive than anticipated. The original estimate of a 30-40% response rate transpired into a 90% success rate.
- At the culmination of the data collection period, 37 out of 40 potential participants had completed the survey.

The following table summarises the process, as implemented.

Table 9: Survey Design – in practice

Type of survey	Subscribed to SurveyMonkey™ "the world's leading provider of web-based survey solutions"
Sampling method	Non-probability. Purposive /Judgemental. Snowballing & Convenience.
Sampling frame (participant selection)	Individuals within organisations with an interest in sustainable retrofit; plus a number of independent industry experts.
Sample size	Forty (40)
Response rates	90% (37/40)

4.2.2 The Questionnaire

As illustrated in the Data Collection Timeline, the Questionnaire design and implementation process was reasonably lengthy. It proceeded as follows:

- **Design**. Draft Questionnaire produced for Supervisor's feedback and subsequent approval
- **Piloting**. Preliminary Questionnaire transcribed into SurveyMonkeyTM for distribution to selected piloting respondents
- **Implementation**. Final Questionnaire configured for distribution to industry experts (once informed consent had been received)

4.2.2.1 Design

The design was based on the format of the 2008 Housing Survey (HS) carried out by ShapeNZ (on behalf of NZBCSD). A copy of the relevant sections is included in the Appendices. This survey collected quantitative data from participants using a 5-point Likert scale (strongly agree or support to strongly disagree or oppose), with a 6th option of 'Don't know'. Space was also allowed for the collection of qualitative commentary.

The draft questionnaire included an introductory section which provided the context for the research, stated the research problem and defined the term 'sustainable retrofit'. Following this was a section asking for identification of the participant, plus a statement reiterating confidentiality and anonymity.

The main part of the questionnaire consisted of 12 primary questions requesting the participant's 'opinion' on different strategy proposals. The questions were categorised by strategy type as follows. Note that the categorisation of strategies was not to be revealed in the questionnaire itself.

- 3x Market Mechanisms
- 3x Regulations
- 3x Financial Incentives
- 3x 'Other' strategies

The Likert scale was used and ranged from 'Very likely' through to 'Very unlikely', with an alternative option of 'Don't know'. Space was also created for additional commentary so that participants could 'justify or comment upon' their opinions.

The final section of the questionnaire included a question regarding perceived responsibility for implementing sustainable retrofit. This question was based on a question in the Household Sustainability Survey 2008 carried out by Research NZ (for the Ministry for the Environment).

4.2.2.2 Piloting

Following the review and approval of the draft questionnaire, it was transcribed into an online format in SurveyMonkey™ for distribution to the selected pilot respondents.

Pilots were selected based on three main factors: convenience (family members), independence (no specific interest in the subject) and intelligence (tertiary education and strong English-language skills. This ensured honest, unbiased and reliable feedback.

Pilots were provided with the context for the survey and an indication of likely participants. Commentary and advice on issues such as clarity, usability and bias was requested. The feedback was invaluable. Basic errors were rectified, assumptions were clarified, the overall research question itself was reworded to clarify its explicit intent and each individual question was rewritten to maintain clarity and cohesion throughout the questionnaire. As a result of the feedback it was also made very clear at the commencement of the questionnaire – how many questions there were.

4.2.2.3 Final Questionnaire

The final questionnaire was not remarkably dissimilar to that proposed in draft format. Apart from the fact that it was clearer and more concise, the major difference was that three more questions were added in the last section of the questionnaire to test bias. A full copy of the final **Sustainable Retrofit Survey** (as it shall be referred to) is included in the Appendices.

In the preface to the questionnaire, the research objective is disclosed:

"The **objective** of this research project is to determine which strategies will most effectively improve the uptake of sustainable retrofit activities, in practice."

At the commencement of the questionnaire itself, the participants are presented with the following:

- We have identified 12 policy strategies that may or may not affect the uptake of sustainable retrofit.
- In your opinion, how likely is it that each strategy will improve the uptake of sustainable retrofit activities in New Zealand's homes?
- Please rate each strategy by selecting the description that best matches your opinion, and justify (or comment upon) that selection as necessary.

The following Table summarises the questions asked, in order. Note that the ordering of the questions was determined with the use of an online random number generator.

Table 10: The Questions

	Initiation
0	Please enter your name (or initials) and your occupation.
	Rating Questions/Statements
1	Providing funding or subsidies (such as clean heating grants) to homeowners undertaking sustainable retrofit.
2	Enabling fast-tracking of the resource and building consent processes for homeowners that are implementing sustainable retrofit features.
3	Providing accommodation supplements to landlords who rent out homes with a minimum environmental performance rating.
4	Requiring homeowners to disclose environmental performance ratings at the time of sale or lease.
5	Taxing or penalising homeowners whose homes fail to meet minimum environmental performance standards.
6	Providing interest free loans for homeowners undertaking sustainable retrofit.
7	The use of information tools that encourage the uptake of sustainable retrofit; such as websites, pamphlets and free advisory services.

8	Ongoing funding into the research and development of initiatives that encourage sustainable retrofit.
9	The creation of commercial organisations that provide integrated and comprehensive 'one stop shop' sustainable retrofit solutions.
10	The introduction of a voluntary performance rating scheme for existing homes, similar to the NZ Green Building Council's Green Star tool.
11	The implementation of minimum sustainability performance standards for existing homes in legislative documents such as the NZ Building Code and the Residential Tenancies Act.
12	Transforming the perceptions of homeowners so that they equate the value of sustainable retrofit activities to an increase in the market value of their home.
	Bias Questions
A	Do you think that sustainable retrofit has significant environmental, social and economic benefits?
B	Who do you think should be primarily responsible for facilitating the sustainable retrofit of the existing housing stock in New Zealand?
C	Do you have any vested interests in any of the strategies mentioned in this survey?
D	Any final comments or suggestions?

Note that the 'type' of strategy is not made explicit within the question or the questionnaire. This information is considered a 'hidden' code and allows for typology analysis in the data analysis stage.

4.2.2.4 Implementation

Once piloting had been completed a full subscription to SurveyMonkey^{TM} was purchased to enable the full functionality of the software. The participants that had given their approval to be surveyed were sent an introductory email and a link to the survey. The management of the process that followed has been covered in the preceding Process Management section.

4.2.3 Ethics

Participants were assured of confidentiality and anonymity throughout the data collection process. When first contacted for pre-approval they were advised:

"The survey will be in the form of a simple online questionnaire and confidentiality/anonymity will be assured."

When correspondence was sent to invite them to participate in the survey (after gaining pre-approval) they were advised:

"Note that your previous approval, plus your subsequent completion of the survey implies informed consent. However, if you would like to view the 'Participant Information' or 'Participant Consent' forms for this project please let me know."

Confidentiality and anonymity was once again assured at the commencement of the survey with the following statement:

"Please note that your participation and contribution will be strictly confidential. The data collected will be seen only by the researcher and the supervisor of this project. All personally identifying features will be removed from any published material."

4.2.4 Reliability and Validity

Reliability is a measure of consistency, and is concerned with how data is measured (Unitec, 2010a). This research project ensured reliability by:

- Utilising a carefully designed online questionnaire (based on a survey approach/design used by a leading NZ research organisation) to gather data from all the participants. The questionnaire was identical in all cases, could not be interfered with and was implemented over a shortened time period.
- Collecting data with use of a standardised Likert scale. Respondents also had the opportunity to provide qualitative responses to each question, to justify their selections, if they so wished.
- Maintaining an independent researcher-subject relationship at all times. Again, the primary data collected was collected using online software so face-to-face meetings were not required. The majority of the subjects were unknown to the researcher, and those that were known would have had no good reason to manipulate their responses in any way.

Validity

Validity can be defined in a number of ways. In this case, the validity of a measurement tool (i.e. survey or questionnaire) is considered to be the degree to which the tool measures what it claims to measure. Similarly, in the area of scientific research design, validity refers to whether a study is able to scientifically answer the questions it is intended to answer.

Internal validity

Issues surrounding face validity (relationship of research method to research question), concept validity (relationship of research approach to research topic) and instrumental validity (appropriate data collection instrument) were carefully considered and documented during the research design phase of the project. Refer the Research Design chapter in this report.

External validity

The sampling method utilised for the collection of the primary data was non-probability, judgmental and purposive. There was never any intention to target a sampling frame that was representative of a "normal" population.

4.3 Results

The primary objective of the data collection phase was to obtain data that would reflect the *opinion* and *preference* of the key stakeholders (Government, Households and Industry) on a range of sustainable retrofit initiatives.

4.3.1 Government data

As previously noted, Government 'opinion' was collected in the form of a speech given by Maurice Williamson (Minister of Building & Construction) at a sustainability conference in 2010. This data is considered to be primary data, but indirectly sourced. A full transcription of the speech cannot be reproduced here, however a copy is included in the appendices.

In the speech, the Minister clearly articulates opinion about sustainability initiatives with commentary such as "I believe in the inherent sense of the market place..." and "I am strongly in favour of industry developing tools which meet a market need without Government having to regulate for their introduction and use."

Further data was sourced in order to 'validate' the claims made in the speech. Initially the Ministry for the Environment (MfE) was approached as it was understood that they were responsible for work in this area (MfE, 2007). However they advised that the Department of Building and Housing (DBH), in conjunction with the Energy Efficiency and Conservation Authority (EECA) were responsible for leading 'sustainable housing work'. Data was therefore also obtained from both DBH and EECA regarding sustainable retrofit initiatives in the residential sector. This information appears to 'back up' the claims made in the speech by the Minister. Copies of the correspondence with MfE, DBH and EECA are included in the Appendices. All this data is considered to be primary and direct.

4.3.2 Household data

Data representing Household 'opinion' was collected from two main sources, both of which can be considered secondary sources. Firstly – as identified in the methodology section – data regarding policy proposals was obtained from the 2008 NZ Housing Survey initiated by the New Zealand Business Council for Sustainable Development (NZBCSD) in conjunction with ShapeNZ.

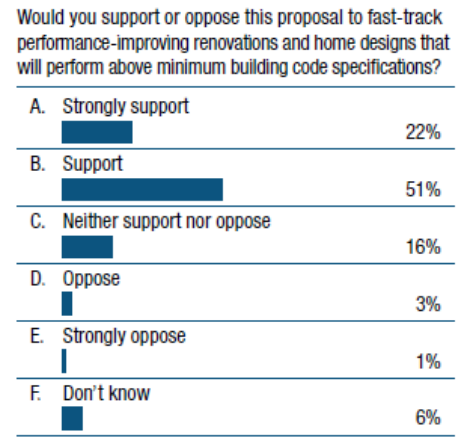


Figure 3: Policy Proposal Results excerpt (NZBCSD, 2008)

Above is an excerpt from this survey, which surveyed 3562 respondents on a range of household sustainability issues. The survey was considered to be representative of the 'normal' NZ population. The relevant sections (this research project focuses primarily on the sections 'Business Council Policy Proposals' & 'Other Possible Policies') are included in the Appendix.

Further data regarding household 'beliefs' was obtained from a survey carried out by Research New Zealand for MfE – entitled the Household Sustainability Survey 2008 (HSS). The key data extrapolated from this report is reproduced below:

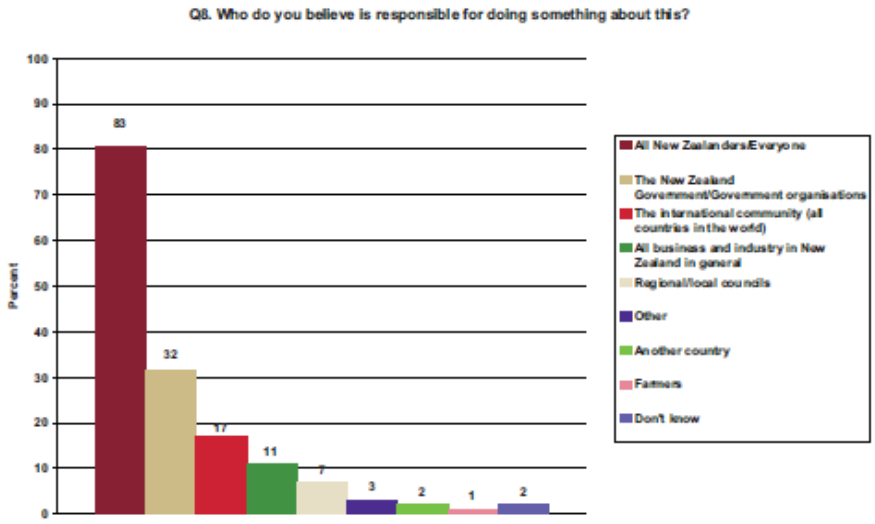


Figure 4: Excerpt from HSS 2008 (Research NZ, 2008)

4.3.3 Industry data

The results of the Sustainable Retrofit Survey were far better than anticipated. Not only did the response rate exceed all initial expectations, but the enthusiasm, clarity and depth of the responses was entirely unexpected too. The predominant objective was to obtain enough responses to undertake qualitative analysis. This objective was met. As mentioned the extent and richness of the quantitative commentary received was considerable and unexpected. Although this data will be utilised to validate and expand upon the rating responses received, it is likely its full value will not be able to be analysed in this research project.

The following pages summarise the qualitative data received from each of the Sustainable Retrofit Survey questions. They were generated in SurveyMonkey™.

4.3.3.1 Survey Questions 1-12

At the commencement of the questionnaire, the participants were asked:

In your opinion, how likely is it that each strategy will improve the uptake of sustainable retrofit activities in New Zealand's homes?

Question 1

Providing funding or subsidies (such as clean heating grants) to homeowners undertaking sustainable retrofit.

	Response Percent	Response Count
Very Likely	32.4%	12
Likely	**59.5%**	**22**
Neutral	2.7%	1
Unlikely	5.4%	2
Very Unlikely	0.0%	0
Don't Know	0.0%	0
Additional comments:		25
answered question		37

Question 2

Enabling fast-tracking of the resource and building consent processes for homeowners that are implementing sustainable retrofit features.

	Response Percent	Response Count
Very Likely	13.5%	5
Likely	**45.9%**	**17**
Neutral	35.1%	13
Unlikely	5.4%	2
Very Unlikely	0.0%	0
Don't Know	0.0%	0
Additional comments:		21
answered question		37

Question 3

Providing accommodation supplements to landlords who rent out homes with a minimum environmental performance rating.

	Response Percent	Response Count
Very Likely	13.5%	5
Likely	**35.1%**	**13**
Neutral	27.0%	10
Unlikely	10.8%	4
Very Unlikely	0.0%	0
Don't Know	13.5%	5
Additional comments:		24
answered question		**37**

Question 4

Requiring homeowners to disclose environmental performance ratings at the time of sale or lease.

	Response Percent	Response Count
Very Likely	**43.2%**	**16**
Likely	32.4%	12
Neutral	16.2%	6
Unlikely	2.7%	1
Very Unlikely	2.7%	1
Don't Know	2.7%	1
Additional comments:		25
answered question		**37**

Question 5

Taxing or penalising homeowners whose homes fail to meet minimum environmental performance standards.

	Response Percent	Response Count
Very Likely	10.8%	4
Likely	18.9%	7
Neutral	21.6%	8
Unlikely	**27.0%**	**10**
Very Unlikely	18.9%	7
Don't Know	2.7%	1
Additional comments:		26
answered question		**37**

Question 6

Providing interest free loans for homeowners undertaking sustainable retrofit.

	Response Percent	Response Count
Very Likely	35.1%	13
Likely	**45.9%**	**17**
Neutral	16.2%	6
Unlikely	0.0%	0
Very Unlikely	0.0%	0
Don't Know	2.7%	1
Additional comments:		23
answered question		**37**

Question 7

The use of information tools that encourage the uptake of sustainable retrofit; such as websites, pamphlets and free advisory services.

	Response Percent	Response Count
Very Likely	8.1%	3
Likely	**48.6%**	**18**
Neutral	32.4%	12
Unlikely	8.1%	3
Very Unlikely	2.7%	1
Don't Know	0.0%	0
Additional comments:		26
answered question		**37**

Question 8

Ongoing funding into the research and development of initiatives that encourage sustainable retrofit.

	Response Percent	Response Count
Very Likely	8.1%	3
Likely	**45.9%**	**17**
Neutral	32.4%	12
Unlikely	2.7%	1
Very Unlikely	8.1%	3
Don't Know	2.7%	1
Additional comments:		24
answered question		**37**

Question 9

The creation of commercial organisations that provide integrated and comprehensive 'one stop shop' sustainable retrofit solutions.

	Response Percent	Response Count
Very Likely	5.4%	2
Likely	**54.1%**	**20**
Neutral	32.4%	12
Unlikely	8.1%	3
Very Unlikely	0.0%	0
Don't Know	0.0%	0
Additional comments:		26
answered question		**37**

Question 10

The introduction of a voluntary performance rating scheme for existing homes, similar to the NZ Green Building Council's Green Star tool.

	Response Percent	Response Count
Very Likely	0.0%	0
Likely	35.1%	13
Neutral	**40.5%**	**15**
Unlikely	16.2%	6
Very Unlikely	8.1%	3
Don't Know	0.0%	0
Additional comments:		24
answered question		**37**

Question 11

The implementation of minimum sustainability performance standards for existing homes in legislative documents such as the NZ Building Code and the Residential Tenancies Act.

	Response Percent	Response Count
Very Likely	56.8%	21
Likely	27.0%	10
Neutral	10.8%	4
Unlikely	2.7%	1
Very Unlikely	0.0%	0
Don't Know	2.7%	1
Additional comments:		24
answered question		37

Question 12

Transforming the perceptions of homeowners so that they equate the implementation of sustainable retrofit with an increase in the market value of their home.

	Response Percent	Response Count
Very Likely	43.2%	16
Likely	43.2%	16
Neutral	8.1%	3
Unlikely	0.0%	0
Very Unlikely	0.0%	0
Don't Know	5.4%	2
Additional comments:		21
answered question		37

4.3.3.2 Additional Questions A–D

Question A

Do you think that sustainable retrofit has significant environmental, social and economic benefits?

	Response Percent	Response Count
Yes	97.3%	36
No	0.0%	0
Don't know	2.7%	1
Additional comments:		17
answered question		37

Question B

Who do you think should be primarily responsible for facilitating the sustainable retrofit of the existing housing stock in New Zealand?

	Response Percent	Response Count
The NZ Government	21.6%	8
Regional & Local Councils	8.1%	3
Industry / Commercial organisations	0.0%	0
Homeowners	18.9%	7
Everyone	**48.6%**	**18**
Don't know / Other	2.7%	1
Additional comments:		18
answered question		37

Question C

Do you have any vested interests in any of the strategies mentioned in this survey?

	Response Percent	Response Count
Yes	56.8%	21
No	43.2%	16
If yes, please explain:		23
answered question		37

Question D

Any final comments or suggestions?

	Response Count
	16
answered question	16
skipped question	21

Note that for confidentiality reasons, the additional qualitative comments received throughout the survey will not be reproduced in this report. Copies of the responses area included in the Student Research File – a separate document.

5 DATA ANALYSIS

- **Primary objective**: to collect the opinions of the key stakeholders (government, industry and the householder) on a selection of sustainable retrofit strategies that could improve the uptake of sustainable retrofit activities in New Zealand's residential sector.
- **Secondary objective**: to determine each group's preference for different types of strategies.
- **Overall objective**: to determine which (type of) strategies could most effectively improve the uptake of sustainable retrofit activities, in practice.

5.1 Government opinion/preference

The Government data was analysed qualitatively. There were three main parts to the analysis:

- The identification of strategies relating to sustainable retrofit
- Strategies were categorised according to type (of intervention)
- Significant commentary or opinion regarding sustainable retrofit strategies were noted or quoted.

5.1.1 Department of Building and Housing

Table 11: Analysis of DBH Response

Identification of strategy/initiative/policy	**Type of strategy/initiative/policy**	**Significant Quotes / Notes**
Warm Up New Zealand (administered by EECA)	Subsidies (financial incentive)	"The Government is also interested in the **economic** and **social** sustainability of housing retrofits. In this regard work on **productivity** of the building sector and **affordability** of housing is relevant."
Support the development of the residential rating tool	Other / Market Mechanism	

5.1.2 Energy Efficiency and Conservation Authority

Table 12: Analysis of EECA Response

Identification of strategy/initiative/policy	**Type of strategy/initiative/policy**	**Significant Quotes / Notes**
Warm Up New Zealand: Heat Smart. Energy Wise: Clean Heat. Energy Wise: Funding for Solar and Heat Pump Water Heating.	Grants (financial incentives)	"EECA's focus on the policy for energy efficiency in the residential sector is focused on providing **grants** and on providing **information**."
The Energy Spot (TV)	Information (other)	
Not identified.	Regulation	"The Department of Building and Housing also works on encouraging energy efficiency through improvements to the Building Code."

5.1.3 Speech to the NZ Sustainable Building Conference

The analysis is broken into two sections. Firstly, strategies directly related to sustainable retrofit are identified and categorized, with the presentation of additional quotes that signify the Minister's opinion and preference in regards to possible interventions.

The second section presents opinion relating to 'other initiatives' that may not be directly related to sustainable retrofit, but are still considered to be important signifiers of the Government's opinion/preference for different types of policy interventions.

5.1.3.1 Sustainable Retrofit Strategies

Table 13: Analysis of Maurice Williamson's Speech

Identification of strategy/initiative/policy	**Type of strategy/initiative/policy**	**Significant Quotes / Notes**
Warm Up New Zealand: Heat Smart	Subsidy (financial incentive) [includes free information/advice/quotes]	"I believe in the inherent sense of the **market** place..."
Home Rating Tool	Other / Market Mechanism [includes information & support]	"The Government – through EECA and the Department of Building and Housing – is supporting an **industry initiative** to develop an assessment and rating tool..."
Sponsoring Research	Other. [In the context of the speech, he applies this to 'commercial buildings' however govt. Does fund research in the residential sector e.g. Beacon]	"I am strongly in favour of **industry** developing tools which meet a **market** need without Government having to **regulate** for their introduction and use."
Solar water heaters guidance	Other (guidance/education)	"This should let **industry** innovate and do things more efficiently, while not running into red-tape." "This sort of education and guidance – rather than **regulation** – fits into a wider push by this Government to improve competence in the building sector..."

5.1.3.2 Other Interventions

The following quotes were also extrapolated from the speech. Although they were not made in explicit reference to sustainability initiatives, they nevertheless clearly illustrate the current Government's opinion and preference for intervention 'types'.

- "It is intended to encourage market-based solutions..."
- "I want the partnership to be sector led, with Government departments supporting the work where appropriate."
- "This blueprint encompasses a number of initiatives to reduce regulatory barriers..."
- "In brief, the Building Act review is looking at options to reduce the cost and complexity of consenting..."
- "The results of this research will also be used to help Government decide if any policy intervention is needed to drive improvements in energy efficiency. Such interventions could be:
    - providing advice on improving energy efficiency
    - providing incentives to owners and tenants
    - or, as a last resort, changing the building regulations"

5.1.4 Summary of Findings

Overall analysis of the data presented in the preceding sections suggests that the government has a 'preference' for intervention types in the following order:

- Market mechanisms / Other initiatives
- Incentives (including financial)
- Regulation

This is clearly evidenced by the type of strategies that are currently in place:

- The preference for market mechanisms and 'other' strategies such as; support for the residential rating tool, information tools, education and guidance and the sponsorship of research into the area.
- Financial incentives in the form of the Warm Up and Energy Wise programmes.

- Regulation is not specifically referred to as an intervention type for improving sustainability in the existing buildings sector. If anything, it appears that the current Government is more interested in limiting the regulatory approach:
- "I am strongly in favour of industry developing tools which meet a market need without Government having to regulate for their introduction and use."

5.2 Industry opinion/preference

The key objective of the Sustainable Retrofit Survey (SRS) was to collect the *opinions* of industry and then through analysis of that data, determine each group's *preference* for the types of strategies presented. Whereas opinions were collected using a *rating* system (the Likert scale), the fundamental aim of the data analysis procedure was to *rank* the strategies in order of apparent preference; both individually and by type.

The data retrieved from the SRS was analysed quantitatively and qualitatively.

The survey questions relating to strategies were, for the most part, analysed with quantitative tools (such as Microsoft Excel). In particular Multi-Attribute Utility Analysis (MAUA) was used to determine the mean rating of the responses to each question, which in turn could facilitate ranking of the strategies. The 'additional questions' were analysed qualitatively.

5.2.1 Analysis of 'Survey Questions'

The raw results from the data collection phase are shown graphically in the preceding Results section, and will not be reproduced here.

5.2.1.1 Types of Interventions

Firstly, it is important to indicate what 'type' of intervention each strategy is – as presented in the Questionnaire. As noted in the Data Collection section, the questions were categorised by strategy type as follows:

- 3x Market Mechanisms
- 3x Regulations
- 3x Financial Incentives
- 3x 'Other' strategies

Table 14: Rating Questions by Type of Intervention

Q	Rating Question/Statement	Type of Strategy
1	Providing funding or subsidies (such as clean heating grants) to homeowners undertaking sustainable retrofit.	Financial Incentive (F)
2	Enabling fast-tracking of the resource and building consent processes for homeowners that are implementing sustainable retrofit features.	Other Initiative (O)
3	Providing accommodation supplements to landlords who rent out homes with a minimum environmental performance rating.	Financial Incentive (F)
4	Requiring homeowners to disclose environmental performance ratings at the time of sale or lease.	Regulation (R)
5	Taxing or penalising homeowners whose homes fail to meet minimum environmental performance standards.	Regulation (R)
6	Providing interest free loans for homeowners undertaking sustainable retrofit.	Financial Incentive (F)
7	The use of information tools that encourage the uptake of sustainable retrofit; such as websites, pamphlets and free advisory services.	Other Initiative (O)
8	Ongoing funding into the research and development of initiatives that encourage sustainable retrofit.	Other Initiative (O)
9	The creation of commercial organisations that provide integrated and comprehensive 'one stop shop' sustainable retrofit solutions.	Market Mechanism (M)
10	The introduction of a voluntary performance rating scheme for existing homes, similar to the NZ Green Building Council's Green Star tool.	Market Mechanism (M)
11	The implementation of minimum sustainability performance standards for existing homes in legislative documents such as the NZ Building Code and the Residential Tenancies Act.	Regulation (R)
12	Transforming the perceptions of homeowners so that they equate the value of sustainable retrofit activities to an increase in the market value of their home.	Market Mechanism (M)

They were ‘coded’ as M, R, F and O respectively, and for illustrative purposes each type was colour coded also. The previous Table summarises each strategy question by intervention type.

5.2.1.2 Quantitative Data Analysis

The statistical analysis itself will not be reproduced here (refer Appendices), however the Table below summarises the results of the analysis.

Table 15: Data Analysis Summary

Q	Rating Question/Statement	Type	Mean Rating	Ranking
1	Funding or subsidies	F	4.19	4
2	Enabling fast-tracking of RC/BC processes	O	3.68	6
3	Accommodation supplements (for landlords)	F	3.59	7
4	Environmental performance rating disclosure	R	4.14	5
5	Taxing or penalising homeowners	R	2.75	12
6	Interest free loans	F	4.19	3
7	Information tools	O	3.51	9
8	Funding research and development	O	3.44	10
9	One stop shops	M	3.57	8
10	Residential Rating tool	M	3.03	11
11	Minimum performance standards	R	4.42	1
12	Transforming the perceptions of homeowners	M	4.37	2

This Table shows – for example – that Strategy 1: Funding or subsidies had a mean rating of 4.19 (Likely-Very likely) and was the 4th most preferred strategy (based on the feedback from all participants in the questionnaire, utilising MAUA).

Mean Rating Scale:

Rating	1	2	3	4	5
Meaning	Very Unlikely	Unlikely	Neutral	Likely	Very Likely

Note that answers of 'Don't know' were excluded from the MAUA calculations.

It is interesting to note that all but one of the proposed strategies rated above 'neutral'. The following Table illustrates the strategies in order of rating from highest to lowest.

Table 16: Data Analysis Summary (ranked by mean rating)

Q	**Rating Question/Statement**	**Type**	**Mean Rating**	**Ranking**
11	Minimum performance standards	**R**	4.42	1
12	Transforming the perceptions of homeowners	**M**	4.37	2
1	Funding or subsidies	**F**	4.19	4
6	Interest free loans	**F**	4.19	3
4	Environmental performance rating disclosure	**R**	4.14	5
2	Enabling fast-tracking of RC/BC processes	**O**	3.68	6
3	Accommodation supplements (for landlords)	**F**	3.59	7
9	One stop shops	**M**	3.57	8
7	Information tools	**O**	3.51	9
8	Funding research and development	**O**	3.44	10
10	Residential Rating tool	**M**	3.03	11
5	Taxing or penalising homeowners	**R**	2.75	12

This table shows that:

- the top five strategies rated between 4.00 and 4.50 (i.e. more than likely),
- the next four strategies rated between 3.50 and 4.00 (less than likely)
- only two strategies rated between 3.00 and 3.50 (better than neutral)
- and only one strategy rated (less than) neutral

This suggests that the industry respondents, as a group, believe all bar one of the proposed strategies has the potential to improve (to varying degrees) the uptake of sustainable retrofit activities.

The following graph illustrates the results of the Sustainable Retrofit Survey, ranked in order by mean rating.

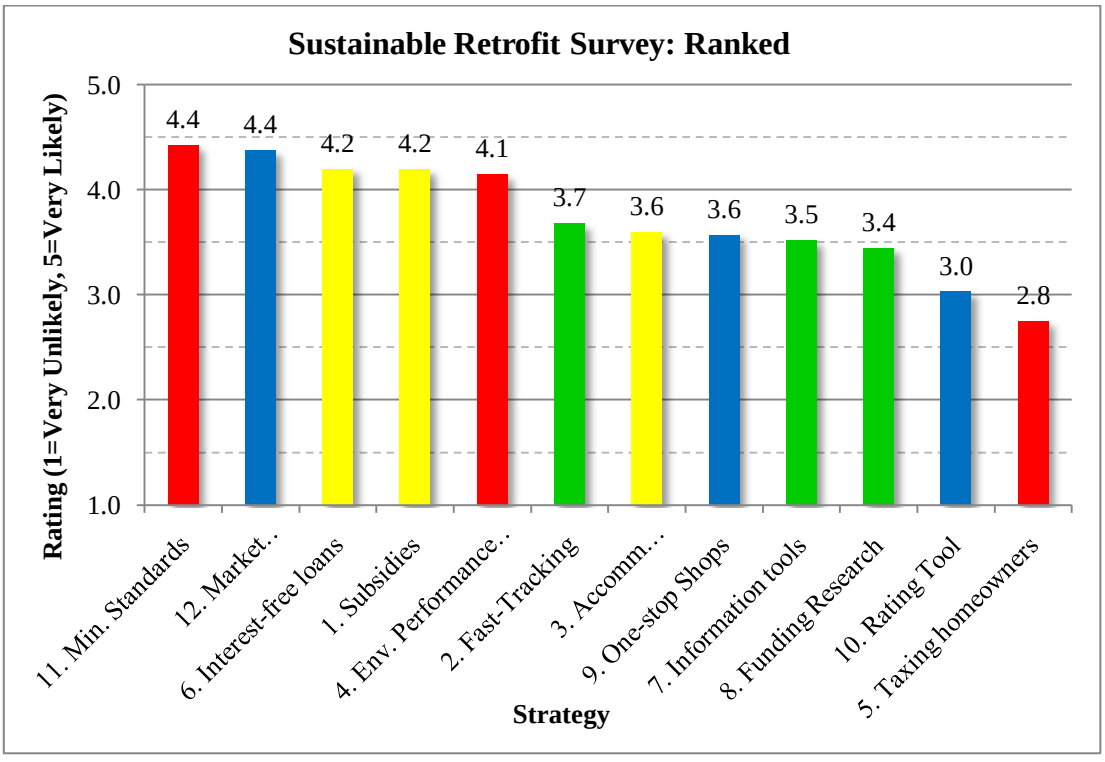


Figure 5: SRS Strategies – Ranked

The graph illustrates three primary clusters of results: those that achieved a rating of more than 4.00 (more than likely), those that achieved a rating in the 3.00 – 4.00 range (less than likely), and the two least preferred strategies that rated at or below the 3.00 mark (neutral).

Also, two strategies at each end of the spectrum appear to 'stand out'. Falling strongly in the 'more than likely' category is Strategy 11: Minimum Performance Standards and Strategy 12: Transforming the Perceptions of Homeowners.

At the other end of the scale, at or below the neutral line is Strategy 10: The Residential Rating Tool and Strategy 5: Taxing or Penalising Homeowners.

Interestingly the top and bottom two strategies are either Regulations or Market Mechanisms.

5.2.1.3 Qualitative Data Analysis

Independent qualitative analysis of each strategy is beyond the scope of this research project (given the stated objectives plus time limitations); however a brief discussion about two of the most preferred and least preferred strategies is proposed.

Refer the Results section for graphical representation of the results.

Most Preferred Strategy No.1:

Strategy 11	**The implementation of minimum sustainability performance standards for existing homes in legislative documents such as the NZ Building Code and the Residential Tenancies Act.**	
Type of Strategy	**Regulation (R)**	
Results (37)	**21**	**Very Likely**
	10	Likely
	4	Neutral
	1	Unlikely
	0	Very Unlikely
	1	Don't know
Additional comments	24	
Qualitative Analysis		
The commentary was very clear on this strategy. Those that thought it was 'very likely' to improve the uptake of sustainable retrofit activities generally agreed that this type of regulation is effective, tried and tested (in the UK), "will always work best" and "is the most cost effective"; however many also agreed that it would be very unlikely to be implemented in practice, in New Zealand. "Regulation will always work best but I cannot see any government putting this in place unfortunately." Respondents that were more concerned with this strategy's effectiveness cited issues such as length/timing, complexity and the difficulties of implementing it on existing houses.		

Most Preferred Strategy No.2:

Strategy 12	**Transforming the perceptions of homeowners so that they equate the implementation of sustainable retrofit with an increase in the market value of their home.**	
Type of Strategy	**Market Mechanism (M)**	
Results (37)	**16**	**Very Likely**
	16	**Likely**
	3	Neutral
	0	Unlikely
	0	Very Unlikely
	2	Don't know
Additional comments	21	

Qualitative Analysis

Only marginally less popular than the preceding strategy. Overwhelmingly, and as anticipated, the question that the respondents invariably returned was "How?"...

"Good idea, but the question is how?"

"The trick with this question is 'how do you transform' perceptions???"

"The challenge is always how to get this value added dimension visible"

"You'd need a way to do this..."

Further consideration of this strategy is likely to be (and probably has already been) the focus of an entire research project. A couple of other comments reiterate the complexities of the proposal: "Easier said than done. This will require a multi-faceted approach of interventions over time (not a quick fix)."

"This will only be successful if sustainable retrofits and market values are actually linked."

"You need to prove that it does add value!!! And value is only added when the buyer proves this by paying more – extraordinary research will need to be conducted in this area to support such a claim – not just hearsay."

Least Preferred Strategy No.1:

Strategy 5	**Taxing or penalising homeowners whose homes fail to meet minimum environmental performance standards.**	
Type of Strategy	**Regulation (R)**	
Results (37)	4	Very Likely
	7	Likely
	8	Neutral
	10	**Unlikely**
	7	Very Unlikely
	1	Don't know
Additional comments	26	

Qualitative Analysis

This was the least preferred strategy that was presented to the respondents. It was also the most divisive with the least amount of clustering of responses. As already illustrated it ended up in the 'unlikely' to 'neutral' range.

Respondents tended to fluctuate between two extremes. One group saw the potential for the strategy to work effectively but seriously questioned whether it could ever be implemented:

"Politically almost impossible, but quite likely effective seeing people are very loss-averse."

"This just won't happen. But if it did, people would do something about it."

"This would be extremely difficult to implement and police – not to mention political suicide" and "Politically a nightmare"

The other group (who tended to favour the strategy less) were also politically concerned; but they also commented on the potential social (equity) and economic (affordability) implications as well:

"This would be hard as there is a lot of equity issues tied up in this. A lot of people are struggling and times are tough"

"The main issue I can see with this is people may not be able to afford to do the upgrade in the first place."

Least Preferred Strategy No.2:

Strategy 10	**The introduction of a voluntary performance rating scheme for existing homes, similar to the NZ Green Building Council's Green Star tool.**	
Type of Strategy	**Market Mechanism (M)**	
Results (37)	0	Very Likely
	13	Likely
	16	**Neutral**
	6	Unlikely
	3	Very Unlikely
	0	Don't know
Additional comments	24	

Qualitative Analysis

Somewhat surprisingly, this was not a particularly popular strategy with those surveyed. Surprising for two reasons: one, a residential tool is currently being developed and about to be released; and two, because the commercial Green Star Tool has been especially successful at driving uptake of sustainability in commercial buildings in NZ (new construction).

Those that thought it was likely to succeed suggested it would tend to only work in conjunction with adequate information/publicity and other incentives:

"This will help to a small extent but is likely to get lost in the barrage of information out there unless it is attached to an incentive".

Those that were less enthused about the tool were in reasonable agreement that the voluntary nature of the tool was a problem, and cited the current Home Energy Rating System (HERS) as proof of failure. Many also thought it would only be used as a "stamp of approval" for houses that were already performing adequately i.e. it would not necessarily drive uptake in poorly performing homes. Also there was a concern that "these types of tools only reach the people who are generally already aware of, or already want, to be environmentally responsible..." A particularly negative response was a s follows:

"No one bothered to take up HERS, no-one knows what the GBC Green Star tool is – "another" voluntary scheme would prove just as ineffective (and waste of money/resources)"

5.2.1.4 Preferences for Types of Intervention

In terms of the potential for different *types* of interventions to influence uptake, the results of the data analysis thus far appears inconclusive at this stage, and requires further analysis.

At a visual level, it could be suggested that the financial incentives appear to be clustering within the 'likely' margin, and the 'other' initiatives appear to be clustering around the 'neutral' to 'likely' range. However regulations range from most preferred to least preferred, and market mechanisms are also intermittently interspersed with the data spread.

When analysed by strategy type, the following results are obtained:

Table 17: Data Analysis Summary (ranked by type)

Q	Rating Question/Statement	Type	Average Mean Rating	Ranking
1	Funding or subsidies	F	3.99	1
6	Interest free loans			
3	Accommodation supplements (for landlords)			
11	Minimum performance standards	R	3.77	2
4	Environmental performance rating disclosure			
5	Taxing or penalising homeowners			
12	Transforming the perceptions of homeowners	M	3.66	3
9	One stop shops			
10	Residential Rating tool			
2	Enabling fast-tracking of RC/BC processes	O	3.54	4
7	Information tools			
8	Funding research and development			

Where F = Financial Incentive, R = Regulation, M = Market Mechanism, O = Other

The table indicates that overall:

- Financial Incentive type strategies were rated as the most likely to improve the uptake of sustainable retrofit activities (with a mean rating of almost 4.00)
- Regulation type strategies were favoured next (with a mean rating of 3.77)
- Market Mechanism type strategies rated next (mean rating = 3.66)
- Other type strategies were the least favoured strategies (mean rating = 3.54)

The following graph illustrates the results of the Sustainable Retrofit Survey, ranked in order by average mean rating.

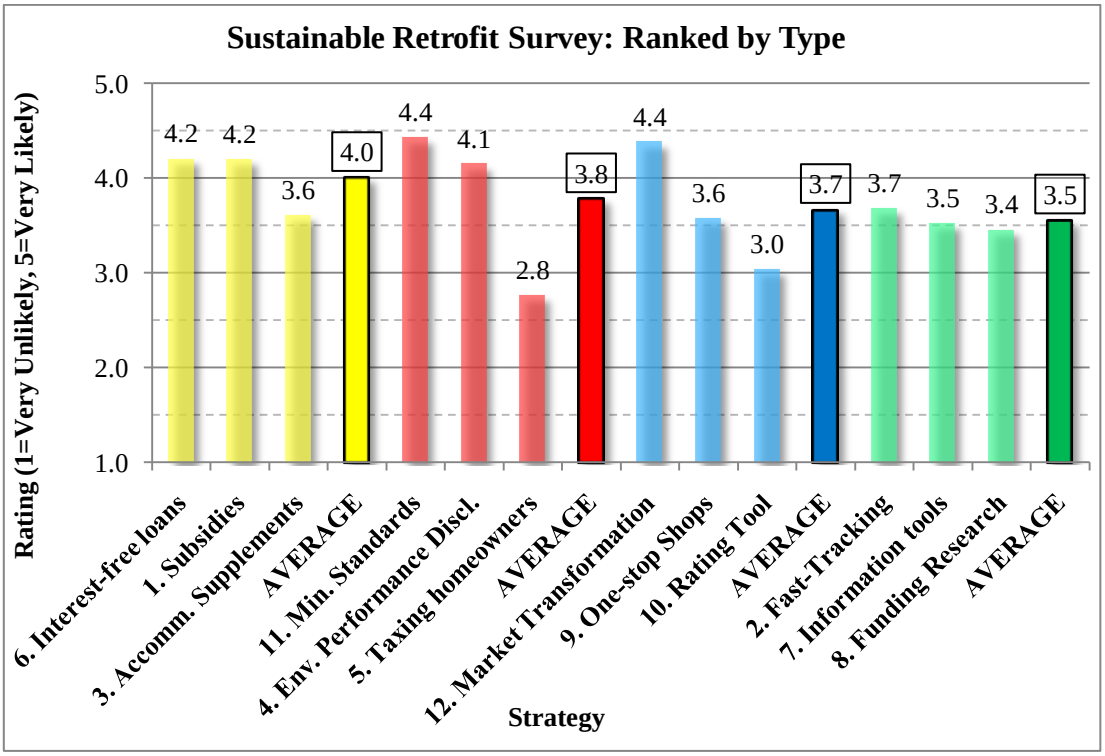


Figure 6: SRS Strategies – Ranked by Type

When the individual strategies are grouped by type and averaged, the results *appear* to illustrate a descending trend from financial incentives (4.0) to regulations (3.8) to market mechanisms (3.7) to other (3.5). It is important to note, however, that this analytic approach is overly simplistic: as a group all the strategies actually fall in the 'neutral to likely' range.

5.2.1.5 Summary of Findings

The ranking of the individual strategies by mean rating clearly indicates that industry prefers some types of strategies over others. This is illustrated in the first part of the quantitative analysis – where each strategy is ranked in order from most likely to least likely. Given the objective to determine which strategies are most likely to improve uptake, it would not be unreasonable to consider only those strategies that rated as 'more than likely' as the preferred strategies. This would include any strategy that achieved a mean rating of more than 4.00, and includes the following:

Table 18: Preferred Strategies

Q	Rating Question/Statement	Type	Mean Rating	Ranking
11	Minimum performance standards	**R**	4.42	1
12	Transforming the perceptions of homeowners	**M**	4.37	2
1	Funding or subsidies	**F**	4.19	4
6	Interest free loans	**F**	4.19	3
4	Environmental performance rating disclosure	**R**	4.14	5

The preferred strategies include a mix of intervention types, including regulations, financial incentives and market mechanisms; but not 'other' types of interventions.

On the other hand, the ranking of types of intervention by average mean rating *appears* to indicate a preference for some types of interventions over others; however the preference is not so clearly expressed. When grouped by intervention type, none of the categories achieve a rating of 'more than likely'. In fact they all fall within the 'less than likely' range but 'better than neutral'. As with the individual strategies, there appears to be a preference for **financial incentives, regulations and market mechanisms** over 'other' strategies, and in this order.

It is interesting to note if the two least preferred strategies were removed (as outliers) from the analysis, the results would indicate the following hierarchy: **regulations, financial incentives and then market mechanisms**; in that order.

5.2.2 Analysis of 'Additional Questions'

These questions were primarily introduced to test the 'biases' of the respondents with reference to sustainable retrofit in general. This was deemed to be particularly important as most of the participants either worked in organisations with interests in sustainable retrofit, or else had 'strong' opinions on the subject. This was deliberate, of course, and was as a result of the judgemental sampling approach.

5.2.2.1 Qualitative Data Analysis

Question A

Do you think that sustainable retrofit activities have significant environmental, social and economic benefits?		
Results (37)	**36**	**Yes**
	1	Don't Know
Additional comments	17	
Qualitative Analysis		
All respondents (bar one) agreed with the basis of this question. Not many of the responses addressed the environmental side, although one participant said "The environmental benefits go without saying". Most of the commentary agreed with the health benefits of sustainable retrofit ("health in particular is affected") but the thoughts regarding economic benefits was mixed ("I am less convinced there would be economic benefits" versus "The benefits have been quantified and represent At least 1% of GDP per annum"). The other qualitative responses ranged considerably in content from a simple "No brainer" to commentary about issues surrounding the quantification of benefits, diminishing returns, optimisation, the specifics of the retrofit undertaken and market penetration. One respondent summed up the situation nicely: "I think in the current climate the more pressing question is how these benefits can be shown. In my view, it is necessary to reduce all of the above (environmental, social and economic) to monetary benefits/outcomes".		

Refer also, the Results section for graphical representation of the results.

Question B

Who do you think should be primarily responsible for facilitating the sustainable retrofit of the existing housing stock in NZ?		
Results (37)	8	NZ Government
	3	Regional & Local Councils
	0	Industry / Commercial Organisations
	7	Homeowners
	18	**Everyone**
	1	Don't know/Other
Additional comments	18	

Qualitative Analysis

Although the consensus (48.6%) was that 'Everyone' was responsible for facilitating sustainable retrofit ("if you leave it to one group nothing will happen"); there was also a strong divide between those who thought Government was responsible (21.6%) and those who thought Homeowners (18.9%) should take responsibility for their own homes.

This was reflected in the commentary too, with some suggesting government should be leading, legislating, incentivising and even enforcing facilitation. On the other side, some respondents thought that whereas government could invariably influence facilitation with the use of subsidies or market interventions it was ultimately up to the homeowner to "decide how they spend their dollars".

Most interestingly, however, was the fact that **none** of the respondents believed Industry should be primarily responsible for facilitating sustainable retrofit.

Overall, the commentary generally reinforced a holistic approach: "it does need to be lead by government, supported by local government and incentives provided to industry, commercial organisations and homeowners to get buy in".

Question C

Do you have any vested interests in any of the strategies mentioned in this survey?		
Results (37)	**21**	**Yes**
	16	No
Additional comments	23	
Qualitative Analysis		
Although the responses may have been dependent on each respondent's interpretation of 'vested' there was almost a 50/50 split in the responses to this question. Those that answered yes were typically working in the field (researchers and central or local government employees). No respondents appeared to have any particular bias towards any one of the strategies. One alternative response was interesting: "I'm a citizen of this country and have young children; therefore I have a vested interest in the future well-being of the nation and the individuals!"		

Question D

Any final comments or suggestions?		
Results (37)	16	Yes
	21	**No**
Additional comments	16	
Qualitative Analysis		
Most of the responses were forms of well-wishing and/or requests for a summary of findings. There were a number of interesting comments: "Sustainable retrofit is very important and needs to be adopted into NZ society. The definition of sustainable retrofit is also important and should be well considered before any action" "I think most of the approaches in the survey could make a difference, but it would depend hugely on how they were done including publicity, targeting, level of funding etc."		

"Some interesting questions. We've got to get passed having to dangle carrots in order for people to do stuff"

"Need to combat the potential backlash of 'nanny state' type public feedback by first footing what UK, Europe, Australia and others are doing in this area. Most kiwis don't know how far behind we are in these areas and were mislead by populist opposition politicians and industry lobbyists during the previous government"

"Increase the price of electricity to account for externalities. Stop subsidising heat pumps. Fund research into building integrated renewables in NZ and feed-in tariffs. Introduce mandatory smart metering for all homes. Make energy an issue of concern through encouragement rather than doom scenarios. Make energy issues a part of the teaching curriculum. Make me the Minister for Energy in NZ." (!)

5.2.2.2 Summary of Findings

Industry clearly agrees with the proposition that was presented in the introduction to this research. That is; that sustainable retrofit activities have significant environmental, social and economic benefits. This confirmation provides substantial justification for undertaking research into this area.

The question regarding responsibility for facilitation was arguably the most important question asked in this section (especially given the potential to compare the results with both the Government and householder responses). Clearly, the majority of respondents thought 'everyone' was responsible for facilitation, however similar amounts of respondents were also divided between the assignation of responsibility between government and households.

The question about vested interests was introduced to ensure that responses about particular strategies would not be skewed based on a respondent's personal interests. In essence, this was a non-concern as the large numbers of responses effectively eliminating any individual bias. Regardless, the commentary in response to the question revealed no apparent conflicts of interest anyway.

The commentary received from the final question indicated that the survey was well received, prompted significant discussion and retained the respondent's interest throughout.

5.3 Household opinion/preference

Household data was obtained from two main sources. Firstly, the 2008 NZ Housing Survey which surveyed "3526 New Zealanders on the state of their homes and future home improvement policy preferences." Secondly, data regarding household 'beliefs' was obtained from a survey carried out by MfE: the Household Sustainability Survey 2008. It is important to note that these data sources are secondary. The results were produced by others, but the analysis that follows was carried out by the researcher for the purposes of this research paper.

5.3.1 NZ Housing Survey

Householders were surveyed on a range of NZBCSD policy proposals, some of which align with the strategies that 'industry' was questioned on. As in the preceding section regarding industry opinion/preference; data from this survey was analysed as follows:

- Strategies were identified and categorised by 'type' of intervention
- The results (reproduced in full in the Appendices) were quantitatively analysed using the MAUA technique in an attempt to determine household preference (via ranking) for the surveyed range of policy proposals

The following table summarises the policy proposals selected for analysis. The description of the proposal and the determination of type have been assigned by the researcher:

Table 19: Selected Policy Proposals

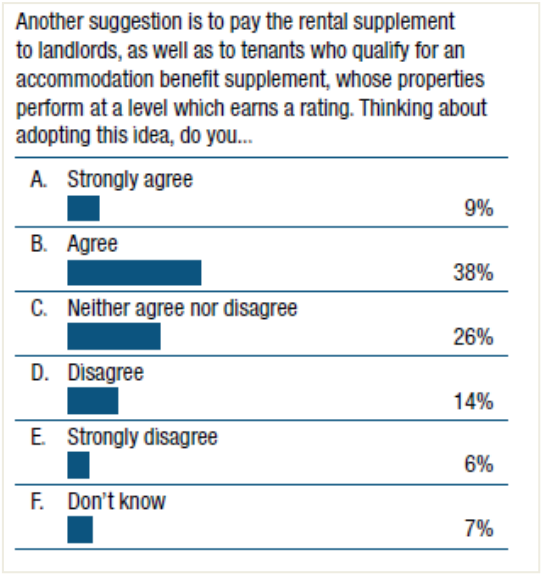
#	Policy Proposal	Type of Strategy
1	Mandatory building performance rating (sales)	Regulation (R)
2	Accommodation supplement (for landlords)	Financial Incentive (F)
3	Housing consents (fast-track or green tape solutions)	Other Initiative (O)
4	Business-Government alignment on improving housing	Other Initiative (O)
5	Govt. To fund market research into sustainable retrofit solutions	Market Mechanism (M)
6	Govt, banks or energy companies to offer 100% loans	Financial Incentive (F)

The following graphs indicate the results from the household survey on each of the above proposals:

1 – Mandatory building performance rating (sales):

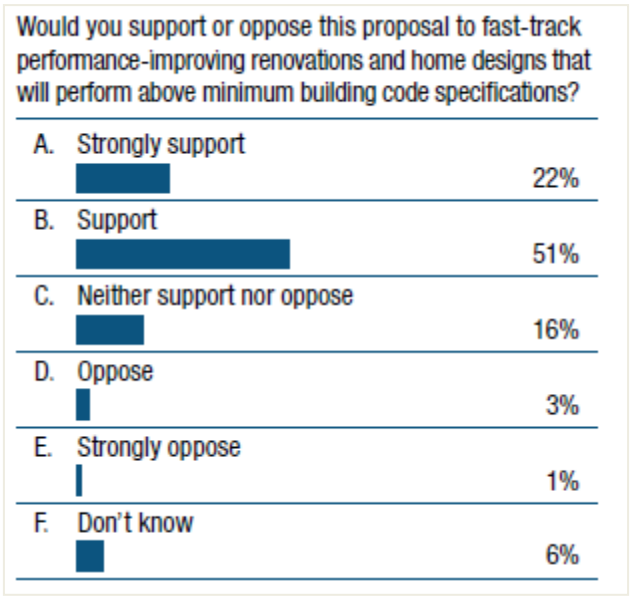
Source: NZBCSD, 2008c.

2 – Accommodation supplement (for landlords):



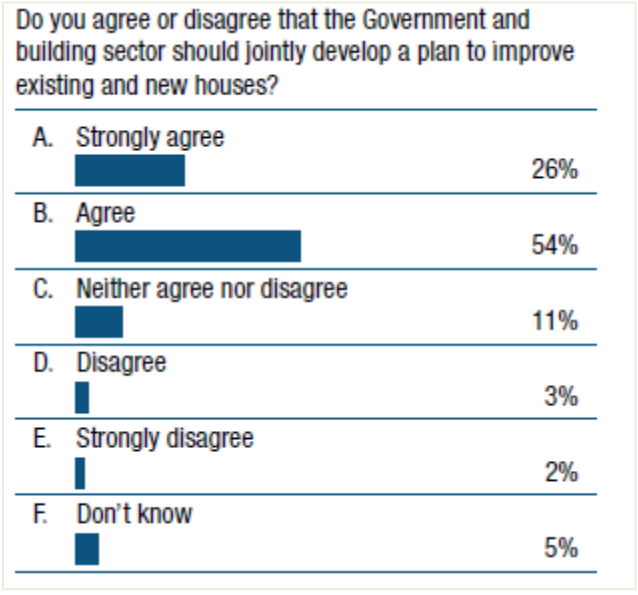
Source: NZBCSD, 2008c.

3 – Housing consents (fast-track or green tape solutions):



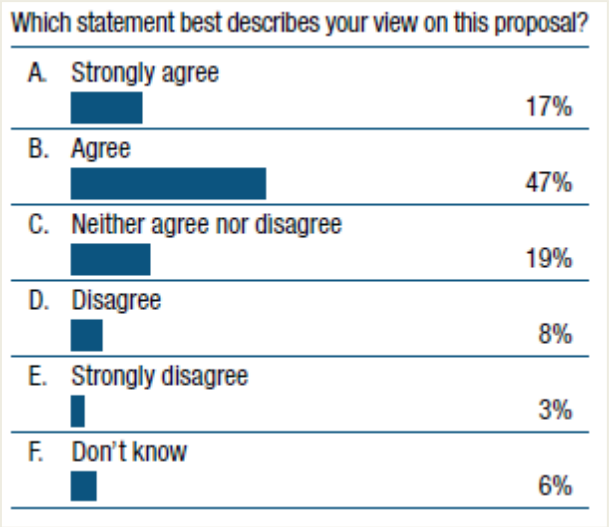
Source: NZBCSD, 2008c.

4 – Business-Government alignment on improving housing:



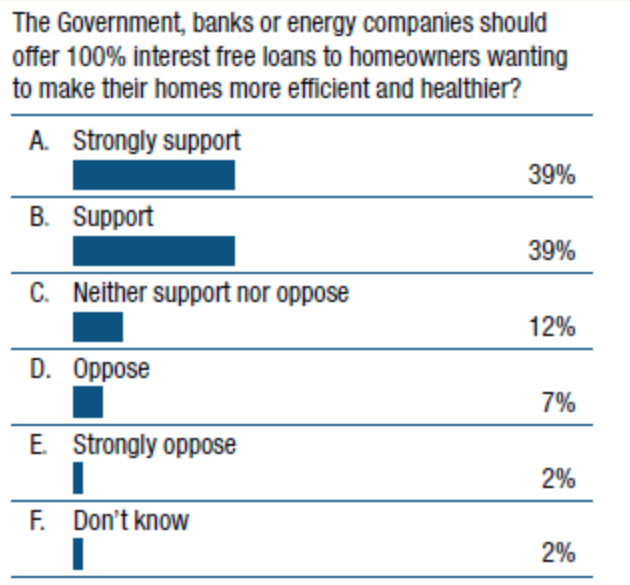
Source: NZBCSD, 2008c.

5 – Government to fund market research into sustainable retrofit solutions:



Source: NZBCSD, 2008c.

6 – Government, banks or energy companies to offer 100% loans:



Source: NZBCSD, 2008c.

5.3.1.1 Quantitative Data Analysis

The Table below summarises the results of the quantitative analysis. Refer the Appendices for the statistical analysis which will not be reproduced here.

Table 20: Data Analysis Summary (ranked by mean rating)

#	Policy Proposal	Type	Mean Rating	Ranking
6	Govt, banks or energy companies to offer 100% loans	F	4.07	1
4	Business-Government alignment on improving housing	O	4.03	2
3	Housing consents (fast-track or green tape solutions)	O	3.97	3
5	Govt. To fund market research into sustainable retrofit solutions	M	3.71	4
1	Mandatory building performance rating (sales)	R	3.63	5
2	Accommodation supplement (for landlords)	F	3.32	6

Mean Rating Scale:

Rating	1	2	3	4	5
Meaning	Strongly oppose/disagree	Oppose/disagree	Neither	Support/agree	Strongly support/agree

Responses of 'Don't know' were excluded from the MAUA calculations.

It is difficult to make any particular strong conclusions given the outcome of the results; however the following general observations can be made:

- The results indicate that Householders tend to agree and/or support the policy proposals, as listed above. When the ratings are rounded to the nearest whole number, all the strategies – bar one – could be considered as being supported by householders.
- Interest-free loans (highest mean rating) are clearly preferred over accommodation supplements (lowest mean rating), even though they can both be considered as financial incentives
- 'Other' interventions appear to be favoured over regulatory type of interventions.
- There does not appear to be a clear preference for type of intervention, although it must be stated that the sample frame is reasonably limited.

The following illustrates the tabulated results in a graphical format:

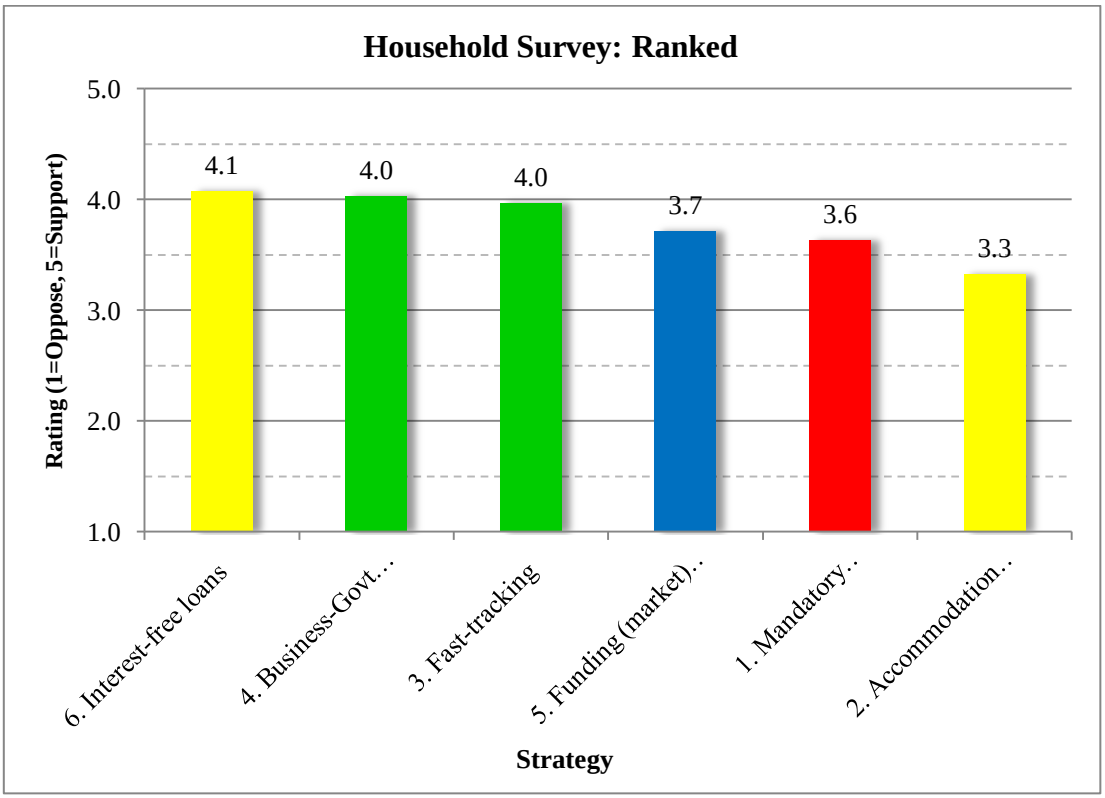


Figure 7: Policy Proposals – Ranked

As with the industry analysis, and taking into account the strategies being analysed here amount to only six (versus twelve in the industry survey), there is some evidence of clustering of results.

It could be suggested that householders seem to prefer strategies six, four and three (support/agree) over strategies five and one (between 'neutral' and support/agree). Strategy two is least preferred and is closer to 'neither support nor oppose' than support/agree.

The qualitative data from this survey was not available for analysis – with the exception of some discourse around the accommodation supplements – "the largest number (18%) agreed with the idea in theory, but others (12%) said it would waste taxpayers' money, while others wondered about the system being 'rorted' and whether tax rebates or low interest loans would work better" (NZBCSD, 2008c).

5.3.2 Household Sustainability Survey

Of interest here are the results from the Household Sustainability Survey 2008 regarding household "beliefs about who is responsible for taking care of the environment".

"A nationally representative sample of 1000 New Zealanders" was asked to assign responsibility to a number of different groups of people, including "Everyone, The NZ Government, The International Community, All Business and Industry, Councils" and others.

Householders clearly believe that 'everyone' should take responsibility for caring for the environment. The bulk of the other responses assign responsibility to government, the international community or industry.

Table 21: Analysis of HSS 2008

Everyone	Government	International	Industry	Councils	Other
53%	20%	11%	7%	4%	5%

The figure illustrating these results is reproduced below.

Figure 4: Beliefs about who is responsible for taking care of the environment (n=1000)

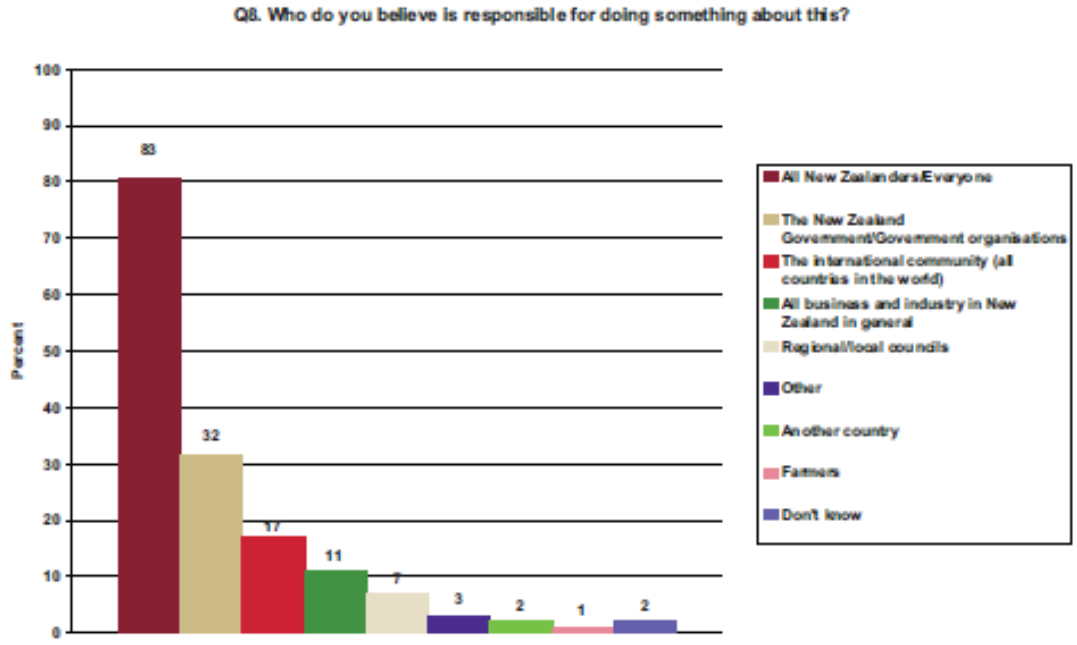


Figure 8: Excerpt from HSS 2008 (Research NZ, 2008)

5.3.3 Summary of Findings

As already suggested, it proved difficult to make any robust conclusions about the household findings. Mostly because the data analysed was not significant enough, in depth or breadth. However, notwithstanding the risk of generalising, the following observations have been made:

- Firstly, householders appear to prefer financial incentives over any of the other interventions. However it would also appear that they don't necessarily condone 'handouts'. Their relative indifference for accommodation supplements, for example, seems to indicate incentives are okay, but not at the risk of inequity or unfairness.
- Secondly, householders appear to favour initiatives that come under the 'other' category such as fast-tracking and collaborative Government-Industry efforts. Both proposals could be described as initiatives that are unimposing on the householder i.e. the onus is on government and industry to design processes that facilitate retrofit activities without overly burdening the householder.

- Finally, householders appear to favour regulatory interventions the least. This is perhaps understandable as most householders prefer to be left to manage their own affairs without Government imposing effort or cost upon them - unless they have very good reason to do so.
- In terms of responsibility, it is evident that householders think everyone is responsible, with Government, and then Industry sharing the balance.

5.4 Integration of Findings

5.4.1 Objectives

In essence, the preceding sections have met the primary and secondary research objectives; that is to collect the opinions of government, industry and householders on a range of strategies. The intent being that each group's preference for types of interventions and/or strategies could be ascertained through analysis of that data. Most of this research has focused on the primary data gathered from industry.

In addition secondary data was collected from the Government and the Householder, in the hope that by utilising a form of triangulation, the research could integrate the findings from each group so as to determine which type of strategies could most effectively improve the uptake of sustainable retrofit activities, in practice.

Integration will occur at two primary levels. Firstly, each group's preference for type of intervention will be examined and discussed. Then, each group's beliefs about responsibility for facilitating sustainable retrofit will be assessed.

5.4.2 Preferences for Types of Intervention

The following table summarises each group's preference for intervention types, as ranked in the preceding data analysis sections. Note that the categories 'market mechanisms' and 'other' initiatives have been grouped together for the purposes of this analysis. The reasoning is two-fold. Firstly, the 'other' category has the potential to be based on any of the other intervention types, and hence is somewhat of a hybrid category anyway. Secondly, the line between 'other' initiatives and market mechanisms is often 'blurred' with many 'other' initiatives reliant on market forces for effectiveness. The Regulation and Incentives categories are more definable and discreet.

Table 22: Preference by Intervention Type

Preference	1	2	3
Government	**Market/Other**	**Incentives**	**Regulation**
Industry	**Regulation**	**Incentives**	**Market/Other**
Householder	**Incentives**	**Market/Other**	**Regulation**

Although the analysis method is rather simplistic, the table does illustrate a number of corroborations; and also a number of contradictions.

Contradictions

First and foremost, it is apparent that there is no clear consensus on any of the intervention types across all of the key stakeholders. In terms of overall preference, government, industry and the household opinions all contradict each other. The data clearly suggests that government prefers market mechanisms; that industry believes regulations will work best; and as may be expected, householders prefer to rely on financial incentives for motivation (although it must be reiterated that the household data requires additional validation).

It is also interesting to note that industry's preferences do not coincide in any way with the householders' preferences, and that industry preference has an inverse relationship with that of government preference. This is particularly evident with regulation as an intervention type: industry prefers this method, whereas both the government and the householder prefer this type of intervention the least.

Corroborations

There are only two sets of corroborating results. Firstly, Government and Industry are in agreement in one instance, and regard financial incentives as the second most preferred type of intervention. Both parties agree that incentives have the ability to 'stimulate' the market; however they must be implemented very carefully.

Secondly Government and the Householder are in agreement, in that they both prefer regulation as a form of intervention the least. This is understandable too, as this Government (in particular) seems overly aware of being perceived as the "nanny state" and would therefore prefer to take a hands-off approach to regulation as much as possible. The householders also clearly prefer other types of intervention ahead of regulation.

Overall, it appears that the opinions of Government and Households are more closely aligned than those of industry.

5.4.3 Responsibility for Facilitation

Although the comparison is a little tenuous - because the data was collected in quite different ways – the analysis to follow still gives a reasonably good indication of where each group's preferences lie in terms of "responsibility".

The following table ranks each group's opinion regarding who should be primarily responsible for facilitating sustainable retrofit and/or who should be responsible for taking care of the environment.

Table 23: Preference for Facilitation

Preference	**1**	**2**	**3**
Government	**Industry**	**Householder**	**Government**
Industry	Everyone	**Government**	**Householder**
Householder	Everyone	**Government**	**Industry**

Note that although Government (via the speech) does not explicitly refer to the householder as a group, the Minister's recurring reference to industry and "the market" is indicative of its preference. "I am strongly in favour of industry developing tools which meet a market need without Government having to regulate for their introduction and use" (Williamson, 2010). The market, of course, is made up of households. This statement, in itself, reinforces the order of preference shown in the table.

Contradictions

As with the analysis of intervention types, there appears to be no clear consensus amongst the three different groups regarding who should take primary responsibility for 'facilitation'. What is most interesting is each group's apparent renunciation of responsibility. Government places itself in third position, whereas both Industry and Householders don't even name themselves! This avoidance of responsibility (which could also be considered as the external assignation of responsibility), is particular evident in the Industry survey where not one respondent suggested that Industry should be responsible for facilitating sustainable retrofit. The data surrounding the Householder's opinion is less reliable however, because in the household survey they did not have the option of selecting "homeowners" or similar. Theoretically, the term "everyone" would include "householders" anyway, so in some ways Householders are in agreement that they need to take responsibility as well.

Also of significant interest is the disparity between the Government and Industry opinions: each believing the other (with the exception of the "everyone" response) to be primarily responsible. This apparent discrepancy could be very problematic indeed, if some integrated solution to the "problem" of incentivising sustainable retrofit is ever to be agreed upon.

Corroborations

Whereas Government appears to be at odds with the other two groups on this matter, there is some agreement between Industry and Households. Both groups believe "everyone" is responsible, followed by Government. As already noted, the disparity occurs further down the rank where they name each other in 'third' position.

Without decent qualitative data available to interpret, it is difficult to conclude exactly what the householders implied with the use of the term "everyone". The Industry responses were much clearer though, and they seemed to be in genuine favour of a collaborative approach to the problem. Although in saying that, many still indicated that it was an issue that needed resolution at each end of the scale. Many responses suggesting that Government should lead, legislate, incentivise and even

enforce facilitation, whereas Householders still required some serious convincing (with other interventions such as reliable information and financial incentives).

Although in agreement about the placement of Government in the ranks, it should be noted that opinions about responsibility do not necessarily mean the same thing. For example, Industry believes Government should primarily take responsibility with the use of regulatory tools, whereas Households would prefer to be incentivised into action, rather than 'forced' via mandatory legislation.

5.4.4 Relationship to Literature

The discoveries of the literature review seem to endorse these findings. In terms of household opinion, Saville-Smith (2008) notes that home owners are resistant to invest in retrofitting; Hargreaves (2005) also suggests that a significant barrier is "the predominant reliance on government funding". As already discussed, if the primary barrier limiting uptake is cost then the householder is most likely to be motivated by financial incentives, as shown in the results.

Saville-Smith's research also illustrates the different motivations between owner-occupiers and landlords. Owner-occupiers appear willing to invest as long as there is a direct link to a range of tangible benefit. This indicates their preference for market mechanisms (such as reliable retrofitting goods and services) and other initiatives (such as adequate information). The research also indicates that landlords will only retrofit if the government provides assistance; again, illustrating the householder's preference for incentives.

The findings from the industry survey also corroborate the findings of the literature review. In terms of regulatory interventions, Storey (2004) argues that they have the potential to have the greatest effect "of all conceivable measures in improving sustainability standards in NZ". This sentiment is clearly expressed in the industry survey where a form of regulatory intervention is deemed to be the most preferred strategy. Even the least preferred strategy (taxing homeowners) had significant traction with many of the industry respondents; some suggesting it would clearly improve uptake, it would just *never* be implemented.

The use of incentives was one area where Government and Industry agreed. This is an important consideration, because as it is the preferred method for householders, it perhaps has the greatest potential to significantly improve uptake. The research has shown that there are a number of incentives currently in place in New Zealand, which do appear to be stimulating some increased demand for retrofit activities. However, as Mansfield (2009) notes, the Government could do more to stimulate activity through the use of "direct and indirect" initiatives. McChesney (2006) also suggests that incentives need to be instigated more widely and intensively in NZ in order to be effective.

The Government has clearly expressed its preference for market-based initiatives, and its apparent reluctance to substantially intervene in the sustainable retrofit sector reinforces this approach. Although industry and homeowners do not show a clear preference for this type of intervention, such forms of intervention still ranked reasonably highly in both the industry and household surveys. The literature suggests that market mechanisms can be effective drivers for uptake (McChesney, 2006) and can also be "the most successful" type of intervention (Storey, 2004); however both authors' agree they cannot be used in isolation. To be most effective, they need to be accompanied by financial incentives and/or 'other' initiatives such as adequate information.

Overall, the somewhat inconclusive results of this research seem to emulate the findings of McChesney (2006) when he summarised "the challenges facing the industry" as follows:

"...it is the mix of market mechanisms, incentives and regulations, supported by information and appropriate institutional responses working together ... that provides the recipe for success" (McChesney, 2006).

5.4.5 Limitations

The following limitations should be noted and taken into consideration:

- All results, findings and conclusions have been formulated from qualitative data i.e. people's perceptions, opinions and interpretations of meanings.
- Similarly, even though quantitative data analysis techniques have been used in the research, the overall analysis is, of course, subject to researcher bias. Quantitative results are not necessarily any more reliable or valid than those based on qualitative analysis. Similarly, the qualitative analysis was significantly reliant on the researcher's preferences and selections.
- The intent was to follow a strictly empirical approach; however deficiencies in the data have necessitated some amounts of speculative reasoning. Attempts have been made to point this out as it occurs.
- By definition, applied research attempts to answer a real world, complex problem. The problem encountered in this research is open-ended and has no definitive solution.
- The research process has been exploratory. It has evolved and changed over time, and has therefore not been driven by a well defined theory or from a position of expert knowledge. Questions will still remain unanswered at the conclusion.
- The primary data collection process was controlled and under the direct influence of the researcher. Secondary data was collected by others. Therefore the author can take no direct responsibility for the validity, or otherwise, of this data.
- Industry participants were explicitly selected based on their expertise. This was deliberate, however there is the possibility that data collected was biased based on the characteristics of the respondents chosen.
- The attempted use of data triangulation was somewhat problematic. Although the intent was just; the identified disadvantages did affect the process. The additional 'work' required to pursue this method put limits on the depth of study undertaken resulting in considerable over-simplification of very complex issues. Similarly, inconsistencies in data collection methods made accurate comparisons difficult, with the possibility of producing contradictory and/or tenuous results.
- Refer also, the Introduction for additional limitations.

6 CONCLUSION

6.1 Conclusions

A large proportion of New Zealand's existing housing stock performs poorly, particularly in terms of energy efficiency. As homeowners tend to be reluctant to invest in sustainable retrofit activities, policy interventions or initiatives are often introduced in an attempt to improve uptake. This is generally on the basis that retrofit activities can bring significant environmental, social and economic benefits.

The aim of the research was to identify a range of strategies that could be implemented to improve the uptake of sustainable retrofit activities in existing homes in New Zealand. Using a form of data triangulation, qualitative data was collected from government, industry expertise and homeowners to establish each group's preferences for different types of sustainable retrofit strategies. The overall objective was to integrate these findings in an attempt to determine whether there was any consensus of opinion.

The findings indicate that there was no clear consensus across the three groups.

In terms of preference for different types of strategies, government clearly prefers market mechanisms and 'other' interventions. This is evidenced by their support of initiatives such as the residential rating tool, the provision of information and the sponsorship of education and research.

Industry, on the other hand, seems to believe that regulation and financial incentives have the most potential to improve uptake. Preferred strategies include minimum performance standards and mandatory environmental performance ratings; plus providing subsidies and interest free loans for homeowners undertaking sustainable retrofit.

The results obtained for homeowners were less than satisfactory; however they do appear to favour strategies that are not regulatory, onerous or inequitable. Preferred strategies include financial incentives like interest-free loans; and other initiatives such as fast-tracking building consent processes for those undertaking performance improving activities.

Overall, it would seem that government and homeowner opinion is more closely aligned than that of industry. Seeing as government appears to be willing to let the market decide, and homeowners do not want to be burdened with additional cost, it will be 'business-as-usual' unless market transforming measures are actually implemented. Industry appears to have the desire to encourage uptake, but they do not appear to be willing to directly facilitate it.

Ultimately it will require reconciliation at the supply and demand ends of the scale. Government needs to explicitly realise the benefits of sustainable retrofit, and then proceed to take extensive measures to incentivise it. Homeowners also need to be convinced that the benefits of sustainable retrofit can offset the costs, especially in financial terms. Only then will the uptake of sustainable retrofit activity really take off.

6.2 Recommendations

"What strategies could be implemented to improve the uptake of sustainable retrofit activities in the existing residential sector, in New Zealand?"

The research indicates that it is the combination of regulations, financial incentives, market mechanisms *and* other initiatives - in combination with the integrated efforts of those best able to facilitate it - that will improve uptake. The following strategies may have the potential to do so:

- Regulations that facilitate uptake without being overly stringent or burdensome on the homeowner; such as minimum performance standards or requiring the disclosure of environmental performance at time of sale/lease (perhaps in conjunction with the use of a mandatory rating tool). The key is introducing regulation that can be retroactively applied to existing homes; fairly and without initiating mis-use.
- Financial incentives that are applied extensively and fairly for the long term. It is important that subsidies are available to all homeowners, and that they don't distort the market. The current insulation and clean heat schemes in place appear to be improving uptake, especially with landlords and owner-occupiers, however overall success still comes down to the relative availability of funds, in accompaniment with adequate information and reliable service providers.

- The reliance on market mechanisms only does not appear to be enough. A business-as-usual approach will tend to develop, and when times are tough, making ends meet becomes far more important that sustainably retrofitting your home. Key to stimulating this segment of the market will be transforming the perceptions of homeowners such that they explicitly realise the 'value' of retrofit. This will need to be in combination with the provision of adequate industry goods and service providers that can facilitate uptake.
- Although not overly popular with industry opinion, 'other' initiatives should not be discounted. The provision of reliable information, ongoing funding into research and development, and the introduction of initiatives that assist the homeowner implement retrofit activities (such as fast-tracking) can all support the overall objective in a reasonably affordable and unobtrusive way.

6.3 Further Research

The findings of this study suggest that future research could be as follows:

- Surveying the range and effectiveness of regulatory interventions globally.
- Researching and documenting the actual uptake of sustainable retrofit activities already in place – such as the Government's WarmUp NZ programme.
- Intensive research into how to transform the perceptions of homeowners. How do we equate retrofit activities with added value in the residential market?
- Further surveying and analysis of homeowner opinion about sustainable retrofit strategies.
- Monitoring the performance and effectiveness of the soon-to-be released residential rating tool: Home Star.
- More intensive evaluation of the qualitative data collected in the Sustainable Retrofit survey (this research).

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APPENDICES