

# Auckland Council Retrofit Your Home Financial Support Programme: A Social Return on Investment (SROI) Evaluation

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# Auckland Council Retrofit Your Home Financial Support Programme: A Social Return on Investment (SROI) Evaluation

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# Executive Summary

## Introduction

This study focuses on the impact of Retrofit Your Home (RYH), a programme delivered by Auckland Council that seeks to improve the quality of housing for all Aucklanders by enabling better access to efficient and effective home heating and insulation.

The evidence presented in this evaluation report is based on a Social Return on Investment (SROI) analysis, an accepted method of measuring the social, environmental and economic impact of activities and programmes by placing a monetary value on them. This SROI covers the impact of the RYH programme for the financial year 2012/2013.

## Context

New Zealand's housing stock is generally poorly insulated and difficult to heat, which is a widely recognised problem across the country. The fuel and energy costs required to heat houses to acceptable temperatures can be particularly high, and difficult for many households to afford.

Auckland Council is the governing body for the whole of the Auckland region. The council is responsible for managing air quality in the region under the Resource Management Act (1991) and the National Environmental Standards for Air Quality. Domestic home heating is one of the three main sources of air pollution in Auckland. Fine particle emissions from domestic (wood-burning) fires are of particular concern as a health risk. A reduction in these emissions and improved home insulation are seen as ways to improve the health of Aucklanders.

The council also recognises that well-designed and well-constructed housing is critical for people's well-being, not just for environmental reasons. Housing is one of the key determinants of health and there is a strong link between asthma and respiratory and contagious illness, and damp, cold homes.

## About Retrofit Your Home

In March 2011 a regional pilot Retrofit Your Home programme was approved in principle by the council. The pilot expanded the initial RYH programme, which had been developed by the legacy Waitakere City Council, shortly before the creation of Auckland Council in November 2010. The council supported a regional programme in recognition that outcomes from the programme align closely with the goal of creating the "world's most liveable city" by addressing aspects of the Auckland Plan relating to home retrofitting, air quality and climate change mitigation.

Through both the Auckland Plan and the Housing Action Plan, the council recognises the importance of evaluating the effectiveness of its programmes against priority targets and outcomes. This report outlines the result of Social Return on Investment (SROI) evaluation of one year of RYH programme 2012-2013.

## About SROI

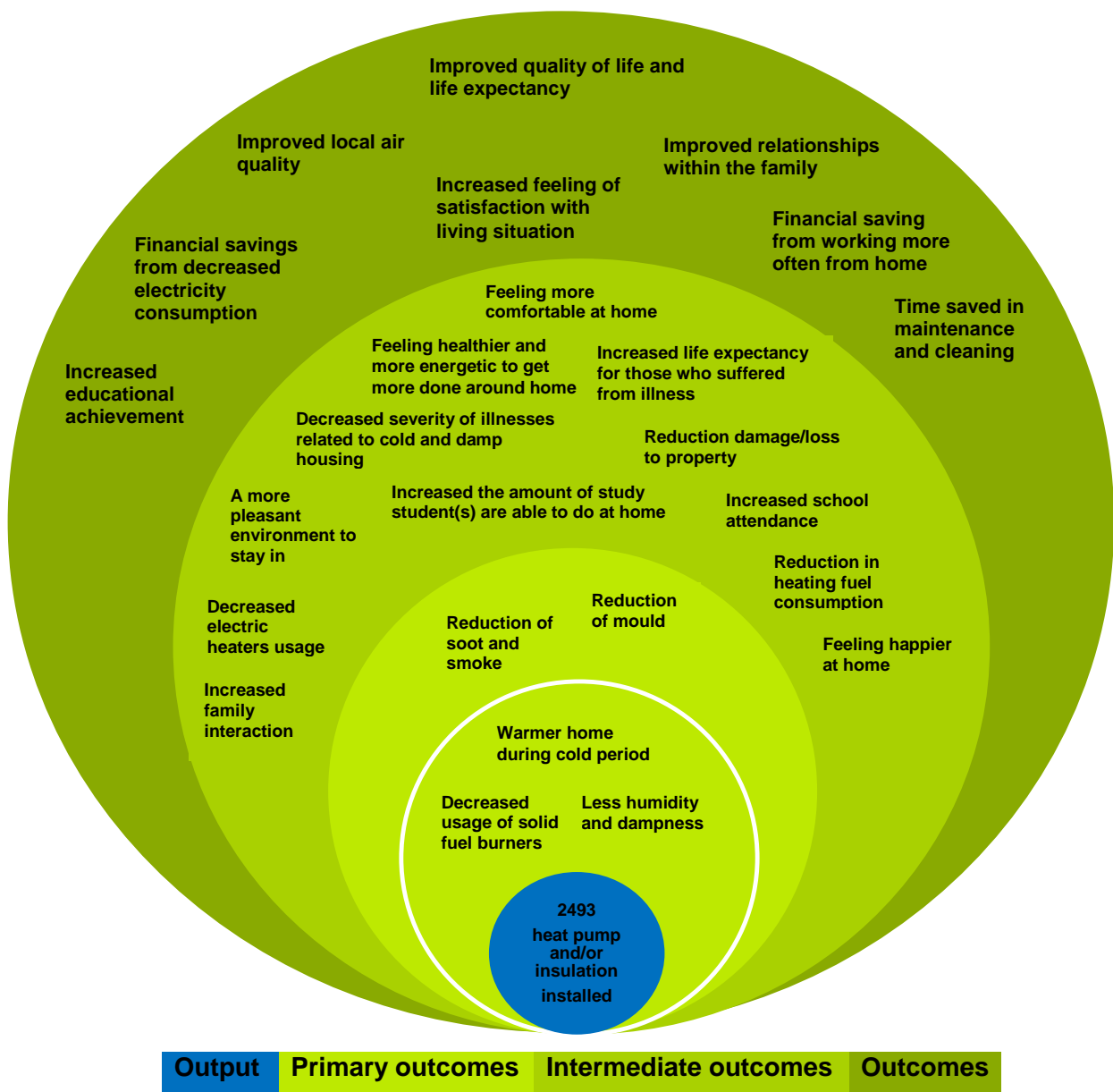
SROI methodology is a framework for understanding social, economic and environmental value created by a programme, policy or intervention and expressing these values in monetary terms, using economic valuation techniques. The monetary value of the outcomes created by the RYH programme allows the benefit of the

programme to be compared with its investment. The SROI ratio indicates how much value is created for RYH stakeholders for each dollar spent on this programme.

## The findings

SROI is an outcomes-based tool. The outcomes or the changes experienced by stakeholders as the result of the RYH programme are identified through the development of a Theory of Change (TOC). This is the core task of the SROI process. The TOC for each stakeholder group is designed as the result of a collaborative engagement process with that group. Figure A illustrates the process of identifying outcomes for RYH stakeholders.

Figure A: RYH programme-a summary of the theory of change



The SROI evaluation showed that the material outcomes for the RYH programme included improved local air quality and a range of outcomes for RYH occupiers.

The natural environment, as a stakeholder, experienced improvement in the local air quality.

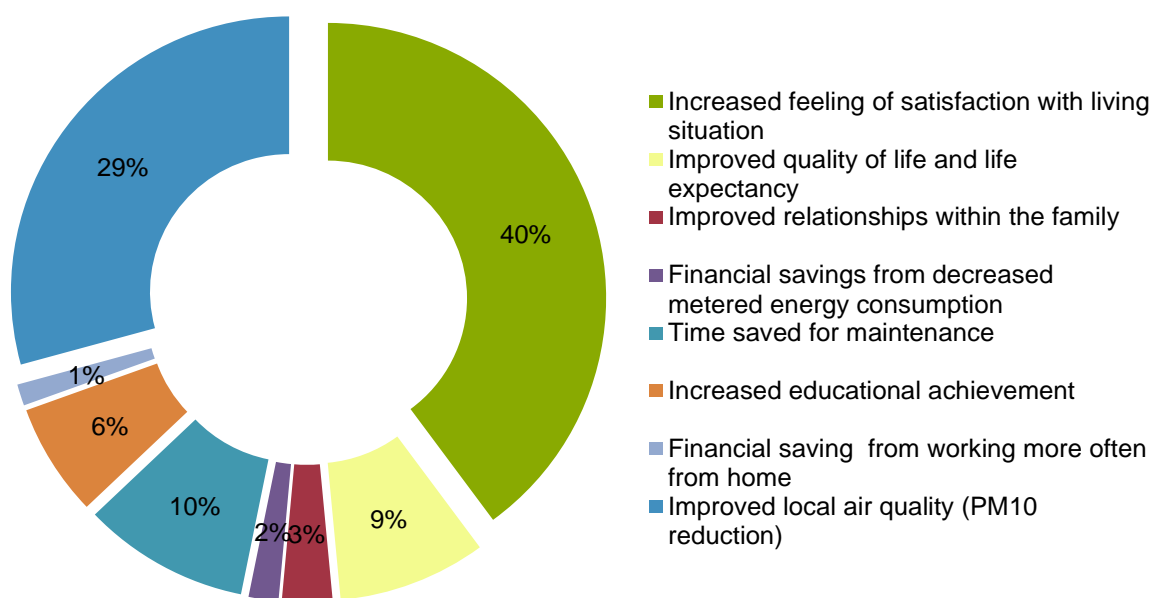
Occupiers of the retrofitted homes experienced the following outcomes:

- Increased feeling of satisfaction with their living situation
- Improved quality of life and life expectancy for those occupiers who suffered from an illness related to cold and damp housing
- Improved relationships within the family
- Financial savings from decreased electricity
- Time saved in maintenance and cleaning
- Increased educational achievement (for occupiers of RYH who are students)
- Increased efficiency when working from home (for occupiers of RYH who are engaged in paid work from home)

The outcome of ‘increased feeling of satisfaction with their living situation’, including a range of related intermediate outcomes for occupiers, created the highest impact for stakeholders, valued at \$10,238,581. The second main value created by the RYH programme was the positive impact on Auckland residents of ‘improved local air quality’, valued at \$7,810,249. Time saved in maintenance, and improved quality of life and life expectancy (for occupiers who suffer from an illness related to cold and damp housing) were the other major outcomes, with more than \$2 million value each.

A summary of the aggregated value by each material outcome is shown in Figure B below.

**Figure B: Proportion of aggregated value created by each outcome**



## SROI ratio

The SROI ratio was calculated using the present value of RYH outcomes compared to the inputs, or the total investment. The ratio shows that for every dollar invested in the RYH programme, it returns \$3.1 of social, environmental and economic value.

**Table A: SROI ratio**

| <b>Stakeholder</b>  | <b>Total value</b> | <b>Present value</b> |
|---|--------------------|----------------------|
| Occupiers of RYH homes  | \$16,259,186       | \$15,668,047         |
| Occupiers of RYH homes who are students                             | \$1,765,529        | \$1,648,300          |
| Occupiers of RYH homes who are in paid employment working from home | \$335,946          | \$313,640            |
| Auckland residents  | \$7,810,249        | \$7,291,658          |
| Total   | \$26,509,803       | \$24,921,646         |

|  |              |
|--|--------------|
| Total value of inputs                          | \$8,038,559  |
| Net present value (present value minus inputs) | \$16,883,086 |
| <b>SROI ratio</b>                              | <b>3.1</b>   |

## Implications

This SROI analysis is one of the first in New Zealand and the first to address the topic of housing quality. The analysis provided strong evidence about changes experienced by RYH customers by engaging them in the evaluation process.

The findings of this SROI analysis are specific for the RYH programme, but also help to highlight Auckland Council's contribution to achieving the targets and objectives of the Auckland Plan.



## **Acknowledgements**

The authors would like to thank Hilton Furness, John Hatton, Jesse Allpress, Eva McLaren, Carina Meares Hadyn Hitchins, Anil Karen and Michelle Kazor for their varied inputs and assistance in producing the Retrofit Your Home SROI.

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# 1.0 Introduction

## 1.1 Purpose

The purpose of this report is to summarise the story of change resulting from Auckland Council's investment in the Retrofit Your Home (RYH) programme.

This study looks at the impacts of RYH, which seeks to improve the quality of housing for all Aucklanders by enabling better access to efficient and effective home heating and insulation.

This report is based on a Social Return on Investment (SROI) evaluation, which is a method for measuring the social, cultural, environmental, and economic impacts of activities, projects and programmes by calculating a monetary value for the outcomes they create. It documents the SROI evaluation process used for the RYH programme and discusses the key assumptions, the process used, and the key findings of the analysis. This SROI evaluation has been carried out by a project team that included staff from the council's Research, Investigations and Monitoring Unit (RIMU).

## 1.2 Report structure

The following is an overview of this report and how it corresponds to stages in the SROI process. Section 2 provides background on Retrofit Your Home and the context of Auckland's housing quality and air quality issues. An overview of the SROI framework, its principals and steps are discussed in Section 3. Section 4 provides a description of the methodology that has been used in establishing the scope of the evaluation, the stakeholder identification and engagement process, and the materiality checking process. The Theory of Change and the process for its development are described in Section 5. Formulating material outcomes' indicators, giving value to outcomes, and valuing inputs are incorporated in Section 6. In Section 7, deadweight, attribution, displacement duration and drop-off are discussed and the completed impact map is presented. The SROI ratio and the result of the sensitivity analysis calculation are provided in Section 8. The conclusion and recommendations are provided in Section 9. Table 1 shows the correspondence between the steps in the analysis and the stages in the SROI framework.<sup>1</sup>

**Table 1: Report sections and SROI steps**

| Report section heading | Corresponding SROI stage / step                             |
|------------------------|---|
| Section 4              | Stage 1: Establishing scope and identifying stakeholders    |
| Section 5              | Stage 2: Mapping outcomes                                   |
| Section 6              | Stage 3: Evidencing outcomes and assigning value            |
| Section 7              | Stage 4: Establishing impact                                |
| Section 8              | Stage 5: Calculating the SROI                               |
| Section 9              | Stage 6: Using the results, conclusions and recommendations |

## 2.0 Background and context

Section 2 provides background and context for the SROI evaluation. It contains a description of Auckland Council and its role, and provides information about the Retrofit Your Home programme. The problem of cold and damp housing in Auckland is discussed along with the related social, economic, and environmental issues drawn from the literature review.

### 2.1 Auckland Council – issues and goals

Auckland Council is the governing body for the whole of the Auckland region, established in November 2010. It came into being following reorganisation and amalgamation of the seven legacy territorial local authorities (district councils) and the regional council, creating a single unitary authority for the whole of Auckland.

The council is responsible for managing air quality in the region under the Resource Management Act (1991) and the National Environmental Standards for Air Quality. Domestic home heating is one of the three main sources of air pollution in Auckland. Fine particle emissions from domestic (wood-burning) fires are of particular concern as a health risk. A reduction in these emissions and improved home insulation is seen as a means to improve the health of Aucklanders.

The council also recognises that well-designed and well-constructed housing is critical for people's well-being, not just for environmental reasons. Housing is one of the key determinants of health and there is a strong link between asthma and respiratory and contagious illness, and damp, poorly ventilated homes. Well-designed and -constructed housing – sited to capture sun, and incorporating high-efficiency and low-emitting heating methods, and high insulation standards, has definite benefits for households, such as better health and lower running costs. These housing improvements also have wider benefits, including improved air quality and greater energy efficiency, which in turn leads to financial savings for households and reduced greenhouse gas emissions.

In 2012 there were an estimated 400,000 inadequately insulated homes within the Auckland region. New Zealand's housing stock is poorly insulated and difficult to heat, which is a widely recognised problem across the country. The fuel and energy costs required to heat houses to acceptable temperatures can be particularly high, and difficult for many households to afford<sup>2</sup>.

#### 2.1.1 The Auckland Plan

The Auckland Plan adopted in 2012 is a shared plan for all of Auckland, setting out the vision for Auckland to become the "world's most liveable city". As the council's key strategic document, it sets out a series of principles, priorities, actions and targets for achieving this shared vision.

In recognition of the issues highlighted above, the Auckland Plan contains specific priorities, targets and directions related to improving the quality of housing and air quality, as well as responding to a changing climate, as summarised in Table 2.

<sup>2</sup>Expert Advisory Group on Solutions to Child Poverty (2012).



**Table 2: Summary of relevant Auckland Plan strategic directions, targets, priorities and directives**

|                               |  |
|-------------------------------|--|
| <b>Strategic direction 7</b>  | <b>Acknowledge that nature and people are inseparable</b>  |
| <b>Targets</b>                | Reduce air pollutant emissions (PM <sub>10</sub> ) by 50% by 2016 (based on 2006 levels) to meet national and international ambient air quality standards and guidelines, and achieve a further 20% reduction by 2040  |
| <b>Priority 2</b>             | <i>Sustainably manage natural resources</i>  |
| <b>Directives</b>             | 7.6 Reduce emissions from home heating, transport and other sources to improve air quality.  |
| <b>Strategic direction 8</b>  | <b>Contribute to tackling climate change and increasing energy resilience</b>  |
| <b>Targets</b>                | Reduce the amount of human-induced greenhouse gas emissions (based on 1990 emissions levels) by: <ul style="list-style-type: none"> <li>a. 10%-20% by 2020</li> <li>b. 40% by 2040</li> <li>c. 50% by 2050</li> </ul>  |
| <b>Priority 2</b>             | <i>Improve energy efficiency, security and resilience</i>  |
| <b>Directives</b>             | 8.3 Improve energy efficiency and conservation (in both supply and use) through: <ul style="list-style-type: none"> <li>• Energy-efficient development and design by supporting the retrofitting and redevelopment of residential, commercial and industrial buildings.</li> </ul> |
| <b>Strategic direction 11</b> | <b>House all Aucklanders in secure, healthy homes they can afford</b>  |
| <b>Target</b>                 | Retrofit 40% of Auckland's housing stock in need of retrofitting by 2030<br>Reduce preventable housing-related hospitalisation by 35% by 2020  |
| <b>Priority</b>               | <i>Improve the quality of existing and new housing</i>   |
| <b>Directive</b>              | 11.4 Encourage and incentivise retrofitting of existing housing stock, and require new housing to be sited and designed to meet best practice urban design and sustainable housing principles  |

The council developed Retrofit Your Home as a means to contribute to achieving these targets and directives. RYH has since become the council's flagship home sustainability and housing improvement initiative.

### 2.1.2 The Housing Action Plan

Along with the Auckland Plan, there are a number of other council strategies and plans that support the development of the Retrofit Your Home programme. The most relevant of these plans is the Housing Action Plan (HAP), which was adopted in December 2012.

This plan was developed in response to the Auckland Plan, and its emphasis on the provision of affordable, healthy and safe housing. The HAP identifies the non-regulatory tools and levers that council can use to influence housing improvements. The plan outlines a number of priorities, with Priority Area 8 being most relevant.

**Table 3: Housing Action Plan - relevant priorities and actions**

| Priority Area 8  | Improving the quality of existing and new housing  |
|------------------|--|
| <b>Action 25</b> | Undertake a Social Return on Investment evaluation of council’s current Retrofit Your Home Programme (RYH) to analyse how well the programme is delivering to the Auckland Plan targets for improving housing quality and environmental performance, Particularly in order to achieve increased take up in rental accommodation. |

Through both the Auckland Plan and the Housing Action Plan, the council recognises the importance of evaluating the effectiveness of its programmes against priority targets and outcomes. Through evaluation, adjustments can be made to existing programmes and progress toward long-term targets can be broken down into meaningful intermediate measures and steps.

In addition, evaluation is essential to inform future policy and programme development decisions. More details regarding the evaluation plan for Retrofit Your Home are outlined in Section 2.2 below.

## 2.2 About Retrofit Your Home

This section discusses the history and development of RYH over time, explaining its links to related central government initiatives. It also outlines a summary of the programme’s evaluation plan, which led the council to conduct this SROI.

### 2.2.1 The Retrofit Your Home programme

The initial RYH programme was developed and launched by the legacy Waitakere City Council in 2010, shortly before the creation of Auckland Council in November 2010. The original Waitakere Retrofit Your Home was unique in that it aimed to address household energy and water efficiency, and improve indoor air quality, while enabling wider public benefits such as reduced air pollution, energy and water conservation, and climate change adaptations. The original programme included the following elements:

- an optional whole of house sustainability assessment
- a home sustainability “plan” with easy to follow personalised “house specific” recommendations and appropriate action steps along with a “Homesmart” renovation homeowner manual
- the opportunity to access central government subsidies and grants for installing insulation and clean heat along with additional financial assistance in the form of a low-interest financial assistance facility from the Council to undertake sustainability improvements up to a value of \$5000 (GST inclusive).

In March 2011 a regional pilot programme was approved in principle by the governing body that expanded the programme, making it available to all Auckland residents with homes built before 2000. The council supported a regional programme in recognition that outcomes from the programme align closely with the goal of creating the “world’s most liveable city” by addressing aspects of the Auckland Plan relating to home retrofitting, air quality and climate change mitigation.

To ensure equity of service, and long-term affordability, the council decided in 2012 to modify the programme in the 2012/2013 financial year to focus solely on the improvement of housing performance in terms of clean heating and insulation. Council committed \$6 million per year in low-interest financial assistance to householders, on the basis that these costs would be fully recoverable.

The programme, delivered by the council’s Environmental Services Unit, works by offering financial assistance to householders (at 7% interest) for up to \$5000 toward the cost of insulation and/or clean heating, with the financial assistance repaid through a targeted rate on the rates bill, spread over a period of nine years. Households are able to take advantage of the council’s low rate of borrowing.

The cost for this programme is recovered by the council through the payments charged to each retrofit customer. The interest rate for the financial assistance incorporates a fee that allows the council to cover its administrative costs, plus interest (including GST) on the amount borrowed.

In the 2012/2013 financial year, the RYH programme achieved its target and provided retrofits to 2,493 homes.

## **2.2.2 Related programmes – Warm Up NZ: Heat Smart**

Another important driver for council to develop the RYH programme was the existence of a subsidy programme for clean heating and insulation that was being funded by central government, called Warm Up NZ: Heat Smart. This programme, administered by the Energy Efficiency and Conservation Authority (EECA) had a funding pool of \$360 million to contribute toward home insulation and clean heating between 2009 and 2013.

Warm Up NZ offered homeowners a subsidy of up to 33 per cent on the costs of insulation and 25 per cent on the purchase of clean heating for homes built before 2000, with higher subsidies (60%) available for houses owned or tenanted by community services card holders. Householders applied for the subsidy through an application process, with insulation and clean heating provided through a variety of approved government suppliers.

The RYH programme was conceived as a way for householders to take advantage of the Warm Up NZ subsidies without putting undue financial pressure on themselves to meet any remaining costs. By partnering with EECA, the council was able to take advantage of an existing quality assurance process by utilising existing preferred and vetted suppliers. EECA also funded and provided the audit process.

## **2.2.3 RYH evaluation framework**

Recognising the need to track the progress of RYH against its objectives and outcomes, in 2012 a programme evaluation and monitoring plan was adopted. The plan sets out a methodology including both quantitative and qualitative methods for evaluation. The plan calls for monitoring of programme outputs as well as evaluating the programme’s effectiveness in terms of its broader outcomes. It includes specific evaluation objectives both for short/medium term and the long-term. These evaluation objectives include

determining the level of improvement to the environment, the local economy, and the social benefits (such as health improvements) that can be attributed to the programme. It also highlights the types of tools that can be used to engage stakeholders and to gather the research.

To meet these evaluation objectives and following the adoption of the Housing Action Plan – Stage 1 in December 2012, the council investigated the use of SROI as a framework to provide more robust evaluation of the economic, social and environmental outcomes of services and/or programmes.

SROI is increasingly being used in the public sector as a means of attributing value to aspects of programmes that are not traditionally valued by standard cost benefit analysis (CBA). As such, SROI seemed an appropriate methodology for evaluating the RYH programme, because it achieves outcomes across the triple bottom lines of social, environmental and economic values. The council began the process of undertaking a formalised SROI in mid-2013, completing the evaluation work in April 2014. More detail regarding the SROI process is discussed in Section 3 below.

## 2.3 Cold and damp homes

This section discusses the key issues related to cold, damp homes and outlines the review of literature undertaken as part of this SROI evaluation.

The literature review provided a source of secondary research to assist in the preliminary identification of stakeholders. This research also became the source of data for some stakeholder groups, where primary research could not be undertaken.

### 2.3.1 The problem of cold and damp housing

As noted briefly in section 2.1, Auckland has a large proportion of cold and damp homes.

There are a number of issues arising from poor quality housing that are associated with a lack of proper insulation and inefficient heating. These issues are summarised below.

- **Health:** direct and indirect negative impacts on the health of householders living in cold, damp conditions
- **Natural environment:** the contribution of inefficient solid-fuel burners to poor air quality and pollution and the impact of energy inefficiency and associated emissions on climate change
- **Energy:** the contribution of inefficient heating systems to electricity usage
- **Quality of life:** negative impact on comfort, life satisfaction and happiness

There is a growing body of evidence that links quality of life and life opportunities with healthy housing. The impact of cold, damp housing is greatest on children and the elderly, with respiratory infections being a leading cause of hospital admissions for children under 2 years of age. Of particular current concern are New Zealand's high rates of Acute Rheumatic Fever (ARF), which appears to be spread through household crowding.

While a significant number of homes in the region were insulated in recent years through various incentive programmes, there are likely to still be well in excess of 300,000 inadequately insulated homes in Auckland.

Along with the health issues associated with cold and damp homes, there is also evidence to suggest New Zealand's housing stock is a poor performer in terms of energy efficiency, and is also contributing negatively to air pollution and other environmental degradation.

The national air quality standards contain regulations for particulates from combustion i.e. PM<sub>10</sub>. The standards set limits on outdoor air quality and have more recently introduced requirements for all new wood burners in an effort to improve their efficiency and reduce the pollution associated with burning solid fuel.

Both the burning of solid fuel and inefficiency of heating also contribute to greenhouse gas emissions and associated climate change.

### **2.3.2 Literature review**

A wide variety of relevant literature was reviewed as part of the SROI process.

Table 4 summarises New Zealand research and the most relevant overseas studies relating to the impact of housing quality and heating methods on air quality, health, energy, education (school absenteeism), productivity at work (work absenteeism), the wider economy and a range of other social and economic outcomes. The summary of literature also includes other housing-related SROI reports.

These studies helped to both identify stakeholders, as well as identify the types of changes anticipated as a result of the programme. In some cases, the literature also provided a source of secondary data for outcome valuation.

**Table 4: Summary of literature review**

| Study  | Author(s)   | Category  | Description of results   |  |
|--|---|---|--|--|
| Evaluation of Warm Up New Zealand: Heat Smart<br>(3-tiered study)  | Warming Up New Zealand: Impacts of the New Zealand Insulation Fund on Metered Household Energy Use.                               | Grimes et al., 2011(a)  | Energy   | The energy analysis showed a reduction in average annual household electricity use and metered energy use at 0.96 and 0.66 per cent respectively as a result of insulation retrofit. As a result of heat pump installation, the analysis showed an increase in electricity use and annual metered energy at 1.92 and 0.75 per cent respectively as the result of replacing non-metered energy or gas burners with heat pumps.  |
|  | The impact of retrofitted insulation and new heaters on health services utilisation and costs, pharmaceutical costs and mortality | Telfar-Barnard et al., 2011   | Health   | The health analysis result shows that at the individual level there was no significant change in hospitalisation as a result of participating in WUNZ:HS. However, the mortality rate was reduced for participants aged 65 and over who had recently undergone a cardiovascular hospitalization with an estimated ongoing effect of \$439.95 per year per treated household. The result of household level analysis shows that annual savings for hospitalisation included yearly savings in circulatory illness at \$67.44, respiratory illness at \$98.88, and asthma-related savings as a subset of respiratory at \$107.52. The other health related factor, pharmaceutical savings, was small but highly statistically significant for insulation, but not statistically significant for heating. |
|  | Impacts of the NZ Insulation Fund on Industry and Employment  | Covec, 2011   | Economy (suppliers surplus and employment)   | "The net employment impacts of the programme, i.e. additional jobs that would not exist in the absence of the programme, are estimated to be approximately 64-424 full time equivalents (FTEs) in the first year and to peak at 85-560 FTEs in 2011/12. This compares with an estimated peak gross employment number of 1,140 FTEs in 2011/12 (not all of which can be considered additional jobs)."(Grimes et al., 2011(b), p.iii)  |
|  | Summary:  |   |  | The result of the analysis showed a \$4 benefit per each \$1 spent on the Warm Up NZ: Heat smart programme.  |
| Auckland Sustainable Homes Assessment: Part 1, insulation and clean heat appliances                        | Parfitt et al., 2009  | <ul style="list-style-type: none"> <li>• Energy</li> <li>• Air quality</li> <li>• Health</li> </ul> | This report had a similar result in terms of the benefits of council intervention by insulation and clean heat installation. Considering that all improvements continue for 20 years, the benefit-cost ratio result is 5.31. This shows that for each \$1 invested by council, a \$5.31 benefit for Auckland is created.   |  |
| 2012 Home Heating Survey Results   | Stones- Havas, 2014   | Air quality   | The latest Home Heating Survey (HHS 2012) results (Stones-Havas, 2014) shows that an average of 26 per cent of households in the Auckland region use at least one solid-fuel burner. The 2013 census figure is slightly different and shows that 23 per cent of Auckland households use domestic fires as a heating method.  |  |
| Domestic Fire Emissions 2012: Options for Meeting the National Environmental Standard for PM <sub>10</sub> | Metcalfe et al., 2013   | Air quality   | The study assessed various policy options considered to reduce emissions to meet the national environmental standard for PM <sub>10</sub> by 2016, and the Auckland plan target of reducing the PM <sub>10</sub> emissions to 6.3 tonnes per day by the same year. The result of this study shows that each policy has an effect on air quality improvement and a combination of policies was suggested. The dominant package of policies suggested a combination of a point of sale rule, no new installations and an open fire ban (with 43 per cent average cumulative reduction in PM <sub>10</sub> emission compared with business as usual between 2015 and 2031)  |  |
| State of Auckland: Air Quality Report Card.  | Auckland Council, 2012  | Air quality   | Domestic fires are the major driver of PM <sub>10</sub> emission in New Zealand and one of the dominant sources in Auckland with 41 per cent of total annual PM <sub>10</sub> emission.  |  |
| Effects of Fuel and Operation on Particulate Emissions from Wood burners                                   | Xie et al., 2010  | Air quality   | The effects of domestic fires on air pollution have been presented in these reports. Secondary data regarding domestic fire emission factors (wet weight), average fuel use in winter days and average PM <sub>10</sub> emission per day were used in outcomes calculations.   |  |
| Estimation of Domestic Fire Emissions in 2006  | Metcalfe, 2010  |   |  |  |
| Updated Health and Air Pollution in New Zealand Study (Updated HAPINZ)                                     | Kuschel et al., 2012  | <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Health</li> </ul>                   | The particulate levels for particulates smaller than 10 micrometres (PM <sub>10</sub> ) and smaller than 2.5 micrometre (PM <sub>2.5</sub> ) have risen over time. Although international assessments are replacing PM <sub>10</sub> with PM <sub>2.5</sub> , most of the studies in New Zealand have been done based on the PM <sub>10</sub> emission as there is more data available for measuring this pollutant and its effect on human health. The health impact (social cost) from air pollution (PM <sub>10</sub> ) in New Zealand has been estimated by this study. The study suggests that the cost associated with PM <sub>10</sub> pollution from all sources <sup>3</sup> is \$4.28 billion (NZ\$ as at June 2010) per year. The social cost includes premature deaths in adults and children, extra hospital admissions for respiratory and cardiac illnesses, and restricted activity days. <sup>4</sup> |  |
| Auckland Council Air Quality Domestic Options: Cost Benefit Analysis – 2013 Update Final Report            | Mcllraith, 2013   | <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Health</li> </ul>                   | The benefits of options were estimated using the emissions calculated in Auckland Council's Domestic Fire Emissions Prediction Model (DEPM) and costs were based on the HAPINZ study. The private cost for homeowners including consent and installation is included in the CBA, but not the operational cost of using heating systems. The BCR and NPV results show that all packages have a positive return on investment. The authors suggested that council consider its wider policy mandate to select one or a combination of the policy packages.   |  |

<sup>3</sup>This includes 56 per cent from domestic fires, 22 per cent from vehicles, 10 per cent from industry and 12 per cent from open burning.

<sup>4</sup> Restricted activity days are defined as days on which people cannot do the things they might otherwise have done if air pollution was not present.

| Study  | Author(s)   | Category   | Description of results   |
|--|---|--|--|
| Retrofitting houses with insulation: a cost–benefit analysis of a randomised community trial                       | Chapman et al., 2008  | <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Health</li> <li>• Energy</li> <li>• Education (school absenteeism)</li> <li>• Productivity (work absenteeism)</li> </ul>   | The study assessed the impact of housing in terms of the indoor environmental conditions and impact on householders' health. The impacts included: reduced number of general practitioner (GP) visits, reduction in hospitalisation, reduction in days off school and work, energy saving and CO <sub>2</sub> reduction. The result shows that the BCR is 1.5-2.   |
| The Cost of Ill Health, New Zealand Treasury   | Holt, 2010  | <ul style="list-style-type: none"> <li>• Health</li> <li>• Work absenteeism</li> </ul>   | The study quantified some of the indirect costs associated with ill health in New Zealand including the cost of absenteeism, presenteeism, working less and not working at all because of illness. Evaluated at the average full-time pay rate, the estimated hours lost equate to \$4.127 billion to \$11.563 billion in 2004/05; 2.7 per cent to 7.6 per cent of Gross Domestic Product (GDP).   |
| The Social Impact of Housing Providers   | Fujiwara, 2013  | <ul style="list-style-type: none"> <li>• Life satisfaction</li> <li>• Happiness</li> </ul>   | The study used a wellbeing valuation method to identify what people directly self-report about the impact of housing conditions on their wellbeing. The study looked at various housing situation factors, including lack of space, garden, neighbour noise, street noise, poor lighting, bad heating, condensation, leaks, damp, rot, vandalism and local environment (pollution). The result shows that damp has the highest negative impact on both happiness and life satisfaction second only to neighbour noise. The monetary value of housing quality indicators shows that people would be willing to pay £1068 more in rent per year for a non-damp house.                                  |
| Air Pollution Economics: Health Costs of Air Pollution in the Greater Sydney Metropolitan Region                   | Australian Department of Environment and Conservation, 2005 | <ul style="list-style-type: none"> <li>• Air quality</li> <li>• Health</li> </ul>  | Australian Department of Environment and Conservation provided a report on the health cost of air pollution in greater Sydney in 2005. In this report, particulate matter (PM) was identified as a factor resulting in serious health impacts, including premature death and cardiovascular and respiratory diseases. Those particularly susceptible are the very young, the elderly and those with pre-existing health conditions.  |
| The Social Value of Community Housing in Australia   | Ravi and Reinhardt, Net Balance, 2011                       | <ul style="list-style-type: none"> <li>• Economy</li> <li>• Education</li> <li>• Health</li> <li>• Quality of life (Community Inclusion)</li> </ul>  | The impacts of community housing on wellbeing were examined by this study. The results show total present value of community housing (with 5 years duration for outcomes) equivalent to \$664 million.   |
| SROI Vineburgh Development : Cunninghame Housing Association   | Social Value Lab, 2011                                      | <ul style="list-style-type: none"> <li>• Social outcomes</li> <li>• Health</li> <li>• Economic outcomes</li> <li>• Air quality</li> </ul>  | The SROI ratio for the redevelopment of Vineburgh, a five year, £37 million project, is estimated at £3.25:£1. This is the result across a range of outcomes for key stakeholders.   |
| New Barracks Estate Retrofit: Pre Social Return on Investment Post Retrofit Evaluative Social Return on Investment | ARUP, 2011; ARUP, 2012                                      | <ul style="list-style-type: none"> <li>• Wider economy</li> <li>• Health</li> <li>• Energy</li> <li>• Social outcomes</li> <li>• Quality of life (comfort)</li> <li>• Time on repair</li> <li>• Work absenteeism</li> <li>• Air quality</li> </ul> | The study is a forecast evaluation using SROI for retrofit works to houses in the New Barracks Estate in Salford, UK. The monetised total value of benefits over the 20 years of the evaluation period to all relevant stakeholders, including New Barracks estate tenants, the New Barracks Co-operative, Salix Homes, Salford City Council, Central Government, equipment suppliers and installers, the environment, the wider economy and utilities companies, was estimated to be £3.4m compared to £1.9m value of input for the retrofit programme. The SROI ratio is 1.6:1 using a 3.5 per cent discount rate.   |
| Nottingham City Homes: Decent Homes Impact study, SROI report  | Jones, 2013   | <ul style="list-style-type: none"> <li>• Social outcomes</li> <li>• Health (mental)</li> <li>• Education</li> <li>• Economic</li> <li>• Air quality</li> <li>• Energy</li> <li>• Wider economy (employment)</li> </ul>                             | Nottingham City Homes (NCH) measured the social, economic and environmental benefits of its services using SROI methodology. NCH is a social housing provider on behalf of Nottingham City Council. NCH implemented the Decent Homes programme using government funding to "create homes and places where people want to live" by making homes secure, warm and modern. The result of the SROI evaluation shows that the total present value of the changes resulting from the Decent Homes programme in Aspley was calculated to be £25.1 million over the five years following the home improvement. It means that NCH creates £1.46 of value for every £1 invested in the Decent Homes Programme. |

## 3.0 Methodology

This section provides an overview of Social Return on Investment (SROI) analysis, the framework used in this evaluation. SROI principles and steps are reviewed based on the SROI Network's "SROI Guide" as published in 2012.

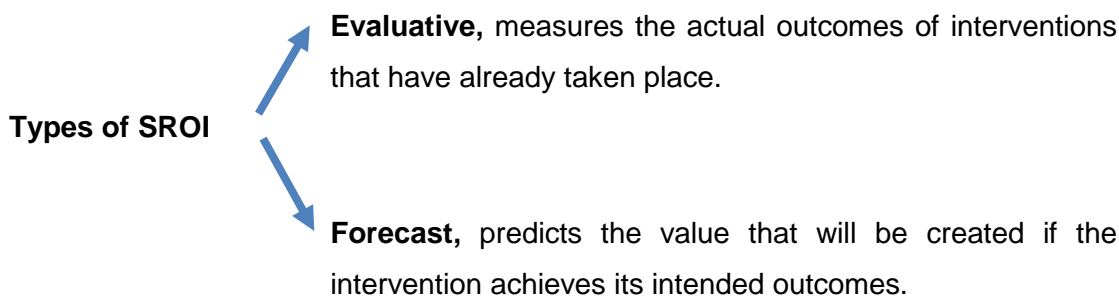
SROI Network is a leading international social enterprise, owned by its members with the aim of changing the way society accounts for value.<sup>5</sup>

### 3.1 SROI Methodology

Social Return on Investment (SROI) is a framework for understanding, managing and communicating the value of the triple bottom line – the social, economic and environmental outcomes created by an activity or organisation.

The SROI approach aims to value the things that matter to material stakeholders, rather than focusing on what can be easily measured. Stakeholders must be involved in the process from the outset. "SROI is an outcome –based measurement tool, as measuring outcomes is the only way you can sure that changes for stakeholders are taking place." (The SROI Network, 2012. p. 33)

There are two types of SROI:



This report is an evaluative SROI, which measures the changes experienced by stakeholders as the result of RYH programme.

Like any research methodology and framework, the SROI has its own language while using popular terms too. Some of the key phrases have been defined in the relevant section and a comprehensive glossary at the end of this report includes a description of all the phrases.

### 3.2 SROI principles and stages

The SROI framework is based on social accounting and cost-benefit analysis, following seven principles:

- **Involve stakeholders:** stakeholder engagement

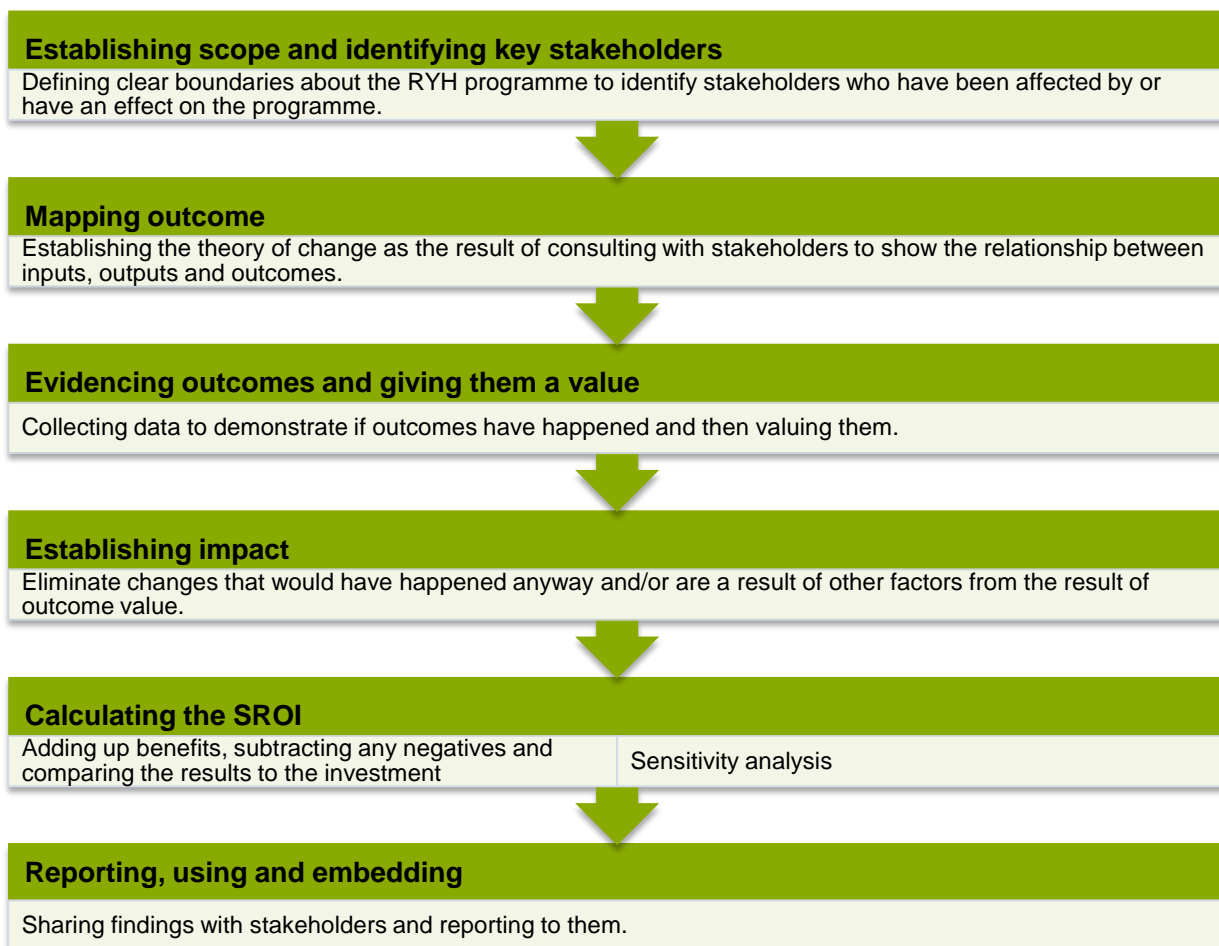
<sup>5</sup><http://www.thesroinetwork.org/>



- **Understand what changes:** the theory of change
- **Value the things that matter:** not only those that can be measured through their market value
- **Only include what is material:** include anything that, if omitted, would potentially affect the stakeholder’s decision
- **Do not over-claim:** eliminate deadweight, attribution of other factors, displacement of other outcomes and value drop of in duration of outcome
- **Be transparent:** write a full and honest account of the evaluation for stakeholders
- **Verify the result:** peer review by an appropriate independent assurance committee ‘The SROI Network’.

On this basis, the evaluation aims to deliver an honest and defensible account of the social returns that are associated with the council’s intervention, the RYH programme. Figure 1 shows the several stages undertaken to provide a transparent SROI report.

Figure 1: **Stages of SROI**



## 4.0 Establishing scope and identifying key stakeholders

This section provides information on the scope of the SROI analysis, and explains the process of stakeholder identification and engagement as well as materiality check. It is through identifying and engaging stakeholders and examining materiality that the Theory of Change can be developed (see Section 5).

### 4.1 The scope of the SROI analysis

As noted in section 2.2, the Retrofit Your Home programme is expected to be implemented for a 10 year period beginning in 2011/2012, as outlined in the council's Long-term Plan.

The scope of this SROI evaluation is a single year of programme delivery, from July 2012 to the end of June 2013. To ensure regional equity of service, and to better align with the central government programme, a decision was made to focus initially on a limited range of interventions that incorporate under-floor and ceiling insulation and heat pump<sup>6</sup> options.

This SROI was conducted between September 2013 and April 2014 by the council's Research, Investigations and Monitoring Unit (RIMU). A Steering Group was established from the outset to guide the evaluation process. It included representatives from RIMU and the council's Environmental Services Unit (ESU), which is the unit that has responsibility for delivering the RYH programme. The SROI evaluation was funded jointly by these council units.

### 4.2 Stakeholder identification

As discussed in section 1, the purpose of this study is to develop a deeper understanding of the changes experienced by stakeholders of RYH programme, and to measure and assign value to these changes.

These changes or "outcomes" can be social, cultural, environmental or economic, and have the potential to cut widely across a broad range of stakeholders. The first step in this process is to identify stakeholders. Stakeholders are both those who have been affected by the RYH programme, and those who have an effect on the RYH programme.

Stakeholders are defined as people or organisations that experienced change or affect the activity, whether positive or negative, as the result of the activity being analysed.

Once stakeholders are identified, further engagement or research can be undertaken to determine the types and level of change experienced by each. In SROI analysis, there is a primary interest to find out how much value has been created, or destroyed, and for whom. Stakeholders can include direct beneficiaries, such as those that occupy retrofitted homes. They can also include individuals or organisations that are affected in some way by the programme, such as service providers e.g. suppliers of insulation, or even indirect beneficiaries in cases where the outcomes for direct beneficiaries are material. For example, outcomes for health providers would be material if the health improvement of customers is material.

As well as helping to determine the value of 'what really matters' for the programme's stakeholders, the engagement through the SROI process also allowed the council to better understand the strengths and

<sup>6</sup> Although clean heating in general is in scope of RYH, this evaluation just includes heat pumps as the most popular clean heating option.

weaknesses of the RYH programme and gave useful information about how the service might be improved in the future.

The scope and decisions regarding potential stakeholders were determined by the project team by examining existing secondary research (see Section 2.3.2) e.g. independent evaluation of Warm Up New Zealand Heat Smart programme, and by undertaking primary research with key stakeholders.

Based on a review of existing research, an intended stakeholder mapping exercise was carried out to create an initial list of stakeholder groups to be engaged. The research also helped the project team to understand the materiality<sup>7</sup> of the change. Table 5 shows the initial list of stakeholders and the reason for their inclusion.

**Table 5: intended list of stakeholders and the reason for inclusion**

| <b>Key Stakeholders</b>  | <b>Reason for inclusion</b>   |
|--|---|
| <b>Customers – sub-category: RYH occupiers (including tenants and owner occupiers)</b> | Group expected to gain the most benefits (direct beneficiaries)   |
| <b>Customers – sub-category: RYH landlords</b>   | The applicants for RYH services   |
| <b>Suppliers</b>   | Provide insulation and/or heat pump and therefore affect the activity   |
| <b>Employees of suppliers</b>  | Install insulation and/or heat pump and therefore affect the activity   |
| <b>Wider economy</b>   | Would be affected by indirect/induced effect on employment  |
| <b>Auckland Council</b>  | Provides finance and administration services, therefore affected by the programme. Also some parts of the council have an interest in terms of potential air quality and environmental impacts. |
| <b>EECA</b>  | Provides financial subsidy and therefore affects the programme  |
| <b>Health care providers (GP, Hospital, DHBs and MoH)</b>                              | May be affected as a result of the impact of RYH programme on health of occupiers   |
| <b>Schools</b>   | May be affected as a result of the impact of RYH programme on the health of occupiers   |
| <b>Employers</b>   | May be affected as a result of the impact of RYH programme on health of occupiers   |
| <b>Home based care givers</b>  | May be affected as a result of the impact of RYH programme on health of occupiers   |
| <b>Local air quality and atmosphere</b>  | May be affected as a result of the installation of clean heat and/or insulation   |
| <b>Neighbourhood of retrofitted home</b>   | May be affected as a result of installation of clean heat and/or insulation   |

### 4.3 Stakeholder involvement

Once the initial list of stakeholders and their relevant and significant outcomes was determined, the project team worked to develop a plan for engagement. Undertaking research directly with stakeholders allowed

<sup>7</sup>Materiality check is described in section 4.4.

council to better understand and observe the actual changes experienced as a result of the RYH programme. The engagement methods used in this evaluation include:

- Workshops
- Telephone surveys
- Face-to-face interviews

At its core, stakeholder engagement was a process that was used to develop the Theory of Change.

In order to use time and resources efficiently, the engagement targeted the main stakeholder groups which were determined to be RYH customers and suppliers. Appendix A includes the material used in stakeholder engagement.

### 4.3.1 Customers

The RYH programme only directly transacts with homeowners, which includes occupiers and landlords. All homeowners have the following interactions with the programme: applications for RYH, receipt of installed heating and/or insulation, repayment of financial assistance and interest via rates (including access to favourable payment terms.)

Thirty homeowners (1.2 per cent of customers) were engaged via a telephone survey. This phone survey was used to detect the range of outcomes experienced as a result of the RYH programme, the household-specific factors in that experience, and the presence of significant contributors other than RYH to assist in identifying attribution.

The survey was guided by the literature review and included open-ended questions to give participants the opportunity to express any outcomes experienced as the result of the programme. Participants were selected in a structured sample taken from the 2012-2013 client list, including all clients who had insulation or clean heating installed. Selections were made from suburbs across a range of Deprivation Index scores,<sup>8</sup> to capture the experience of households with different incomes, including low incomes. The methodology was based on asking one person in each household who was able to speak on behalf of the rest of the household. Participants' children were not asked because it was assumed that they would not be able to articulate the longer term outcomes of the programme for themselves.

The result of customer engagement demonstrated three sub-categories among respondents, including owner occupiers, landlords and tenants. Better understanding of outcomes for these sub-groups of stakeholders also enabled the project team to decide on inclusion of other stakeholders, where their outcomes were related to those of their customers. For example, health care providers would be considered relevant stakeholders at this stage if stakeholders stated there was an improvement in health as the result of the RYH programme. Customers were also asked to provide information on whether the programme had an effect on any other groups, to make sure that all the intended stakeholders had been identified.

<sup>8</sup>Sources used for the Deprivation Index, which uses nine variables from the 2006 Census to calculate eight dimensions of deprivation (<http://www.health.govt.nz/publication/nzdep2006-index-deprivation>) were: Auckland DHB <http://www.aucklandcf.org.nz/file/MacroAuckland-maps-and-appendix-tables/auckland-dhb-deprivation-index-ministry-of-health-.pdf>; Counties Manukau DHB <http://www.aucklandcf.org.nz/file/MacroAuckland-maps-and-appendix-tables/counties-manukau-dhb-deprivation-index-ministry-of-health-.pdf>; Waitemata DHB <http://www.aucklandcf.org.nz/file/MacroAuckland-maps-and-appendix-tables/waitemata-dhb-deprivation-index-ministry-of-health-.pdf>

In addition, in-depth interviews were held with four households in their homes, to explore their experience in more detail. The households were chosen by profiling the results of the preliminary phone survey. The aim was to cover a range of relevant outcomes for customers and other indirectly-affected stakeholders. These in-depth discussions also provided an indication of some outcomes that are specific to sub-groups including higher productivity for householders who are involved in paid employment from home, and householders who are employees in general, and increased educational achievement for householders who are students.

### **4.3.2 Suppliers**

Twenty-two suppliers were contracted to the RYH programme to promote the scheme to the market in the year ended June 2013. Suppliers assist clients in making applications to the fund and complete retrofit installations if the applications are successful. Suppliers were sent a survey that asked them to consider their investment in RYH, for example through marketing the availability of financial assistance to potential customers, as well as the impact participating in the scheme had on their business. The survey was guided by the findings of Covec (2011) on the industry and labour impacts of the Warm Up NZ programme. Of 22 suppliers, nine provided responses. These responses were partial and inconsistently evidenced, thus preventing conclusions on a number of outcomes.

Suppliers were also engaged at a workshop session. They were asked to consider their responses to the survey and discuss questions that included: what benefits has RYH had for the industry; what pressures or costs has RYH put on the industry; and how would we know (evidence or measures). Notes from the workshop were collected and helped to inform decisions on materiality.

## **4.4 Data collection**

The next step in the SROI process is to conduct primary and secondary research in the form of direct and indirect data collection in relation to stakeholder outcomes. This information tests the Theory of Change and is used to estimate the magnitude of change and the value for each outcome.

The primary research was undertaken with customers of retrofitted homes, suppliers, council departments, and health care providers. This data collection was used alongside existing secondary sources of research for developing indicators and potential proxies, deadweight, attribution, displacement and drop off.

The data was collected through a survey of a representative sample (25%) of RYH stakeholders. As one of the key outcomes for Auckland residents, engagement on local air quality improvement was conducted through interviews with air quality experts as well as secondary research. The data for central government outcomes was collected through the customer survey and secondary data.

The data collection for key stakeholder groups is described in the sections that follow.

### **4.4.1 Customers**

The data collection for customers was in the form of a survey conducted by a market research company, Gravitas Research and Strategy Ltd. The survey was guided by the literature review and included open-

ended questions to give customers the opportunity to describe any outcomes they experienced as a result of the programme.

The market research used a telephone-enhanced mail out and online survey hybrid method. The survey was sent to owners because they were the only group of customers (including owner occupiers and landlords) with contact details available in the RYH database. The owners were asked to state if they were the occupier, or if they rented the property out in the evaluation period. There were a total of 634 responses to the questionnaire (25% of customers). Of the total responses, 570 (89%) were owner occupiers, 56 (8%) were landlords and 8 (1%) were tenants. Since the number of responses by tenants was not representative, and the changes they experienced would likely be similar to owner occupiers, the owner occupiers have been considered as the primary set of 'occupiers' in terms of this SROI process.

The customer survey is described in detail in Appendix B-2 and the questionnaire can be seen in Appendix B-3.

#### **4.4.2 Suppliers**

Three face-to-face interviews with suppliers of insulation and heat pumps were held to collect information on suppliers' outcomes and the outcomes for their employees. Because the number of additional employees identified through our survey was different from those described in Covec (2011), another mail out survey was conducted to explore this issue further. However, just four of the 14 existing suppliers<sup>9</sup> answered this questionnaire.<sup>10</sup>

The result of this two-step data collection process showed that the outcomes for suppliers and their employees have high attribution to the EECA subsidy, and that most of the employees were displaced from other parts of the economy or industry.

#### **4.4.3 Auckland Council**

To identify the magnitude of any reputational changes for the council and its Environmental Services Unit (ESU) as the result of RYH, interviews were held with the ESU's Catchment Management and Incentives Manager, and the RYH programme managers to identify the most appropriate duration for this outcome, and proxy and impact factors such as deadweight, attribution, displacement and drop off.

A summary of the data collection process is outlined in Table 6 below.

<sup>9</sup>Suppliers that used to work with the RYH programme are not included in this list.

<sup>10</sup>See appendix B-1 for detail on interviews scripts and follow up email survey.

**Table 6: Summary of data collection process**

| <b>Stakeholder Group</b>  | <b>Number of stakeholders</b> | <b>Method of engagement</b>   | <b>Number of responses/ interviews/ sources</b>        |
|---|-------------------------------|---|--|
| <b>Customers (including owner occupiers, landlords and tenants)</b> | 2493                          | Representative sample survey<br>telephone-enhanced mail out/online hybrid method  | 634  |
| <b>Employees - of RYH suppliers</b>                                 | 21 (suppliers)                | Interviews with suppliers   | 3  |
|   |                               | Mail out survey to suppliers  | 4  |
| <b>Auckland Council</b>   | 1                             | Face-to-face interviews with experts in ESU regarding changes in customer perception of the council including: Catchment Management and Incentives Manager; Strategic Opportunities Advisor; and the Senior Strategic Adviser | 3  |
|   |                               | Correspondence with the Solid Waste Unit regarding inorganic collection service and changes in public perception of the council   | 1  |
| <b>Health care providers (DHBs, MoH, GPs)</b>                       | 1                             | Secondary data was reviewed -see literature review summary in Table 4 for sources of health related outcomes information  | 5  |
|   |                               | Desktop research  | Several sources in DHB and Ministry of Health websites |
|   |                               | Correspondence with Ministry of Health  | Several times  |
| <b>Auckland residents</b>   | 1                             | Interviews with Auckland Council air quality experts in RIMU and CLAW units   | 3  |
|   |                               | Correspondence with Auckland Council Strategic Advice team  | 1  |
|   |                               | Secondary data – see literature review summary in Table 4 for sources of environment-related outcomes information   | Several sources  |

## 4.5 Materiality

Materiality of outcomes was checked using a process that looked at the relevance and significance of each stakeholder and outcome. The materiality check was an ongoing process and followed steps recommended by the SROI Network<sup>11</sup>:

- Determine outcomes and assess relevance
- Highlight outcomes not considered relevant
- If this means that there are stakeholders with no outcomes, highlight these stakeholders
- Determine the quantity of change for remaining outcomes and consider their significance
- Determine the value of change and consider significance
- Determine the impact and consider significance
- Draw together considerations to conclude on the significance of the outcome for stakeholders
- Consider outcomes for all stakeholders
- Finalise decisions on the significance of outcomes arising from the activity
- Highlight those outcomes no longer considered significant
- Summarise decisions on relevance and significance

An outcome or stakeholder is considered material if its exclusion from the analysis would significantly change the conclusions we would draw about the effectiveness of the programme being evaluated.

The use of these steps is reported below across two phases of the materiality test, with the relevance of outcomes discussed in the first phase, followed by significance in the second phase.

### 4.5.1 Materiality test- relevance

As described in Section 4.3, the potential stakeholders and their intended outcomes were determined using the literature review and expert judgments. The relevance of each stakeholder and the outcomes ascribed to each of the identified stakeholders was checked during the stakeholder engagement process. The stakeholders and outcomes considered relevant were selected based on the following aspects and because it was expected that RYH could deliver on them.

- A policy requires the outcome (e.g. local air quality improvement based on Auckland Plan targets)
- A stakeholder needs the outcome (e.g. health improvement for RYH customers)
- A social need for the outcome (e.g. improved customer satisfaction with their home situation)
- There is a financial impact (e.g. a financial saving as the result of a reduction in electricity consumption for RYH customers)

As the result of stakeholder engagement, the materiality of outcomes was sorted into the following three categories:

- **Yes (Include):** These are the stakeholders and/or outcomes that passed the relevance check and are considered more likely to be significant.
- **Yes/No (Maybe include):** These are the stakeholders and/or outcomes that are slightly relevant and the project team postponed the decision on their materiality until more information on their significance could be obtained through data collection. This helped avoid removing a potentially material stakeholder at this stage for the wrong reasons.

<sup>11</sup>Adapted from The SROI Network 2014, p.6



- **No (Exclude):** These are those stakeholders and/or outcomes that failed the materiality check, due to lack of relevance, and the project team could confirm their exclusion at this stage.

Table 7 summarises the results of the materiality test for stakeholders and outcomes, with each of the defined materiality categories shown by 'Yes', 'Yes/No' and 'No' in the materiality column. The change in the market value of landlords' properties was considered an immaterial outcome. A number of stakeholders were also recognised as immaterial as a consequence of this process, including EECA, suppliers, the wider economy (indirect and induced employment), the schools of RYH householders, the employers of RYH householders, neighbours of RYH homes with clean heating, RYH clients who also had a home sustainability assessment.

**Table 7: Summary of materiality test – relevance**

| Stakeholder group      | Stakeholder sub-group   | Outcome  | Materiality  | Reason for materiality / lack of materiality   |
|------------------------|---|--|--|--|
| Customers              | Homeowners who are RYH clients (intended to retrofit anyway)        | Decreased cost of finance  | Yes/No   | This group of customers was identified through stakeholder engagement by suppliers reporting that "significant numbers" of customers would have installed insulation and/or heat pumps anyway in the absence of the RYH programme. These customers experienced the same changes as other customers but with 0 per cent attribution to the RYH programme. Their outcome is relevant to their need and would only be material if the data collection shows significant change as a result of having selected the RYH finance over other finance options. |
|                        | Homeowners-occupiers of RYH homes                                   | Increased feeling of satisfaction with living situation                | Yes/No   | Customers report changes in satisfaction with their home environment following retrofit. Satisfaction with one's living situation is a social norm. More information is needed to evidence the significance of the change.   |
|                        |   | Financial saving as a result of physical health improvement            | Yes/No   | Customers outlined improvement in health following the retrofit for householders who suffer from illnesses related to cold and damp housing. More information is needed to evidence the significance of the change.  |
|                        |   | Increased quality of life and life expectancy                          | Yes/No   | Customers outlined improved health following the retrofit for householders who suffer from illnesses related to cold and damp housing. More information is needed to evidence the significance of the change.  |
|                        |   | Improved relationships within the family                               | Yes/No   | Customers said that they had more time to spend with family and felt more relaxed in the evening. More information is needed to evidence the significance of the change.   |
|                        |   | Improved relationships with relatives and friends                      | Yes/No   | Customers outlined during stakeholder engagement that they are more confident about having their loved ones (e.g. grandchildren) and friends in their home due to better conditions in the house. However, more information is needed to evidence the significance of this change.   |
|                        |   | Financial savings from decreased metered energy consumption            | Yes/No   | Cost savings is one of the key outcomes promoted by the programme, but more information is needed to decide on the significance of metered energy saving and its impact.   |
|                        |   | Financial savings from decreased non-metered energy consumption        | Yes/No   | Energy cost savings is one of the key outcomes promoted by the programme, but more information is needed to decide on the significance of non-metered energy saving and its impact.  |
|                        |   | Financial saving in maintenance and cleaning costs                     | Yes/No   | Reported by customers as a relevant outcome but more information is needed about the significant of the change to make the materiality decision.   |
|                        |   | Time saved in maintenance and cleaning                                 | Yes/No   | Reported by customers as a relevant outcome but the materiality decision requires more information to evidence the significance of the change.   |
|                        | Occupiers of RYH homes who are students                             | Increased educational achievement                                      | Yes/No   | Reported by customers as a relevant outcome, as students' general health is improved as the result of RYH and they are able to study better in an improved home environment. But the materiality decision requires more information to evidence the significance of the change.  |
|                        | Occupiers of RYH homes who are in paid employment working from home | Financial savings from working more often from home                    | Yes/No   | Reported by customers as a relevant outcome but additional information on the significance of the change is needed in order to make a decision about materiality.  |
|                        | Occupiers of RYH homes who are in paid employment                   | Decreased income loss  | Yes/No   | Reported by customers as a relevant outcome but additional information on the significance of the change is needed in order to make a decision about materiality.  |
|                        | Landlords   | Change in house market value   | No   | In Auckland there are very strong drivers on price related to a shortage of supply and location that make a \$5000 home improvement negligible in purchasing negotiations.   |
| Increased rental yield |   | Yes/No   | It is one of the essential reasons for landlords to improve the quality of their rented house and stakeholders indicated that it was significant, but the materiality decision needs more information. |  |
| Auckland residents     |   | Improved local air quality (PM <sub>10</sub> reduction)                | Yes/No   | Reducing air pollution is one of the key desired outcomes of the RYH programme and Auckland residents are considered as the stakeholders who get the benefit of local air quality improvement. It was determined that the materiality in relation to improved air quality would be checked again after data collection.  |
| Natural environment    | Environment general   | Reduction of CO <sub>2</sub> emissions                                 | Yes/No   | The reduction of electricity consumption is one of the desired outcomes that would impact the CO <sub>2</sub> emissions produced by electricity generators. More information is needed to make a decision about the materiality of this outcome.   |
| Auckland council       | Organisation  | Improved reputation  | Yes/No   | Auckland Council is the organisation that provides the finance option for customers as a non-legislative service to improve the quality of housing and air quality in Auckland. Customer satisfaction has been widely reported to the Environmental Services Unit (ESU) as the result of the RYH programme but further research is required to validate the extent of the change and its materiality.  |
|                        | Environmental Services Unit (ESU)                                   | Improved reputation  | Yes/No   | Auckland Council is the organisation that provides the finance option for customers as a non- legislative service to improve the quality of housing and air quality in Auckland. Customer satisfaction has been widely reported to the Environmental Services Unit (ESU) as the result of the RYH programme but further research is required to validate the extent of the change and its materiality.   |
| Employees              | Employees of suppliers (including admin)                            | Increased income   | Yes/No   | Although suppliers reported changes in employment hours, the materiality of this outcome was determined to require further validation by considering deadweight, attribution of EECA and displacement.   |
|                        |   | More satisfied with work status  | Yes/No   | Although suppliers reported changes in employment hours, the materiality of this outcome was determined to require further validation by considering deadweight, attribution of EECA and displacement.   |
| Government             | IRD   | Reduction in cost of unemployment benefits and increase in tax revenue | Yes/No   | Although this outcome is indirectly relevant to policies, materiality depends on the significance of additional employment (from unemployment status to employment). It was determined that materiality would be considered again after the data collection.   |
|                        | Ministry of Health  | Reduction in cost of health services                                   | Yes/No   | The materiality of this outcome depends on the changes related to health outcomes experienced by customers. Therefore the materiality of this outcome will be determined following the data collection.  |

| Stakeholder group  | Stakeholder sub-group   | Outcome  | Materiality | Reason for materiality / lack of materiality  |
|--|---|--|-------------|---|
| <b>Immaterial stakeholders</b>                             |   |  |             |   |
| Government   | EECA  | Efficiency objectives<br>Progress towards air quality energy   | No          | The EECA subsidy aims to improve air quality and energy efficiency, which has a very high overlap with outcomes for the natural environment and electricity savings for occupiers.  |
| Suppliers  |   | Improved financial turnover  | No          | Suppliers could not distinguish between the outcomes of the EECA subsidy and the RYH programme. Suppliers mainly attributed the changes they experienced to the EECA subsidy.   |
|  |   | Lower recruitment and management costs due to reduced seasonal variation in employment resulting from increased trade and availability of finance. | No          | Suppliers could not distinguish between the outcomes of the EECA subsidy and the RYH programme. Suppliers mainly attributed the changes they experienced to the EECA subsidy.   |
| Wider economy  | Indirect employees  | Increased income   | No          | The programme's impact on indirect employment is not material because of the scale of the programme.  |
|  |   | More satisfied with work status  | No          | It is not material because of the scale of the programme.   |
|  | Induced employees (employment effects associated with the increased expenditure of these workers) | Increased income   | No          | It is not material because of the scale of the programme.   |
|  |   | More satisfied with work status  | No          | It is not material because of the scale of the programme.   |
| School of RYH householders                                 |   | Higher classroom performance   | No          | Classroom performance is dependent on a range of factors (e.g. number of children in the class, high needs children, resourcing, and the abilities of the teacher). Therefore it is not possible to specify the impact of a more attentive student on classroom performance as a whole.                           |
| Employer of RYH householders                               |   | Increased financial turnover   | No          | Business turnover is dependent on a range of factors (e.g. employee's position, type of business, economic situation). Therefore it is not possible to specify the impact of a more attentive employee on employers' turnover / business results.   |
| Neighbours to RYH homes with clean heating                 |   | Improved neighbourhood amenity and health  | No          | Outcomes for this stakeholder group overlap with the natural environment outcome. While the benefits may be higher for immediate neighbours, variability in dispersion patterns of smoke etc. means that it is not possible to identify a significant difference for neighbours compared to the regional average. |
| RYH clients whom also had a home sustainability assessment |   |  | No          | Out of scope. Home assessment is no longer part of the RYH programme.   |

## 4.5.2 Materiality test- significance

The results of the data collection enabled the project team to decide on the significance of stakeholders and/or outcomes that were recognised as relevant after stakeholder engagement, but could not be fully evidenced at that time. An outcome would be deemed immaterial as the result of data collection if it met one of these three criteria:

- The data collected for an indicator presented a low number of stakeholders who experienced the change, or the magnitude of change was not significant enough to be monetised. e.g. landlords
- The outcomes are given low value as monetary proxies for change in comparison to other proxies and/or outcomes. e.g. financial saving as the result of health improvement for customers
- The impact calculation considering deadweight, attribution, and displacement resulted in materiality failure for the outcome, or the result of the calculated impact showed a low value (less than one per cent of total value) for the outcome compared to other outcomes for the same stakeholder group or other stakeholders. E.g. 100 per cent displacement of suppliers' additional employees and decreased cost of finance for homeowners who intended to retrofit anyway.

Table 8 outlines the final result based on the materiality test for stakeholders and outcomes based on the data collection results.

The general environment, landlords, Auckland Council, employees of suppliers, Ministry of Health and IRD / WINZ were recognised as immaterial stakeholders. Immaterial outcomes for customers were financial savings as a result of physical health improvement; improved relationships with relatives and friends; financial savings from decreased non-metered energy consumption; financial savings on maintenance and cleaning costs; decreased cost of finance for those customers who intended to retrofit anyway; and decreased income loss for customers who are in paid employment.

Table 8: Summary of materiality test- significance

| Stakeholder group and sub-group  | Outcome   | Materiality | Reason for materiality / lack of materiality  |
|--|---|-------------|---|
| <b>Material stakeholders, Material outcomes</b>                            |   |             |   |
| <b>Customers</b>   |   |             |   |
| <b>Homeowners-occupiers of RYH homes</b>                                   | Increased feeling of satisfaction with living situation         | Yes         | Customers reported significant changes in satisfaction with their living situation.   |
|  | Increased quality of life and life expectancy                   | Yes         | Customers reported significant changes in health following retrofit.  |
|  | Improved relationships within the family                        | Yes         | Customers said that they had more time and felt more relaxed in the evening to spend time with family and the data collection validated the outcome's significance.   |
|  | Financial savings from decreased metered energy consumption     | Yes         | Electricity cost savings was validated by the data collection results.  |
|  | Time saved in maintenance and cleaning                          | Yes         | Reported by customers as a relevant outcome and its significance was confirmed by the data collected.   |
| <b>Occupiers of RYH homes who are students</b>                             | Improved school results   | Yes         | Reported by customers as a relevant outcome and its significance was confirmed by the data collected.   |
| <b>Occupiers of RYH homes who are in paid employment working from home</b> | Financial savings from working more often from home             | Yes         | Reported by customers as a relevant outcome and its significance was confirmed by the data collected.   |
| <b>Auckland residents</b>  |   |             |   |
| <b>Auckland residents</b>  | Improved local air quality (PM10 reduction)                     | Yes         | Reducing air pollution is one of the key desired outcomes of the RYH programme. Data collected shows a significant decrease in PM <sub>10</sub> level and improvement in local air quality.   |
| <b>Material stakeholders, immaterial outcomes</b>                          |   |             |   |
| <b>Customers</b>   |   |             |   |
| <b>Homeowners-occupiers of RYH homes</b>                                   | Financial saving as a result of physical health improvement     | No          | Customers reported relevant changes in health following retrofit but the data shows low financial saving as the result of this health improvement.  |
|  | Improved relationships with relatives and friends               | No          | Customers outlined during stakeholder engagement that they are more confident about having their loved ones (e.g. grandchildren) and friends in their home due to better conditions in the house. However, the result of data collection shows that most of the customers have not experienced any significant change.  |
|  | Financial savings from decreased non-metered energy consumption | No          | Savings in the cost of non-metered energy is one of the outcomes nominated by stakeholders, but there is a very high deadweight on non-metered energy, as data shows most of these sources are accessible for free / low cost.  |
|  | Financial saving in maintenance and cleaning costs              | No          | Reported by customers as a relevant outcome but collected data does not show significant change in the amount stakeholders actually spent in cleaning and maintenance before and after RYH.   |
| <b>Homeowners that are RYH clients (intended to retrofit anyway)</b>       | Decreased cost of finance                                       | No          | The result of data collection shows that a significant number of customers (33%) would have installed insulation and/or a heat pump anyway and that 72 per cent of them were interested in the RYH programme because of the lower cost of borrowing. Although the cost of a commercial loan is twice as much compared to the cost of the RYH financial assistance, the final impact is not significant compared to other outcomes (less than 1 per cent of total impact). |
| <b>Occupiers of RYH homes who are in paid employment</b>                   | Decreased income loss   | No          | Reported by customers as a relevant outcome but the data did not show significant change in levels of unpaid leave.   |

| Stakeholder group and sub-group                 | Outcome  | Materiality | Reason for materiality / lack of materiality  |
|---|--|-------------|---|
| <b>Landlords</b>                                | Increased rental yield   | No          | It is one of the essential reasons for landlords to improve the quality of their rented house, but the survey results showed that the rate of improvement is not significant. Just 12 per cent of landlords responded to the rent question and specified an additional \$10 rent per month. Even if it was significant, it would be a trade off because the additional rent would highly likely be on-charged to tenants. |
| <b>Immaterial Stakeholders</b>                  |  |             |   |
| <b>Environment general</b>                      | Reduction of CO <sub>2</sub> emission                                  | No          | The reduction of electricity consumption (as indicated by the survey) is not significant enough to reduce the level of CO <sub>2</sub> because the primary source of Auckland's electricity supply comes from low-emissions sources e.g. hydroelectric and geothermal power.  |
| <b>Auckland Council</b>                         |  |             |   |
| <b>Organisation</b>                             | Improved reputation  | No          | Customer satisfaction has been widely reported to the Environmental Services Unit (ESU) as the result of RYH programme, but the RYH SROI customer survey results do not show significant change for a large number of customers.  |
| <b>Environmental Services Unit (ESU)</b>        | Improved reputation  | No          | The additional staff and project awards have a 100 per cent displacement from other part(s) of the council.   |
| <b>Employees</b>                                |  |             |   |
| <b>Employees of suppliers (including admin)</b> | Increased income   | No          | Not significant because of high attribution of the outcome to EECA and displacement.  |
|   | More satisfied with work status  | No          | Not significant because of high attribution of the outcome to EECA and displacement.  |
| <b>Government</b>                               |  |             |   |
| <b>Ministry of Health</b>                       | Reduction in cost of health services                                   | No          | The outcome has not been shown to be significant as the result of data collection.  |
| <b>IRD / WINZ</b>                               | Reduction in cost of unemployment benefits and increase in tax revenue | No          | High deadweight and displacement of additional employees made this outcome immaterial.  |

## 5.0 Mapping outcomes - the Theory of Change

This section describes the process and results of the core task in the SROI process, the identification of outcomes or changes experienced by stakeholders as the result of the RYH programme. It begins by describing the inputs in relation to each stakeholder in the RYH programme, as well as the corresponding outputs. Then an overview of the outcome mapping process is explained, followed by presentation of the theory of change.

### 5.1 Identifying inputs and outputs

This section explains the inputs and outputs of the programme and the values subscribed. Inputs represent the investment or financial value of inputs.

One input is the financial assistance and interest payback by customers of the RYH programme.

The financial assistance is paid back by customers over a 9 year period following the

installation of a heat pump and/or insulation. The financial assistance is at a 7 per cent interest rate with quarterly payments made across each year. Although the interest rate is floating and is subject to change each financial year based on changes in the council's average long-term borrowing rate, the assumption in the scope of the evaluation is a fixed interest rate. Table 10 shows the payback amount of the financial assistance and the present value of its interest.

The net operational cost of operating RYH is the council's input. The administration or operational cost of running the programme is the labour and overhead costs that the council incurred to develop the programme in the 2012/2013 financial year. It includes staff time to develop and manage the programme, costs associated with the promotion of the programme and a portion of the council's overhead costs for supporting resources e.g. computers, desks and internet. The net operational cost is the total operational cost net of the total operational revenue (user charge 0.8%) included in the financial assistance interest rate (see Table 9).

The RYH programme requires certain resources or 'inputs' to deliver the activities (measured as 'outputs'). Together these inputs and outputs will result in outcomes for stakeholders. The relationship between the inputs, outputs and outcomes is called a "theory of change" or logic model.

**Table 9: Programme inputs and their values (2012/2013)**

| Stakeholders            | Input                               | Value       | Description  |
|-------------------------|-------------------------------------|-------------|--|
| <b>Customers</b>        | Amount of financial assistance      | \$6,000,000 | Total amount that was allocated as financial support in the 2012/2013 financial year.  |
|                         | Present value of interest repayment | \$1,898,464 | Aggregated present value of interest repayment by customers.   |
| <b>Auckland Council</b> | Net operational costs               | 140,095     | <p>Net operational cost is the total operational cost net of the total operational revenue (user charge 0.8%) that is included in the financial assistance interest rate.</p> <p>It includes the labour and overhead costs that council incurred to develop the programme in the year ended June 2013. The cost includes staff time to develop and manage the programme, costs associated with the promotion of the programme and a portion of the council's overhead costs that enable the programme to function.</p> |

Outputs are a quantitative summary of an activity. The RYH outputs include the number of households that had a heat pump and/or insulation installed between 1 July 2012 and 30 June 2013. According to the RYH programme directive, customers could apply for an 'insulation only' option, but a 'heat pump only' option was available only for properties that already had appropriate insulation. The 'heat pump only' customers are those who had either installed insulation using the RYH fund in the year prior to 2012-2013, or those whose home was already insulated. Table 10 describes the outputs of the programme.

**Table 10: Outputs of the RYH programme (2012/2013)**

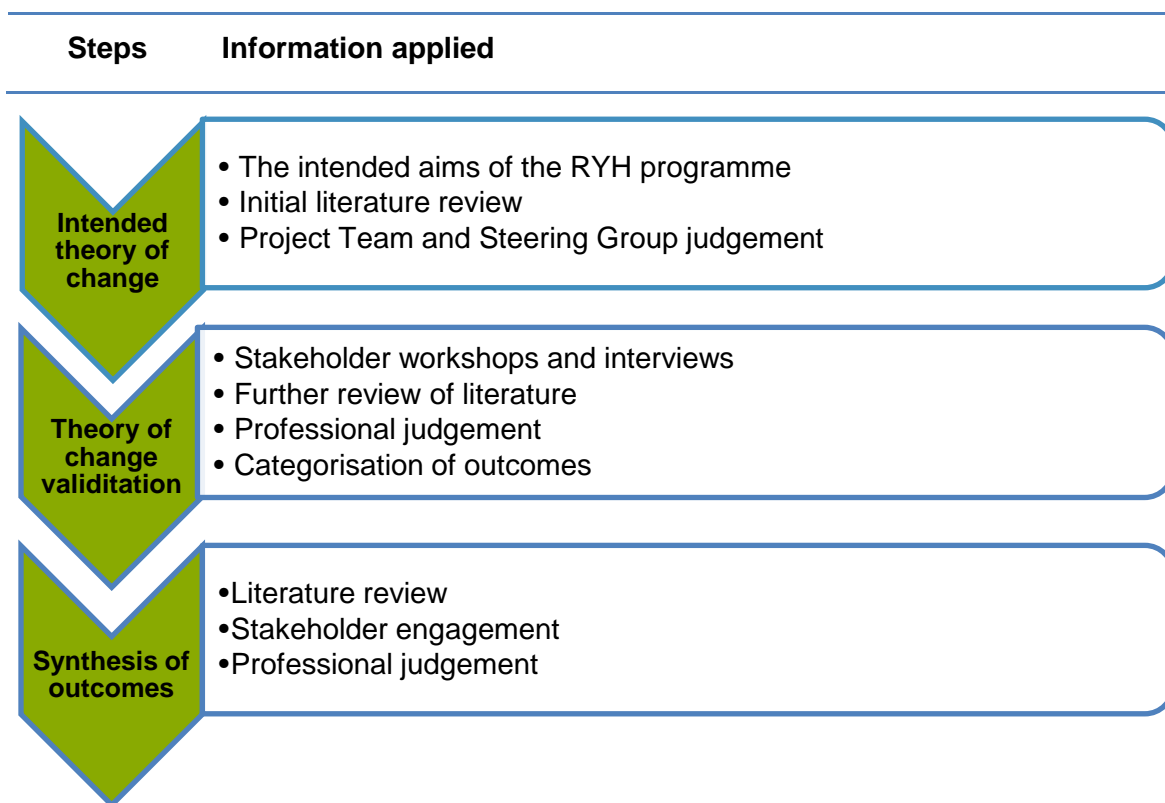
| Outputs  | Value | Description   |
|--|-------|---|
| <b>Number of heat pump only customers</b>                | 1,667 | Customers who only installed a heat pump in the period July 2012-June 2013.                                   |
| <b>Number of insulation only customers</b>               | 206   | Customers who only installed insulation in the period July 2012-June 2013.                                    |
| <b>Number of both heat pump and insulation customers</b> | 620   | Customers who installed both a heat pump and insulation in the period July 2012-June 2013.                    |
| <b>Total customers</b>                                   | 2,493 | Aggregated number of customers who installed a heat pump and/or insulation in the period July 2012-June 2013. |



## 5.2 Process overview of mapping outcomes

The outcomes for the key stakeholders were identified in three steps as outlined in Figure 2.

**Figure 2: Theory of Change development process**



The intended Theory of Change was initially determined by the SROI project team. It was based on the intended outcomes of the RYH programme and informed by the Steering Group and the literature review. The intended Theory of Change considered the impacts of insulation and clean heat installation across a range of stakeholders and outcome areas.

The stakeholder engagement process allowed for validation of the theory of change. At this stage, the changes that stakeholders described were confirmed through dedicated stakeholder engagement and research. Those changes experienced were then categorised by the project team, and confirmed through Steering Group workshops and by consulting the literature review findings.

Outcomes were grouped into general categories:

- Social outcomes including health and wellbeing– e.g. improved health and satisfaction with home situation
- Economic outcomes (financial wellbeing) – e.g. improved financial wellbeing and improved productivity
- Environmental outcomes – e.g. improved local air quality

The last step in the development of the Theory of Change was understanding and articulating the relationships between outcomes. In other words, involvement in the RYH programme may bring a range of changes to various stakeholders, which when taken together, create a set of outcomes for each stakeholder group. However, these relationships between outcomes had to be clarified and narrowed down. The decision on levels of outcomes was shaped by the following considerations:

- applicability to the entire stakeholder group rather than a specific subset of it
- avoiding overlap and double counting the outcomes where they are closely related
- providing a strong evidence base from stakeholder engagement and the literature review
- materiality checking to ensure the most material changes observed within each outcome category are incorporated

The first two levels of outcomes described in the outcome map include 'primary' and 'intermediate' outcomes, which are essentially a chain of changes occurring to the stakeholder that leads to a broader outcome. There is often overlap between primary and intermediate outcomes. Therefore, a third level referred to as 'outcome' was used for the purposes of valuation and quantifying the outcome for stakeholders to avoid double counting of overlapped outcomes. The 'general outcome' refers to high level outcomes linked to the outcomes categories i.e. social, economic and environmental.

The Theory of Change for material stakeholders and outcomes is shown in Table 11.

Table 11: Theory of Change for material stakeholders and outcomes

| Stakeholder group  | Activity/Input   | methods of engagement  | Stakeholder sub group   | Output  | Primary outcome  | Intermediate Outcome(s)   | Outcome   | General outcome              | Description of outcome   |
|--------------------|--|--|---|---|--|---|---|------------------------------|--|
| Customers          | Receiving financial assistance for:<br>-Insulation<br>-Heat pump<br>-Both insulation and heat pump | Telephone survey(s):<br>1- prelim phone survey (30 people)<br>2-In depth case study interviews (4 people)<br>3-Representative sample survey (570 people) | Homeowners-occupiers of RYH homes   | Number of heat pumps and/or insulation installed      | Warmer home during cold periods and less dampness and humidity   | <ul style="list-style-type: none"> <li>• Feeling more comfortable at home</li> <li>• Feeling happier at home</li> <li>• Feeling healthier and more energetic and getting more done around home</li> </ul> | Increased feeling of satisfaction with living situation   | Social wellbeing             | Changes in the warmth and overall condition of the home are expected to result in improved householder satisfaction with their living situation. Improved life satisfaction in the home will lead to an increase in life satisfaction/ improved quality of life. |
|                    |  |  |   |   |  | <ul style="list-style-type: none"> <li>• Decreased severity of illnesses related to cold and damp housing</li> <li>• Increased life expectancy for those who suffer from illness</li> </ul>               | Improved quality of life and life expectancy  | Health improvement           | Increased life expectancy and decreased severity of illness for RYH customers who suffer from an illness (cold and flu, respiratory illness, asthma, circulatory illness, joint pain or arthritis and others) related to living in a cold damp home.             |
|                    |  |  |   |   |  | <ul style="list-style-type: none"> <li>• A more pleasant environment to stay in</li> <li>• Increased family interaction</li> </ul>  | Improved relationships within the family  | Social wellbeing             | In a warmer and drier home families do more at home and are able to gather together in the evening and improve family relationships.   |
|                    |  |  |   |   |  | Decreased usage of electric heaters including electric plug-ins and heat pump   | Financial savings from decreased metered energy consumption   | Financial wellbeing          | Saving in metered energy relates to householders that replaced their heating system with a heat pump and / or installed insulation.  |
|                    |  |  | <ul style="list-style-type: none"> <li>• Reduction of mould</li> <li>• Reduction of smoke and soot</li> </ul> | Reduction of damage/loss to property                  | Time saved in maintenance and cleaning   | Social wellbeing  | Less time spent in cleaning and maintenance due to soot, mould, condensation or related damage in the year after RYH compared to the year before RYH. |                              |  |
|                    |  |  | Occupiers of RYH homes whom are students  | Number of heat pumps and/or insulation installed      | Warmer home during cold periods and less dampness and humidity   | <ul style="list-style-type: none"> <li>• Increased school attendance as the result of health improvements</li> <li>• Increased the amount of study that student(s) are able to do at home</li> </ul>      | Increased educational achievement   | Social wellbeing             | Students able to study more effectively at home and attend school more than before retrofit as the result of warmer and drier homes and health improvements. Therefore they are able to achieve better results at school.  |
|                    |  |  | Occupiers of RYH homes whom are in paid employment working from home  | Number of heat pumps and/or insulation installed      | Warmer home during cold periods and less dampness and humidity   | <ul style="list-style-type: none"> <li>• Health improvements</li> <li>• Increased ability to get more work done in a more pleasant home environment</li> </ul>  | Financial saving from working more often from home  | Financial wellbeing          | For householders who do paid work from home, working in a warmer and drier home enables them to work more efficiently from home on a more regular basis, and allows them to avoid travelling to another work place.  |
| Auckland residents |  | Interview with air quality experts and secondary research  | Auckland residents  | Number of solid fuel burners replaced with heat pumps | <ul style="list-style-type: none"> <li>• Decreased number of solid fuel heaters in Auckland</li> </ul> | <ul style="list-style-type: none"> <li>• Reduction in heating fuel consumption</li> <li>• Reduction in pollution (soot and smoke)</li> </ul>  | Improved local air quality (PM <sub>10</sub> reduction)   | Improved natural environment | Reduction in air pollution in Auckland from the replacement of solid fuel burners improves the health of Auckland residents.   |

## 6.0 Evidencing outcomes and giving them a value

The next stage of SROI is to seek evidence to demonstrate whether outcomes have happened, and to establish a value for each outcome. This is a four step process which includes developing outcome indicators, collecting and analysing outcomes data, identifying the duration of each outcome and then establishing a value for the outcomes.

This section presents each outcome indicator in terms of the changes experienced, and explains in detail the valuation approach for each. Information regarding outcome duration is discussed in Section 7.

### 6.1 Outcome indicators - an overview

Indicators are a means of demonstrating change for a stakeholder. These outcome indicators were chosen to describe the outcome from the perspective of stakeholders, often in their own words.

A combination of objective and subjective indicators was used to determine whether the outcome occurred and to measure the extent of change. Objective indicators are generally statistics that represent facts that are independent of personal evaluations. Subjective indicators are a measure of individual stakeholder perceptions and evaluations of their conditions.

In an effort to express stakeholder outcomes in terms that are measurable, most outcome indicators for customers were defined as the number of customers who experienced the mean level of change, which has been calculated using a weighted attributes system that aggregated the responses to the customer survey.

The magnitude of change for each household was calculated by considering the mean level of change and the number of people who experienced the change in the household. For some outcomes, there were multiple people in a household who experienced a particular change e.g. 'Improved quality of life and life expectancy'. In these cases, outcome multipliers were applied to take into account the average number of people in the household who experienced the change.

To attach monetary value to the measured outcomes, a combination of stated preference and revealed preference methods was used.

In stated preference methods, the individuals are asked directly what their willingness to pay is, for example via the contingent valuation method. In revealed preference methods, individuals indirectly reveal their willingness to pay for or accept environmental goods through market and surrogate market prices such as the hedonic pricing method (Rohani, 2012). The revealed preference technique was used when the value of a related market-traded good or service is used e.g. average wage as a proxy for time value. The stated preference method was used where it was possible to ask customers directly about possible outcomes e.g. change in electricity bills.

Where proxies were not available as an annual figure, a multiplier was applied to create an annualised value.

The rationale and full details for all outcomes calculations can be found in Appendix C.

## 6.2 Outcomes for occupiers of retrofitted homes

The occupiers of retrofitted homes experienced a range of social and economic changes, as presented in the Theory of Change (Table 11).

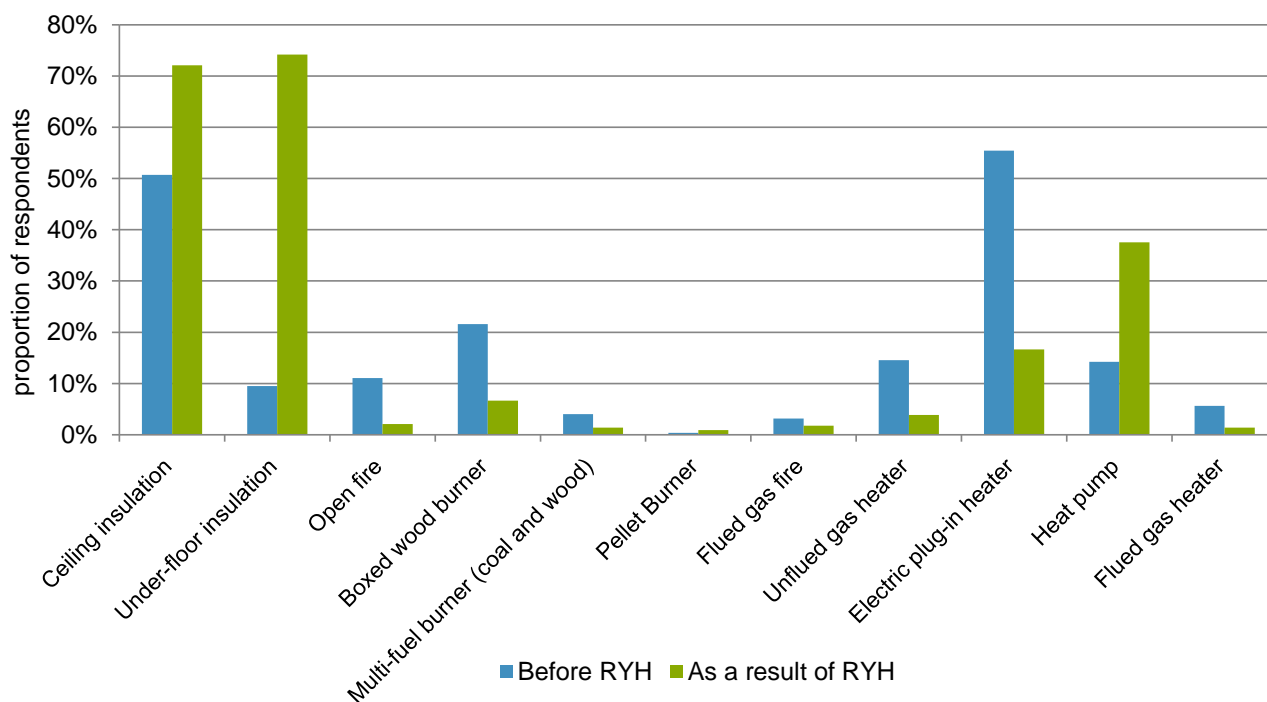
A key output of the RYH programme is a change in a household's use of heating-related products and insulation.

The customer survey data showed that the proportion of owner occupiers with ceiling and under floor insulation increased by 21 per cent and 65 per cent respectively due to RYH. This means that nearly 75 per cent of respondents now have both ceiling and under floor insulation.<sup>12</sup>

The survey also showed that 23 per cent of households installed a heat pump as the result of the RYH programme. This allowed households to remove or stop the use of more inefficient heating systems, mostly electric plug-in heaters (decreased by 39 %), and boxed wood burners (decreased by 15 %). Figure 3 shows the changes in products installed or removed by owner occupiers before and after RYH.

The rest of the section describes the process of measurement and valuation of the various outcomes for this group of stakeholders.

**Figure 3: Proportion of households that installed insulation and a heat pump(s) and removed or no longer use other types of heating**



<sup>12</sup> It should be noted that the survey questionnaire included other services provided by RYH that are not in the scope of this evaluation. The remaining 25 per cent of customers may have had retrofits other than insulation, or did not respond to this question.

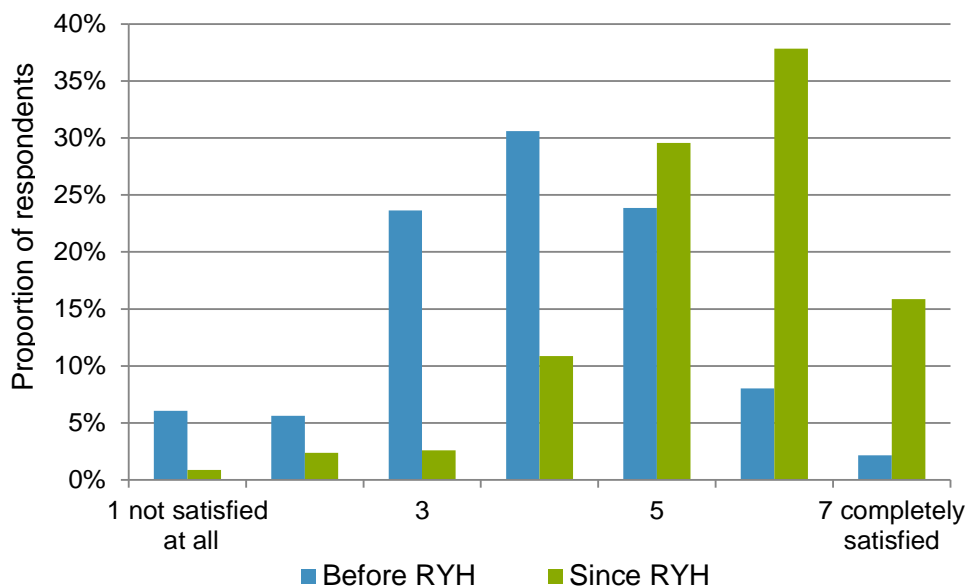
## 6.2.1 Increased feeling of satisfaction with home situation

The customer survey analysis showed that respondents generally feel more satisfied with their home situation after RYH, compared to before. This result is based on the 460 responses to the survey question that asked customers about their level of satisfaction with their home before and after RYH.

“Being warmer meant we were happier because we are a lot more comfortable.”

Figure 4 shows the change in respondents' level of satisfaction with their home situation before and after the retrofit. The x-axis shows the level of satisfaction where '1' is “not satisfied at all” and '7' is “completely satisfied”. There was a 30 per cent increase in the number of respondents reporting a satisfaction level of '6', and a 14 per cent increase in those reporting a satisfaction level '7' as a result of the RYH programme. It appears that there was a decrease in those who are unsatisfied, as well as an increase in the proportion overall who are now satisfied with their home situation.

**Figure 4: Change in level of satisfaction with home situation as the result of RYH**



### 6.2.1.1 The amount of change experienced

A weighting process was used to measure the mean magnitude of change for respondents who experienced either positive, negative or no change. The aim of the weighting system is to show the proportion of customers who experienced the mean level of change after retrofit.

Responses of 'completely satisfied' and 'not satisfied at all' were observed as '100' and '0' per cent respectively. The other five levels of satisfaction-rating between the maximum and minimum were converted to a proportion of 'completely satisfied' following a linear pattern (17%, 33%, 50%, 67% and 83%). For example, if there were two households both responding with satisfaction ratings of level '4', when calculated this became equivalent to one household with complete satisfaction. The proportion of customers who

experienced the mean level of satisfaction was calculated based on the weighting both before and after RYH. The difference between these proportions, comparing before and after RYH, was used to show the proportion of households that experienced the mean level of change as a result of RYH13. The resulting indicator for this outcome is 25 per cent, which is the proportion of households that experienced the mean level of change. The outcome multiple for this indicator is one, because the whole household experiences the change.

### 6.2.1.2 Valuation approach

The contingent valuation approach “Willingness to Accept” (WTA) was the method used to monetise stakeholders’ satisfaction with their home situation.

Although the contingent valuation method is the subject of considerable debate,<sup>14</sup> it is also a recognised and well-used method for obtaining values for social benefits.

It is well matched with SROI, as SROI is essentially a framework for capturing the value of public goods,<sup>15</sup> (Just Economics, 2011), and the contingent valuation method is able to capture intangible or non- use values (Segman, 1999a).

The RYH customers were asked to assign the amount of money they would accept to go back to their home situation prior to RYH. Among the 150 respondents of the WTA question, 17 per cent assigned an amount, and 53 per cent of respondents indicated they would never go back to their home situation pre-retrofit. The rest of the respondents selected the ‘don’t know’ option.

Since this outcome is a combination of several intermediate outcomes and may overlap with other outcomes for this stakeholder group, the correlation between WTA results and other material outcomes was tested. The overlap between satisfaction with the home situation was examined through an ordinary ‘least square regression’ and the correlation ( $R^2 = 55\%$ ) between WTA and other outcomes was removed from the average WTA. Table 12 summarises the indicator and proxy used for monetising the changes in satisfaction with home situation for RYH occupiers. For more information on the OLS regression result see Appendix D.

**Table 12: Summary of ‘changes in satisfaction with home situation’ calculation and value**

|  | Description   | Value    | Source                             |
|--|---|----------|------------------------------------|
| <b>Number of stakeholders</b>            | Number of Customers   | 2,493    | Auckland Council, ESU data         |
| <b>Indicator</b>                         | Proportion of households that experienced the mean level of change in their satisfaction. Calculated using a weighting procedure. | 0.25     | Primary research, RIMU calculation |
| <b>Outcome Multiple</b>                  | Magnitude of change per stakeholder   | 1        | Primary research, RIMU calculation |
| <b>Information for Proxy calculation</b> | Aggregated correlation (R-square) of answers to WTA question with other outcomes for this stakeholder group                       | 54.9%    | Primary research, RIMU calculation |
| <b>Proxy</b>                             | The amount of money that customers would accept to go back to their original home situation                                       | \$19,630 | Primary research, RIMU calculation |
| <b>Proxy Multiple</b>                    | Magnitude of proxy per year   | 1        |                                    |
| <b>Outcome Duration</b>                  | Years that the outcome would last for stakeholders  | 3        |                                    |

<sup>13</sup> The detailed calculation is presented in Appendix C-2.

<sup>14</sup> Including relatively expensive, complex and multidimensional scenarios may be too much of a cognitive burden for respondents and the concept of diversity may similarly be difficult to put across to the respondents, Rohani, (2013).

<sup>15</sup> Goods that can be used by or give utility to more than one individual are called public goods.

## 6.2.2 Improved quality of life and life expectancy

An overall improvement in health for householders who suffer from an illness related to living in a cold and damp home is one of the material outcomes for those living in a retrofitted home.

Improved quality of life and life expectancy is measured using a 'burden of illness' or number of years lost due to disease. The 'disability adjusted life year' (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

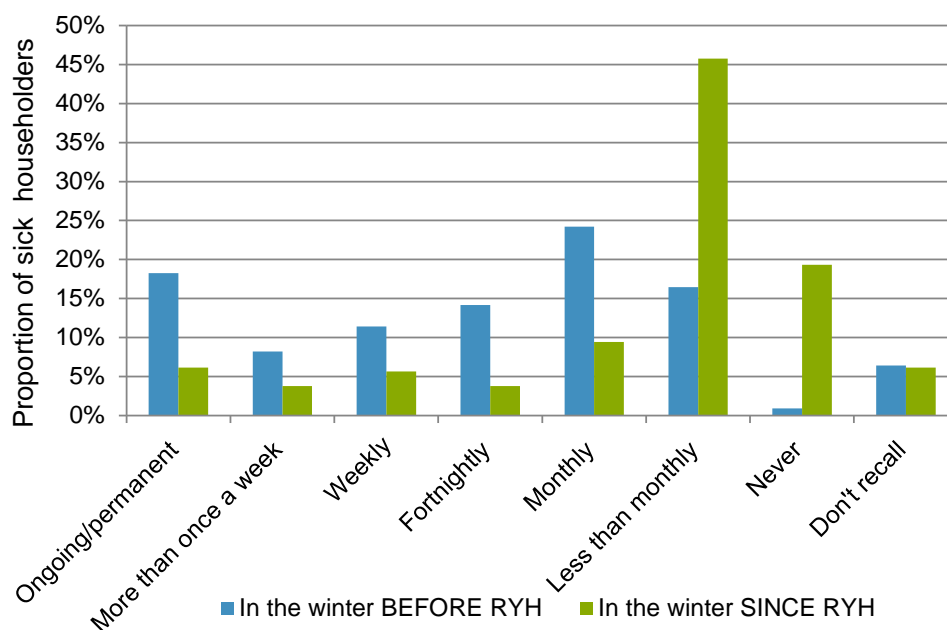
The approach to measuring the burden of illness avoidance and its valuation are described in detail in the sections that follow.

### 6.2.2.1 The amount of change experienced

Customers were asked in the survey to state the number of people in their household who have been ill, with an illness related to cold and damp housing. They also were asked to rate the severity level of the illnesses for people in their household in the winter before and after the RYH programme. If there was more than one person with an illness related to cold and damp homes, the same question was asked in relation to each affected householder. Responses to this question indicated that 50 per cent of customers (203) stated that they have at least one person in their household who suffered from one or more illnesses related to having a cold and damp home, with different degrees of severity. The ratings for levels of severity ranged from a minimum of 'never' to a maximum of 'ongoing/permanent sickness', with five levels of rating in between.

Figure 5 shows the results for the first ill person in each affected family. It indicates that most ill householders experienced illness either 'monthly' (24 %), 'permanently' (18 %) or 'fortnightly' (16 %) out of a total number of respondents to the pre-RYH question (219). After retrofit, the most frequent responses were 'less than monthly' (46 %) and 'never sick' (19 %).

**Figure 5: Proportion of households with one ill person - illness severity before and after RYH**



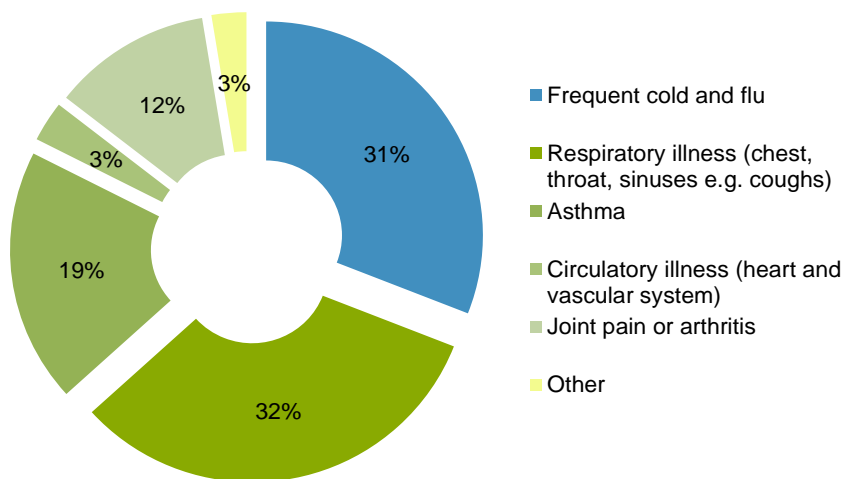
Since frequent cold and flu is not a serious illness it has not been included when considering the magnitude of change. The total number of householders with frequent colds and flu was removed from the outcome calculation. This represented 203 people, which is 31 per cent of the total sick people based on the



aggregated number of households with one and two people sick at home. The results for the category 'other illness' were also removed from the calculation because of the small proportion who reported these conditions (3%); because some conditions were already included in other categories of illness within the survey; and/or because they were not believed to be relevant to changes in the home situation (e.g. cancer).<sup>16</sup>

Figure 6 shows by proportion, the types of illnesses related to the home situation as reported by RYH customers.

**Figure 6 Proportion of illness types among ill householders**



The magnitude of change for each sick householder was calculated by applying a weighting process to the ratings, where 'never sick' is assigned a value of '0' and 'ongoing/ permanent illness' is assigned a value of '1', which represents 100 per cent (see table 13). The remaining five severity levels of illness ratings were assigned values in proportion to the rating using a linear pattern. The change in proportion of the mean level of illness before RYH compared to after was calculated for both the first and second ill person in the households. The result of this calculation is an average change of 22 per cent, representing the magnitude of change for this component of the indicator.

**Table 13: Magnitude of change for ill people using a weighting system**

| Weighting scale       | 1                 | 0.83                  | 0.67   | 0.50        | 0.33    | 0.17              | 0     |  |  |
|-----------------------|-------------------|-----------------------|--------|-------------|---------|-------------------|-------|--|--|
| First ill householder | Ongoing/permanent | More than once a week | Weekly | Fortnightly | Monthly | Less than monthly | Never | Number of householders who experienced the mean level of illness | Proportion of householders who experienced the mean level of illness |

<sup>16</sup> The other illnesses listed by survey respondents included: sleep problems, skin irritation and allergies, eczema, earaches, sinusitis, rheumatoid arthritis, recovery from surgery, multiple sclerosis, hay fever, diabetes and cancer.

|                                       |                   |                       |        |             |         |                   |       |  |  |
|---------------------------------------|-------------------|-----------------------|--------|-------------|---------|-------------------|-------|--|--|
| In the winter BEFORE the retrofit (1) | 40                | 18                    | 25     | 31          | 53      | 36                | 2     | 111  | 0.51   |
| In the winter SINCE the retrofit (2)  | 13                | 8                     | 12     | 8           | 20      | 97                | 41    | 55   | 0.26   |
| Second ill householder                | Ongoing/permanent | More than once a week | Weekly | Fortnightly | Monthly | Less than monthly | Never | Number of householders who experienced the mean level of illness | Proportion of householders who experienced the mean level of illness |
| In the winter BEFORE the retrofit (1) | 9                 | 9                     | 16     | 12          | 45      | 29                | 1     | 53   | 0.42   |
| In the winter SINCE the retrofit (2)  | 3                 | 2                     | 5      | 7           | 19      | 56                | 23    | 27   | 0.22   |

More than half of the households with one ill person stated that a second person in their household was ill as well. Therefore, the outcome multiple is the average number of ill people in households that had at least one ill person at home, or 1.59 people per household.

On this basis there were 7.4 per cent of households with occupants who suffered from an illness (excluding cold and flu), and reported experiencing the mean level of change in the number of illnesses. This was calculated through a combination of these three factors:

- The proportion of owner occupiers who indicated they had at least one person who was ill before RYH (50%) - with an illness related to cold and damp homes
- The proportion of those above with serious illnesses (66%) – this calculation included respiratory illness (chest, throat, or sinus infections), asthma, circulatory illness (heart and vascular system) and joint pain or arthritis
- The proportion of ill householders who experienced the mean level of change (from 'permanent/ongoing' illness to 'never' ill) using a weighting system (22 per cent)

### 6.2.2.2 Valuation approach

Secondary research (Holt and Beasley, 2001; Asher and Byrnes, 2006; Chapman et al., 2008; Ministry of Health, 2009; Access Economics, 2010; Telfar-Barnard et al., 2011; Blakely et al., 2012; MR Cagney, 2014) was reviewed as a means of estimating the cost of DALY for illnesses related to cold and damp homes.

Cost per DALY was used as the proxy for measuring the number of years lost as the result of disability and / or early death. This cost was estimated, based on the value of a statistical life year for New Zealand in 2010 (Access Economics 2010) and the years of healthy life lost (DALY) for each New Zealander who suffers from arthritis.

DALY per illness was calculated according to Access Economics (2010) based on DALY for arthritis (21,491) and the number of arthritis patients (530,000) in New Zealand 2010.

Table 14 summarises the indicator and proxy used for measuring the increased quality of life and life expectancy for RYH householders who suffered from a serious illness related to their home situation.

**Table 14 Summary of ‘changes in quality of life and life expectancy’ calculation and value**

|  | Description   | Value   | Source  |
|--|---|---------|---|
| <b>Number of stakeholders</b>            | Number of Customers   | 2,493   | Auckland Council, ESU data  |
| <b>Indicator</b>                         | Proportion of households with occupants who suffered from an illness related to a cold and damp home (except cold and flu) and reported change in the number of illnesses. The mean level of change was calculated using a weighting procedure. | 0.074   | Primary research, RIMU calculation  |
| <b>Outcome Multiple</b>                  | Average number of household members who suffered from an illness relating to living in a cold, damp home  | 1.59    | Primary research, RIMU calculation  |
| <b>Information for Proxy calculation</b> | The value of a statistical life year in New Zealand 2010  | \$7,285 | Secondary data: Access Economics (2010), The economic cost of arthritis in New Zealand in 2010, Arthritis New Zealand                     |
| <b>Proxy</b>                             | The value of a statistical life year in New Zealand 2013  | \$7,795 | <a href="http://www.rbnz.govt.nz/monetary_policy/inflation_calculator/">http://www.rbnz.govt.nz/monetary_policy/inflation_calculator/</a> |
| <b>Proxy Multiple</b>                    | Magnitude of proxy per year   | 1       |   |
| <b>Outcome Duration</b>                  | Years that the outcome would last for stakeholders  | 3       |   |

### 6.2.3 Improved relationship within the family

A warm, dry and clean house is the best place for a family to spend their time together in winter time that is one of the drivers of family’s relationship improvement.

*“We are now enjoying the warmth and comfort of our house... We have seen the outcomes in what we do as a family on special occasions such as birthdays. We were able to enjoy the house as a family together.”*

The data collection process sought to determine the degree to which RYH families spend more time together at home as a result of the retrofit, and thus enjoy their time as a family more than before.

#### 6.2.3.1 The amount of change experienced

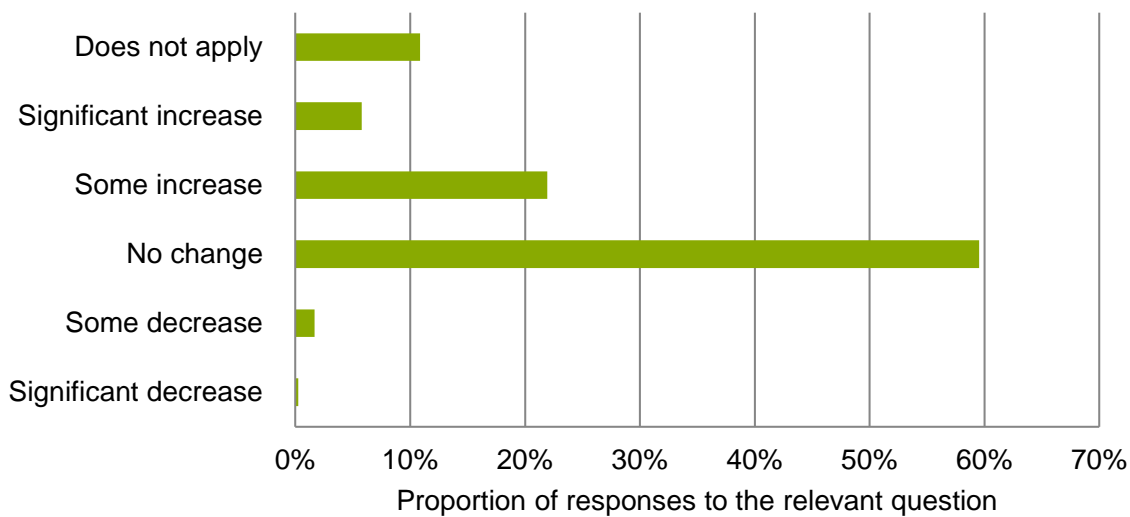
The amount of change in time spent as a family at home was calculated based on the proportion of the total number of respondents who experienced the mean level of increase in the time they spent as a family.

The mean level of change figure was calculated by applying a weighting system to each customer survey rating level, where 'significant increase' is assigned a value of '1', 'some increase' was equivalent to '0.5', 'no change' was equal to '0', 'some decrease' is equal to '-0.5' and 'significant decrease' is equal to '-1'. Therefore the amount of change for two households that experienced 'some increase' in time spent with family was considered equal to the amount of change for one household with an experience of 'significant increase'.

Out of the total responses to this question (370), and based on the application of the weighting system, the proportion of customers who reported experiencing the mean level of increase (65 respondents) is the equivalent of 18 per cent.

The total family is considered as one unit, therefore the outcome multiple is one. Figure 7 shows the distribution of responses to the survey question relating to change in the amount of time families spend together at home.

**Figure 7: Changes in the amount of time families spend together at home as the result of RYH**



### 6.2.3.2 Valuation approach

In a warmer and drier home, members of the household can more comfortably spend more of their time together at home rather than going out in winter time. On average, each Auckland household spends \$118 per week to go out as a family. This expenditure includes 'restaurant meals and ready-to-eat food', 'recreation and cultural services', 'accommodation services', 'package holidays' and 'miscellaneous domestic holiday costs' (Statistics New Zealand Household Expenditure Survey, 2013). Since the main impact of RYH occurs during the cold months of the year it was assumed that half of the average expenditure by an Auckland household for going out per week is saved in winter and half during the spring and autumn months (see 6.2.5.1 and Figure 8) as a result of RYH.

Table 15 summarises the indicator and proxy used to measure the outcome of improved relationships within the family.

**Table 15: Summary of ‘changes in relationships within family’ calculation and value**

|  | Description   | Value | Source  |
|--|---|-------|---|
| <b>Number of stakeholders</b>            | Number of Customers   | 2,493 | Auckland Council, ESU data  |
| <b>Indicator</b>                         | Proportion of customers who as a result of RYH experienced change equivalent to a significant increase in time spent with family. Calculated using a weighting procedure. | 0.18  | Primary research  |
| <b>Outcome Multiple</b>                  | Magnitude of change per stakeholders  | 1     |   |
| <b>Information for Proxy Calculation</b> | None  |       |   |
| <b>Proxy</b>                             | Half of the average household expenditure per week on going out together  | \$59  | Statistics New Zealand, Household Economic Survey 2013: <a href="http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7552">http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7552</a> |
| <b>Proxy Multiple</b>                    | Number of weeks   | 24    | Assumption per 6 cold months  |
| <b>Outcome Duration</b>                  | Years that the outcome would last for stakeholders  | 5     |   |

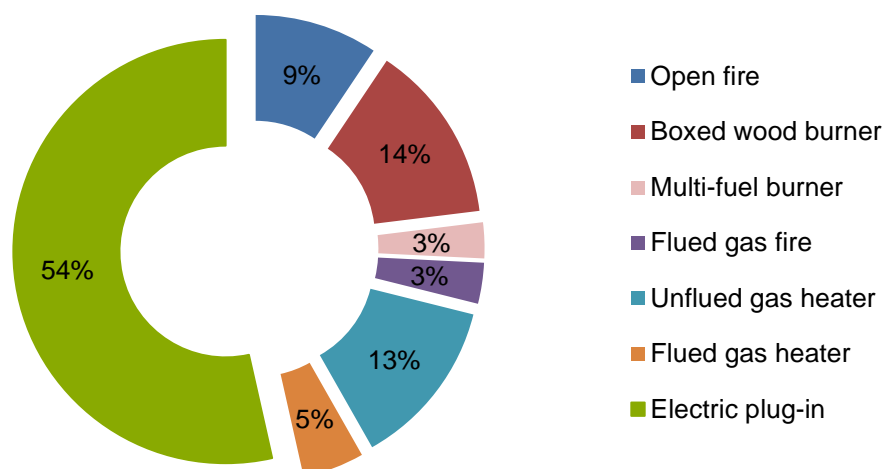
#### 6.2.4 Financial saving from electricity consumption

An important outcome for owner occupiers was the financial saving from reduced electricity consumption following retrofit. Of the 250 households that replaced their previous heating system with a heat pump, 54 per cent used electric plug-in heaters prior to RYH. Figure 8 shows the distribution of heating types customers used pre-RYH and replaced with heat pumps, according to the customer survey results.

“Our electricity bill is cheaper by \$50 a month.”

“We noticed with our power bills, that we were heating the house for longer, but payments were similar.”

**Figure 8: Proportion of heating types prior to RYH**



Customers were asked in the survey to report on metered energy use before and after RYH, including both electricity and gas.

A total of 48 respondents (8 %) reported using some form of gas heater (flued gas fire, unflued or flued gas heater) as their main source of heating before RYH. As a result of RYH, gas heating users reduced to 2 per cent. For those respondents using electric plug-in heating prior to RYH (54 %), there was a reduction in use of electric heating by 39 per cent, with only 15 per cent of customers reporting continued use of electric heating after RYH. The reduction in gas heating was at a much smaller scale compared to changes in electric heating, therefore the project team decided that gas usage was immaterial for the purposes of this indicator.

## 6.2.5 The amount of change experienced

An indicator was defined for each of the three sub-categories of customers, including:

- Heat pump-only customers
- insulation-only customers
- both heat pump and insulation customers

This indicator looks at the proportion of customers in each sub-category who experienced change in electricity cost, either positive or negative, as a result of RYH.

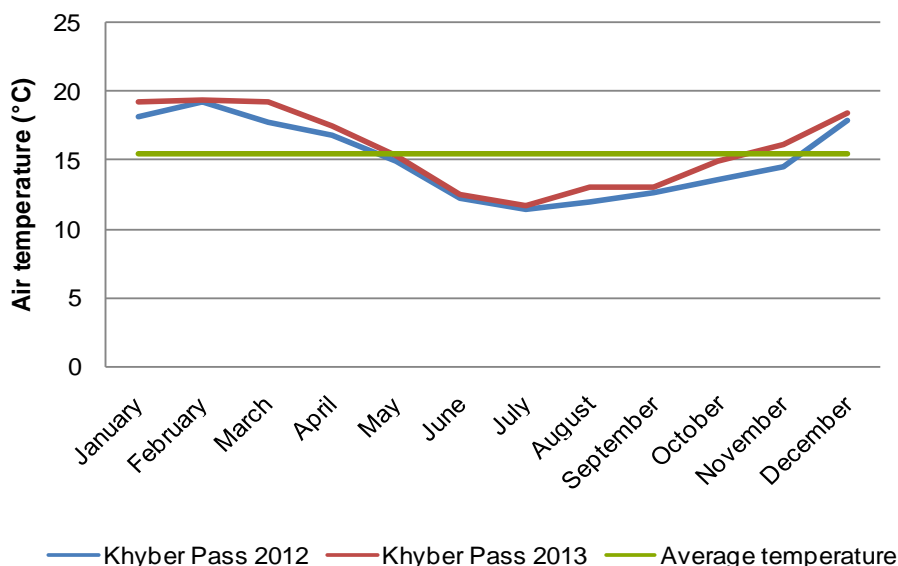
The outcome multiple or magnitude of change is one, because the household as a whole unit experiences the change (see table 16).

### 6.2.5.1 Valuation approach

The stated preference method was chosen as the means to value the amount of change in electricity bills for each household. The change was calculated based on the average monthly positive, negative or neutral change in electricity bills reported by stakeholders.

The proxy multiple for this indicator is the length of time that it is cold enough in Auckland to require heating. This was calculated as the three winter months, plus half of the spring and autumn months, which equates to 6 months in total. Figure 9 shows the number of cold months and the magnitude of cold compared to the average annual temperature in Auckland. Table 16 shows the indicators and values calculated for each sub-group of stakeholders.

**Figure 9: Auckland temperatures in 2012 and 2013 by months compared to annual average**



Source: Auckland council, Environmental monitoring team

**Table 16: Summary of ‘change in electricity consumption’ calculation and value**

|  | Description   | Value | Source                             |
|--|---|-------|------------------------------------|
| <b>Number of Stakeholders</b>            | Number of heat pump customers   | 1,667 | Auckland Council, ESU data         |
|  | Number of insulation customers  | 206   | Auckland Council, ESU data         |
|  | Number of both heat pump and insulation customers   | 620   | Auckland Council, ESU data         |
| <b>Indicator</b>                         | Proportion of customers who have installed a heat pump and stated that they made a financial saving (metered energy) as the result of RYH programme.              | 53%   | Primary research, RIMU calculation |
|  | Proportion of customers who have installed insulation and stated that they made a financial saving (metered energy) as the result of RYH programme.               | 60%   | Primary research, RIMU calculation |
|  | Proportion of customers who have installed heat pump and insulation and stated that they made a financial saving (metered energy) as the result of RYH programme. | 69%   | Primary research, RIMU calculation |
| <b>Outcome Multiple</b>                  | Magnitude of change per stakeholder   | 1     | Basic assumption                   |
| <b>Information for Proxy Calculation</b> | None  |       |                                    |
| <b>Proxy</b>                             | Average financial saving through less electricity consumption per household among those who only installed a heat pump (per month)                                | \$36  | Primary research, RIMU calculation |
|  | Average financial saving through less electricity consumption per household among   | \$19  | Primary research, RIMU calculation |

|                         | Description   | Value | Source                             |
|-------------------------|---|-------|------------------------------------|
|                         | those who only installed insulation (per month)   |       |                                    |
|                         | Average financial saving through less electricity consumption per household among those who installed both a heat pump and insulation (per month) | \$25  | Primary research, RIMU calculation |
| <b>Proxy Multiple</b>   | Number of cold months in a year   | 6     | Assumption                         |
| <b>Outcome Duration</b> | Years that the outcome would last for stakeholders  | 5     |                                    |

## 6.2.6 Time saved in maintenance and cleaning

Warmer homes and those with clean heat sources have less smoke, soot, mould, condensation and related damage. RYH customers who responded to the maintenance and cleaning questions of the survey indicated that they did not experience a significant change in the cost of maintenance and cleaning supplies, however they reported a significant change in the amount of time required for home cleaning and maintenance after RYH.

**“Major mould stains on leather shoes in a cupboards, stale smelling clothes in drawers, wet windows and windowsills, paint bubbling around windows, mould on ceilings and walls.**

**“curtain damage mostly. Required frequent laundering.”**

### 6.2.6.1 The amount of change experienced

The customer survey showed that as a result of RYH, 55 per cent of respondents (225 households) experienced change in the time they spent in cleaning or maintaining their home due to indoor smoke or soot, mould, condensation, or related damage.

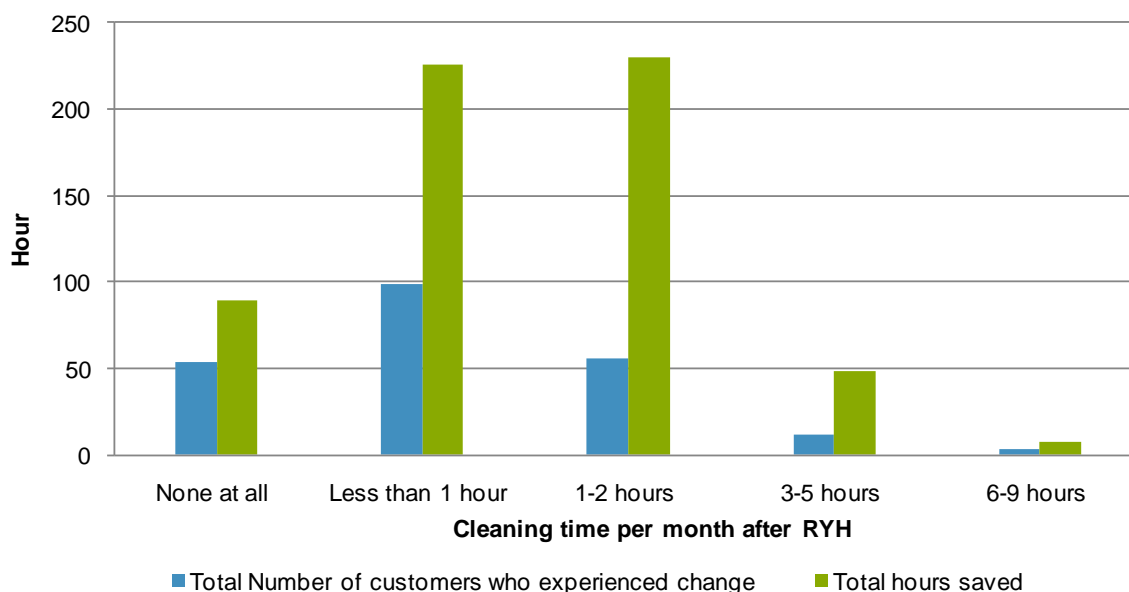
The customer survey data demonstrated an average of 2.9 hours change per month<sup>17</sup> in the time households spent in cleaning or maintaining their home. The average hours saved were calculated based on a weighting system applied to the reported amount of cleaning time before and after the RYH programme. For example, if there were three households that reported spending 6-9 hours per month on cleaning after RYH compared to 10 or more hours before RYH, then the total hours saved for these households would be calculated by using a formula: (3 households \* 10 hours) - (3 households \* 7.5 hours) = 7.5 hours, which is the time saved across all three households, or an average of 2.5 hours of time savings for each household.

Figure 10 shows the total number of customers who experienced change in the time spent in cleaning and maintenance and the aggregated time saved as the result of RYH. On the x-axis, the graph shows the average time customers reported spending per month in cleaning and maintenance after RYH.

<sup>17</sup> Using average weighted change, see Appendix D-6.



**Figure 10: Total number of customers who experienced change in the time spent in cleaning and maintenance and the aggregated time saved as the result of RYH**



### 6.2.6.2 Valuation approach

A revealed preference method, the market price of time, was used to monetise the value of time savings in cleaning and maintenance. The average wage per hour in New Zealand in 2012-2013 (\$27) financial year was used as the proxy for valuing the time.

Table 17 shows a summary of the indicator and value calculated for changes in time spent by RYH customers in cleaning and maintenance of their house as the result of RYH programme. The outcome multiple is the change in time saving per year, therefore the proxy multiple is one.

**Table 17: Summary 'change in time spent in cleaning and maintenance' calculation and value**

|                               | Description  | Value | Source  |
|-------------------------------|--|-------|---|
| <b>Number of stakeholders</b> | Number of customers  | 2,493 | Auckland Council, ESU data  |
| <b>Indicator</b>              | Proportion of households who installed a heat pump and /or insulation and experienced change in time spent in cleaning and maintenance and/or replacement of damaged housewares and furniture. | 0.55  | Primary research, RIMU calculation  |
| <b>Outcome Multiple</b>       | Average time saved by households who experienced change in the amount of time they spent on maintenance (hours per year)   | 35    | -   |
| <b>Proxy</b>                  | Average wage per hour in New Zealand 2013 (financial year, ended June)   | \$27  | <a href="http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=da_b78a79-2fba-4378-9144-5862c64a363e">Earning and Employment Survey, Statistics New Zealand</a><br><a href="http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=da_b78a79-2fba-4378-9144-5862c64a363e">http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=da_b78a79-2fba-4378-9144-5862c64a363e</a> |
| <b>Proxy Multiple</b>         | Magnitude of proxy per year  | 1     | -   |
| <b>Outcome Duration</b>       | Years that the outcome would last for stakeholders   | 5     |   |

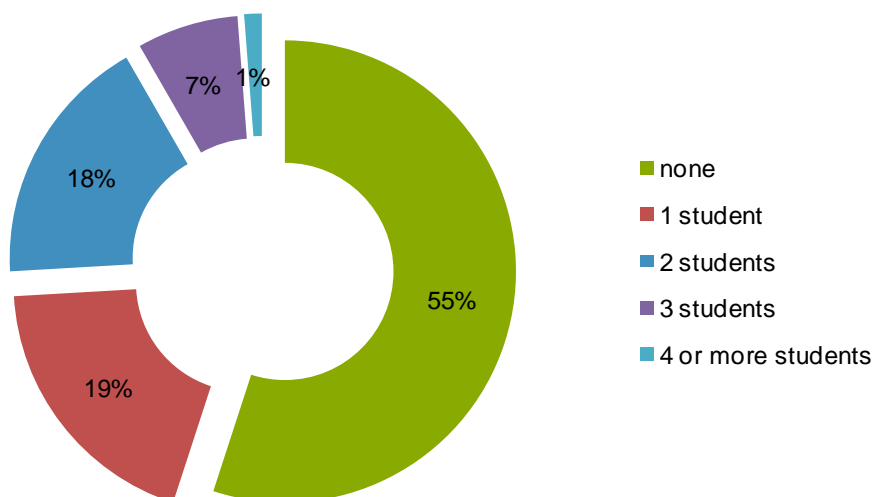
### 6.3 Improved educational achievement for students

New Zealand research (Viggers et al., 2008; Chapman et al., 2009) shows that regular attendance is associated with school achievement. Students, from primary school through to tertiary levels, are a sub-group of customers affected by RYH through improved educational achievement. In the customer survey, respondents were asked about changes in the educational achievement of students in their household as a result of the RYH programme. This change is considered an indirect result of health improvement, and a direct result of the student's increased ability to study by living in a warmer and drier home.

**“Our six-year-old was sick quite frequently for a period last year and her attendance rate got below a certain percentage – now she hasn't really missed a day.”**

Of the 409 respondents (72 %) of the customer survey question, 184 households (45 %) reported having at least one student living at home. Therefore, if applied to the total number of RYH customers (2493), this would equate to 1122 households with at least one student. Figure 11 provides a breakdown of the number of students, and it also shows that 26 per cent of respondents have more than one student in their household.

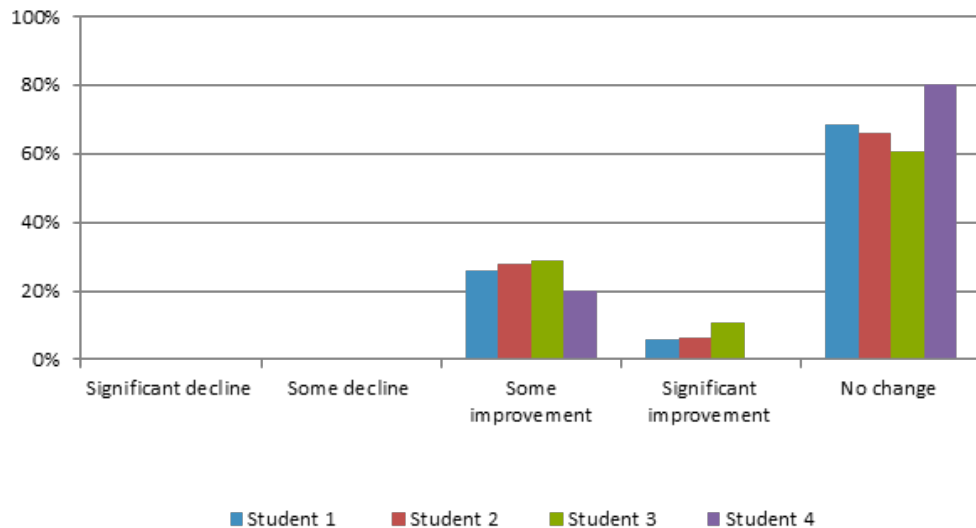
**Figure 11: Owner occupiers with students in their household**



### 6.3.1 The amount of change experienced

To measure the magnitude of change for students, owner occupiers were asked to report on the grades of students in their household, as an indicator for change in their educational achievement. Respondents indicated that for 67 per cent (189 students) there was 'no change', with the remaining 33 per cent experiencing either 'significant' or 'some improvement'. Figure 12 provides a summary of the responses to the educational achievement questions.

**Figure 12: Summary of reported change in school results of students**



The indicator for this outcome is based on the proportion of students who experienced 'the mean level of change in school results, calculated using a weighting system. The weighting scale applied a value of '1' for 'significant increase', a value of '.5' for 'some increase', a value of '0' for 'no change', a value of '-.5' for 'some decrease', and a value of '-1' for 'significant decrease'. Therefore, if two students experienced 'some increase', this would be equal to one student with experience of 'significant increase' in school results. The results of the weighting system showed that 55.5 customers, who have at least one student in their household, experienced the mean level of improvement in their student's educational achievement. This group contains 20 per cent of total customers who stated that there had been change in their student's educational results (282 respondents).

The outcome multiple is the average number of students in each household, which is 1.79.

### 6.3.2 Valuation approach

The approach for valuing this indicator was to determine the avoided cost of compensating for poorer results at school. The average annual cost for a private maths tutoring course (\$2320)<sup>18</sup> (as a general school subject) was considered as the proxy for educational improvement. Since this proxy is annualised, the proxy multiple for the indicator is 1. Table 18 summarises the information used for the calculation of this outcome.

**Table 18: Summary of 'changes in student educational achievement' calculation and value**

<sup>18</sup> <http://nz.kumonglobal.com/page.jsp?id=971&version=sg>  
<http://www.hometuition.co.nz/fees/>  
<http://www.numberworks.co.nz/frequently-asked-questions/#what-does-it-cost>

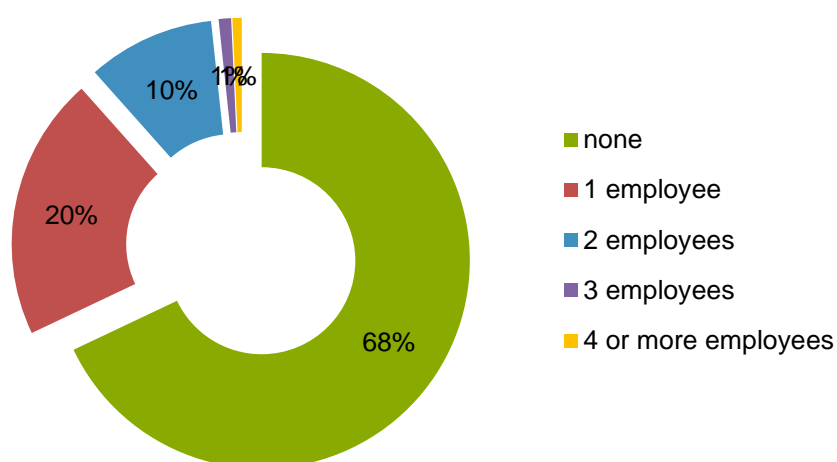
|  | Description  | Value   | Source  |
|--|--|---------|---|
| <b>Number of stakeholders</b>            | Number of RYH customers who have at least 1 student at home  | 1122    | Primary research, RIMU calculation  |
| <b>Indicator</b>                         | Proportion of students who experienced better results at school as the result of the RYH programme | 0.20    | Primary research, RIMU calculation  |
| <b>Outcome Multiple</b>                  | Average number of students per household   | 1.79    | Primary research, RIMU calculation  |
| <b>Information for Proxy calculation</b> | None   |         | Primary research, RIMU calculation  |
| <b>Proxy</b>                             | Annual cost of a private course for mathematics tutoring as a general school subject               | \$2,320 | <a href="http://nz.kumonglobal.com/page.jsp?id=971&amp;version=sg">http://nz.kumonglobal.com/page.jsp?id=971&amp;version=sg</a><br><a href="http://www.hometuition.co.nz/fees/">http://www.hometuition.co.nz/fees/</a><br><a href="http://www.numberworks.co.nz/frequently-asked-questions/#what-does-it-cost">http://www.numberworks.co.nz/frequently-asked-questions/#what-does-it-cost</a> |
| <b>Proxy Multiple</b>                    | Magnitude of proxy per year  | 1       |   |
| <b>Outcome Duration</b>                  | Years that the outcome would last for stakeholders   | 5       |   |

## 6.4 Financial savings from working more often from home

In a warmer, drier and cleaner home environment, people who work from home, especially those in paid employment, are likely to be more productive and work more efficiently.

Of the 415 respondents (73%) that answered the related customer survey question, 133 (32%) indicated that they had one or more people in paid employment working from home in their household. This proportion was then applied to the total number of RYH customers (2493) to provide a value for this indicator (799). Figure 13 shows a breakdown of the data for the number of people working from home. It shows that 12 per cent of respondents indicated that there was more than one householder in paid employment working from home.

**Figure 13: Owner occupiers with household members in paid employment working from home**



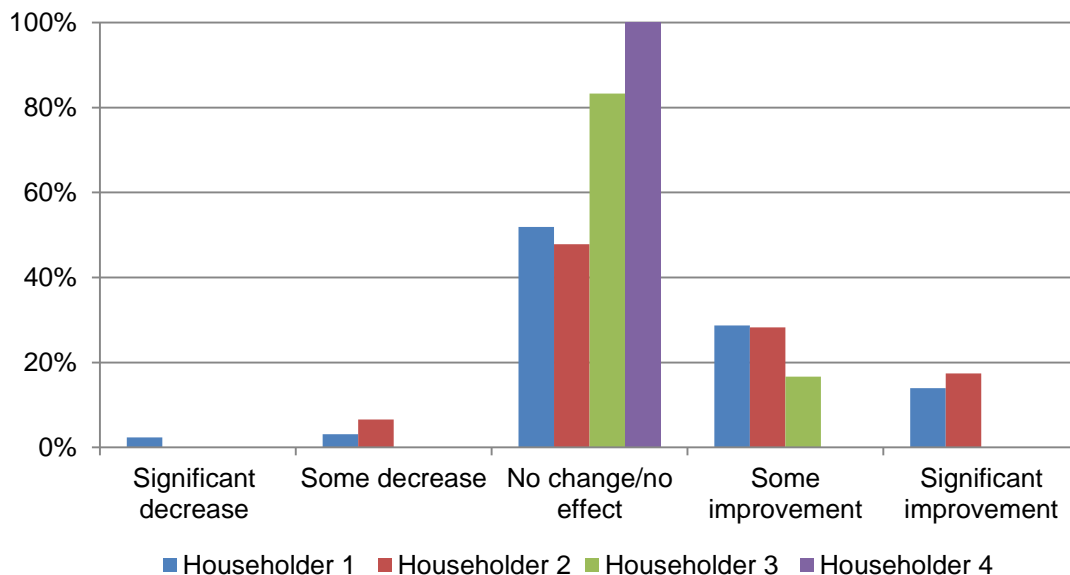
### 6.4.1 The amount of change experienced

Not all customers with household members working from home reported a change in their efficiency. Figure 14 shows the reported change in efficiency of working from home for the first to fourth or more householders in paid employment working from home.

The magnitude of change for this outcome was calculated using the following steps:

- The indicator, the proportion of stakeholders who experienced the mean level of change in the amount of the work they do at home (24%) was calculated using a weighting method. The weighting method applied values using the following scale: a value of '1' for 'significant increase', a value of '0.5' for 'some increase', a value of '0' for 'no change', a value of '-0.5' for 'some decrease', and a value of '-1' for 'significant decrease'.<sup>19</sup>
- The magnitude of change, the mean number of additional days in paid employment working from home in each household in winter (40.46) was calculated based on:
  - a) the average number of householders who work from home (1.44 employees) and
  - b) additional days they reported working from home as the result of RYH. The additional days working from home were calculated using the average number of days working from home per week by RYH customers using the survey result (2.35 days a week). The mean days working from home for 6 cold months (56 days) was calculated based on 4 weeks in each month. The significant improvement in ability to work from home for 24 per cent of customers who experienced a mean level of change assumed as a 50 per cent increase in days working from home, which is equal to 28 days.

**Figure 14: Summary of reported change in efficiency of working from home**



<sup>19</sup> See Appendix D-8 for a detailed description of this outcome calculation.

## 6.4.2 Valuation approach

The avoided cost of commuting and the time saved in avoiding a journey to work were calculated to monetise this outcome.

The commuting cost avoidance is the first component of the avoided cost of a work journey, and was calculated based on the average distance travelled per work journey and the average cost of the journey per kilometre. The average kilometre per work journey for Aucklanders is 11.5 km per work journey (2010-2013, Household Travel Survey, Statistics New Zealand, 2013). The cost of commuting for each kilometre of a work journey was calculated using figures provided by the New Zealand Institute (2007), on \$0.7 NZD. This is equal to \$0.8NZD in 2013 dollars.

Travel time avoidance is the second part of the work journey costs avoided by households with members who work more days from home as a result of RYH. The Household Travel Survey, Statistics New Zealand (2013) shows that Aucklanders on average spend 25 minutes per work journey. A revealed preference method, the market price of time, was used to monetise the value of time saving. The average wage per hour in New Zealand in the 2012/2013 financial year (\$27) was used as the proxy for valuing the time saved. Table 19 shows the summary of information used for calculating the outcome for occupiers of RYH who are in paid employment and working from home.

**Table 19: Summary of ‘changes in efficiency when working from home’ calculation and valuation**

|  | Description  | Value  | Source  |
|--|--|--------|---|
| <b>Number of stakeholders</b>            | Number of RYH customers who have at least one person in paid employment working from home  | 799    | Primary research, RIMU calculation  |
| <b>Indicator</b>                         | Proportion of customers who are in paid employment working from home and experienced the mean level of improvement in their ability to work from home. | 0.24   | Primary research, RIMU calculation  |
| <b>Outcome Multiple</b>                  | Average number of additional days spent working from home.   | 40.5   | Primary research, RIMU calculation  |
| <b>Information for Proxy calculation</b> | Average km per work journey by Aucklanders (2010-2013)   | 11.5   | Statistics New Zealand, New Zealand Household Travel Survey: Travel to work, by main urban area results (3-year moving average)   |
|  | Commuting cost saving per km (2013 NZD)  | \$0.8  | The New Zealand Institute (2007) Defining a broadband aspiration: how much does broadband matter and what does New Zealand need?  |
|  | Average hours per work journey   | 0.42   | Statistics New Zealand, New Zealand Household Travel Survey: Travel to work, by main urban area results (3-year moving average)   |
|  | Average wage per hour in New Zealand 2013 (Financial year, ended June)   | \$27   | <u>Earning and Employment Survey, Statistics New Zealand</u><br><a href="http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=dab78a79-2fba-4378-9144-5862c64a363e">http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=dab78a79-2fba-4378-9144-5862c64a363e</a> |
| <b>Proxy</b>                             | Travel cost savings per journey, including avoided commuting cost and travel time  | \$20.7 | As above  |

|                         | Description  | Value | Source |
|-------------------------|--|-------|--------|
|                         | saving   |       |        |
| <b>Proxy Multiple</b>   | Magnitude of proxy per year                        | 1     |        |
| <b>Outcome Duration</b> | Years that the outcome would last for stakeholders | 5     |        |

## 6.5 Local air quality improvement

Local air quality improvement was measured through the reduction of pollution (PM<sub>10</sub>) as the result of replacing solid fuel heaters with heat pumps.

Although the insulation-only option also has an impact on the use of solid fuel heaters, the customer survey results showed that the changes in solid fuel heating usage for this group of customers was not material compared to those who replaced their solid fuel burner with a heat pump.

### 6.5.1 The amount of change experienced

To measure the impact of local air quality improvement for 1.42 million Auckland residents (Statistics New Zealand, 2013 census), the reduction in level of PM<sub>10</sub> was defined as the outcome indicator. This outcome indicator was calculated based on the number of RYH customers who replaced an open fire, wood burners and/or multi-fuel burners with a heat pump. Of the survey respondents, 37 per cent reported replacing their solid fuel burners with a heat pump. This proportion was then applied to the total number of customers, which means that an estimated 918 customers would have replaced a solid fuel burner with a heat pump. While some households reported that they had more than one solid-fuel burner replaced or no longer used, since these were already considered in the number of replaced heaters, the outcome multiple is one.

### 6.5.2 Valuation approach

The proxy used to value this change was calculated based on the health cost avoidance of PM<sub>10</sub> emissions for Auckland residents. According to the World Health Organization (WHO, 2013), the health effects of inhalable PM are due to exposure over both the short term (hours, days) and the long-term (months, years) and include:

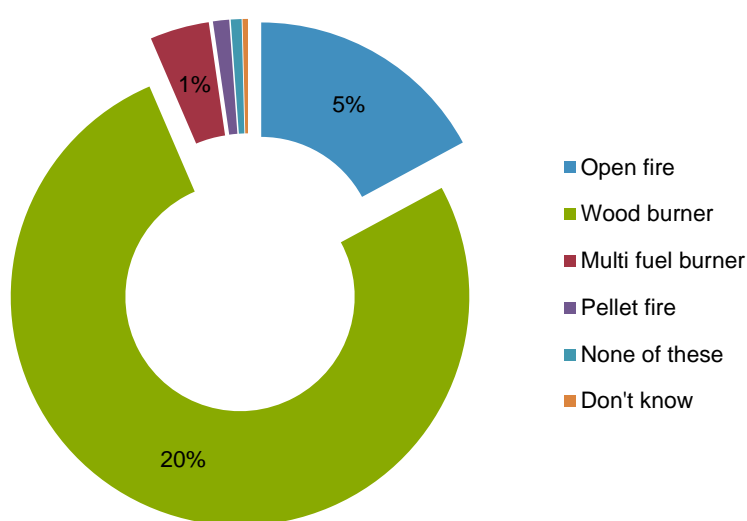
- respiratory and cardiovascular morbidity, such as aggravation of asthma, respiratory symptoms and an increase in hospital admissions;
- mortality from cardiovascular and respiratory diseases and from lung cancer.

In the New Zealand context, the Ministry for the Environment (2003) emphasised that there is no threshold below which health effects of PM<sub>10</sub> do not occur.

Changes in PM<sub>10</sub> levels were calculated per burner, per household and by type of burner, using data drawn from secondary research (Metcalf, 2010; Xie et al., 2010; UHAP, 2012; Owen, 2012; Stones-Havas, 2014). Information used to calculate the social cost avoidance included:

- The proportion of each type of solid fuel heater used by Aucklanders: in 2012, 26 per cent of Aucklanders used a solid fuel burner for heating (Stones-Havas' 2014). The breakdown of usage of different solid fuel heating types used is shown in Figure 15.
- Estimated number of households (488,000) for Auckland in 2006/2007 (Owen, 2012).
- PM<sub>10</sub> emissions produced by each type of solid fuel burner (Metcalf, 2010; Xie et al., 2010). Table 20 shows the information used to estimate the PM<sub>10</sub> emission produced.

**Figure 15: Proportion of each type of solid fuel heater use by Aucklanders 2012**



**Table 20: Emission factors (wet weight), average fuel use in winter days and average PM<sub>10</sub> emission per day**

| Type of burner              | Emissions factor (g/kg) | Average fuel use (kg/day) | Average emission (kg/day) |
|-----------------------------|-------------------------|---------------------------|---------------------------|
| Open fires (wood)           | 12                      | 10                        | 0.12                      |
| Pre-1991 wood burners       | 10.7                    | 14                        | 0.15                      |
| 1991 – 2005 wood burners    | 7.2                     | 14                        | 0.10                      |
| Post 2005 (NES) wood burner | 3.7                     | 14                        | 0.05                      |
| Multi-fuel (wood) burner    | 10.7                    | 14                        | 0.15                      |
| Pellet burner               | 1.4                     | 5                         | 0.01                      |

Source: Adapted from Metcalfe (2010)

Using the estimated number of each type of solid fuel heater in Auckland combined with the average emissions produced by each type per year (180 cold days), the proportion of emissions produced by each type of burner was estimated (see table 21).

The next step is to determine the social cost avoidance per heater type.



The social cost of PM<sub>10</sub> emissions produced by domestic fires or solid fuel burners in Auckland was derived from UHAP (2012). The social cost of PM<sub>10</sub> emissions produced by home solid fuel burners in Auckland is estimated at \$412 million (2010 dollar) as of June 2006. This data was then extrapolated to create a 'social cost avoidance' for each type of solid fuel burner replaced through the RYH programme.

This figure was then applied to the RYH change results. The customer survey results showed a total of 151 solid fuel burners were replaced with a heat pump. The data for types of burners showed open fire, boxed wood burners and multi-fuel burners were at proportions of 34, 56 and 10 per cent respectively.<sup>20</sup> This provided the weighting scale to be applied across Auckland households.

The total social cost saving per burner by type replaced with a heat pump is shown in Table 21.

**Table 21: Annual PM<sub>10</sub> emission produced and social cost per solid fuel burner, solid fuel heating type in Auckland**

| Fuel burner type                  | Estimated number of households in Auckland who use solid fuel heater | Emission factor (g/kg) | Average fuel use (kg/day) | PM <sub>10</sub> emission produced by each heater type in Auckland (kg/year) | Proportion of heater type in Auckland domestic fire emission | Social cost avoidance per heater |
|-----------------------------------|--|------------------------|---------------------------|--|--|----------------------------------|
| Open fire                         | 21825.9  | 12                     | 10                        | 471,440  | 31%  | \$ 5,828.42                      |
| Boxed wood burner                 | 97489.2  | 3.7                    | 14                        | 908,989  | 60%  | \$ 2,515.93                      |
| Multi-fuel burner (coal and wood) | 5335.2   | 10.7                   | 14                        | 143,859  | 9%   | \$ 7,275.81                      |
| Pellet burner                     | 1455.1   | 1.40                   | 5                         | 1,833  | 0.1%   | \$ 339.99                        |
| Total                             |  |                        |                           | 1,526,122.46   | 100%   |                                  |

Table 22 summarises the indicator and proxy used for measuring the outcome of local air quality improvement as a result of the RYH programme.

<sup>20</sup> The data collected shows no pellet burners were replaced with a heat pump.

**Table 22: Summary of 'local air quality improvement' outcome calculation and value**

|  | <b>Description</b>   | <b>Value</b> | <b>Source</b>   |
|--|--|--------------|---|
| <b>Number of stakeholders</b>            | Auckland residents (million people)  | 1.42         | Census 2013, Statistics New Zealand.  |
| <b>Indicator</b>                         | Number of RYH customers who replaced an open fire, wood burner and/or multi fuel burner with a heat pump | 918          | Primary research, RIMU calculation  |
| <b>Outcome Multiple</b>                  | Magnitude of change per stakeholder  | 1            |   |
| <b>Information for Proxy calculation</b> | Average weighted saving in social cost of removing each solid fuel burner in Auckland (June 2010 \$)     | \$4,107      | "• UHAP, (2012) Updated Health and Air Pollution in New Zealand study, Volume 2: Technical Reports, March 2012.   |
| <b>Proxy</b>                             | Average weighted saving in social cost of removing each solid fuel burner in Auckland (June 2013 \$)     | \$4,395      | • Xie, S., Mahon, K., Petersen, J. (2010). Effects of Fuel and Operation on Particulate Emissions from Wood burners. Auckland Regional Council Technical Report 2010/061. |
| <b>Proxy Multiple</b>                    | Magnitude of proxy per year  | 1            |   |
| <b>Outcome Duration</b>                  | Years that the outcome would last for stakeholders   | 5            |   |

## 7.0 Understanding impact

One of the key principles of SROI is reducing the risk of over-claiming outcomes. Understanding impact requires isolating the impacts arising from the change process, and determining the proportion of the outcome that is an actual result of the programme. Understanding impact is also one of the stages of materiality checking (see Section 4.4). This section discusses the process for understanding impact in SROI methodology, by determining the deadweight, displacement, attribution and drop-off of outcomes.

### 7.1 Deadweight

Deadweight for calculated outcomes were calculated as a combination of:

- the proportion of customers who intended to retrofit anyway (33%)
- any change relevant to the outcome that would have happened anyway in the absence of the RYH programme.

Deadweight is a measure of the amount of outcome that would have happened even if the activity had not taken place. It is calculated as a percentage.

Deadweight was calculated using statements from stakeholders on changes they experienced (not related to RYH) in 2013 compared to 2012, and changes in trends. Table 23 summarises the estimated deadweight for each outcome and the source of information.

**Table 23: Summary of deadweight assessment**

| Stakeholder            | Outcome   | Total Deadweight | Description  | Source  |
|------------------------|---|------------------|--|---|
| Occupiers of RYH homes | Increased feeling of satisfaction with living situation     | 46%              | The proportion of customers who intended to retrofit anyway (33%).<br>And the proportion of customers who experienced a change in their satisfaction and who stated there were other changes in their lives that affected their satisfaction (13%) in response to Q68 "Has anything else changed in your household in the 12 months after the retrofit that might have affected the life satisfaction of householders (e.g. change in job, family event)?"   | Primary research, RIMU calculation  |
|                        | Increased quality of life and life expectancy               | 33%              | The proportion of customers who intended to retrofit anyway (33%).<br>And average annual life expectancy improvement (2007-2012) (1%).   | Statistics NZ, New Zealand period life tables 1950–52 to 2010–12  |
|                        | Improved relationships within the family                    | 32%              | The proportion of customers who intended to retrofit anyway (33%).<br>And the average annual changes in committed time spent together by New Zealand families (-0.5%). "Committed time describes activities that a person has committed to because of previous acts or behaviours or community participation such as having children, setting up a household or doing voluntary work. The consequent housework, care of children, shopping or provision of help to others are committed activities. In most cases, services could be bought to provide the same activity. The unpaid work activities which are identified in the satellite national accounts are all committed time activities." (StatsNZ)<br>Changes in this category of time spent by New Zealanders is considered as deadweight for the relationship inside the family - an indicator of having more time to spend with kids and other members of the family. | Stats NZ Time Use Survey 2009-2010 compared with 1998-99 survey.  |
|                        | Financial savings from decreased metered energy consumption | 43%              | The proportion of customers who intended to retrofit anyway (33%).<br>And average annual changes in residential electricity use in New Zealand (2001-2011) controlled for population, dwelling size and density growth (9.92%).  | Ministry of Economic development, Electricity data tables.<br><a href="http://www.med.govt.nz/sectors-industries/energy/energy-modelling/data/electricity">http://www.med.govt.nz/sectors-industries/energy/energy-modelling/data/electricity</a> |
|                        | Time saved in maintenance and cleaning                      | 32%              | The proportion of customers who intended to retrofit anyway (33%).<br>And average changes in committed family time spent by New Zealand households (-0.5%).  | Stats NZ Time Use Survey 2009-2010 compared with the 1998-99 survey.  |

| Stakeholder  | Outcome  | Total Deadweight | Description   | Source  |
|--|--|------------------|---|---|
| <b>Occupiers of RYH homes who are students</b>                                 | Increased educational achievements                     | 34%              | The proportion of customers who intended to retrofit anyway (33%).<br>And the average annual changes in literacy and numeracy for year 11 students in New Zealand schools (2008-2012). The available data on annual changes in levels of literacy and numeracy (1%) for year 11 students has been used as an indication of the improvement in school results that would have happened anyway. | NZQA (2012), Annual Report on NCEA and New Zealand Scholarship, Data and Statistics (2012), pp. (41,45)   |
| <b>Occupiers of RYH homes who are in paid employment and working from home</b> | Increased efficiency when working from home            | 29%              | The proportion of customers who intended to retrofit anyway (33%).<br>And the average changes in GP visits was considered the deadweight for this outcome as an indicator of health improvement and less absenteeism that would happen anyway in the absence of the RYH programme (-3.4%).  | Data from Ministry of Health (See Appendix D.)  |
| <b>Natural environment</b>   | Reduction of PM <sub>10</sub> (particulates) emissions | 33%              | The proportion of customers who intended to retrofit anyway (33%).<br>And the percentage rate of change in PM <sub>10</sub> emission levels produced by domestic fires in Auckland (0.8%).  | Auckland State of the Environment Air Quality Monitoring. The annual average PM <sub>10</sub> levels for individually monitored sites were combined and averaged for 2011 and 2012 years. |

## 7.2 Displacement

The material outcomes considered in this evaluation have not displaced other outcomes for RYH stakeholders or other groups in society.

Displacement is an assessment of how much of the outcome displaced other outcomes.

## 7.3 Attribution

Attribution shows the part of deadweight for which we had better information and could attribute at least a portion of an outcome to other people or organisations.

Attribution is an assessment of how much of the outcome was caused by the contribution of other organisations or people.

Since RYH was not the only programme contributing to the change for identified stakeholders, the EECA programme subsidy was considered to be a source of attribution across all outcomes. EECA's contribution toward heat pumps and insulation installation in 2012-2013, as estimated by ESU, was deemed to be 25 and 33 per cent respectively.

The total attribution of outcomes to the EECA subsidy is 29 per cent. This was calculated as the average of EECA's contribution toward heat pumps and insulation.

The only outcome with different attribution to the EECA subsidy is the financial saving from decreased electricity consumption, which is divided into three sub-categories of stakeholders including heat pump-only, insulation-only and combined heat pump and insulation customers. Table 24 summarises the results of attribution to the EECA subsidy.

**Table 24: Summary of attribution assessment**

| Stakeholder  | Outcome   | Attribution | Description  |
|--|---|-------------|--|
| <b>Occupiers of RYH homes</b>  | Increased feeling of satisfaction with living situation                                     | 0.29        | Average EECA attribution in insulation and heat pump installation. |
|  | Increased quality of life and life expectancy   | 0.29        | Average EECA attribution in insulation and heat pump installation. |
|  | Improved relationships within the family  | 0.29        | Average EECA attribution in insulation and heat pump installation. |
|  | Financial savings from decreased metered energy consumption (heat pump only)                | 0.25        | EECA's attribution in heat pump installation.                      |
|  | Financial savings from decreased metered energy consumption (insulation only)               | 0.33        | EECA's attribution in heat pump installation.                      |
|  | Financial savings from decreased metered energy consumption (both heat pump and insulation) | 0.29        | Average EECA attribution in insulation and heat pump installation. |
|  | Time saved in maintenance and cleaning  | 0.29        | Average EECA attribution in insulation and heat pump installation. |
| <b>Occupiers of RYH homes who are students</b>                             | Increased educational achievement   | 0.29        | Average EECA attribution in insulation and heat pump installation. |
| <b>Occupiers of RYH homes who are in paid employment working from home</b> | Increased efficiency when working from home   | 0.29        | Average EECA attribution in insulation and heat pump installation. |
| <b>Natural environment</b>   | Reduction of PM <sub>10</sub> (particulates) emissions                                      | 0.29        | Average EECA attribution in insulation and heat pump installation. |

## 7.4 Benefit period and drop-off

In Section 6, the duration of each outcome was presented in the calculation and valuation table. In this section the rationale of the benefit period and drop-off for each outcome is discussed.

The duration of an outcome is the period the outcome is expected to last for a given stakeholder, and is different from the life expectancy of assets. For outcomes that have a duration of more than one year, the outcome is likely to diminish in the following years and may be influenced by other factors that reduce attribution of the outcome to the RYH programme. Drop-off is the means to account for this reduction in benefits or impacts, and was considered for each outcome after the first year of duration.

The duration of the outcome 'increased satisfaction with home situation' was expected to last a short time (three years) because people get used to their new conditions. There are also many factors that would affect their satisfaction with their home situation (e.g. need for more space because of the family growing).

The duration of 'increased quality of life and life expectancy' was calculated based on the life expectancy of a 75 year-old in New Zealand (12 years). Since improved health as the result of the RYH programme would not last the full length of life expectancy, and would likely be affected by other factors (e.g. other types of illnesses), a quarter of this life expectancy period (3 years) was considered as the outcome duration.

The rationale for duration of other outcomes is that these outcomes would last for the same period that the heat pump and insulation are in the high efficiency period of their product life. This was applied to six outcomes, which are 'improved relationships within the family', 'financial savings from decreased metered energy consumption', 'time saved in maintenance and cleaning', 'increased educational achievement', 'increased efficiency when working from home', and 'improved local air quality'.

As an indicator of the high efficiency period for these products, their warranty period was used. The average warranty for different makes and models of heat pump is 5 years, and the warranty for insulation is 20 years. The shorter of the two warranty periods was considered as the duration for these six outcomes, because after 5 years, there are potentially many other factors that could affect outcomes and make their attribution to the RYH programme immaterial.

Table 25 summarises the duration and drop off and the rationale for percentage drop off each year from the second year of duration.



**Table 25: Summary of duration and drop-off assessment**

| Stakeholder                                    | Outcome   | Duration (Years) | Rationale for Drop-off   | Year 2 | Year 3 | Year 4 | Year 5 |
|--|---|------------------|--|--------|--------|--------|--------|
| <b>Occupiers of RYH homes</b>                  | Increased feeling of satisfaction with living situation     | 3                | The drop-off is assumed to be 30 per cent each year. This is because it is assumed that the efficiency of heat pumps and insulation drop over time and the feeling of satisfaction will drop as people get used to their new conditions.   | 0.3    | 0.3    |        |        |
|  | Increased quality of life and life expectancy               | 3                | The drop-off is assumed to be 30 per cent for the second year, and 50 per cent for the following year. This is because it is assumed that people who used to be ill gradually get used to their new health conditions as the result of RYH. There are also many other factors that may affect their quality of life and life expectancy after the first year.  | 0.3    | 0.5    |        |        |
|  | Improved relationships within the family                    | 5                | The outcome has its maximum impact in the first year and it is expected to drop off gradually by 30 per cent in the next two years, then 50 per cent for the rest of the duration. This is because it is assumed that households will get used to the new conditions, and because there are many other factors that may affect the relationship inside families.                                     | 0.3    | 0.3    | 0.5    | 0.5    |
|  | Financial savings from decreased metered energy consumption | 5                | The drop-off is assumed to be 10 per cent per year. This is based on the assumption that there will be a reduction in the efficiency of insulation and/or heat pumps, and because as people get used to their new conditions, there may be a drop in financial savings from energy consumption.  | 0.1    | 0.1    | 0.1    | 0.1    |
|  | Time saved in maintenance and cleaning                      | 5                | The drop-off is assumed to be 10 per cent for the second and third years after installation, and 20 per cent annual drop-off for the rest of the outcome duration. This is based on the assumption that the products will wear out over time and that the frequency of cleaning may increase. Therefore there will be more time required for cleaning and maintenance as the product ages.           | 0.1    | 0.1    | 0.2    | 0.2    |
| <b>Occupiers of RYH homes who are students</b> | Increased educational achievement                           | 5                | The drop-off is assumed to be 10 per cent for the second and third years after installation, and 20 per cent annual drop-off for the rest of the outcome duration. This is based on the assumption that the efficiency of RYH products will decrease over time. And also that there may be drop-off as students get used to their new home situation and other factors affect their study situation. | 0.1    | 0.1    | 0.2    | 0.2    |

| Stakeholder  | Outcome                                     | Duration (Years) | Rationale for Drop-off  | Year 2 | Year 3 | Year 4 | Year 5 |
|--|---|------------------|---|--------|--------|--------|--------|
| <b>Occupiers of RYH homes who are in paid employment working from home</b> | Increased efficiency when working from home | 5                | The drop-off is assumed to be 10 per cent for the second and third years after installation, and 20 per cent annual drop-off for the rest of the outcome duration. This assumes a reduction in the efficiency of the RYH products over time. And also as people get used to their new home situation and other factors affect their work situation. | 0.1    | 0.1    | 0.2    | 0.2    |
| <b>Natural environment</b>   | Improved local air quality                  | 5                | The drop-off is assumed to be 10 per cent starting from the second year for this outcome. This assumes that people will get used to the outcome, and a reduction in heat pump efficiency over time may affect the impact on PM <sub>10</sub> .  | 0.1    | 0.1    | 0.1    | 0.1    |

## **7.5 Completed impact map**

The final impact map (Table 26) shows the result of the calculations for each RYH outcome using the methodology described in Sections 6 and 7. The impact of the RYH programme was estimated by calculating the quantity of outcomes, multiplied by the value of the financial proxy, minus deadweight, attribution and drop-off for each outcome, as discussed earlier in this section.

The details for the calculation of the SROI ratio are outlined in Section 8.

**Table 26: Retrofit Your Home, Social Return on Investment Evaluation- Impact Map**

| Stakeholders   |       | Outcome  | Outcome Indicator                                  | Outcome Multiple                         | Outcome Incidence | Duration | Outcome Proxy  |          | Deadweight % | Attribution % | Displacement % | Drop off % |        |        |        | Impact      |             |             |           |           |
|--|-------|--|--|--|-------------------|----------|--|----------|--------------|---------------|----------------|------------|--------|--------|--------|-------------|-------------|-------------|-----------|-----------|
| Description  | No.   |  | Proportion of stakeholders that experienced change | Magnitude of change for each stakeholder |                   |          | Description and Source   | Value    |              |               |                | year 2     | year 3 | year 4 | year 5 | Year 1      | Year 2      | Year 3      | Year 4    | Year 5    |
| Occupiers of RYH homes   | 2,493 | Increased feeling of satisfaction with living situation  | 25%  | 1  | 621               | 3        | The amount of money that customers would accept to go back to their home situations before RYH.<br>• Primary research<br>Willingness to Accept           | \$19,630 | 46           | 29            | 0              | 30         | 30     |        |        | \$4,675,151 | \$3,272,606 | \$2,290,824 |           |           |
| Occupiers of RYH homes   | 2493  | Increased quality of life and life expectancy  | 7%   | 1.59                                     | 292               | 3        | The value of a statistical life year in new Zealand 2013.<br>• Access Economics (2010),<br>• Arthritis New Zealand (2010)                                | \$7,795  | 33           | 29            | 0              | 30         | 50     |        |        | \$1,076,905 | \$753,833   | \$376,917   |           |           |
| Occupiers of RYH homes   | 2,493 | Improved relationships within the family   | 18%  | 1  | 438               | 5        | Half of the average household expenditure on going out together in winter.<br>• Stats NZ (2013), HES.  | \$1,414  | 32           | 29            | 0              | 30         | 30     | 50     | 50     | \$298,057   | \$208,640   | \$146,048   | \$73,024  | \$36,512  |
| Occupiers of RYH homes who just installed a heat pump                | 1,667 | Financial savings from decreased metered energy consumption (heat pump only customers)           | 53%  | 1  | 889               | 5        | Average financial savings through less electricity consumption per household (in winter)<br>• Primary research   | \$214    | 43           | 25            | 0              | 10         | 10     | 10     | 10     | \$81,895    | \$73,706    | \$66,335    | \$59,702  | \$53,731  |
| Occupiers of RYH homes who just installed insulation                 | 206   | Financial savings from decreased metered energy consumption (insulation only customers)          | 60%  | 1  | 124               | 5        |  | \$115    | 43           | 33            | 0              | 10         | 10     | 10     | 10     | \$5,492     | \$4,943     | \$4,449     | \$4,004   | \$3,603   |
| Occupiers of RYH homes who installed both a heat pump and insulation | 620   | Financial savings from decreased metered energy consumption (heat pump and Insulation customers) | 69%  | 1  | 425               | 5        |  | \$148    | 43           | 29            | 0              | 10         | 10     | 10     | 10     | \$25,686    | \$23,118    | \$20,806    | \$18,725  | \$16,853  |
| Occupiers of RYH homes   | 2,493 | Time saved in maintenance and cleaning   | 55%  | 35                                       | 47932             | 5        | Average wage per hour in New Zealand (2013).<br>• Statistics New Zealand, Earning and employment survey.   | \$27     | 32           | 29            | 0              | 10         | 10     | 20     | 20     | \$631,883   | \$568,694   | \$511,825   | \$460,642 | \$414,578 |
| Occupiers of RYH homes who are students                              | 1,122 | Increased educational achievement  | 20%  | 1.8                                      | 395               | 5        | Average annual cost of a private course for mathematics tutoring as a general school subject.<br>• Kumon,<br>• hometuition.co.nz,<br>• numberworks.co.nz | \$2,320  | 34           | 29            | 0              | 10         | 10     | 20     | 20     | \$431,132   | \$388,019   | \$349,217   | \$314,295 | \$282,866 |

| Stakeholders  |       | Outcome  | Outcome Indicator                                  | Outcome Multiple                         | Outcome Incidence | Duration | Outcome Proxy  |         | Deadweight % | Attribution % | Displacement % | Drop off % |        |        |             | Impact      |             |             |             |             |
|---|-------|--|--|--|-------------------|----------|--|---------|--------------|---------------|----------------|------------|--------|--------|-------------|-------------|-------------|-------------|-------------|-------------|
| Description   | No.   |  | Proportion of stakeholders that experienced change | Magnitude of change for each stakeholder |                   |          | Description and Source   | Value   |              |               |                | year 2     | year 3 | year 4 | year 5      | Year 1      | Year 2      | Year 3      | Year 4      | Year 5      |
| Occupiers of RYH homes who are in paid employment working from home | 799   | <b>Increased efficiency when working from home</b> | 0.24   | 40.46                                    | <b>7905</b>       | 5        | Travel cost savings per work journey, including avoided commuting cost and travel time saving.<br>Statistics New Zealand, New Zealand Household Travel Survey: Travel to work, by main urban area results (3-year moving average)<br>• The New Zealand Institute (2007)<br>• Statistics New Zealand, New Zealand Household Travel Survey: Travel to work, by main urban area results (3-year moving average)<br>• Statistics New Zealand, Earning and Employment survey. | \$21    | 29           | 29            | 0              | 10         | 10     | 20     | 20          | \$82,036    | \$73,832    | \$66,449    | \$59,804    | \$53,824    |
| Auckland residents  | 1.42m | <b>Improved local air quality</b>                  | 918  | 1  | <b>918</b>        | 5        | Average weighted saving in the social cost of removing each solid fuel burner in Auckland (June 2013 \$).<br>• UHAP 2012, Updated Health and Air Pollution in New Zealand study, Volume 2: Technical Reports, March 2012.<br>• Xie et al. (2010)<br>• Metcalfe, J. (2010)<br>• Owen, (2012)<br>• Stones-Havas (2014)<br>• RIMU calculation   | \$4,395 | 33           | 29            | 0              | 10         | 10     | 10     | 10          | \$1,907,218 | \$1,716,496 | \$1,544,847 | \$1,390,362 | \$1,251,326 |
| <b>Total</b>  |       |  |  |  |                   |          |  |         |              |               |                |            |        |        | \$9,215,455 | \$7,083,887 | \$5,377,716 | \$2,380,559 | \$2,113,293 |             |

## 8.0 Calculating the SROI

This section provides a summary of the final result for the Social Return on Investment evaluation undertaken for the Retrofit Your Home programme.

The SROI ratio is a ratio of return, and is derived by dividing the value of the impact or total present value created by the activity, by the value of the investment made.

### 8.1 Calculation overview

In total, the RYH programme in 2012-2013 created \$26 million worth of social, economic and environmental value. The present value of the outcomes, with the discount rate applied, equals \$25 million (see table 27).

The present value of outcomes represents the aggregated discounted values for RYH outcomes in their duration. The discount rate reflects the 'time value of money'. Discounting is used because people prefer to receive financial value today, rather than in the future. This allows avoidance of the risk (e.g. of not being paid) or because there is an opportunity cost (e.g. potential gain from alternative investment).

Using a discount rate in SROI puts an emphasis on higher values in the near future, rather than on the longer term where some values might actually increase over time e.g. environmental benefits to future generations. For the purposes of this SROI, the project team applied a discount rate of 4 per cent, which is the rate recommended in the Auckland Council CBA primer (2013),<sup>21</sup> and was applied to the future values after the first year of duration.

Table 27 shows the total value and present value calculated for each outcome as the result of the RYH programme.

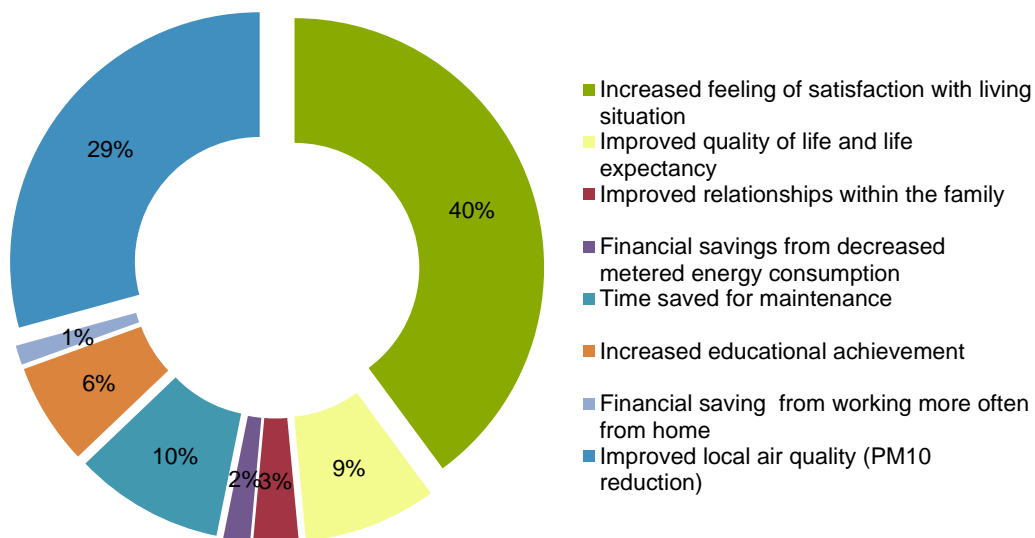
**Table 27: Total value and present value of RYH outcomes**

| Stakeholder   | Outcome   | Total value  | Present value |
|---|---|--------------|---------------|
| Occupiers of RYH homes  | Increased feeling of satisfaction with living situation     | \$10,238,581 | \$9,939,883   |
| Occupiers of RYH homes  | Increased quality of life and life expectancy               | \$2,207,655  | \$2,150,225   |
| Occupiers of RYH homes  | Improved relationships within the family                    | \$762,280    | \$729,830     |
| Occupiers of RYH homes  | Financial savings from decreased metered energy consumption | \$463,048    | \$432,302     |
| Occupiers of RYH homes  | Time saved in maintenance and cleaning                      | \$2,587,622  | \$2,415,807   |
| Occupiers of RYH homes who are students                             | Increased educational achievement                           | \$1,765,529  | \$1,648,300   |
| Occupiers of RYH homes who are in paid employment working from home | Increased efficiency when working from home                 | \$335,946    | \$313,640     |
| Auckland residents  | Improved local air quality                                  | \$7,810,249  | \$7,291,658   |
| Total   |   | \$26,170,910 | \$24,921,646  |

<sup>21</sup> The social discount rate is usually lower than a financial discount rate and is the best choice for an SROI. The recommended discount rate in the Auckland Council CBA primer is the lowest recommended discount rate available in New Zealand.

The aggregated value contributed by each of the stakeholder outcomes shows 'increased feeling of satisfaction with home situation' for RYH home occupiers, and 'improved local air quality' are the largest outcomes of the RYH programme. Figure 16 shows the proportion of each outcome in terms of the aggregated value created by the RYH programme.

**Figure 16: Proportion of aggregated value created by each outcome**



## 8.2 The SROI ratio

In total, the RYH programme in 2012-2013 created \$26 million worth of social, economic and environmental value. Each dollar of the \$8 million investment in this programme created \$3.1 of social return. The ratio is often expressed as a single figure representing the social return, which for RYH is 3.1.

## 8.3 Sensitivity analysis

A sensitivity analysis was undertaken to test the robustness of the results of the SROI analysis. The aim of sensitivity analysis is to test which assumptions have the greatest impact on the SROI model and results.

Sensitivity was tested by altering the various figures for indicators, proxies, deadweight, displacement, and attribution in such a way that the SROI ratio becomes one.

The result of the sensitivity analysis shows that no single figure can turn the SROI ratio to one, because none of the outcomes or the figures used in the calculations derives the ratio exclusively. Sensitivity analysis considered the following:

- An altered value for calculating elements of the outcomes that have highest proportion in value created by the RYH programme and their related figures 100 per cent drop-off after the first year of all outcomes duration.

Table 28 provides a summary of the sensitivity analysis, showing values altered, the rationale behind the alterations, and the impact on the SROI ratio.



Table 28: Summary of the sensitivity analysis

| <b>Stakeholder: Occupiers of RYH homes</b>  |              |                      |  |                        |
|---|--------------|----------------------|--|------------------------|
| <b>Outcome: Increased feeling of satisfaction with living situation</b>                     |              |                      |  |                        |
|   | <b>Value</b> | <b>Altered value</b> | <b>Rationale</b>   | <b>Impact on ratio</b> |
| <b>Indicator</b>  | 0.25         | 0                    | The altered value represents the impact of no stakeholders experiencing this outcome   | 1.86                   |
| <b>Information for proxy calculation</b>  | 54.9%        | 99%                  | The altered value represents one extreme of the range of possible values that represent the highest overlap between responses to the WTA question and other outcomes for customers | 1.89                   |
| <b>Proxy</b>  | \$19,630     | 300                  | The lowest amount of money that customers stated they would accept to live in their pre-retrofit home  | 1.88                   |
| <b>Deadweight</b>   | 46%          | 99%                  | The altered value represents one extreme of the range of possible values   | 1.89                   |
| <b>Attributions</b>   | 29%          | 99%                  | The altered value represents one extreme of the range of possible values   | 1.88                   |
| <b>Outcome: Improved quality of life and life expectancy</b>                                |              |                      |  |                        |
| <b>Indicator</b>  | 0.074        | 0                    | The altered value represents the impact of no stakeholders experiencing this outcome   | 2.83                   |
| <b>Outcome multiple</b>   | 1.59         | 1                    | The altered value represents one lowest of the range of possible values  | 3                      |
| <b>Proxy</b>  | \$7,795      | \$500                | The altered value represents one lowest of the range of possible values  | 2.85                   |
| <b>Deadweight</b>   | 33%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.84                   |
| <b>Attributions</b>   | 29%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.84                   |
| <b>Outcome: Time saved in maintenance and cleaning</b>                                      |              |                      |  |                        |
| <b>Indicator</b>  | 0.55         | 0                    | The altered value represents the impact of no stakeholders experiencing this outcome   | 2.80                   |
| <b>Outcome multiple</b>   | 35           | 1                    | The altered value represents one lowest of the range of possible values  | 2.81                   |
| <b>Proxy</b>  | \$27         | \$1                  | The altered value represents one lowest of the range of possible values  | 2.81                   |
| <b>Deadweight</b>   | 32%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.80                   |
| <b>Attributions</b>   | 29%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.80                   |
| <b>Stakeholder: Occupiers of RYH homes whom are students</b>                                |              |                      |  |                        |
| <b>Outcome: Increased educational achievement</b>   |              |                      |  |                        |
| <b>Indicator</b>  | 0.20         | 0                    | The altered value represents the impact of no stakeholders experiencing this outcome   | 2.90                   |
| <b>Outcome multiple</b>   | 1.79         | 1                    | The altered value represents one lowest of the range of possible values  | 3.01                   |
| <b>Proxy</b>  | \$2,320      | \$1                  | The altered value represents one lowest of the range of possible values  | 2.90                   |
| <b>Deadweight</b>   | 34%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.90                   |
| <b>Attributions</b>   | 29%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.90                   |
| <b>Stakeholder: Natural environment</b>   |              |                      |  |                        |
| <b>Outcome: Reduction of PM<sub>10</sub> (particulates) emissions</b>                       |              |                      |  |                        |
| <b>Indicator</b>  | 918          | 0                    | The altered value represents the impact of no stakeholders experiencing this outcome   | 2.19                   |
| <b>Proxy</b>  | \$4,395.08   | \$2,515.93           | The altered value represents the lowest in a range of possible values that reflect the social cost avoidance per removed wood burner   | 2.71                   |
| <b>Deadweight</b>   | 33%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.21                   |
| <b>Attributions</b>   | 29%          | 99%                  | The altered value represents one extreme of the range of possible values   | 2.21                   |
| <b>Drop off for all outcomes which is varies for different outcomes and different years</b> |              | 100                  | The altered value represents one extreme of the range of possible values that means only one year duration for all outcomes  | 1.15                   |

## 9.0 Conclusions and recommendations

### 9.1 Key insights

This SROI evaluation provides strong evidence of the social, economic and environmental value created by the RYH programme. The value generated by the programme exceeded the total cost of the programme by a return of \$3.1 per each dollar spent.

Although many groups of stakeholders experienced changes relevant to the programme (e.g. the council, suppliers, and suppliers' employees) in some cases they were not significant enough to be considered material. This was generally because of the small number of stakeholders who experienced the change and/or the magnitude of the change, the low value of some outcomes compared to others, or due to high deadweight, attribution and/ or drop-off.

The majority of the value created by RYH was for customers (occupiers), who experienced 71 per cent of the value created by RYH. This was followed by Auckland residents as the only other material stakeholder, who received the remaining 29 per cent of the value created by the programme.

### 9.2 Recommendations for maximising the value created by the RYH programme

According to the feedback received from RYH customers during the stakeholder engagement step of the SROI evaluation, most customers indicated that they were happy with the outcomes the programme had delivered.

The comments received contain a number of recurring themes which provide some insight into potential future improvements for the RYH programme. These key themes were:

#### 9.2.1 A desire for more retrofit options

A number of customers stated that they were happy with the programme outcomes but would like to see more retrofit options available. Those most frequently cited by customers were:

- **Recirculation / heat transfer systems**
- **Wall insulation**
- **Double glazing**
- **Other – extractor fans**
- **Solar heating**
- **Hot water heating**
- **Fireplace removal**

## **9.2.2 Issues with the payment process and payment-related communication**

The largest source of negative feedback and suggestions for improvement came from customers who were unhappy with the payment process and the level of communication associated with this. While some of these customers indicated that they were happy with the service received and with the overall outcomes of the programme, they claimed that the payment system did not deliver clear information about how payments would be made, when payments would start, and the balance left to be paid. It was suggested that customers be allowed to view accounts online, including payment history and balances, or to have account summaries provided with their rates bills.

## **9.2.3 Issues with the installation process**

Another source of negative feedback related to the installation itself and communication with suppliers. The comments were varied but most related to specific workmanship or site issues. However, several customers pointed out that the small number of specified contractors may have caused higher prices in comparison with other suppliers. It was suggested that the supplier list be reviewed and widened into the future to ensure greater market competitiveness in pricing.

## **9.3 Recommendations for further evaluation**

It is recommended that the council conduct a formative evaluation (e.g. forecast SROI) of any potential new services or retrofits being considered, as a way to 'test them' before they are introduced.

The following recommendations give more strength to future evaluations of RYH, and specifically any subsequent SROI.

- Although we believe that talking to parents / caregivers provided an accurate account of the impacts on children, we have acknowledged that future research of this nature could be improved by engaging more than one household member. For example, if there are children in the household, they could be engaged directly to check for any additional impacts of the programme not identified by their parents / caregivers.
- This evaluation was based on strong primary and secondary sources but estimates of duration and drop off are partly based on research in this SROI. It is recommended that this be improved in future evaluations by asking the stakeholders directly about the expected duration and drop off for each outcome.
- Further evaluation should be undertaken at multiple points in time to improve the robustness of the SROI. This should include at least before and after retrofit, or at later periods for example. Collecting data before the programme removes errors in customers' estimations of their situation before the programme.
- To improve counterfactual information, it is recommended that a baseline population be identified to compare some of the key outcomes for RYH customers with people living in similar homes.

## 10.0 Glossary

### Acronyms

|      |  |
|------|--|
| EECA | Energy Efficiency and Conservation Authority |
| ESU  | Environmental Services Unit                  |
| RIMU | Research, Investigations and Monitoring Unit |
| RYH  | Retrofit your Home                           |

### SROI Glossary

(Adapted from *A Guide to Social Return on Investment SROI Network, 2012*)

|                           |  |
|---------------------------|--|
| <b>Attribution</b>        | An assessment of how much of the outcome was caused by the contribution of other organisations or people.  |
| <b>Deadweight</b>         | A measure of the amount of outcome that would have happened even if the activity had not taken place.  |
| <b>Discounting</b>        | The process by which future financial costs and benefits are recalculated to present-day values.   |
| <b>Discount rate</b>      | The interest rate used to discount future costs and benefits to a present value.   |
| <b>Displacement</b>       | An assessment of how much of the outcome has displaced other outcomes.   |
| <b>Distance travelled</b> | The progress that a beneficiary makes towards an outcome (also called 'intermediate outcomes').  |
| <b>Drop-off</b>           | The deterioration of an outcome over time.   |
| <b>Duration</b>           | How long (usually in years) an outcome lasts after the intervention, such as the length of time a participant remains in a new job.  |
| <b>Impact</b>             | The difference between the outcome for participants, taking into account what would have happened anyway, the contribution of others and the length of time that outcomes last.      |
| <b>Impact Map</b>         | A table that captures how an activity makes a difference: that is, how it uses its resources to provide activities that then lead to particular outcomes for different stakeholders. |

|                             |  |
|-----------------------------|--|
| <b>Income</b>               | An organisation's financial income from sales, donations, contracts or grants.   |
| <b>Inputs</b>               | The contributions made by each stakeholder that are necessary for the activity to happen.  |
| <b>Materiality</b>          | Information is material if its omission has the potential to affect the readers' or stakeholders' decisions.   |
| <b>Monetise</b>             | To assign a financial value to something.  |
| <b>Net present value</b>    | The value in today's currency of money that is expected in the future minus the investment required to generate the activity.  |
| <b>Outcome</b>              | The changes resulting from an activity. The main types of change from the perspective of stakeholders are unintended (unexpected) and intended (expected), or positive and negative. |
| <b>Outcome indicator</b>    | Well-defined measure of an outcome.  |
| <b>Outputs</b>              | A way of describing the activity in relation to each stakeholder's inputs in quantitative terms.   |
| <b>Payback period</b>       | Time in months or years for the value of the impact to exceed the investment.  |
| <b>Proxy</b>                | An approximation of value where an exact measure is impossible to obtain.  |
| <b>Scope</b>                | The activities, timescale, boundaries and type of SROI analysis.   |
| <b>Sensitivity analysis</b> | Process by which the sensitivity of an SROI model to changes in different variables is assessed.   |
| <b>Social return ratio</b>  | Total present value of the impact divided by total investment.   |
| <b>Stakeholders</b>         | People, organisations or entities that experience change, whether positive or negative, as a result of the activity that is being analysed.  |

Adapted from: *A guide to Social Return on Investment* (SROI Network , 2012)

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# Appendix A Stakeholder engagement

## Appendix A-1 RYH customers, phone survey script

### Introduction

My name is .... and I am making this call on behalf of Retrofit Your Home, Auckland Council's insulation and clean heating initiative. Can I speak to [the person listed] or someone in the household who was involved?

[Once that person is on the line, repeat the first line of the introduction if necessary, and then continue ...]

Anything you say will remain confidential and you will not be personally identified in the results of the survey.

Do you still live in the house that had the retrofit? [If NO see A below]

Was the house rented when it had a retrofit? [If YES see A below]

To deliver the right service in the future we need to understand what changed for your household because of the initiative. This is a brief call: about 5 minutes. Are you happy to proceed? [If NO see B below]

### Questions

I am going to name some changes. Tell me whether these applied to your household:

- Warmer
- Drier
- Lower power or fuel costs
- Reduction of smoke or smell from a burner
- Improved health
- Feeling more energetic
- Happiness at home
- Attendance at school or work
- What other changes did you notice? Did you do or feel anything else different?
- Did you experience any problems as a result of the retrofit? [please describe]

How would we know e.g. what would look different or what would you be doing differently? E.g. you wore less clothing inside in winter E.g. you went to the doctor less [Go through the YES answers one by one]

Was there anything else going on, other than the retrofit, that might have affected the changes you've described, reducing or increasing them? E.g. you still had an old burner or fireplace installed

'Are there any other changes you could have made to get the same results? [If YES - 'what?' and 'why did you choose retrofit instead?']

A. If contact does not live in the house

Are you able to speak confidently about

- what it was like to live in the house before and after the retrofit AND
- how the difference affected them (or their tenants)

[If not, please thank the client for answering the call and explain that we need to speak to people who can speak about the change they experienced]

B Not happy to proceed

Is there anything about the programme that you want to comment on?

THANK YOU FOR YOUR TIME TODAY.

## Appendix A-2 RYH customers, in depth interview

### Checklist

- Ipad + Dictamus
- Consent statement copies
- Questionnaire copies
- Note paper
- Pens
- Runsheet
- Client list with details from spreadsheet

### Runsheet

1. Connecting in
2. What we are doing
3. What we'll do today incl recorder
4. Any questions
5. Consent form – explain, read and sign
6. Put recorder on
7. Case study questions
8. Questionnaire
9. How did you find it? What parts felt awkward?

### Case study questions

1. How did you come to apply for RYH?
2. What was it like for you to go through the process?
3. What changed for you once the insulation or heating was installed?
4. If your home was warmer, what did that mean for you? What else changed?
5. If there was one thing you would tell others about your experience, what would it be?
6. Anything else? Can you tell me more about ...

## Appendix A-3 RYH suppliers, industry impact survey

### 1) Retrofit Your Home programme:

This survey is conducted with suppliers to the Retrofit Your Home programme. It takes a close look at the impacts of the RYH programme for industry. The results will help the Council understand the programme's return on investment including social benefits and how to deliver the right service in the future.

The survey can be completed in two steps:

- 2) suppliers find business information to answer the questions in blue
- 3) suppliers then complete the survey at the contract re-signing meeting on the 20<sup>th</sup> May, with the help of Council staff who will be on hand to clarify any questions.

The answers you give will be used only for the purpose of this research and your business will not be identified in the results. It is important that you answer all questions.

### Base information

Company Contact person

Phone Email

Size of business (employees): 1-3 / 4-9 / 10-19 / 20-49 / 50-99 / 100-499 / 500+ (circle one)

Date started supply to RYH: [month/year]

Total number of dwellings retrofitted with insulation or clean heating for all customers in 12 months **prior** to your start date:

### Your investment in RYH

|           |   |   |                   |
|-----------|---|---|-------------------|
| <b>1.</b> | Please list all the ways you have promoted the RYH scheme e.g. in print media and estimate a <b>cash</b> cost against each one<br><br><i>Explanation: Many suppliers promote RYH to attract customers. Council wants to understand how much cash suppliers have invested in promoting RYH. It is also important to apportion that cash between RYH and any other focus.</i> |   |                   |
|           | Activity  | Focus: main/shared/minor<br><i>Main = main focus is RYH</i><br><i>Shared = focus is shared</i><br><i>Minor = minor focus is RYH</i> | Total \$ invested |
|           |   |   |                   |
| <b>2.</b> | Please estimate the <b>time</b> you have invested in the RYH scheme<br><br><i>Explanation: Many suppliers contribute time to RYH, in addition to any cash invested. Council wants to understand how much time suppliers have invested.</i>  |   |                   |
|           | Activity  | Time  |                   |
|           | Training workers about RYH  | [hrs] total per year  |                   |

|    |  |  |
|----|--|--|
|    | Advising customers of RYH<br>Administering RYH applications and invoices<br>Other (please specify) | [hrs] per customer<br>[hrs] per customer<br>[hrs] total per year |
| 3. | What other ways have you invested in RYH, if any?  |  |
|    | Activity   | Time (hrs) / cash (\$)   |
|    |  |  |

### Business impacts

|    |   |  |                     |
|----|---|--|---------------------|
| 4. | Please specify the <b>number of dwellings you have retrofitted</b> with insulation or clean heating since your start date in the RYH scheme, including both RYH and non-RYH customers<br><br><i>Explanation: RYH has attracted more customers to retrofitting in Auckland both directly through loan finance and indirectly by increasing awareness in the market. Council wants to understand the size of this effect.</i>   |  |                     |
|    | RYH retrofits   |  | Non-RYH retrofits   |
| 5. | Please specify the <b>additional employees</b> you have hired since your start date in the RYH scheme, in terms of their total duration of employment<br><br><i>Explanation: Participation in RYH may have required you to employ additional workers. Because the number of workers may have fluctuated over time, Council wants to count the total additional hours employed. A worksheet is attached at the back of this questionnaire to assist with the calculations.</i> |  |                     |
|    | Number of new hires   | Total duration of employment (hrs)       | % Attributed to RYH |
|    |   |  |                     |
|    |   | Total employment (hrs) attributed to RYH |                     |

|            |  |   |                |
|------------|--|---|----------------|
| <b>6.</b>  | What new skills have you trained the new workers (see Q5) in?  |   |                |
|            | Skill type   | Number of employees trained in this skill |                |
|            |  |   |                |
| <b>7.</b>  | Has participation in RYH lost you any existing work? YES / NO (circle one)<br>If YES, please explain below   |   |                |
|            | Reasons for loss   | Size of loss                              |                |
|            |  | Amount                                    | Unit           |
|            |  |   |                |
| <b>8.</b>  | What other ways has your business changed as a result of being a supplier for RYH? E.g. you have changed your materials suppliers. Please consider positive and negative changes |   |                |
|            | Type of change   | Reason for change                         | Size of change |
|            |  |   | Amount +/-     |
|            |  |   |                |
| <b>9.</b>  | Has anything other than RYH significantly affected your business since your start date? YES/ NO (circle one).<br>If YES please briefly describe it below                         |   |                |
|            |  |   |                |
| <b>10.</b> | Please add any additional comments   |   |                |
|            |  |   |                |

THANK YOU FOR COMPLETING THIS SURVEY.

Any correspondence can be addressed to [damon.birchfield@aucklandcouncil.govt.nz](mailto:damon.birchfield@aucklandcouncil.govt.nz)





## Appendix A-4 RYH suppliers, workshop plan

### Main task and purpose

To verify the Theory of Change (outcomes experienced) and detect as much different experience of change as possible, while also measuring specific indicators of impact relating to suppliers.

The session will also finish with a request to follow up around any specific themes or interesting results that arise.

### Introduction

This session is about understanding the impacts of the RYH programme for industry. The results will help the Council deliver the right service and work with suppliers better in the future.

The session will take less than an hour. About half the time will be answering the survey and we'll be coming around to help you with anything that's unclear.

The information will only be used for the research purpose and you will not be personally identified in the results of the survey.

We've asked you to find some information before the session; hopefully you've got it on hand. If not we'll need to get the completed survey from you afterwards.

[CHECK UNDERSTANDING AND MOOD]

Open session: impacts of RYH on industry

Q1. What benefits has RYH had for the industry? \* (10 min)

Q2. What pressures/costs has RYH put on the industry? (5 min)

Q3. How would we know – what would we see / measure? (10 min)

Q4. Feedback: what are your top 2 most important answers? (5 min)

### \* Try asking this ...

- Has investment by RYH also led to more non-RYH customers? How?
- Has investment by RYH led to changes in products? If so, what?

### Tips

Group the sticky notes together on the paper, in a way that makes sense to you on, before selecting the biggest impacts

Facilitators are there to ...

Answer questions

Photograph the finished map

Industry impact survey

20 minutes to answer: get as far as you can. Our job in this time is to help you understand how to complete the survey.

Closing

Any other comments – thoughts raised for you when doing the survey?

### Follow up

If necessary we are going to follow up with you after the session to get a completed survey from you. We may also be in touch to follow up around any specific themes or interesting results that arise.

## Appendix A- 5 Other interview scripts

### Auckland Council and Environmental Services representatives, interview 1

- What are the outcomes of the Retrofit Your Home programme that are of value to the Auckland Council?
- What is the value of these outcomes to the 'council'?
  - o 'Council' reputation with ratepayers (customers, suppliers, wider public)
  - o Individual councillors reputation with ratepayers
  - o Council's reputation with central government?
  - o Relationship building – with EECA, DHBs, Ministries etc? What is the value of such relationships?
  - o What do improved reputation and relationships allow the council/councillors to do (more of)?
  - o Meeting targets/KPIs etc. What is the value of meeting targets for the council? What would the cost be of not meeting them?
- What would the council have to do to achieve similar outcomes?
  - o What other council initiative/programme would achieve a similar increase in reputation?  
Inorganic collections?
    - o How much would the council spend on advertising/promotions to achieve a similar increase in reputation?
    - o Is there a financial cost or benefit of meeting targets?
- What are the outcomes/effects of the RYH programme for the Regional Environmental Programmes Unit?
  - o Has RYH had any flow on effects on other programmes? E.g. access to funding, other opportunities available, ability to take on programmes?
  - o Has RYH had any flow on effects for the capacity and capability of the unit? E.g. relationship building within the council and external actors (funders, other programme providers), staff capability building, unit profile
  - o What is the value of these outcomes/how would you value them?
  - o Have any other significant projects affected changes in funding/resourcing?
- Effects on Environmental Services Unit/Programmes funding and other forms of capacity (staff, relationship building, profile)
  - o What are the outcomes?
  - o What is their value/how would you value them?
  - o Have any other significant projects affected changes in funding/resourcing?
- What is the value of RYH for wider council?

- What is the value (to the council) of improved reputation with customers, suppliers and the wider public?
- How much would the council spend on advertising/promotions to achieve a similar increase in reputation? Eg 1 pt increase (Likert scale)

### **Auckland Council and Environmental Services representatives, interview 2**

1. What are the outcomes of the Retrofit Your Home programme that are of value to the Auckland Council?
2. Are there limits on the number of customers that can receive finance per year? Are those limits likely to change with time?
3. Do we expect increase in number of customers in general (because Aucklanders are more interested in RYH, population change)
4. Do we expect changes in number of customers, because of changes in EECA's financial subsidy for insulation?
5. How long will the RYH programme last? What factors might affect its lifespan?
6. Is there a fixed (maximum) number of and/or specific suppliers that RYH work with?
7. How long does the payment process to suppliers usually take?
8. What is usually included in a supplier invoice? (e.g. unit costs, installation costs, admin costs)
9. Can we assume that all/90% of RYH customers received:
10. Is EECA the only other form of subsidy that RYH customers could use for their council-financed retrofit, or is it possible that some used DHB funding or similar?
11. If we were to talk to a couple of suppliers to get more information on their experience of RYH, who would you recommend? (large and small?)
12. If we were to talk to EECA about the outcomes of RYH for their programme, who should we talk to?
13. Effects on Environmental Services Unit/Programmes funding and other forms of capacity (staff, relationship building, profile)  
What are the outcomes?  
What is their value/how would you value them?  
Have any other significant projects affected changes in funding/resourcing?

### **Air quality experts**

1. What is the impact of replacing solid fuel burners with an electric heater such as heat pump on air quality?
2. What is the best measure of changes on Auckland air quality?
3. Are there any best practice air quality related researches in New Zealand and specifically in Auckland?
4. What is the difference between PM<sub>10</sub> and PM<sub>2.5</sub>?
5. What are the main outcomes of air quality improvement for Auckland and who are mostly affected?

# Appendix B Data collection

## Appendix B-1 Interviews scripts

### Suppliers

#### Questions for suppliers

1. What is the size and operation of your company? What is your role in that company?
2. What are the outcomes for your business?
3. Number of installations:
  - a. Have numbers increased overall?
  - b. Proportion RYH customers?
  - c. Increase in non-RYH customers? Why is this?
  - d. Has there been a noticeable change since EECA withdrew funding for heat pumps and/or insulation? How have you noticed this?
4. Clean heating:
  - a. How many installers per each installation are needed?
  - b. What is the number of clean heat installations per person per day? (Covec 50-100 m<sup>2</sup>)
  - c. What is the average wholesale price of a heat pump per unit?
  - d. What is installation price per unit?
5. Insulation:
  - a. How many installers per each insulation of an average house are needed?
  - b. what is the average installation area per house?
  - c. What is the installation area per person per day? (Covec 50-100 m<sup>2</sup>)
  - d. What is the average wholesale price of insulation material per m<sup>2</sup>? (please nominate the material and price for ceiling and floor separately)
  - e. What is installation price per m<sup>2</sup>?
6. Effects on running of business:
  - a. Effects of working with council processes on administration, invoicing/payment etc?
    - i. What is the usual timing for payment to them after the work has been done (non-RYH work)?
    - ii. What percentage usually pay later (than the council)?
    - iii. Do you have customers that do not pay after the work has been done (non-RYH work)? Can you give us a percentage of these cases in your work?
    - iv. Have you experienced any changes in recruitment and management costs due to seasonal variation in employment resulting from increased trade and availability of finance? If so what percentage of your cost?
  - b. Does this have an effect on profit per installation?/ what is the cost of these effects on your business?
  - c. Effects on seasonality of installations?
  - d. Has the withdrawal of EECA subsidies affected administration timeframes etc?
7. Employment:
  - a. Has RYH/resulting increases in installations resulted in hiring new employees? Full time vs part time? Permanent vs temporary? What percentage of them were unemployed?
  - b. Has RYH/resulting increases in installations resulted in increase in total employment hours?
  - c. Has RYH/resulting increases in installations resulted in changes to nature of employment for current employees? Full time vs part time? Permanent vs temporary? Seasonality?
  - d. Any other employment effects?
8. Financial security:
  - a. Do you feel more secure about your business as a result of retrofit?
    - i. Secure about payment for jobs?
    - ii. Timing of income? – seasonality etc
    - iii. Long-term business stability?
  - b. Do you expect your business to grow (amount of work, employment, profits) as a result of retrofit?
  - c. How long do you expect these effects (security, growth) to last?

**Follow up email survey related to number of additional employees**

- 1- How many staff hours did you add to your business as the result of the Warm up New Zealand and Retrofit Your Home (RYH) programmes? (Please specify hiring new staff, employing seasonal workers as full-time staff, etc.)
- 2- If the number of staff hours changed as a result of the Warm up New Zealand and Retrofit Your Home programmes, please provide more information on the work status of staff whose working hours were affected, before and after these two programmes.

Please fill in the following table with **Number of employees** whose employment status changed as the result of Warm Up New Zealand and RYH programmes.

| Work Status of additional employees Before the warm up New Zealand and RYH programme | Number of Additional staff who were hired with a new employment status as the result of the Warm up New Zealand and RYH programmes. |                     |                     |
|--|---|---------------------|---------------------|
|  | Seasonal employees  | Part-time employees | Full-time employees |
| Unemployed   |   |                     |                     |
| Seasonal employees in your company   |   |                     | *                   |
| Seasonal employees for another company   |   |                     |                     |
| Part-time employees in your company  |   |                     |                     |
| Part-time employees for another company  |   |                     |                     |
| Full-time employees for another company  |   |                     |                     |

\* e.g. if you fill this cell with number '3' it means that you employed 3 additional full-time employees as the result of Warm up New Zealand and RYH and all 3 of them used to work seasonal in your company before these two programmes.

- 3- What is the average working hour per week and per annum for seasonal, part-time and full-time employees in your company?

| Work status        | Average working hour per week | Average working hour per Year |
|--------------------|-------------------------------|-------------------------------|
| Seasonal employee  |                               |                               |
| Part-time employee |                               |                               |
| Full-time employee |                               |                               |

**Auckland Council, RYH team**

14. Are there limits on the number of customers that can receive finance per year?  
Are those limits likely to change with time?
15. Do we expect increase in number of customers in general (because Aucklanders are more interested in RYH, population change)
16. Do we expect changes in number of customers, because of changes in EECA's financial subsidy for insulation?

17. How long will the RYH programme last? What factors might affect its lifespan?
18. Is there a fixed (maximum) number of and/or specific suppliers that RYH work with?
19. How long does the payment process to suppliers usually take?
20. What is usually included in a supplier invoice? (e.g. unit costs, installation costs, admin costs)
21. Can we assume that all/90% of RYH customers received:
22. Is EECA the only other form of subsidy that RYH customers could use for their council-financed retrofit, or is it possible that some used DHB funding or similar?
23. If we were to talk to a couple of suppliers to get more information on their experience of RYH, who would you recommend? (large and small?)
24. If we were to talk to EECA about the outcomes of RYH for their programme, who should we talk to?

### **Auckland Council**

1. Effects on Environmental Services Unit/Programmes funding and other forms of capacity (staff, relationship building, profile)
  - o What are the outcomes?
  - o What is their value/how would you value them?
  - o Have any other significant projects affected changes in funding/resourcing?
2. What is the value of RYH for wider council?
3. What is the value (to the council) of improved reputation with customers, suppliers and the wider public?
4. How much would the council spend on advertising/promotions to achieve a similar increase in reputation? Eg 1 pt increase

## Appendix B-2 Customer survey, methodology

The Market research company used a telephone-enhanced mail out/online hybrid method to conduct the Retrofit Your Home research. *Note: Due to the complexity of the questionnaire, the Retrofit Your Home research programme did not offer a CATI option.*

All customers with email addresses available were emailed an invitation to the online survey. Those with telephone numbers only were contacted by telephone and asked whether they would prefer to complete the survey online or on hard copy. In addition, a random sample<sup>22</sup> of those initially sent the email invitation who had not responded after a pre-determined time were also contacted by telephone and encouraged to participate. Interviewing statistics were as follows:

- N=1,440 respondents with email addresses were emailed the online survey invitation ('cold invitation') and received two email reminders. No personal contact was made. Of these, n=343 **(24%)** completed the survey.
- N=419 respondents with email addresses were emailed the online survey invitation and received an email reminder. In addition, they received a personal reminder phone call from a member of the interviewing team encouraging them to participate. Of these, n=167 **(40%)** completed the survey.
- N=362 respondents without email addresses were contacted by telephone, asked to take part in the research and also were offered two options to complete the questionnaire. Of these:
  - 120 (33%) nominated to complete the survey online
  - 180 (50%) nominated to receive a hard copy of the questionnaire
  - 62 (17%) declined to participate.

Of the 120 who nominated to complete the survey online, n=65 **(54%)** completed the survey. Of the 180 who received the survey in hard copy, n=59 (33%\*) completed the survey. *\*Note: n=18 were returned well after the costing date. If these were included, the response rate would have been 43%. Note that the number of completes from the recruited participants could have been higher had reminder calls been made. However, the target number of completed interviews had been well exceeded by this point in the fieldwork and no budget had been set aside for these reminder calls.*

Using these methods, the target sample size (n=360) was exceeded – n=634 surveys were returned.

### Final Sample Sizes and Margins of Error

|                | Sample size | Margin of error |
|----------------|-------------|-----------------|
| Total          | n=634       | ±3.9            |
| Owner occupier | n=570       | ±4.1            |
| Landlord       | n=56        | ±13.0           |
| Tenant         | n=8         | ±34.6           |

### A Note on Identifying Tenants

The following process was used to attempt to identify tenants to take part in the survey.

Firstly, the database of programme participants provided was reviewed to identify any contacts who were listed multiple times and/or contact details that differed from the retrofitted property address listed – indicating that these participants may be landlords rather than owner-occupiers. This process identified n=49

<sup>22</sup>Note that not all respondents were contacted as no budget had been set aside for this component.

addresses. A questionnaire was then sent to the retrofitted address in the hope that the people living at the address were tenants who would qualify for the survey. *Note: A questionnaire was also sent to the contact address to also pick up the owner/landlord.* While n=49 questionnaires were sent, some may have actually been to owner-occupiers and/or tenants who may, or may not, have qualified for the survey (i.e. they may not have lived there on or before 1st June). So the number of definite tenants who would have qualified for the survey is unknown.

A question was also added to the survey with landlords to identify whether the retrofitted property was currently tenanted (n=47 said it was currently tenanted) and that their current tenants were living in the property on or before the 1st of June 2012 (n=29 said that their current tenants would qualify). The n=29 identified tenants were then mailed out a questionnaire.



## Appendix B-3 Customer survey, questionnaire

### Retrofit Your Home

Intro Auckland Council's Retrofit Your Home (RYH) programme is intended to help more people enjoy the benefits of warm, dry and healthy homes by providing assistance for insulation or efficient heating. This survey is for owners and occupiers of homes with installations under the programme (referred to as "the retrofit" below). With the information from this survey, Council will better understand the benefits of the programme and how it can deliver the right service in the future. The answers you give will be used only for the purpose of this research. Neither your address nor the people in your household will be identified in the results of this study. Please complete the questionnaire by Monday 7th October. To thank you for taking part, all completed questionnaires received by the 7th October will go into a prize draw for one of ten \$100 vouchers of your choice. (Prize winners will be contacted on the 11th of October).

We would like you to answer this survey in relation to the property at {address}.

Q1 Are you the owner of this home?

- m Yes (1)
- m No (2)

Q2 Do you usually rent this home out - that is, you don't usually live in it yourself.

- m Yes (1)
- m No (2)

Q3 Do you live in this home (most of the time)?

- m Yes (1)
- m No (2)

Q4 Do you use this as a holiday home?

- m Yes (1)
- m No (2)

Q5 Were you living in this home (or using it as a holiday home) on or before 1st of June 2012?

- m Yes (1)
- m No (2)

## The Retrofit

Q6 What heating and insulation did/does your house have:

|  | Before you took part in the Retrofit Your Home Programme? (1) | As a result of the Retrofit Your Home Programme? (2) |
|--|---|--|
| Ceiling insulation (1)                             |   |  |
| Under-floor insulation (2)                         |   |  |
| Under-floor moisture/vapour barrier (3)            |   |  |
| Hot water cylinder wrap (4)                        |   |  |
| Pipe wraps/lagged pipes (5)                        |   |  |
| Open fire (6)                                      |   |  |
| Boxed wood burner (7)                              |   |  |
| Multi-fuel burner (coal and wood) (8)              |   |  |
| Pellet Burner (9)                                  |   |  |
| Flued gas fire (10)                                |   |  |
| Unflued gas heater (portable or wall mounted) (11) |   |  |
| Electric plug-in heater (12)                       |   |  |
| Heat pump (13)                                     |   |  |
| Flued gas heater (14)                              |   |  |

Q7 Auckland Council is trying to understand whether retrofitting makes rental properties more marketable. By how much, if any, did you raise the rent (per month) as a result of the retrofit?

m Rent Increase (please specify \$/month) (1) \_\_\_\_\_

m Home hasn't been rented out since retrofit (2)

m No increase, or rent

decreased (3)

### Joining The Programme

Q12 Which of these features would you have still installed even if you had not had financial assistance through the Retrofit Your Home programme?.

- q Ceiling insulation (1)
- q Under-floor insulation (2)
- q Under-floor moisture/vapour barrier (3)
- q Hot water cylinder wrap (4)
- q Pipe wraps/lagged pipes (5)
- q Efficient wood burner (6)
- q Efficient pellet burner (7)
- q Heat pump (8)
- q Efficient flued gas heater (9)
- q None - wouldn't have installed any features without the financial assistance through the Retrofit Your Home programme (11)

Q13 Did you install any non-RYH financed features around the same time as your retrofit? Please tick all boxes that apply to you.

- q No, I only installed RYH features (1)
- q I installed thermal drapes (2)
- q I installed double glazing (3)
- q Other - please specify any features relating to making your home warmer, drier and healthier. (5) \_\_\_\_\_

Q14 At the time you applied for Retrofit Your Home funding (and the Energy Wise (EECA) subsidy), what other finance options did you seriously consider using to pay for your intended retrofit? Please tick all those that you actually looked into using.

- q Full payment up-front (1)
- q Extending my mortgage (2)
- q Using the revolving credit on my mortgage (3)
- q Getting a personal loan from the bank (4)
- q Getting a loan from family or friends (5)
- q Getting a loan from a private finance company (6)

q Other - please specify (7) \_\_\_\_\_

q Don't recall (8)

q None - only considered

RYH (9)

Q15 Auckland Council wants to understand how appealing it is to provide financial assistance for retrofits when there are other financial options available. Please tick the factors that made each option appealing to you.

|  | Retrofit your home (1) | Extending my mortgage (2) | Using my revolving credit (3) | Personal loan from bank (4) | Loan from family or friends (5) | Loan from finance company (6) | Other (7) |
|--|------------------------|---------------------------|-------------------------------|-----------------------------|---------------------------------|-------------------------------|-----------|
| The interest rate was attractive (1)   |                        |                           |                               |                             |                                 |                               |           |
| The interest free period was attractive. Note: If this option doesn't have an interest free period, please leave it blank. (2) |                        |                           |                               |                             |                                 |                               |           |
| The regular repayment amount was manageable (4)  |                        |                           |                               |                             |                                 |                               |           |
| I could repay the loan earlier than required without penalties (5)   |                        |                           |                               |                             |                                 |                               |           |
| I felt secure about the provider. Note: The provider for RYH is Auckland Council (6)   |                        |                           |                               |                             |                                 |                               |           |
| This option made me feel more able to manage my finances (7)   |                        |                           |                               |                             |                                 |                               |           |

Q13a What else, if anything, appealed about obtaining financial assistance through the Retrofit Your Home programme?

Q16 Did you use any other financial assistance (in addition to RYH and the energy-wise subsidy) to carry out your retrofit?

m Yes (1)

m No (2)

Q17 How much additional finance did you require?

Q18 Please rate the following statements about your RYH repayments:

|  | Strongly agree<br>(1) | Agree (2) | Neither<br>Agree nor<br>Disagree<br>(3) | Disagree<br>(4) | Strongly<br>Disagree<br>(5) |
|--|-----------------------|-----------|---|-----------------|-----------------------------|
| I have been able to meet the cost of RYH payments through my rates (1) |                       |           |   |                 |                             |
| The repayments have put me under financial stress (2)                  |                       |           |   |                 |                             |

Q19 As a result of your experience with the RYH programme, would you say you are:

- m A lot more positive about Auckland Council (1)
- m A little more positive (2)
- m A little more negative (3)
- m A lot more negative (4)
- m RYH has had no impact on your perception of Auckland Council (5)

Q20 Is this property tenanted at the moment?

- m Yes (1)
- m No (2)

Q21 Were the current tenants living in the property on or before the 1st of June 2012?

- m Yes (1)
- m No (2)

#### About You And Your Household

If possible, the person who pays the bills should answer these questions.

Q22 Please fill out the following table for each person in your home including yourself.

|  | Are they at<br>school or in<br>tertiary | Are they a<br>Community<br>Services | Are they in<br>paid work<br>(full or part | - |
|--|---|-------------------------------------|---|---|
|  |   |                                     |   |   |

|               | education? |        | Card holder? |        | time)?  |        | Age (1) |
|---------------|------------|--------|--------------|--------|---------|--------|---------|
|               | Yes (1)    | No (2) | Yes (1)      | No (2) | Yes (1) | No (2) |         |
| Person A (1)  |            |        |              |        |         |        |         |
| Person B (2)  |            |        |              |        |         |        |         |
| Person C (3)  |            |        |              |        |         |        |         |
| Person D (4)  |            |        |              |        |         |        |         |
| Person E (5)  |            |        |              |        |         |        |         |
| Person F (6)  |            |        |              |        |         |        |         |
| Person G (7)  |            |        |              |        |         |        |         |
| Person H (8)  |            |        |              |        |         |        |         |
| Person I (9)  |            |        |              |        |         |        |         |
| Person J (10) |            |        |              |        |         |        |         |
| Person K (11) |            |        |              |        |         |        |         |
| Person L (12) |            |        |              |        |         |        |         |

### Heating Your Home

Q23 What heating and insulation did/does your house have:

|   | Before you took part in the Retrofit Your Home Programme (1) | As a result of the Retrofit Your Home programme (2) |
|---|--|---|
| Ceiling insulation (1)                  |  |   |
| Under-floor insulation (2)              |  |   |
| Under-floor moisture/vapour barrier (3) |  |   |
| Hot water cylinder wrap (4)             |  |   |
| Pipe wraps/lagged pipes (5)             |  |   |
| Open fire (6)                           |  |   |
| Boxed wood burner (7)                   |  |   |

|  |  |  |
|--|--|--|
| Multi-fuel burner (coal and wood) (8)              |  |  |
| Pellet Burner (9)                                  |  |  |
| Flued gas fire (10)                                |  |  |
| Unflued gas heater (portable or wall mounted) (11) |  |  |
| Electric plug-in heater (12)                       |  |  |
| Heat pump (13)                                     |  |  |
| Flued gas heater (14)                              |  |  |

Q24 Please describe your use of heating appliances before and after the retrofit. We realise that you may not remember exactly, so it is your impressions that count. Please estimate the number of hours in an average winter's day (June to August) that you would use... Note: If you did not have the heating appliance either before or after the retrofit, please record 'NA' (not applicable) in the box. Please enter '0' to indicate no hours used.

|   | BEFORE the Retrofit (Hrs per day) |             | SINCE the Retrofit (Hrs per day) |             |
|---|-----------------------------------|-------------|----------------------------------|-------------|
|   | Weekday (1)                       | Weekend (2) | Weekday (1)                      | Weekend (2) |
| Open fire (1)                                     |                                   |             |                                  |             |
| Boxed wood burner (pre 2005 model) (2)            |                                   |             |                                  |             |
| Boxed wood burner (2005 and later model) (3)      |                                   |             |                                  |             |
| Pellet burner (4)                                 |                                   |             |                                  |             |
| Flued gas fire (5)                                |                                   |             |                                  |             |
| Unflued gas heater (portable or wall mounted) (6) |                                   |             |                                  |             |
| Electric plug-in heater (7)                       |                                   |             |                                  |             |
| Heat pump (8)                                     |                                   |             |                                  |             |
| Multi-fuel burner (coal and wood) (9)             |                                   |             |                                  |             |
| Flued gas heater (15)                             |                                   |             |                                  |             |

Q25 What type of fuel did/do you burn? (please select)

|                         | Mainly coal (1) | Mainly wood (2) | A mix of wood and coal (3) | Not applicable - didn't have or use appliance at this time (4) |
|-------------------------|-----------------|-----------------|----------------------------|--|
| BEFORE the retrofit (1) |                 |                 |                            |  |
| SINCE the retrofit (2)  |                 |                 |                            |  |

Q26 Which of the following best describes your access to firewood? (please select)

|                         | All the firewood I had/have access to was free (1) | Some of the firewood I had/have access to was free (2) | None of the firewood I had/have access to was free (3) | Not applicable (4) |
|-------------------------|--|--|--|--------------------|
| BEFORE the retrofit (1) |  |  |  |                    |
| SINCE the retrofit (2)  |  |  |  |                    |

Q27 How often does your household:

|  | BEFORE the Retrofit |            |               |           | SINCE the Retrofit |            |               |           |
|--|---------------------|------------|---------------|-----------|--------------------|------------|---------------|-----------|
|  | Always (1)          | Mostly (2) | Sometimes (3) | Never (4) | Always (1)         | Mostly (2) | Sometimes (3) | Never (4) |
| Heat all the rooms in your home that you wanted to heat? (1)               |                     |            |               |           |                    |            |               |           |
| Heat your home for as much of the day and night as you wanted to heat? (2) |                     |            |               |           |                    |            |               |           |
| Heat your home to temperatures that felt warm and comfortable? (3)         |                     |            |               |           |                    |            |               |           |



Q28 How many layers did/do you wear on your upper body while in your home during winter during the day? This may include blankets that you wrap around yourself.

|                         | 1 Layer (1) | 2 Layers (2) | 3 Layers (3) | 4 Layers or more (4) |
|-------------------------|-------------|--------------|--------------|----------------------|
| BEFORE the Retrofit (1) |             |              |              |                      |
| SINCE the Retrofit (2)  |             |              |              |                      |

### Money Matters

Q33 Approximately how much was your MONTHLY household...

|  | Electricity bill (\$) Note: If you use mains gas, this includes the cost of mains gas as well. (5) | Spend on heating fuels (e.g. wood, coal, bottled gas). If you did not spend anything on heating fuels, please enter \$0. (6) |
|--|--|--|
| In winter 2012 (June, July or August 2012) (1) |  |  |
| In winter 2013 (June, July or August 2013) (2) |  |  |

Q8 Do you use gas from the mains for heating? (Note: This does not include gas from a gas bottle)

- m Yes (1)
- m No (2)
- m Don't know (3)

Q35 Please identify any other changes\* in your home that might have affected the amount you spend on electricity or fuels? \*E.g. changes in your appliances (e.g. another shower), electricity provider, or the number of people in your household.

### Comfort Matters

These next questions ask you to rate how comfortable you felt in your home prior to, and since, receiving the retrofit. We realise that you may not remember exactly, so it is your impressions that count.

Q36 Please rate how strongly you agree with the following statements :

|  | BEFORE the Retrofit |           |                                |              |                       | SINCE the Retrofit |           |                                |              |                       |
|--|---------------------|-----------|--------------------------------|--------------|-----------------------|--------------------|-----------|--------------------------------|--------------|-----------------------|
|  | Strongly Agree (1)  | Agree (2) | Neither agree nor disagree (3) | Disagree (4) | Strongly Disagree (5) | Strongly Agree (1) | Agree (2) | Neither agree nor disagree (3) | Disagree (4) | Strongly disagree (5) |
| I felt comfortable in my home (1)                          |                     |           |                                |              |                       |                    |           |                                |              |                       |
| My home felt clean (2)                                     |                     |           |                                |              |                       |                    |           |                                |              |                       |
| My home was warm and dry (3)                               |                     |           |                                |              |                       |                    |           |                                |              |                       |
| My home smelt pleasant (4)                                 |                     |           |                                |              |                       |                    |           |                                |              |                       |
| I was not bothered by noise in my home (5)                 |                     |           |                                |              |                       |                    |           |                                |              |                       |
| I felt good about the condition of my home (6)             |                     |           |                                |              |                       |                    |           |                                |              |                       |
| I felt I could change my home to improve its condition (7) |                     |           |                                |              |                       |                    |           |                                |              |                       |

Q37 How dissatisfied or satisfied were/are you with your home overall:

|                         | 1 (not satisfied at all) (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 6 (6) | 7 (completely satisfied) (7) |
|-------------------------|------------------------------|-------|-------|-------|-------|-------|------------------------------|
| BEFORE the Retrofit (1) |                              |       |       |       |       |       |                              |
| SINCE the Retrofit (2)  |                              |       |       |       |       |       |                              |

### Maintenance Matters

We are interested in knowing whether the retrofit to your house has changed the extent to which you maintain it. We realise that you may not remember exactly, so it is your impressions that count.

Q38 Please rate the extent to which the following problems occurred:

|   | BEFORE the Retrofit During the 2012 winter (June-August 2012) |                   |                      |                 |                  | AFTER the Retrofit During the 2013 winter (June-August 2013) |                   |                      |                 |                  |
|---|---|-------------------|----------------------|-----------------|------------------|--|-------------------|----------------------|-----------------|------------------|
|   | No problem (1)  | Small problem (2) | Moderate problem (3) | Big problem (4) | Don't recall (5) | No problem (1)   | Small problem (2) | Moderate Problem (3) | Big problem (4) | Don't recall (5) |
| Soot or smoke indoors (1)   |   |                   |                      |                 |                  |  |                   |                      |                 |                  |
| Mould/mildew (2)  |   |                   |                      |                 |                  |  |                   |                      |                 |                  |
| Condensation/dampness (3)   |   |                   |                      |                 |                  |  |                   |                      |                 |                  |
| Damage to the house or your belongings caused from soot, smoke, mould or condensation (4) |   |                   |                      |                 |                  |  |                   |                      |                 |                  |

Q39 Please describe the type and amount of damage to your house or personal belongings due to soot, smoke, mould or condensation in winter 2012:

Q40 Approximately how many hours a month did/do you spend cleaning or maintaining your home due to indoor smoke or soot, mould, condensation, or any damage caused by those things?

|                          | None at all (1) | Less than 1 hour a month (2) | 1-2 hours a month (3) | 3-5 hours a month (4) | 6-9 hours a month (5) | 10 or more hours a month (6) | Don't recall (7) |
|--------------------------|-----------------|------------------------------|-----------------------|-----------------------|-----------------------|------------------------------|------------------|
| BEFORE the Restrofit (1) |                 |                              |                       |                       |                       |                              |                  |
| SINCE the Retrofit (2)   |                 |                              |                       |                       |                       |                              |                  |

Q41 What was your average annual spend (if any) on cleaning or repairs due to soot, mould, condensation or related damage in the winter BEFORE the retrofit? Note: This may include your landlord's spend on cleaning, repairs. (Enter '\$0' if spent nothing)

- m Average annual spend on cleaning or repairs BEFORE the Retrofit (\$) (1) \_\_\_\_\_
- m Don't know (2)

Q41a What was your average annual spend (if any) on cleaning or repairs due to soot, mould, condensation or related damage in the winter SINCE the retrofit? Note: This may include your landlord's spend on cleaning, repairs. (Enter '\$0' if spent nothing)

- m Average annual spend on cleaning or repairs SINCE the Retrofit (\$) (1) \_\_\_\_\_
- m Don't know (2)

Q41b What was your average annual spend (if any) on replacement of damaged items due to soot, mould, condensation or related damage in the winter BEFORE the retrofit? Note: This may include your landlord's spend on replacement of damaged items. (Enter '\$0' if spent nothing)

- m Average annual spend on replacement of damaged items BEFORE the Retrofit (\$) (1) \_\_\_\_\_
- m Don't know (2)

Q41c What was your average annual spend (if any) on replacement of damaged items due to soot, mould, condensation or related damage in the winter SINCE the retrofit? Note: This may include your landlord's spend on replacement of damaged items. (Enter '\$0' if spent nothing)

- m Average annual spend on replacement of damaged items SINCE the Retrofit (\$) (1) \_\_\_\_\_
- m Don't know (2)

## Health Matters

The following questions are related to the health of all your household members before and after the retrofit.

Q42 Before the retrofit, did anyone in the household have any illness commonly related to living in a cold damp home? These illnesses include frequent cold and flu, respiratory illness (chest, throat, sinuses eg coughs), asthma, circulatory illness (heart and vascular system), joint pain or arthritis.

m Yes (1)

m No (2)

Q43 How many household members experienced any of these illnesses before the retrofit?

m 1 (1)

m 2 (2)

m 3 (3)

m 4 (4)

m 5 (5)

m 6 or more (6)

Now thinking about the **first** person in the household who experienced an illness commonly related to living in a cold damp house.

Q44 What is the age of this person?

Q45 Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?

q Frequent cold and flu (1)

q Respiratory illness (chest, throat, sinuses e.g. coughs) (2)

q Asthma (3)

q Circulatory illness (heart and vascular system) (4)

q Joint pain or arthritis (5)

q Other – please specify: (6) \_\_\_\_\_

Q46 How often did this person experience this/these illnesses relating to living in a cold, damp home:

|                                       | Ongoing/permanent (8) | More than once a week (1) | Weekly (2) | Fortnightly (3) | Monthly (4) | Less than monthly (5) | Never (6) | Don't recall (7) |
|---------------------------------------|-----------------------|---------------------------|------------|-----------------|-------------|-----------------------|-----------|------------------|
| In the winter BEFORE the retrofit (1) |                       |                           |            |                 |             |                       |           |                  |
| In the winter SINCE the retrofit (2)  |                       |                           |            |                 |             |                       |           |                  |

Now thinking about the **second** person in the household who experienced an illness commonly related to living in a cold damp house.

Q44/2 What is the age of this person?

Q45/2 Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?

- q Frequent cold and flu (1)
- q Respiratory illness (chest, throat, sinuses e.g. coughs) (2)
- q Asthma (3)
- q Circulatory illness (heart and vascular system) (4)
- q Joint pain or arthritis (5)
- q Other – please specify: (6) \_\_\_\_\_

Q46/2 How often did this person experience this/these illnesses related to living in a cold, damp home:

|                                       | Ongoing/ Permanently (8) | More than once a week (1) | Weekly (2) | Fortnightly (3) | Monthly (4) | Less than monthly (5) | Never (6) | Don't recall (7) |
|---------------------------------------|--------------------------|---------------------------|------------|-----------------|-------------|-----------------------|-----------|------------------|
| In the winter BEFORE the retrofit (1) |                          |                           |            |                 |             |                       |           |                  |
| In the winter SINCE the retrofit (2)  |                          |                           |            |                 |             |                       |           |                  |

Now thinking about the **third** person in the household who experienced an illness commonly related to living in a cold damp house.

Q345 What is the age of this person?

Q346 Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?

- q Frequent cold and flu (1)
- q Respiratory illness (chest, throat, sinuses e.g. coughs) (2)
- q Asthma (3)
- q Circulatory illness (heart and vascular system) (4)
- q Joint pain or arthritis (5)
- q Other – please specify: (6) \_\_\_\_\_

Q347 How often did this person experience this/these illnesses related to living in a cold, damp home:

|                                       | Ongoing/<br>Permanently (8) | More than<br>once a<br>week (1) | Weekly (2) | Fortnightly<br>(3) | Monthly (4) | Less<br>than<br>monthly<br>(5) | Never (6) | Don't<br>recall<br>(7) |
|---------------------------------------|-----------------------------|---------------------------------|------------|--------------------|-------------|--------------------------------|-----------|------------------------|
| In the winter BEFORE the retrofit (1) |                             |                                 |            |                    |             |                                |           |                        |
| In the winter SINCE the retrofit (2)  |                             |                                 |            |                    |             |                                |           |                        |

Q352 Now thinking about the **fourth** person in the household who experienced an illness commonly related to living in a cold damp house.

Q353 What is the age of this person?

Q354 Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?

- q Frequent cold and flu (1)
- q Respiratory illness (chest, throat, sinuses e.g. coughs) (2)
- q Asthma (3)
- q Circulatory illness (heart and vascular system) (4)
- q Joint pain or arthritis (5)

q Other – please specify: (6) \_\_\_\_\_

Q355 How often did this person experience this/these illnesses related to living in a cold, damp home:

|  | Ongoing/<br>Permanently (8) | More than<br>once a<br>week (1) | Weekly (2) | Fortnightly<br>(3) | Monthly (4) | Less<br>than<br>monthly<br>(5) | Never (6) | Don't<br>recall<br>(7) |
|--|-----------------------------|---------------------------------|------------|--------------------|-------------|--------------------------------|-----------|------------------------|
| In the winter BEFORE the retrofit<br>(1) |                             |                                 |            |                    |             |                                |           |                        |
| In the winter SINCE the retrofit<br>(2)  |                             |                                 |            |                    |             |                                |           |                        |

Now thinking about the **fifth** person in the household who experienced an illness commonly related to living in a cold damp house.

Q361 What is the age of this person?

Q362 Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?

- q Frequent cold and flu (1)
- q Respiratory illness (chest, throat, sinuses e.g. coughs) (2)
- q Asthma (3)
- q Circulatory illness (heart and vascular system) (4)
- q Joint pain or arthritis (5)
- q Other – please specify: (6) \_\_\_\_\_

Q363 How often did this person experience this/these illnesses related to living in a cold, damp home:

|  | Ongoing/<br>Permanently (8) | More than<br>once a<br>week (1) | Weekly (2) | Fortnightly<br>(3) | Monthly (4) | Less<br>than<br>monthly<br>(5) | Never (6) | Don't<br>recall<br>(7) |
|--|-----------------------------|---------------------------------|------------|--------------------|-------------|--------------------------------|-----------|------------------------|
| In the winter BEFORE the retrofit<br>(1) |                             |                                 |            |                    |             |                                |           |                        |
| In the winter SINCE the retrofit<br>(2)  |                             |                                 |            |                    |             |                                |           |                        |



Now thinking about the sixth person in the household who experienced an illness commonly related to living in a cold damp house.

Q369 What is the age of this person?

Q370 Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?

- q Frequent cold and flu (1)
- q Respiratory illness (chest, throat, sinuses e.g. coughs) (2)
- q Asthma (3)
- q Circulatory illness (heart and vascular system) (4)
- q Joint pain or arthritis (5)
- q Other – please specify: (6) \_\_\_\_\_

Q371 How often did this person experience this/these illnesses related to living in a cold, damp home:

|  | Ongoing/<br>Permanently (8) | More than<br>once a<br>week (1) | Weekly (2) | Fortnightly<br>(3) | Monthly (4) | Less<br>than<br>monthly<br>(5) | Never (6) | Don't<br>recall<br>(7) |
|--|-----------------------------|---------------------------------|------------|--------------------|-------------|--------------------------------|-----------|------------------------|
| In the winter BEFORE the retrofit<br>(1) |                             |                                 |            |                    |             |                                |           |                        |
| In the winter SINCE the retrofit<br>(2)  |                             |                                 |            |                    |             |                                |           |                        |

Q47 Thinking now about YOUR ENTIRE HOUSEHOLD, how many times did adults and/or children in the household visit the doctor (GP) for an illness related to living in a cold, damp home? Please type in the number. Type '0' if no visits. If you can't remember, please enter '99' in the relevant box.

|  | All adults in<br>household (1) | All children<br>in<br>household<br>(2) |
|--|--------------------------------|--|
| In the winter BEFORE the retrofit<br>(winter 2012) (1) |                                |  |

|  |  |  |
|--|--|--|
| In the winter SINCE the retrofit (winter 2013) (2) |  |  |
|--|--|--|

Q48 How many times did adults and/or children in the household visit the hospital for illnesses related to living in a cold, damp home? Please type in the number. Type '0' if no visits. If you can't remember, please enter '99' in the relevant box.

|  | In the winter BEFORE the retrofit (winter 2012) |              | In the winter SINCE the retrofit (winter 2013) |              |
|--|---|--------------|--|--------------|
|  | Adults (1)                                      | Children (2) | Adults (1)                                     | Children (2) |
| Number of visits to Accident and Emergency (1) |   |              |  |              |
| Number of outpatient day visits (2)            |   |              |  |              |
| Number of nights in hospital (3)               |   |              |  |              |

Q48a Did you or anyone in your household have surgery for an illness related to living in a cold, damp home?

|                                       | Adults (1) | Children (2) |
|---------------------------------------|------------|--------------|
| In the winter BEFORE the Retrofit (1) |            |              |
| In the winter SINCE the Retrofit (2)  |            |              |

Q54 Which of the following healthcare did people in your household pay for all illness commonly related to living in a cold damp home?

|                                   | In the winter BEFORE the retrofit (winter 2012) (1) | In the winter SINCE the retrofit (winter 2013) (2) |
|-----------------------------------|---|--|
| Doctor (GP) visits (1)            |   |  |
| Hospital visits (2)               |   |  |
| Surgery in a public hospital (3)  |   |  |
| Surgery in a private hospital (4) |   |  |

|                     |  |  |
|---------------------|--|--|
| Outpatient care (5) |  |  |
| Medicines (6)       |  |  |

Q55 How many days off work and school did your household have due to illnesses commonly related to living in a cold damp home? Please feel free to check. Please enter "0" if no days.

|  | Number of days in the winter BEFORE the retrofit (1) | Number of days in the winter SINCE the retrofit (2) |
|--|--|---|
| Paid leave to care for children or other householders (1)  |  |   |
| Unpaid leave to care for children or other householders (2)  |  |   |
| Days off school by sick children (3)   |  |   |
| Paid care for sick children or other householders (not including during adults' treatment or recovery) (4) |  |   |
| Paid leave for sick adults (5)   |  |   |
| Unpaid leave for sick adults (6)   |  |   |
| Paid care for children or other householders during adults' treatment or recovery (7)                      |  |   |

Q56 Has anything else changed in your home or lives in the 12 months since the retrofit that might have affected the incidence of illness in your household?

Productivity Matters

The following questions ask you about changes in you and your household's activities, work and education in the 12 months since the retrofit.

Q57 Please rate how much the following things have changed for you personally since the retrofit, which you think is related to the retrofit (e.g. you sleep better because your house is warmer):

|  | Significant decrease (1) | Some decrease (2) | No change (3) | Some increase (4) | Significant increase (5) | Does not apply (6) |
|--|--------------------------|-------------------|---------------|-------------------|--------------------------|--------------------|
| The amount I get done in my work/study (1)                             |                          |                   |               |                   |                          |                    |
| The amount I get done around home (2)                                  |                          |                   |               |                   |                          |                    |
| Participation in activities (e.g. sports, social) outside the home (3) |                          |                   |               |                   |                          |                    |
| The amount of energy I have in the evenings (4)                        |                          |                   |               |                   |                          |                    |

Q58 Please rate how much the following things have changed for your household since the retrofit, which you think is related to the retrofit:

|  | Significant decrease (1) | Some decrease (2) | No change (3) | Some increase (4) | Significant increase (5) | Does not apply (6) |
|--|--------------------------|-------------------|---------------|-------------------|--------------------------|--------------------|
| The amount of time the household spends together at home (1)   |                          |                   |               |                   |                          |                    |
| How productive the household is in the home (this could include, cooking, cleaning, studying, working, or playing) (2) |                          |                   |               |                   |                          |                    |
| The number of visitors to our home (3)   |                          |                   |               |                   |                          |                    |

Q59a How many people in your household do paid work from home, at least occasionally?

- m 1 (1)
- m 2 (2)
- m 3 (3)

m 4 or more (4)

m None (5)

Q60 Please indicate often each of these householders works from home:

|                   | All the time (5 days a week) (1) | 3-4 days a week (2) | 1-2 days a week (3) | Occasionally (1-2 days a month) (4) | Don't know (5) |
|-------------------|----------------------------------|---------------------|---------------------|-------------------------------------|----------------|
| Householder 1 (1) |                                  |                     |                     |                                     |                |
| Householder 2 (2) |                                  |                     |                     |                                     |                |
| Householder 3 (3) |                                  |                     |                     |                                     |                |
| Householder 4 (4) |                                  |                     |                     |                                     |                |

Q61 Overall, how has the retrofit affected the ability of householder(s)', who do paid work from home, to get their work done at home?

|                   | Significant decrease (1) | Some decrease (2) | No change/no affect (3) | Some improvement (4) | Significant improvement (5) |
|-------------------|--------------------------|-------------------|-------------------------|----------------------|-----------------------------|
| Householder 1 (1) |                          |                   |                         |                      |                             |
| Householder 2 (2) |                          |                   |                         |                      |                             |
| Householder 3 (3) |                          |                   |                         |                      |                             |
| Householder 4 (4) |                          |                   |                         |                      |                             |

Q62i How many people living in your home are at school or tertiary education

m None (1)

m 1 (2)

m 2 (3)

m 3 (4)

m 4 or more (5)

Q62 Please rate how much the amount of study student(s) are able to do at home has changed for each student in your household, which you think is related to the retrofit. If you think none of the change is attributable to the retrofit, please select 'no change':

|               | Significant decline (1) | Some decline (2) | No change (3) | Some improvement (4) | Significant improvement (5) | Does not apply (6) | No change (7) |
|---------------|-------------------------|------------------|---------------|----------------------|-----------------------------|--------------------|---------------|
| Student 1 (1) |                         |                  |               |                      |                             |                    |               |
| Student 2 (2) |                         |                  |               |                      |                             |                    |               |
| Student 3 (3) |                         |                  |               |                      |                             |                    |               |
| Student 4 (4) |                         |                  |               |                      |                             |                    |               |

Q63 Please rate how much the grades or reports the student(s) receive have changed for each student in your household, which you think is related to the retrofit. If you think none of the change is attributable to the retrofit, please select 'no change':

|               | Significant decline (1) | Some decline (2) | Some improvement (4) | Significant improvement (5) | Does not apply (6) | No change (7) |
|---------------|-------------------------|------------------|----------------------|-----------------------------|--------------------|---------------|
| Student 1 (1) |                         |                  |                      |                             |                    |               |
| Student 2 (2) |                         |                  |                      |                             |                    |               |
| Student 3 (3) |                         |                  |                      |                             |                    |               |
| Student 4 (4) |                         |                  |                      |                             |                    |               |

Q63 Has anything else changed in your household in the 12 months after the retrofit that might have affected the productivity of householders (e.g. change in job, family event)?

### Life Satisfaction

Q64 How dissatisfied or satisfied were/are you with your life overall?

|  | 1 (not satisfied at all) (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 6 (6) | 7 (completely satisfied) (7) |
|--|------------------------------|-------|-------|-------|-------|-------|------------------------------|
|  |                              |       |       |       |       |       |                              |

|                         |  |  |  |  |  |  |  |
|-------------------------|--|--|--|--|--|--|--|
| BEFORE the Retrofit (1) |  |  |  |  |  |  |  |
|-------------------------|--|--|--|--|--|--|--|

Q64a Has your satisfaction with your life overall:

- m Increased since the retrofit (1)
- m Stayed the same (2)
- m Decreased since the retrofit (3)
- m Don't know (4)

Q64b How dissatisfied or satisfied were/are you with your life overall?

|                        | 1 (not satisfied at all) (1) | 2 (2) | 3 (3) | 4 (4) | 5 (5) | 6 (6) | 7 (completely satisfied) (7) |
|------------------------|------------------------------|-------|-------|-------|-------|-------|------------------------------|
| SINCE the Retrofit (2) |                              |       |       |       |       |       |                              |

Q65 How long do you expect this change in your life satisfaction to last?

- m Up to 1 year (1)
- m 2 years (2)
- m 3 years (3)
- m 4 years (4)
- m 5 years (5)
- m 6 years (6)
- m 7 years (7)
- m 8 years (8)
- m 9 years (9)
- m 10 years + (10)
- m Does not apply (11)

Q66 How much would you need to spend each year on a holiday to achieve a similar increase in life satisfaction? Please take a moment to reflect, and provide a best estimate.

m Please enter amount (\$) (1) \_\_\_\_\_

m Don't know (2)

Q67 What amount of money would you need to be paid to go back to living in your house prior to the retrofit? Please take a moment to reflect, and provide a best estimate.

m Please enter amount (\$) (1) \_\_\_\_\_

m Would never go back (2)

m Don't know (3)

Q68 Has anything else changed in your household in the 12 months after the retrofit that might have affected the life satisfaction of householders (e.g. change in job, family event)?

Q69 As a result of your experience with the RYH programme, would you say you are:

m A lot more positive about Auckland Council (1)

m A little more positive (2)

m A little more negative (3)

m A lot more negative (4)

m RYH has had no impact on your perception of Auckland Council (5)

#### Household Details

Lastly, we would like to ask a few questions about you and your household. This will allow us to compare the outcomes of the Retrofit Your Home programme for different types of people.

Q70 Which best describes your household's total annual income before tax?

m \$0-\$19,999 (1)

m \$20,000-\$29,999 (2)

m \$30,000-\$39,999 (3)

m \$40,000-\$49,999 (4)

m \$50,000-\$74,999 (5)

m \$75,000-\$99,999 (6)



- m \$100,000-\$124,999 (8)
- m \$125,000-\$149,999 (9)
- m \$150,000 and more (10)

Q71 Which ethnic group, or groups, do members of your household belong to? Please select all groups that apply.

- q New Zealand European (including Kiwi, Pakeha) (1)
- q Māori (2)
- q Samoan (3)
- q Cook Island Māori (4)
- q Tongan (5)
- q Niuean (6)
- q Chinese (7)
- q Indian (8)
- q Other European (9)
- q Other (please state) (10) \_\_\_\_\_

Q72 Please use this space to provide any further feedback on Auckland Council's Retrofit Your Home programme.



## Appendix C The outcomes calculation

### Appendix C-1 Basic information

| Basic Information  |         |   |  |
|--|---------|---|--|
| Description  | Value   | Rationale   | Source   |
| Number of heat pump only customers   | 1,667   | Customers who only installed heat pump in the period of July 2012-June 2013. Heat pump only option is available for properties that already have appropriate insulation.  | Auckland Council, ESU data   |
| Number of insulation only customers  | 206     | Customers who only installed insulation in the period of July 2012-June 2013.   | Auckland Council, ESU data   |
| Number of both heat pump and insulation customers  | 620     | Customers who installed both heat pump and insulation in the period of July 2012-June 2013.   | Auckland Council, ESU data   |
| Total customers  | 2,493   | Aggregated number of customers who installed heat pump and/or insulation in the period of July 2012-June 2013.  | Auckland Council, ESU data   |
| Number of responses to customer survey   | 570     | Number of customers who installed heat pump and/or insulation in the period of July 2012-June 2013 and participated in the customer data collection survey.   | Primary research, customer survey result, RIMU calculation                                       |
| Completed survey   | 410     | Number of respondents who answered most of the key questions.   |  |
| Proportion of customers who would install heat pump and or insulation anyway in the absence of RYH programme | 0.33    | 67 per cent of respondents to question 12 of the customer survey outlined they 'Would not have installed any features without RYH', and the rest of the respondents stated they would install insulation and/or heat pump anyway in absence of RYH programme.                                   | Primary research, customer survey result, RIMU calculation                                       |
| Loan repayment period (years)  | 9       | 9 years is the standard repayment period of RYH programme.  | Auckland Council, ESU data   |
| Loan repayments incidence in a year  | 4       | The loan repays quarterly per year.   | Auckland Council, ESU data   |
| Interest rate  | 0.07    | The interest rate for the evaluation year (July 2012-June 2013) is 7 per cent. Although it is floating and is subject to change each financial year based on changes in the council's average long-term borrowing rate, the assumption in the scope of the evaluation is a fixed interest rate. | Auckland Council, ESU data and the SROI project team assumption for the scale of the evaluation. |
| Average loan   | \$2,407 | Average loan calculated based on the total amount of loan and number of customers.  | RIMU calculation   |

## Basic Information

| Description                                      | Value       | Rationale  | Source  |
|--|-------------|--|---|
| Auckland Council's operational cost              | \$140,095   | Net operational cost is the total operational cost net of the total operational revenue (user charge 0.8%) that is included in the loan interest rate.<br>The operational cost is the labour and overhead costs that council incurred to develop the programme in year ended June 2013. The cost includes staff time to develop and manage the programme, costs associated with promotion of programme and a portion of the council's overhead costs that enable the programme to function e.g. computers, desks and internet. | Auckland Council, ESU   |
| Amount of loan                                   | \$6,000,000 | Total amount that has been allocated as financial support in the year ended June 2013.   | Auckland Council, ESU   |
| Present value of interest repayment by customers | \$1,898,464 | Aggregated present value of interest repayment by each customer  |   |
| Discount rate                                    | 0.04        | It is recommended by Auckland Council CBA primer that "A 4% discount rate should be applied in the first instance for Auckland Council proposals with sensitivity testing at 6% and 8%."   | Auckland Council (2013), Cost Benefit Analysis Primer, version 20 May 2013. |
| EECA's attribution (Heat pump)                   | 0.25        | ESU calculation, based on a quarter of heat pump subsidy paid by EECA's warm up NZ programme   | Auckland Council, ESU   |
| EECA's attribution (Insulation)                  | 0.33        | One third of insulation subsidy that was funded by EECA in 2012-2013 financial year.   | Auckland Council, ESU   |

## Appendix C-2 Increased feeling of satisfaction with living situation

| Stakeholder                              | Occupiers of RYH homes   |       |   |                                    |
|--|--|-------|---|------------------------------------|
| Outcome                                  | Increased feeling of satisfaction with living situation  |       |   |                                    |
|  | Description  | Value | Rationale   | Source                             |
| <b>Number of stakeholders</b>            | Number of Customers  | 2,493 | Aggregated number of customers who installed heat pump and/or insulation in the period of July 2012-June 2013.  | Auckland Council, ESU data         |
| <b>Indicator</b>                         | Proportion of households who experienced mean level of change in their satisfaction. Calculated using a weighting procedure. | 0.25  | <p>The stakeholders were asked "Q37: How dissatisfied or satisfied were/are you with your home overall, before and since the RYH" where 1 was not satisfied at all and 7 completely satisfied. A weighting process has been used to calculate the number of households that felt satisfied on average, with respect to their situations both before and since retrofit. In this process responses to completely satisfied and not satisfied at all are observed as '100' and '0' per cent respectively. The other 5 levels of satisfaction between min and max broken up in a linear pattern as a proportion of completely satisfied (17%, 33%, 50%, 67% and 83%). Therefore two households with point 4 are equivalent to one household with complete satisfaction (when 1 is not satisfied at all (0%) and 7 is completely satisfied (100%)). The results are 225 and 340 completely satisfied households before and after RYH respectively.</p> <p>In the next step, the proportion of the mean level of change is calculated by dividing the above numbers by the number of responses to Q37 in before (461) and after (460) category. The results are 0.49 before and 0.74 since RYH.</p> <p>In the last step the difference between the proportion of equivalent to completely satisfied since RYH and before it is calculated: <math>0.74 - 0.49 = 0.25</math></p> | Primary research, RIMU calculation |
| <b>Outcome multiple</b>                  | Magnitude of change per stakeholders   | 1     | The change in satisfaction in home situation is just considered for the respondents to questionnaire, because the experience of other household members of change in satisfaction may differ.   | Primary research, RIMU calculation |
| <b>Information for proxy calculation</b> | Aggregated correlation (R-square) of answers to WTA question with other outcomes for this stakeholder group                  | 54.9% | <p>The WTA question asked stakeholders about the amount of money they would accept to be willing to go back to the situation of their home before RYH. To account for the satisfaction with home situation, the correlation between WTA answer and other outcomes for households is removed from WTA result.</p> <p>A least squares regression including health, relationship inside family and school results, as independent variables, that had the highest probability, has been run and the R-square of the regression used as the percentage overlap between satisfaction with home situation and other calculated outcomes.</p>  | Primary research, RIMU calculation |

| Stakeholder           |   | Occupiers of RYH homes                                  |   |                                    |
|-----------------------|---|---|---|------------------------------------|
| Outcome               |   | Increased feeling of satisfaction with living situation |   |                                    |
|                       | Description   | Value   | Rationale   | Source                             |
| <b>Proxy</b>          | The amount of money that customers would accept to go back to the home situation before RYH | \$19,630  | <p>A WTA approach has been conducted to calculate improvement in satisfaction with home situation. The result based on 150 responses to Q67: "What amount of money would you need to be paid to go back to living in your house prior to the retrofit?", shows that on average, \$20,339 would be required to compensate 25 respondents (17%) to live in their home situation before RYH. 80 respondents (53%) stated they would never go back to before RYH situation and 45 respondents (30%) answered "I don't know". Therefore, the WTA is a conservative amount that could be considered for compensating customers to accept to live in their home in a pre-retrofit situation.</p> <p>The average WTA calculated after normalising the answers.</p> <p>As mentioned above the WTA would have overlap with other outcomes for this stakeholder group and the amount of overlap has been taken out through aggregated correlation between WTA and other outcomes. <math>(20339 * (1 - 0.55))</math>.</p> | Primary research, RIMU calculation |
| <b>Proxy multiple</b> | Magnitude of proxy per year   | 1   | The proxy is per annum.   |                                    |

## Appendix C-3 Improved quality of life and life expectancy

| Stakeholder                   | Occupiers of RYH homes  |       |   |                                    |
|-------------------------------|---|-------|---|------------------------------------|
| Outcome                       | Improved quality of life and life expectancy  |       |   |                                    |
|                               | Description   | Value | Rationale   | Source                             |
| <b>Number of stakeholders</b> | Number of Customers   | 2,493 | Aggregated number of customers that installed heat pump and/or insulation in the period of July 2012-June 2013.   | Auckland Council, ESU data         |
| <b>Indicator</b>              | Proportion of households with occupants who suffered from an illness related to cold and damp home (except cold and flu) and reported change in the number of illnesses. The mean level of change calculated using a weighting procedure. | 0.074 | <p>In total 50 per cent of respondents who completed the survey and answered Q46 "How often did this person experience this/these illnesses relating to living in a cold, damp home?", stated that they had at least one sick person in the home before RYH with various degrees of illness severity.</p> <p>Because responses include cold and flu, which are excluded from the burden of illness calculation, the proportion of people who stated cold and flu as an illness have been removed from the calculation. This figure has been calculated based on answers to Q45: "Which of the following illnesses commonly related to living in a cold damp home were they affected by before the retrofit?" Response shows that 31% of illnesses were in the cold and flu category. 3 per cent other illnesses have also been removed as they generally include illnesses (skin problems, diabetes and cancer) that are not directly relevant to a cold and damp home.</p> <p>In the last step, a weighting procedure was applied to determine the degree that respondents are better off from a condition of "permanent ill" to "100 per cent better off". In the weighting system, a score of 1 is equivalent to "permanent sickness" and 0 is equivalent to "never sick".</p> <p>The severity of illness / illness level has been considered a proportion of 1 in a linear pattern linked to responses. Changes in proportion of the mean level of illness after RYH are compared to before RYH for the first and second sick person (In some families there are more than one sick as reported in the survey). This mean level of change has been calculated at 0.22.</p> <p>Therefore, the proportion of households who had at least one person ill before the retrofit (0.93)* proportion of all type of illnesses related to cold and damp home except cold and flu and other category (0.66)* proportion of ill people who experienced being the average 'better off' (0.22) = proportion of households who suffer from a severe illness relating to cold and damp home (except cold and flu) and experienced completed better off as the result of RYH.</p> | Primary research, RIMU calculation |

| Stakeholder                              | Occupiers of RYH homes   |         |   |   |
|--|--|---------|---|---|
| Outcome                                  | Improved quality of life and life expectancy   |         |   |   |
|  | Description  | Value   | Rationale   | Source  |
| <b>Outcome multiple</b>                  | Average number of household members who suffered from an illness relating to living in a cold, damp home | 1.59    | Percentage of those responding to Q46 whom also answered Q46/2 relating to illness of second person in household (59%). No responses were received for third, fourth, ... ill person at home.   | Primary research, RIMU calculation  |
| <b>Information for proxy calculation</b> | The value of a statistical life year in new Zealand 2010   | \$7,285 | Cost per disability life years (DALY) for diseases related to cold and damp home is not available in New Zealand. Therefore, the cost per DALY calculated based on the secondary research in New Zealand on cost of arthritis:<br>a) the value of a statistical life year for New Zealand \$177,683 for New Zealand in 2010.<br>b) Disability adjusted life years, the years of healthy life lost for 530000 New Zealanders who suffered from arthritis has been estimated at 21,491 through secondary research. Therefore 21,491/530000 gives an indication of average DALY per arthritis patient in New Zealand 0.041.<br>Cost per DALY for arthritis calculated $\$177,683 \times 0.041 = \$7,285$ | Secondary data:<br>Access Economics (2010), The economic cost of arthritis in New Zealand in 2010, Arthritis New Zealand                  |
| <b>Proxy</b>                             | The value of statistical life year in new Zealand 2013   | \$7,795 | The proxy calculation and its rationale are included in the above cell. This is the proxy in 2013 dollars.  | <a href="http://www.rbnz.govt.nz/monetary_policy/inflation_calculator/">http://www.rbnz.govt.nz/monetary_policy/inflation_calculator/</a> |
| <b>Proxy Multiple</b>                    | Magnitude of proxy per year  | 1       | The proxy is per annum.   |   |



## Appendix C-4 Improved relationships within the family

| Stakeholder                   | Occupiers of RYH homes   |       |  |  |
|-------------------------------|--|-------|--|--|
| Outcome                       | Improved relationships within the family   |       |  |  |
|                               | Description  | Value | Rationale  | Source   |
| <b>Number of stakeholders</b> | Number of Customers  | 2,493 | Aggregated number of customers who installed heat pump and/or insulation in the period of July 2012-June 2013.   | Auckland Council, ESU data   |
| <b>Indicator</b>              | Proportion of customers who as a result of RYH experienced the mean level of increase in time spent with family. Calculated using a weighting procedure. | 0.18  | A result of 370 (except for "does not apply") responses to Q58: "Please rate how much the following things have changed for your household since the retrofit, which you think is related to the retrofit: The amount of time the household spends together at home" shows that 16 per cent of respondents experienced the mean level of change in amount of time the household spend together as the result of RYH. The mean level of change is calculated using a weighting procedure where 'significant increase' responses are given a score of 1; 'some increase' is 0.5; 'no change' is 0; 'some decrease' is 0.5; and 'significant decrease' is a score of -1. Therefore for every two households that experience 'some increase', this becomes equal to one household with experience of 'significant increase'. 1 significant decrease*(-1) +7 some decrease*(-0.5) +247 no change*(0) +91 some increase*(0.5) +24 significant increase*(1) =65 the mean level of change (increase).<br>$65/370=0.18$ | Primary research   |
| <b>Outcome multiple</b>       | Magnitude of change per stakeholders   | 1     | Total household considered as a family.  |  |
| <b>Proxy</b>                  | Half of the average household expenditure on going out together per week   | \$59  | In a warmer and drier home households could spend more of their spare time together at home rather than going out in winter time. It assumed that half of the average expenditure by an Auckland household for going out per week including 'restaurant meals and ready-to-eat food', 'recreation and cultural services', 'accommodation services', 'package holidays' and 'miscellaneous domestic holiday costs' is saved as the result RYH.  | Statistics New Zealand, Household Economic Survey 2013:<br><a href="http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7552">http://nzdotstat.stats.govt.nz/wbos/Index.aspx?DataSetCode=TABLECODE7552</a> |
| <b>Proxy multiple</b>         | Number of weeks  | 24    | Number of weeks in winter months and half of spring and autumn were considered as the months that the change in temperature and humidity of house changes as the result of RYH.  | Assumption per 6 cold months   |

## Appendix C-5 Financial savings from decreased metered energy consumption

| Stakeholder            | Occupiers of RYH homes   |       |  |                                    |
|------------------------|--|-------|--|------------------------------------|
| Outcome                | Financial savings from decreased metered energy consumption  |       |  |                                    |
|                        | Description  | Value | Rationale  | Source                             |
| Number of stakeholders | Number of heat pump customers  | 1,667 | Number of RYH customers who only installed heat pump in the period of July 2012-June 2013.   | Auckland Council, ESU data         |
|                        | Number of insulation customers   | 206   | Number of RYH customers who only installed Insulation in the period of July 2012-June 2013.  | Auckland Council, ESU data         |
|                        | Number of both heat pump and insulation customers  | 620   | Number of RYH customers who only installed heat pump in the period of July 2012-June 2013.   | Auckland Council, ESU data         |
| Indicator              | Proportion of customers who have installed heat pump and stated financial saving (metered energy) as the result of RYH programme.                | 53%   | Based on responses to "Q23 What heating and insulation did/does your house have: before and after RYH", and Q24 "Please describe your use of heating appliances before and after the retrofit, hour per weekdays and hour per weekend." and Q33 "Approximately how much was your MONTHLY household...: Electricity bill (\$) Note: If you use mains gas, this includes the cost of mains gas as well." Respondents who only installed heat pump and proportion of those whom experienced change in electricity bill has been calculated. Number of customers who only installed heat pump and experienced change in electricity bill (all the no changes removed)/Number of customers who only installed heat pump and answered electricity cost question (including those who did not experience change). | Primary research, RIMU calculation |
|                        | Proportion of customers who have installed insulation and stated financial saving (metered energy) as the result of RYH programme.               | 60%   | Based on responses to "Q23 What heating and insulation did/does your house have: before and after RYH", Q24 "Please describe your use of heating appliances before and after the retrofit, hour per weekdays and hour per weekend." and Q33 "Approximately how much was your MONTHLY household...: Electricity bill (\$) Note: If you use mains gas, this includes the cost of mains gas as well." Respondents who only installed insulation and proportion of those whom experienced change in electricity bill has been calculated. Number of customers who only installed insulation and experienced change in electricity bill (all- no changes)/Number of customers who only installed insulation and answered the electricity cost question (including those who did not experience change)          | Primary research                   |
|                        | Proportion of customers who have installed heat pump and insulation and stated financial saving (metered energy) as the result of RYH programme. | 69%   | Based on responses to "Q23 What heating and insulation did/does your house have: before and after RYH", and Q24 "Please describe your use of heating appliances before and after the retrofit, hour per weekdays and hour per weekend." and Q33 "Approximately how much was your MONTHLY household...: Electricity bill (\$) Note: If you use mains gas, this includes the cost of mains gas as well." Respondents who installed both heat pump and insulation and proportion of those whom experienced  | Primary research                   |

| Stakeholder             | Occupiers of RYH homes   |       |   |                                    |
|-------------------------|--|-------|---|------------------------------------|
| Outcome                 | Financial savings from decreased metered energy consumption  |       |   |                                    |
|                         | Description  | Value | Rationale   | Source                             |
|                         |  |       | change in electricity bill has been calculated. Number of customers who installed both heat pump and insulation and experienced change in electricity bill (all- no changes)/Number of customers who installed both heat pump and insulation and answered the electricity cost question (including those who did not experience change)   |                                    |
| <b>Outcome multiple</b> | Magnitude of change per stakeholders   | 1     | Each household as a whole experience the change.  | Basic assumption                   |
| <b>Proxy</b>            | Average financial saving by less electricity consumption per household who only installed Heat pump (per month)                | \$36  | Based on responses to "Q23 What heating and insulation did/does your house have: before and after RYH", Q24 "Please describe your use of heating appliances before and after the retrofit, hour per weekdays and hour per weekend." and Q33 "Approximately how much was your MONTHLY household...: Electricity bill (\$ Note: If you use mains gas, this includes the cost of mains gas as well." Average change in electricity cost in winter months (based on winter 2013 compared to 2012) for heat pump only customers is \$35.66.                | Primary research, RIMU calculation |
|                         | Average financial saving by less electricity consumption per household who only installed insulation (per month)               | \$19  | Based on responses to "Q23 What heating and insulation did/does your house have: before and after RYH", Q24 "Please describe your use of heating appliances before and after the retrofit, hour per weekdays and hour per weekend." and Q33 "Approximately how much was your MONTHLY household...: Electricity bill (\$ Note: If you use mains gas, this includes the cost of mains gas as well." Average change in electricity cost in winter months (based on winter 2013 compared to 2012) for insulation only customers is \$19.23.               | Primary research, RIMU calculation |
|                         | Average financial saving by less electricity consumption per household who installed both heat pump and insulation (per month) | \$25  | Based on responses to "Q23 What heating and insulation did/does your house have: before and after RYH", Q24 "Please describe your use of heating appliances before and after the retrofit, hour per weekdays and hour per weekend." and Q33 "Approximately how much was your MONTHLY household...: Electricity bill (\$ Note: If you use mains gas, this includes the cost of mains gas as well." Average change in electricity cost in winter months (based on winter 2013 compared to 2012) for both heat pump and insulation customers is \$24.69. | Primary research, RIMU calculation |
| <b>Proxy Multiple</b>   | Number of cold months in a year  | 6     | Winter months and half of spring and autumn were considered as the months customers could save electricity as the result of RYH.  | Assumption                         |

## Appendix C-6 Time saved in maintenance and cleaning

| Stakeholder             | Occupiers of RYH homes   |       |   |   |
|-------------------------|--|-------|---|---|
| Outcome                 | Time saved in maintenance and cleaning   |       |   |   |
|                         | Description  | Value | Rationale   | Source  |
| <b>Indicator</b>        | Proportion of households who installed heat pump and /or insulation and experienced change in time spent in cleaning and/or replacement of damaged housewares and furniture. | 0.55  | Based on 225 responses (just those who expressed change, 55% of completed survey) to Q40 "Approximately how many hours a month did/do you spend cleaning or maintaining your home due to indoor smoke or soot, mould, condensation, or any damage caused by those things? Before RYH and Since RYH" Total weighted hours saved by customers calculated. Weighting scale is based on the responses, with 'None at all'=0, 'Less than 1 hours a month'=0.5, '1-2 hours a month'=1.5, '3-5 hours a month'=4, '6-9 hours a month'= 7.5, '10 and more hours a month'=10. Total weighted hours saved is 560 per month and average hours saved per household per month is 2.9, which is equivalent with 35 hours per year. | Primary research, RIMU calculation  |
| <b>Outcome multiple</b> | Average time saved by HH who experienced changed as the result of time they spend on maintenance (hours per year)  | 35    |   | Primary research, RIMU calculation  |
| <b>Proxy</b>            | Average wage per hour in New Zealand 2013 (Financial year, ended June)   | \$27  | The cost for time saved through avoidance has been considered equal to average wage per hour in New Zealand as the minimum value.   | Statistics New Zealand<br><a href="http://www.stats.govt.nz/info/share/ViewTable.aspx?pxID=dab78a79-2fba-4378-9144-5862c64a363e">http://www.stats.govt.nz/info/share/ViewTable.aspx?pxID=dab78a79-2fba-4378-9144-5862c64a363e</a> |
| <b>Proxy multiple</b>   | Magnitude of proxy per year  | 1     | The indicator and outcome multiples are based on the time saved per annum; therefore proxy does not need a multiple to show the annual change.  | Primary research, RIMU calculation  |

## Appendix C-7 Increased educational achievement

| Stakeholder                              | Occupiers of RYH homes whom are students  |         |   |   |
|--|---|---------|---|---|
| Outcome                                  | Increased educational achievement   |         |   |   |
|  | Description   | Value   | Rationale   | Source  |
| <b>Number of stakeholders</b>            | Number of RYH customers who have at least 1 student at home                                     | 1122    | 45% of 409 respondents to Q62i "How many people living in your home are at school or tertiary education?" stated at least one person in their home is at school or tertiary education. This proportion of total customers (2,493) has been considered as number of stakeholders in this group.  | Primary research, RIMU calculation  |
| <b>Indicator</b>                         | Proportion of students who experienced better results at school as the result of RYH programme. | 0.20    | The mean improvement level (55.5) in school results has been calculated for 282 customers responding to Q63: "Please rate how much the grades or reports the student(s) receive have changed for each student in your household, which you think is related to the retrofit. If you think none of the change is attributable to the retrofit, please select 'no change'". The weighting scales are based on 'significant increase'= 1, 'some increase'=0.5, 'no change' =0, 'some decrease'=-0.5 and 'significant decrease'=-1. Therefore two students who experience 'some increase' is equal to one student with experience of 'significant increase' in school results. The proportion calculated by dividing 55.5 by 282. | Primary research, RIMU calculation  |
| <b>Outcome multiple</b>                  | Average number of students per households   | 1.79    | Average number of students per household who responded to Q62i. Calculated by dividing number of total students (329) to number of households who responded to this question and stated at least one student at home(184).  | Primary research, RIMU calculation  |
| <b>Information for proxy calculation</b> | None  |         |   | Primary research, RIMU calculation  |
| <b>Proxy</b>                             | Average annual cost of a private course for mathematics tutoring as a general school subject.   | \$2,320 | The avoided cost of compensating for poorer results at school as the result of living in the cold damp home has been considered as the proxy for education improvement. Since the questions had not been designed in a way to ask change in school improvement by subjects, mathematic has been considered as a general subject at school. Average cost of a math course per annum calculated based on annual tuition cost of three well-known courses in Auckland.   | <a href="http://nz.kumonglobal.com/page.jsp?id=971&amp;version=sg">http://nz.kumonglobal.com/page.jsp?id=971&amp;version=sg</a><br><a href="http://www.hometuition.co.nz/fees/">http://www.hometuition.co.nz/fees/</a><br><a href="http://www.numberworks.co.nz/frequently-asked-questions/#what-does-it-cost">http://www.numberworks.co.nz/frequently-asked-questions/#what-does-it-cost</a> |
| <b>Proxy multiple</b>                    | Magnitude of proxy per year   | 1       | The proxy is per annum and does not need a multiplier.  |   |

## Appendix C-8 Financial saving from working more often from home

| Stakeholder Outcome                                |   | Occupiers of RYH homes whom are in paid employment working from home |  |                                    |
|--|---|--|--|------------------------------------|
| Financial saving from working more often from home |   |  |  |                                    |
|  | Description   | Value  | Rationale  | Source                             |
| <b>Number of stakeholders</b>                      | Number of RYH customers who have at least one person in paid employment from home   | 799  | Proportion of customers with at least one person in paid employment working from home (0.32). Calculated by dividing 133 respondents who stated at least one person in paid employment working from home of total 415 RYH customers who responded to Q59a: "How many people in your household do paid work from home, at least occasionally?" Number of stakeholders in this group calculated by $0.32 \times 2493$ (total number of stakeholders)   | Primary research, RIMU calculation |
| <b>Indicator</b>                                   | Proportion of customers who are in paid employment working from home and experienced a mean level of improvement in their ability to work from home | 0.24   | Not all the householders who work from home experienced change in the amount of work they do at home after RYH. The result of responses to Q61 "Overall, how has the retrofit affected the ability of householder(s) who do paid work from home, to get their work done at home?" shows that 24% of people who are in paid work from home experienced the mean level of improvement in the amount of the work done at home. The mean is calculated based on a weighting system scaling: 'significant increase'= 1, 'some increase'=0.5, 'no change' =0, 'some decrease'=-0.5 and 'significant decrease'=-1.  | Primary research, RIMU calculation |
| <b>Outcome multiple</b>                            | Average number of additional days spent working from home in each household   | 40.46  | Responses to Q59a "How many people in your household do paid work from home, at least occasionally?" show that in 133 households there is at least one person in paid employment from home, and there are 191 people employed and working from home. Therefore an average of 1.44 (191/133) considered as number of people employed working from home in each household.<br>The additional days working from home calculated using the mean number of days working from home by RYH customers (2.35 days a week). The mean days working from home for 6 cold months (56 days) calculated based on 4 weeks in each month. The significant improvement in ability of working from home for 24% of customers who in average experienced significant change assumed 50% additional days working from home $56 \times .5 = 28$ . Magnitude of change per household who have at least one person working from home calculated $28 \times 1.44 = 40.46$ . | Primary research, RIMU calculation |

| Stakeholder Outcome: Occupiers of RYH homes whom are in paid employment working from home<br>Financial saving from working more often from home |   |         |   |  |
|---|---|---------|---|--|
|   | Description   | Value   | Rationale   | Source   |
| <b>Information for proxy calculation</b>  | Average km per work journey by Aucklanders (2010-2013)  | 11.50   | The commuting cost avoidance is the first component of avoided cost of a work journey. The three-year moving average (journey to work) for Auckland households has been considered as the km reduction in householder travel to work while working a day from home. | Statistics New Zealand, New Zealand Household Travel Survey: Travel to work, by main urban area results (3-year moving average)  |
|   | Commuting cost saving per km (2013 NZD)   | \$0.80  | The cost of commuting for each km journey is calculated by the New Zealand Institute (including average cost of private vehicle+ parking and public transport) is 0.7 NZD 2007. This is equal to \$0.8 NZD in 2013 dollars.   | The New Zealand Institute (2007) Defining a broadband aspiration: how much does broadband matter and what does New Zealand need?   |
|   | Average hours per work journey  | 0.42    | Travel time and its cost is the second part of the cost avoided by households who work more days from home as the result of RYH. The New Zealand Household Travel survey shows that Aucklanders on average spend 25 minutes per work journey.                       | Statistics New Zealand, New Zealand Household Travel Survey: Travel to work, by main urban area results (3-year moving average)  |
|   | Average wage per hour in New Zealand 2013 (Financial year, ended June)                        | \$27    | The cost for time saved through travel avoidance has been considered equal to the average wage per hour in New Zealand as the minimum value.  | <a href="http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=dab78a79-2fba-4378-9144-5862c64a363e">Statistics New Zealand<br/>http://www.stats.govt.nz/infoshare/ViewTable.aspx?pxID=dab78a79-2fba-4378-9144-5862c64a363e</a> |
| <b>Proxy</b>  | Travel cost savings per work journey, including avoided commuting cost and travel time saving | \$20.66 | Avoided cost of commuting and time saving due to an avoided work journey. $11.50 * \$0.8 + 0.42 * \$27 = \$20.66$   |  |
| <b>Proxy multiple</b>   | Magnitude of proxy per year   | 1       | One saving per journey.   |  |

## Appendix C-9 Local air quality improvement

| Stakeholder                              |  | Auckland residents            |   |   |
|--|--|-------------------------------|---|---|
| Outcome                                  |  | Local air quality improvement |   |   |
|  | Description  | Value                         | Rationale   | Source  |
| <b>Number of stakeholders</b>            | Auckland residents (million)   | 1.42m                         | Auckland residents experienced the domestic air quality improvement as the result of RYH programme. This air quality improvement is one of the primary aims of the RYH programme.   | Census 2013, Statistics New Zealand.  |
| <b>Indicator</b>                         | Number of RYH customers who replaced open fire, wood burner and/or multi fuel burner with heat pump  | 918                           | The result of customer survey, Q23 "What heating and insulation did/does your house have: before and after RYH?" shows that 151 of total reported (209) solid fuel burners (open fire, wood burner and/or multi fuel burner) replaced with heat pump. This number is 37% of total completed survey respondents (410). Therefore 37 per cent of total customers (2493) has been applied and considered those whom have replaced their solid fuel burner with heat pump.  | Primary research, RIMU calculation  |
| <b>Outcome multiple</b>                  | Magnitude of change per stakeholders   | 1                             | The number of solid fuel burners per household is considered 1. Although based on survey results there were some cases that more than one solid fuel burner was reported before RYH and none after the programme.   |   |
| <b>Information for proxy calculation</b> | Average weighted saving in social cost of removing each solid fuel burner in Auckland (June 2010 \$) | \$4,108                       | <p>The social cost per fuel burner is the proxy that has been used for measuring the impact of the RYH programme on Auckland air quality. PM<sub>10</sub> is the main local air quality emission in Auckland and the total social cost from PM<sub>10</sub> produced by domestic fires in 2006 (June 2010 \$) for Auckland is estimated as \$411.8 million.</p> <p>The results of the Home Heating Survey (2102) by Auckland Council in 2013 shows that in total 26% of households in Auckland use solid fuel burners (wood burner 20%, open fire 4.5% , multi fuel burner 1.1% and pullet burner 0.3%).</p> <p>Total number of households in Auckland in 2006-2007 has been estimated 485021.</p> <p>Using emission factor (g/kg fuel) and average fuel use (kg/day) for each type of solid fuel burner, the produced PM<sub>10</sub> emission per type per year (winter days+ half of spring and autumn) has been calculated. The result shows that the total PM<sub>10</sub> from domestic fires generally is produced by wood</p> | <ul style="list-style-type: none"> <li>• UHAP 2012, Updated Health and Air Pollution in New Zealand study, Volume 2: Technical Reports, March 2012.</li> <li>• Xie, S., Mahon, K., Petersen, J. (2010). Effects of Fuel and Operation on Particulate Emissions from Wood burners. Auckland Regional Council Technical Report 2010/061.</li> <li>• Metcalfe, J. (2010). Estimation of Domestic Fire Emissions in 2006. Prepared for Auckland Regional Council. ARC Technical Report No. 2010/056.</li> <li>• Owen, P. N. (2012). Auckland Futures Growth Model 2012 V3.</li> </ul> |



| Stakeholder           |   | Auckland residents            |  |   |
|-----------------------|---|-------------------------------|--|---|
| Outcome               |   | Local air quality improvement |  |   |
|                       | Description   | Value                         | Rationale  | Source  |
|                       |   |                               | <p>burners (60%), open fire (31%), multi fuel burner (9%) and pellet burner (0.1%).</p> <p>Social cost saving because of PM<sub>10</sub> reduction per heater (by type) substituted with heat pump is calculated using all above information: (Total social cost of PM<sub>10</sub> from domestic fire in Auckland (2010 dollar)\$411.8m*share of burner type in domestic fire PM<sub>10</sub> produced in Auckland (as above)) /Estimated number of households in Auckland who have solid fuel burner by type (20%*485021=97489 wood burner, 4.5%*485021=21826 open fire, 51.1%* 485021=335 multi fuel burner). The result of this equation is: \$2516 per each wood burner removed, \$5828 per each open fire removed, and \$7276 per each multi fuel burner removed.</p> <p>The average weighted social cost of PM<sub>10</sub> produced by all types of solid fuel heater calculated based on above results for each burner type weighted by the proportion of removed burners by type as the result of RYH based on survey result (56%, 34%, 10% of reported removed solid fuel burners are wood burner, open fire and multi fuel burner respectively). No pellet burners were reported as removed.</p> | <p>Auckland Council Technical Report TR2012/014.</p> <ul style="list-style-type: none"> <li>• Stones-Havas, T. (2014). 2012 Home Heating Survey Results. Auckland Council technical report, Auckland Council</li> <li>• RIMU calculation</li> </ul> |
| <b>Proxy</b>          | Average weighted saving in social cost of removing each solid fuel burner in Auckland(June 2013 \$) | \$4,395.08                    | The proxy calculation and its rationale are included in the above cell. This is the proxy in 2013 dollars.   | <a href="http://www.rbnz.govt.nz/monetary_policy/inflation_calculator/">http://www.rbnz.govt.nz/monetary_policy/inflation_calculator/</a>   |
| <b>Proxy multiple</b> | Magnitude of proxy per year   | 1                             | The proxy is an annual cost.   |   |

## Appendix D Correlation between WTA responses and other outcomes for customers

Between two regressions that have been run, the result of the first regression, including all other outcomes as a variable, shows that electricity saving, health improvement and time saving for maintenance, are not explaining by WTA as their probability is high for 95 per cent confidence and the R-square and adjusted R-square have relatively high difference. The second regression with 4 remaining variables 'health', 'relationship within family', 'educational achievement' and 'productivity improvement for those who are in paid employment from home' was ran. In the second regression the only variable that has high probability belongs to 'grades' but removing it reduce the R-square to 11%.

### The result of the regression

Dependent Variable: WTA

Method: Least Squares

Date: 03/17/14 Time: 18:06

Sample (adjusted): 30 396

Included observations: 18 after adjustments

WTA=C(1)+C(3)\*HEALTH+C(4)\*RELATIONSHIP+C(5)\*GRADES+C(7)\*productivity  
PRODUCTIVITY

|                    | Coefficient | Std. Error            | t-Statistic | Prob.    |
|--------------------|-------------|-----------------------|-------------|----------|
| C(1)               | 34377.29    | 14781.44              | 2.325707    | 0.0369   |
| C(3)               | -95684.37   | 51646.22              | -1.852689   | 0.0868   |
| C(4)               | 13737.09    | 4967.835              | 2.765206    | 0.0161   |
| C(5)               | -44108.5    | 30006.02              | -1.469988   | 0.1653   |
| C(7)               | 59357.21    | 26387.51              | 2.249444    | 0.0425   |
| R-squared          | 0.548741    | Mean dependent var    |             | 80000    |
| Adjusted R-squared | 0.409891    | S.D. dependent var    |             | 38691.84 |
| S.E. of regression | 29722.5     | Akaike info criterion |             | 23.66733 |
| Sum squared resid  | 1.15E+10    | Schwarz criterion     |             | 23.91466 |
| Log likelihood     | -208.006    | Hannan-Quinn criter.  |             | 23.70143 |
| F-statistic        | 3.952065    | Durbin-Watson stat    |             | 0.381165 |
| Prob(F-statistic)  | 0.025905    |                       |             |          |

The P value (2.5%) for the OLS regression in a 5% test shows that essentially there is no chance at all that the coefficients of the right-hand side variables all equal zero. The constant, coefficient of 'relationship inside family' and 'financial saving from more often working from home' are strongly significant with (3%), (2%) and (4%) P-values, respectively. The coefficient for 'improved quality of life and life expectancy' is weakly significant with an 8% per cent P value and 'increased educational achievement' is insignificant. This is mostly because of a mismatch of data between increased educational achievement and the rest of the sample, as it is an outcome for a subgroup of the sample. This problem could be improved by enlarging the sample size of this subgroup. This regression has no direct impact on the result of the evaluation and is just used as a tool to measure the correlation between the 'feeling of satisfaction with home environment' and other outcomes for RYH occupiers. It, and should be improved upon in future evaluations.

# Appendix E Data from Ministry of Health on changes in GP visit per capita

|                             | 2006/07 | 2011/12 | 2012/13 |
|-----------------------------|---------|---------|---------|
| GP consultations per capita | 3.2     | 2.9     | 3.0     |

Source: New Zealand Health Survey

► Find out more: phone 09 301 0101  
email [research@aucklandcouncil.govt.nz](mailto:research@aucklandcouncil.govt.nz)  
or visit [www.aucklandcouncil.govt.nz](http://www.aucklandcouncil.govt.nz)

