Good Practice Guide for Designing and Implementing an Incentives Programme for Domestic Heating

Prepared under Envirolink Tools project number NIWX0802
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Executive Summary

A well designed incentives programme will assist Councils to reduce PM_{10} emissions and to meet the National Environmental Standard for PM_{10} of 50 µg m^{-3} (24 hour average).

This *'Good Practice Guide for Designing and Implementing an Incentives Programme for Domestic Heating'* is part of the Envirolink funded *'Developing a Cost Effective Air Quality Incentives Programme Toolkit'*. The Toolkit has been prepared to enable Councils to develop an incentives programme to reduce PM_{10} emissions in their communities.

There are four main components to the *'Developing a Cost Effective Air Quality Incentives Programme Toolkit'*:

- This *'Good Practice Guide for Designing and Implementing an Incentives Programme for Domestic Heating'* to assist Councils to develop an incentives programme.
- An Emissions and Socio-Economic Spatial Model (ESESM) has been developed on a Geographic Information System (GIS) platform. The model presents the spatial distribution of PM_{10} emissions from domestic solid fuel heating on census area unit (CAU) and mesh block scales. ESESM enables the easy identification of areas that have relatively high PM_{10} emissions from home heating sources. The model defines the number of houses (private and rental) burning wood or coal within any particular CAU. The model also provides social and economic indicators of the households contained within each CAU. Details on how to use the Spatial Model and integrate it into the design of an incentive programme are included in Section 5 and 7 of this Good Practice Guide.
- A Cost Model that will enable Councils to determine the likely costs of an incentives programme or how many households can be assisted depending on funding availably and type of incentives programme. Details how to use the Cost Model and integrate it into the design of an incentive programme are included in Section 6 and 7 of this Good Practice Guide.
- Decision Trees, illustrated in Section 7 of this Good Practice Guide that show how to link these tools together to facilitate the design and implementation of a cost effective incentives programme.

A review and an analysis of the incentives programmes that are currently operating in New Zealand, including incentives programmes developed by the Energy Efficiency and Conservation Authority, the Ministry for the Environment, Environment Canterbury, Nelson City Council, Otago Regional Council and Hawke's Bay Regional Council are included in the Good Practice Guide.

The starting point to designing an incentives programme is to determine the programme objective. It is likely that a Council will identify one of the following objectives for an incentives programme:

1. Reduce PM_{10} concentrations via incentives.
2. Mitigate the social and economic impacts that may arise from regulatory methods.
3. Reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from regulatory methods.

The Toolkit focuses on identifying strategies to most efficiently reduce PM_{10} by targeting areas that contribute to worst case PM_{10} concentrations, as well as identifying sectors of the community that are likely to be the most cost effective in terms of reducing PM_{10} emissions or require the most assistance to mitigate social and economic impacts. To assist with this, four groups that an incentives programme could be targeted towards are identified. The target groups are:

- Target Group - Low income home owners.
- Target Group - Middle income home owners.
- Target Group - High income home owners.
- Target Group - Rental properties.

The positive and negative social impacts that may arise from PM_{10} reduction strategies are identified in Section Three. An assessment is provided on the groups that are most likely to be affected by negative social impacts that may arise from PM_{10} reduction strategies, and advice is provided on how Councils can develop mitigation strategies that consider negative social impacts.

The heating choices guide identifies types of appliances that can be used to heat homes or reduce energy loss. The advantages and disadvantages of each appliance, including their effect on PM_{10} emissions are discussed. The recommended heating and insulation options to include in an incentives programme include:

- Energy efficiency – home insulation.
- NES wood burners (if the required PM_{10} reductions for an airshed allow for some solid fuel burning).
- Pellet burners (if the required PM_{10} reductions for an airshed allow for some solid fuel burning).
- Heat pumps.
- Flued gas burners.
- Diesel burners.

An analysis of heating methods by household demographics is included. The analysis shows that in New Zealand 46% of owner occupied houses use wood, and 31% of rental properties use wood. Seven percent of owner occupied houses use coal, and seven percent of rental properties use coal.

The factors that influence heating choices are identified. Previous recommendations of Taylor Baines and Associates et. al., (2005) relating to a combined warm homes and air quality objective are supported on the basis that health benefits of achieving air quality standards are unlikely to be realised if they come at the expense of warm homes.

Factors, including income level and lifestyle choice that influence participation in an incentives programme are discussed and an analysis of the uptake of existing Council incentives programmes is provided.

An analysis of the type of incentives programme, for example, full assistance, partial subsidy, loan or interest free loan, by Target Group identified that the most effective incentive type for each Target Group taking into account the cost to Council and the potential uptake rate was:

- Middle income target group: Interest free loan (if only a small number of middle income households were to be targeted it is probable that the partial subsidy would be the most effective option as it is more cost effective).
- High income target group: Partial subsidies.
- Rental properties: Partial subsidies, or interest free loan.

The most cost effective approach of mitigating social and economic impacts for different types of incentives programme by Target Group were identified as:

- Low income home owners target group: Full subsidy utilising EECA incentives with additional funding provided by Councils or third party funders.
- Rental properties – Utilising EECA incentives or third party funders (with additional funding where tenants are low income).
- Middle income target group: Utilising EECA incentives with consideration given to including interest free loans, or assisting ratepayers to pay off their retrofit via chosing a targeted rate (which is designed to be cost-neutral to councils). Councils would have to provide the additional funding for interest free loans. Note that EECA requires insulation to be undertaken prior to clean heating, if homeowners wish to uptake the EECA programme.

Section Seven of the Good Practice Guide provides technical detail on how to design an incentives programme that integrates programme objectives, PM_{10} considerations, appropriate heating choices, cost effectiveness issues and social and economic considerations. Advice is provided on the implementation of an incentives programme to

meet Council objectives, the role of energy assessors and administration of the incentives programme.

Section Eight of the Good Practice Guide explores how Councils can encourage the community to become involved in an incentives programme, through focusing on effective communications strategies to engage the community. A template is provided that outlines information on how to define the scope and objectives of an incentives programme, identify target groups, develop key messages and implement a communications strategy. Various communication methods are analysed and sample communication tools are included.

The final section of the Good Practice Guide provides a check list of the information required to design and implement an incentives programme.

Although the Good Practice Guide has been designed to assist all Regional Councils and Unitary Authorities throughout New Zealand to develop a cost effective incentives programme, it is acknowledged that the social and economic dynamics of a community often differ. Further work may be required to ensure that an incentives programme is appropriately targeted for any specific area.

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1 Introduction

In over 30 urban areas in New Zealand, concentrations of inhalable particles exceed the National Environmental Standard for Air Quality (NES) for PM_{10} of 50 µg m^{-3} (24-hour average). Particles in the air less than 10 microns in diameter (PM_{10}) penetrate the lungs and cause significant health impacts. Elevated PM_{10} concentrations are linked to an estimated 900 premature deaths per year in New Zealand (Fisher et al., 2007).

The extent of the PM_{10} problem in New Zealand is significant. All regions except for Taranaki and Gisborne have reported breaches of the NES. Appendix A: Contribution of domestic heating to wintertime PM_{10} emissions shows the main source of PM_{10} in New Zealand urban areas is typically solid fuel burning for domestic home heating. Older wood burners are of particular concern.

A large proportion of Regional Councils and Unitary Authorities are developing policy around domestic home heating to reduce PM_{10} concentrations to meet the NES. Many are considering the implementation of incentives programmes as a method of achieving reductions in PM_{10} or to mitigate the likely social and economic impacts of regulatory measures.

This *'Good Practice Guide for Designing and Implementing an Incentives Programme for Domestic Heating'* report is part of the Envirolink funded 'Developing a Cost Effective Air Quality Incentives Programme Toolkit' This Good Practice Guide together with the Spatial Model (available at http://wrenz.niwa.co.nz/webmodel/emissions) and Cost Model (available at www.niwa.co.nz/our-science/atmosphere/research-projects/all2/envirolink/air-quality) provide a complete toolkit to enable councils to develop cost effective incentives programmes to reduce PM_{10} concentrations in their communities.

This report provides guidance on whether an incentives programme to reduce PM_{10} concentrations is an appropriate management approach for Regional Councils and Unitary Authorities and provides a comprehensive assessment of the issues surrounding the development of an incentives programme.

Although this Good Practice Guide has been designed to assist Councils throughout New Zealand to develop a cost effective incentives programme, it is acknowledged that the social and economic dynamics of a community often differ. Further work may be required to ensure that an incentives programme is appropriately targeted for specific areas.

1.1 Management of PM_{10} in New Zealand

1.1.1 Standards and Guidelines for PM_{10}

At a national level the Ministry for the Environment (MfE) is responsible for providing guidance on the management of New Zealand's air resource. The National Environmental Standards for Air Quality (NES) were introduced in October 2004. The standards include provisions relating to discharges of dioxins and other toxics into the air, standards for ambient air quality, a design standard for new wood burners installed in urban areas and a requirement for landfills over one million tonnes of refuse to collect greenhouse gas emissions.

The main environmental standard of concern nationally is the PM_{10} requirement of 50 µg m^{-3} (24-hour average) with one allowable exceedence per airshed per year. The regulations specify that if the NES is not met by 2013, Councils will be unable to grant resource consents for discharges of PM_{10} to air for that airshed. In addition, between September 2005 and 2013 consents for discharges to air can only be granted if Councils can demonstrate a 'straight-line path' to compliance that will not be impinged on by the granting of the consent. This applies only to an airshed that is non compliant with the NES and if the proposed discharge is likely to result in a 'significant' increase in PM_{10} concentrations.

In 2009 the Minister for the Environment announced a review of the NES, which may result in changes to these regulations. This Good Practice Guide is written to be consistent with 2004 NES regulations and associated documents. It does not consider the implications of any changes that may be made as a result of the outcomes of the 2009 NES review.

The Ministry for the Environment also developed the Ambient Air Quality Guidelines (2002) that updated the 1994 guidelines. In regards to PM_{10} the maximum concentration over a 24-hour period is 50 µg m^{-3}. An annual average of 20 µg m^{-3} is also specified.

1.1.2 Air Quality Plans throughout New Zealand

Regional Councils and Unitary Authorities are responsible for ensuring compliance with the NES of 50 µg m^{-3} for PM_{10} by 2013. Air Quality Plans are the main tool for managing air quality and are prepared in accordance with the Resource Management Act (1991). Regional Air Quality plans can also contain air quality targets that may be stricter than NES requirements.

Although all Councils have either notified or operative air quality plans, only a few have prepared air quality plans with the aim of meeting the NES by 2013. These have typically

involved a combination of regulatory and incentives approaches. Incentives programmes have been used to ensure compliance with regulatory requirements and to mitigate the social impacts that may result from regulations.

1.2 Incentives programmes

There are a number of reasons why local government organisations may implement an incentives programme targeting domestic home heating:

- To minimise the financial burden on low income households that are required by new regulations to replace their solid fuel heating appliances.
- To incentivise households to change to cleaner heating methods.
- To increase community acceptance and compliance with new regulations requiring the replacement of solid fuel burners.

The development of an incentives programme to manage PM_{10} emissions, improve household warmth and to mitigate the social and economic impacts that may arise from managing PM_{10} emissions has a number of advantages, including:

- Improved health throughout the community as PM_{10} concentrations are lowered and homes are made warmer.
- Increased compliance with air quality regulations as community perceives regulations as being the 'carrot' as well as the 'stick'.
- Enhanced socio-equability across all sectors of society.
- Changing to more efficient heaters in some cases lower heating costs for residents.

There are also a number of disadvantages that can become apparent when designing and implementing an incentives programme. The disadvantages of an incentives programme include:

- Can be expensive.
- Can be difficult to manage with high administration costs.
- Govenment funded programmes demand a high level of compliance- (may pay to touch on the EECA three strikes and your out policy and the risk this leaves council programmes in).
- Council or Government agencies may not have the in house expertise to manage an incentives programme.
- The outcomes of the incentives programmes may not benefit the community, for example, reduced PM_{10} concentrations but a cold home problem.

- It may be difficult to be seen as being fair all of the time, for example households with Community Services Cards and substantial assets eligible for funding from an incentives programme.
- More demand than can be serviced by the funds available.
- The whole incentives programme could become overly political.
- Success of the programme is hard to measure as air quality is affected by many factors making an improvement in average pollution levels hard to determine is affected by the incentives programme.

Regional Councils and Unitary Councils may use incentives programmes in areas where regulations alone in air plans are not achieving the required reductions in PM_{10} concentrations. Incentives programmes have the potential to accelerate PM_{10} removal and can be implemented quickly relative to other options.

The effectiveness of an incentive programme can be improved by:

- Aiming to convert the maximum number of households to clean heat.
- Targeting areas where emission reductions are most effective in reducing PM_{10} concentrations in worst case areas.
- Targeting high density areas where the greatest number of people are exposed.

A well designed and implemented incentives programme will take into account the positive and negative aspects of incentives programmes and the programme benefits the community.

1.3 Council objectives for an incentives programme

The first step in designing an incentives programme is to determine the programme objective. It is likely that a Council will identify one of the following objectives for an incentives programme:

1. Reduce PM_{10} concentrations via incentives.
2. Mitigate the social and economic impacts that may arise from regulatory methods.
3. Reduce PM_{10} and mitigate the social and economic impacts that may arise from regulatory methods.

1.3.1 Reduce PM_{10} concentrations via incentives

Councils may decide that the most effective management strategy to reduce PM_{10} concentrations includes the development of an incentives programme. This approach

may involve identifying the most cost effective or 'easiest pickings' in terms of PM_{10} reductions or may require the targeting of a range of groups with varying costs to Council. This objective would focus on reducing PM_{10} concentrations only.

1.3.2 Mitigate social and economic impacts that may arise from regulatory methods

Councils may decide that the objective of the incentives programme is to mitigate the social and economic impacts that may result from regulations that require a change to clean heat. If this is the Council objective, then the focus is likely to include ensuring that there is sufficient insulation to reduce energy requirements and home heating costs.

1.3.3 Reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from regulatory methods

Another option for Councils is to determine that the objective of an incentives programme is to reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from regulatory methods. This approach has been adopted by Environment Canterbury and Nelson City Council.

Section Seven of this Good Practice Guide, provides technical advice on how to design an incentives programme for each of these objectives.

1.4 Target Groups for an incentives programme

Four broadly based target groups have been identified to assist with the design of the incentives programmes in this Good Practice Guide. The categories are based on research on eligibility for community services cards, rates relief, other government welfare benefits, previous eligibility for Energy Efficiency Conservation Authority (EECA) funded home insulation programmes, and existing Council criteria. The target groups, and a description of the likely income levels for each group are:

- Target Group: Low income: Households with an income of less than $50 000 or as shown in Table 1.1.
- Target Group: Middle income: Households with an income between $50 000 and $100 000.
- Target Group: High income: Households with an income above $100 000.
- Target Group: Rental properties.

Table 1.1: Indicators for low income households.

Indicator	**Household Income level**
Household incomes	Less than $50 000
Rates Rebates	Less than $21 180 per year
Unemployment Benefit	
Sickness Benefit	
Domestic Purposes Benefit	
Invalids Benefit	

1.5 Integration of incentives into air quality management framework

Figure 1.1 shows how an incentives programme can fit within an air quality management framework for addressing urban PM_{10} issues. In this diagram the boxes represent tasks and the ovals represent outcomes that require the completion of subsequent tasks. The incentives programme features twice within this framework; as an optional method for achieving PM_{10} reductions and as an optional method for mitigating the impacts of regulations.

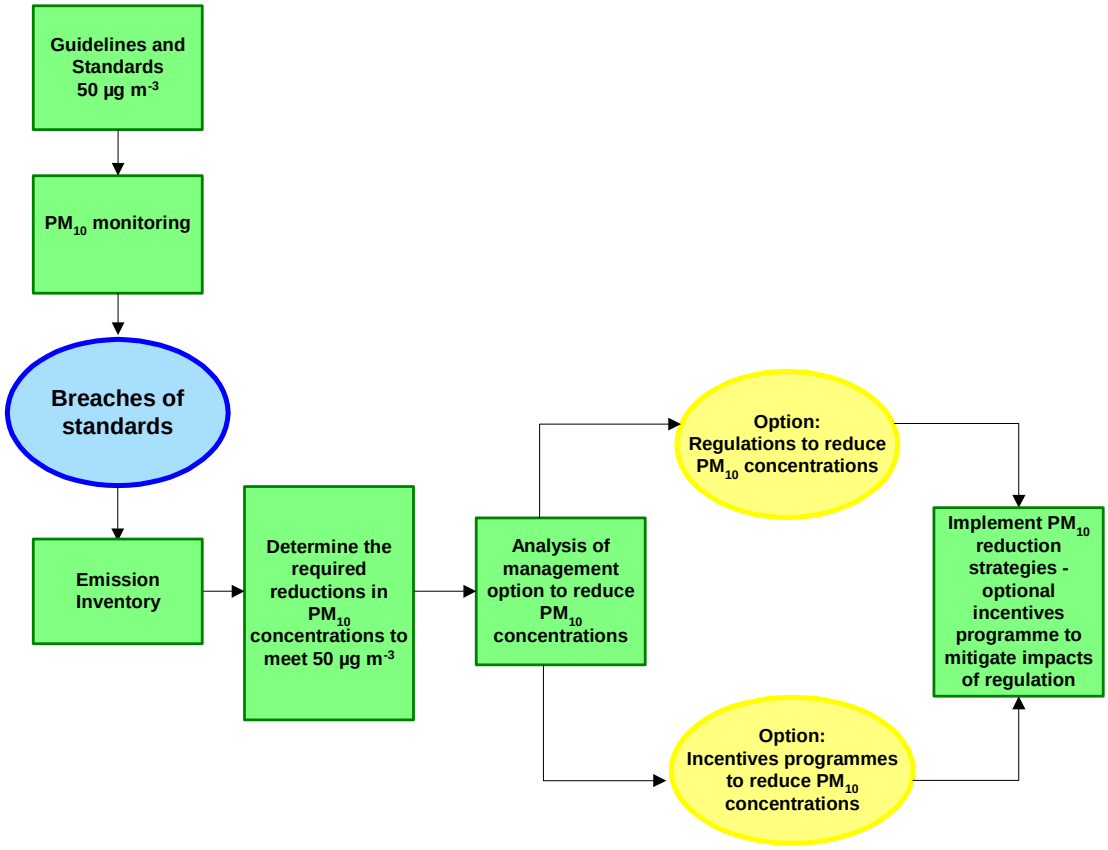


Figure 1.1: Integration of incentives programmes into air quality management frameworks.

The analysis of management options to reduce PM_{10} concentrations is likely to include quantification of the numbers of solid fuel burners that require removal or replacement (if any) via an incentives programme if incentives are to be used to reduce PM_{10}. Thus it is probable that Councils will go into an incentives programme (Objective 1 incentives programme) with an indication of the number of burners to be converted.

1.6 Structure of this Good Practice Guide

This Good Practice Guide is structured to facilitate the design and implementation of an effective incentives programme.

Sections Two, Three and Four of the Good Practice Guide review and present relevant background information.

Section Two of this Good Practice Guide describes incentives programmes that are operating in New Zealand and Australia. National and regional incentives programmes are presented and advice on how to integrate the objectives of Council incentives

programmes with the objectives of the Government-funded 'Warm up New Zealand: Heat Smart' programme, administered by the Energy Efficiency Conservation Authority (EECA), is included.

Section Three identifies the positive and negative social impacts that may arise from PM_{10} reduction strategies. An assessment is provided on the groups that are most likely to be affected by negative social impacts that may arise from PM_{10} reduction strategies, and advice is provided on how Councils can develop strategies to mitigate negative social impacts.

Section Four is a home heating guide that provides an analysis on home heating options and an analysis of fuel use in New Zealand. The factors that influence heating choices and participation in incentives programme are identified.

The next four sections of the report detail the tools that have been developed for the toolkit and demonstrate how to link these tools together to facilitate the design and implementation of a cost effective incentives programme.

Section Five provides details the Emissions and Socio-Economic Spatial Model (ESESM) that has been developed on a Geographic Information System (GIS) platform. The model presents the spatial distribution of PM_{10} emissions from domestic solid fuel heating by census area unit together with social and economic indicators of the households contained within each CAU. Section Five together and Appendix H detail how ESESM can be used.

Section Six provides guidance on how the Cost Model that has been developed to assist Councils to determine the cost of their incentives programme can be used.

Section Seven shows how Councils can design a cost effective incentives programme by following the steps in decision trees. Decision trees are provided for the different objectives that Councils will have identified for their incentives programmes. Advice is provided on the implementation of an incentives programme.

Section Eight shows how communication strategies can be developed to encourage community participation in incentives programmes.

The final section provides a check list of the information required to design and implement an incentives programme.

2 Incentives programmes in New Zealand and Australia

This section provides a review and an analysis of home heating incentives programmes in New Zealand and Australia. The key lessons learned are highlighted and are incorporated into the advice provided later in this Good Practice Guide.

At a national level, government agencies can implement incentive programmes to encourage changes in behaviour and promote positive environmental outcomes. In New Zealand the Energy Efficiency and Conservation Authority is the main agency that delivers incentives programmes to improve the environmental performance of homes. Incentives programmes are focused on improving home insulation and, in some cases, providing funding for clean heat appliances.

2.1 Energy Efficiency Conservation Authority

The Energy Efficiency and Conservation Authority is a Crown entity established under the Energy Efficiency and Conservation Act 2000. The Authority's purpose is to promote energy efficiency, energy conservation and renewable energy in New Zealand.

A number of projects aiming to make homes warmer or more energy efficient have been developed by EECA. Historically, EECA programmes have included funding for low income homeowners or tenants, funding for middle income homeowners, and some assistance for clean heat appliances. Appendix B: Historical incentives programme – Energy Efficiency Conservation Authority, provides information on these programmes. In Budget 2009 changes to EECA programmes for home insulation projects were announced which, on 1 July 2010, replaced the previous EECA home insulation programmes. The section below details EECA's current incentives programme.

Warm up New Zealand – Heat Smart

The 'Warm up New Zealand: Heat Smart' programme aims to retrofit around 190,000 homes between 2009 and 2013. The programme target is to retrofit around 49,000 households during 2009/2010. This will rise to 60,500 a year for 2011/12. The Government has allocated $318 million dollars in grant funding to the 'Warm up New Zealand:Heat Smart' programme (EECA, 2009).

The programme differs from previous programmes in that there are no income thresholds for eligibility. Previous criteria for low income and middle income households no longer apply. Funds are available for all income levels. The programme is designed to develop linkages with other agencies to establish finance mechanisms to improve accessibility to insulation and clean heat appliances (EECA, 2009).

Previous EECA programmes provided funding to Councils that supported Council incentives programmes via service providers. The 'Warm Up New Zealand: Heat Smart' programme does not provide funding to Councils. Instead funding is provided directly to households through approved service providers – although two councils have chosen to become service providers in their own right.

All homeowners with houses built before 2000 that have insufficient insulation can participate in the 'Warm Up New Zealand: Heat Smart' programme. Measures available under the programme are:

- Ceiling and underfloor insulation.
- A clean heat appliance in the main living room.
- Hot water cylinder wraps, pipe lagging, draught-stopping and ground moisture barriers.

Clean heat appliances are only available if insulation meets the required home insulation standards. Clean heating appliances include low emission wood burners, pellet fires, heat pumps and flued gas heaters. Table 2.1 shows the funding that is available for all eligible houses, homeowners who have a Community Services Card and landlords who tenants hold a Community Services Card. Full subsidy for low income households (those that do have a Community Services Card) is not available under the programme. However in some areas EECA has formed partnerships with agencies such as the public health organisation or charities and full funding is available in these areas.

Table 2.1: 'Warm Up New Zealand: Heat Smart' programme grants. Source: http://www.energywise.govt.nz

Product	**Insulation**	**Clean heating**
All eligible houses built before 2000 and have insufficient insulation.	33% of the total cost up to $1300 (incl GST)	$500 (incl GST)
Homeowners who hold Community Services Cards	60% of the total cost	$1200 (incl GST)
Landlords with tenants who hold Community Services Cards	60% of the total cost	$500 (incl GST)

EECA Service Providers

The 'Warm Up New Zealand: Heat Smart' programme is administered through service providers that are approved by EECA to install EECA approved insulation and clean heat products. Service providers are required to be certified to undertake assessments of the energy efficiency requirements of a house, install ceiling and underfloor insulation, hot water cylinder wraps, pipe lagging and draft excluders. Service providers must also be able to install heat pumps, wood and pellet burners and flued gas heaters.

The Energy Efficiency Conservation Authority negotiates funding agreements with service providers and targets for retrofitting houses are negotiated. The service provider then invoices EECA each month for the number of houses that have been retrofitted during that period. Service providers can enter into a number of service agreements with EECA to ensure that they can deliver a range of products and can sub contract work if required. Service providers are expected to undertake a minimum of 200 retrofits a year.

2.2 Ministry for the Environment

The Ministry for the Environment has been involved in incentives programmes for clean heat in the past. Appendix C: Historical incentives programmes - Ministry for the Environment, provides details of the Warm Homes Project which was administered by the Ministry for the Environment from 2004 to 2006. The main outcome of the Warm Homes Project was the development of the Clean Heat project. Since the beginning of the 2007/08 financial year the Clean Heat continues to be funded by MfE, however the project administration has been transferred to EECA.

The Ministry for the Environment continues to be involved in incentives programmes via its' funding of the Clean Heat project. Several regional councils, including NCC, ECan and ORC have current MFE Clean Heat programme contracts. These contracts form the basis of each council's incentive programme. The programmes vary from council to council and even from airshed to airshed. The NCC, ECan ORC incentives programmes provide useful illustrations on how incentive programmes can be designed and are reviewed in following sections.

Clean Heat project

Funding available under the 'Clean Heat' project targets low income households in areas that have high PM_{10} concentrations. Clean heat options included heat pumps, low emission wood burners and pellet fires and certain types of flued gas heaters.

The eligibility criteria for the 'Clean Heat' project were:

- Houses must have been built prior to 1 January 2000.
- The homeowner must have been eligible for a Community Services Card.
- The home must have been located in an area with high PM_{10} concentrations and in an area where the programme was being delivered.
- An open fire or non- compliant wood burner must have been used as the main heat source in the main living area.
- Applicants were required to be the owner and occupier of the property - tenanted properties were not eligible.
- Homeowners were required to have insulation fitted at the time the installation of the clean heat appliance was completed.

Homeowners were not required to pay more than $500 towards a clean heat appliance. In 2009 the 'Clean Heat' project was operated in Waimakariri, Timaru, Christchurch, Arrowtown, Cromwell, Clyde, Alexandra, Milton and Naseby, Tokoroa, Rotorua, Taupo, Te Kuiti, and Nelson. In late 2009 the criteria were changed so that conversions in low income homes under an interest-free targeted rate scheme could be eligible to receive 'Clean Heat' grants.

2.3 Environment Canterbury

The Air Quality Chapter of the Environment Canterbury Natural Regional Resource Plan (NRRP) became operative in 2009.

Christchurch

The use of open fires and solid fuel burners that are 15 years or older is banned from 1 April to 30 September in the Christchurch Clean Air Zone 1 from 2009. There are also other regulations that prohibit or control the use of open fires and solid fuel burners in new homes.

Environment Canterbury's incentives programme is called the 'Clean Heat' project. The 'Clean Heat' project commenced in July 2002 and is scheduled to finish in June 2013. The project aim is to mitigate the potential adverse effects on the Christchurch community as a result of proposed regulations to reduce PM_{10}. The incentive package, at a total cost of $60 million is financed through a special rate that applies to all houses in Christchurch. Funding is also provided by EECA as part of the 'Warm Up New Zealand: Heat Smart' programme (see section 2.1). Environment Canterbury is an EECA approved service provider.

The 'Clean Heat' project aims to aid the conversion to clean heat appliances and energy efficiency measures for households that are currently using an open fire or older non-

complying solid fuel burner that is used as the main form of heating and is located in the main living area of a house.

Clean heating appliances include solid fuel burners that are a 'Clean Heat Approved' appliance (including pellet fires), heat pumps, electric nightstore heaters, flued gas, diesel and oil heaters that meet a 40mg/MJ standard. A 'Clean Heat Approved' appliance is outlined in the Canterbury Natural Resources Plan as an appliance with an efficiency criteria of 1g/kg and 65% thermal efficiency. This differs to the NES of 1.5g/kg and 65% thermal efficiency.

The 'Clean Heat' project does not apply to dwellings that are owned by the government or government agencies, such as Housing New Zealand Corporation or Christchurch City Council houses.

In Christchurch, households are offered a free energy assessment to determine eligibility for the 'Clean Heat' project, as well as advice to determine the best clean heating option and energy efficiency measures to improve insulation. In 2009 changes were made to the 'Clean Heat' project. Details of the incentives programme that was offered by Environment Canterbury prior to 2009 are outlined in Appendix D: Historical incentives programmes - Environment Canterbury.

Five financial plans are available under the 'Clean Heat' project, and each option has been designed to target different groups and different levels of subsidy or assistance are available. Funding available under the EECA 'Warm Up New Zealand: Heat Smart' programme is integrated into the 'Clean Heat' project.

Full assistance

Full assistance is provided for low income owner occupied houses that are eligible for rates relief and covers the full cost of the conversion to cleaner forms of heating. The conversion includes:

- The removal or boarding up of the existing solid fuel burner or fireplace.
- The provision and installation of a 'Clean Heat Approved' heating appliance.
- The retrofitting of necessary insulation to meet building standards.

Substantial assistance

A substantial assistance financial plan is available to householders that have a Community Services Card, and an open fire or an older non-complying solid fuel burner that is used as the main form of heating in the main living area. Eligible participants are entitled to a clean heat appliance, ceiling and underfloor insulation and project management costs. Householders are required to pay $500 towards the cost of a clean

heat appliance, $250 towards ceiling insulation, and $250 towards underfloor insulation. Landlords are not eligible for the substantial assistance financial plan.

Subsidy - Homeowners and landlords

A subsidy offered by Environment Canterbury for households and landlords of residential homes, that have an open fire or an older non-complying solid fuel burner that is used as the main form of heating in the main living area. A subsidy of $500 towards a clean heat appliance, 33% of the cost of ceiling and floor insulation and $100 towards the cost of removing the open fire or old burner is available.

Subsidy - Landlords with a tenant with a Community Services Card

A subsidy is also offered to landlords with a tenant that has a Community Services Card. The subsidy includes $500 towards a clean heat appliance, 60% of the cost of ceiling and underfloor insulation and $100 towards the cost of removing open fires or older non-complying solid fuel burners.

Interest free loan

An interest free 'Clean Heat Loan' is offered by Environment Canterbury as an alternative to the subsidies. A loan to a maximum of $5200 is available for the capital cost of the installation project. The interest free loan must be repaid over a period of 10 years at 10 percent per year through a targeted rate. This process includes:

- The assessed cost of the installation of the recommended heating appliance.
- Any required insulation.
- Administration fees.

The project has been successful. In Christchurch, by the end of January 2009, 13, 475 houses had been converted to clean heating. Of those around 60% of households converted to heat pumps, around 19% converted to solid fuel, and about 16% converted to pellet fires (Figure 2.1).

Based on incentive programme that operated from 2002 to 2009 (see Appendix D), 48% of households received the full subsidy, 20% received the landlord subsidy, 19% chose the subsidy incentive and 14% chose the loan programme. The household uptake of each of these programmes is shown in Figure 2.2. The loan programme began in 2006. Environment Canterbury has found that people generally prefer the interest free loan option to the subsidy option as there is no requirement for immediate capital expenditure for the interest free loan (pers. comm., Mike Gaudin, Environment Canterbury, 2009).

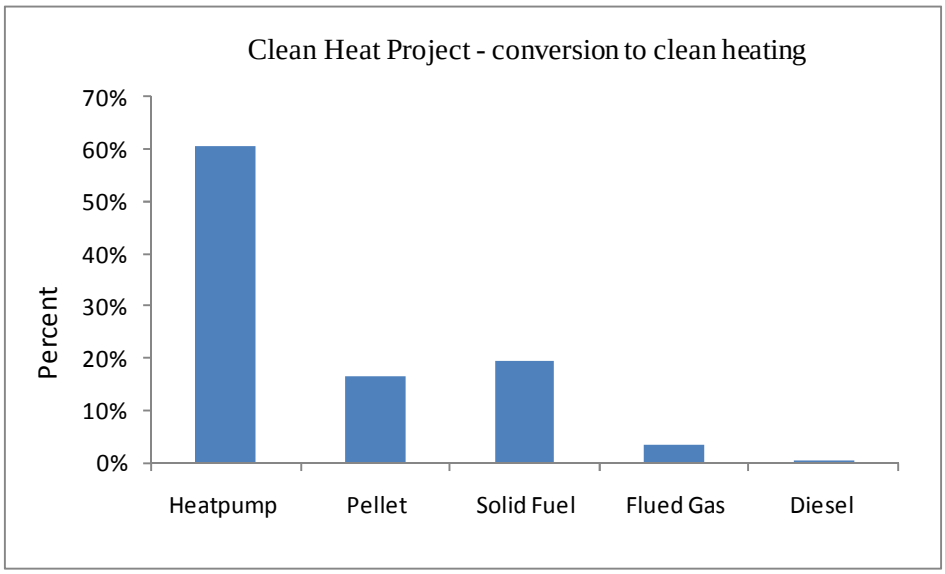


Figure 2.1: Conversion to clean heating under the Environment Canterbury 'Clean Heat' project (February 2003 – January 2009). Source: Environment Canterbury, 2009.

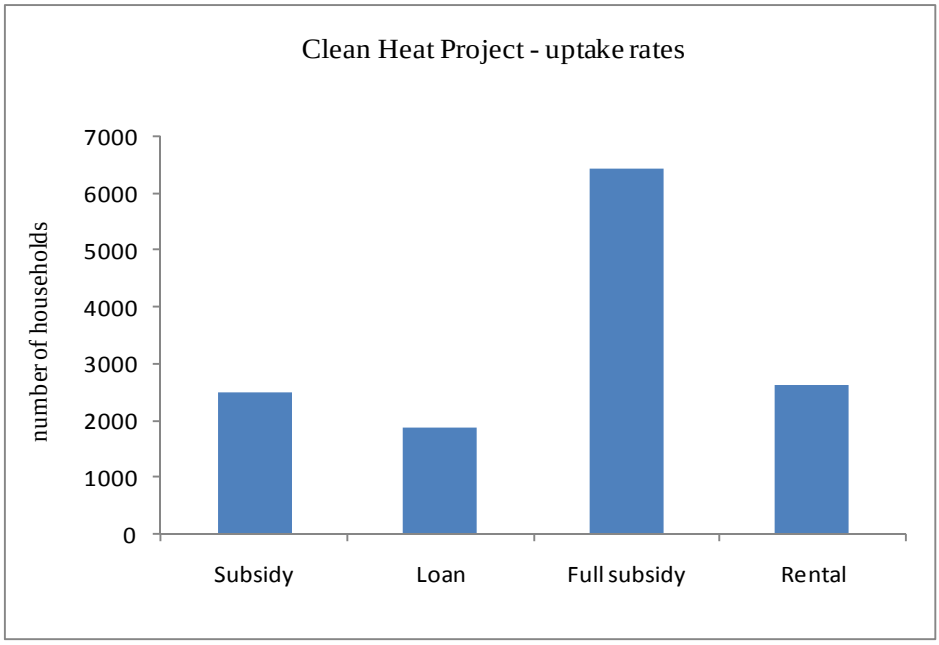


Figure 2.2: Uptake of different programmes under the Environment Canterbury 'Clean Heat' project (February 2003 – January 2009). Source: Environment Canterbury, 2009.

In 2006 Environment Canterbury reviewed the 'Clean Heat' project. Three hundred participants involved in the project were surveyed to determine satisfaction levels. The results showed that overall 98% of participants were either very or quite satisfied with

the 'Clean Heat' project and 82% of participants considered that their new form of heating was better that their old form of heating (Opinions Market Research Ltd, 2006).

Some of the lessons learned from the project included:

- A combination of rules, education and incentives are required to reduce PM_{10}.
- Without an incentives programme it may be very difficult to implement change.

Other areas in Canterbury

In mid 2008 Environment Canterbury extended the 'Clean Heat' programme to Kaiapoi, Rangiora, Ashburton and Timaru, all areas that have exceeded the NES for PM_{10}. A number of revisions were made to the Christchurch Clean Heat project to efficiently adapt it to fit the other areas. Full assistance to homeowners eligible for rates rebate is not available. A $1200 subsidy for clean heating appliance and 60% of the cost of ceiling and underfloor heating is offered to homeowners that have a Community Services Card. In addition a $100 subsidy towards removing an open fire or old non-complying wood burner is offered and Environment Canterbury administrative fees are waivered. The subsidy for households and landlords that is offered in Christchurch is also offered in Kaiapoi, Rangiora, Ashburton and Timaru. In addition, homeowners also have to pay a $250 Environment Canterbury administrative fee. The subsidy for landlords with a tenant and interest free loan financial plans are the same as the Christchurch financial plans.

2.4 Nelson City Council

The Nelson Air Quality Plan was notified in 2003 and became operative in November 2008.

Open fires were prohibited in Nelson's urban areas from January 2008. Replacement wood burners are required to meet the NES standard of 1.5g/kg. New solid fuel burners, except for very low emitting pellet fires (0.8g/kg) are not allowed in new houses or houses that do not have solid fuel burners in them prior to the notification of the plan. The Air Quality Plan uses a staged approach to replace older solid fuel burners in areas with high PM_{10} concentrations, based on the assumption of a 15 year operating period of a burner. The plan also includes a prohibition on the burning of wood with a moisture content of more than 25%.

Nelson City Council undertook the following research to develop the Air Quality Plan:

- Detailed monitoring of PM10 concentrations

- An emissions inventory to determine the sources of PM_{10}.
- An assessment of various options to determine which management options would meet the requirements of the NES.
- An assessment of the likely health impacts associated with high PM_{10} concentrations.
- A social impact assessment to determine the potential impacts of a variety of management options.

The 'Clean Heat Warm Homes' programme was developed as a result of this work.

The 'Clean Heat Warm Homes' programme was established in 2004 to mitigate any adverse effects from regulations in the Air Quality Plan. Phase One of the programme finished in 2007 and applied to low income home owners who used open fires as the main form of heating in their living area. The programme paid for the full cost of replacement of the open fire with a heat pump, flued gas heater or low emitting wood burner, and the installation or upgrade of housing insulation. Eligibility for a Community Services Card was used as a measure of low income for home owners. The programme also included provision for 40% of funding for clean heat appliances to private landlords if their tenant held a Community Services Card and used an open fire as the main form of heating in their living area. Around 300 open fires were replaced under the 'Clean Heat Warm Homes' programme. The programme was then expanded to include pre 1996 wood burners in the most polluted airsheds.

Of those converting from open fires, 56% installed heat pumps, 34% installed low emitting wood burners, and 10% installed flued gas.

Representatives from Nelson City Council have reported that the 'Clean Heat Warm Homes' programme was successful in meeting the project aims. The only substantial issue raised was that the full incentives programme could have been slightly generous and that using Community Services Cards to determine eligibility for the programme may not have been the best indicator of low income groups.

In 2008 the 'Clean Heat Warm Homes' programme was extended to the 'Pay as you Heat' scheme. This scheme involves the replacement of old solid fuel burners with clean heat appliances (heat pump, flued gas heater, pellet burner or a Council authorised wood burner) and home insulation by the Council that is paid back by the home owner over a ten year period on an interest free basis. The programme is administered through a targeted rate. Homeowners that are eligible for the Council's rates rebate scheme are not required to repay the interest free loan.

The 'Pay as you Heat' scheme is not available for the replacement of all older solid fuel burners throughout Nelson. It only applies to areas that have compulsory phase out

periods under the Air Quality Plan. Open fires are not included in the scheme, nor are households that have previously received assistance under the 'Clean Heat Warm Homes' programme.

The expected uptake rate for the loan is around 2500 wood burners. From the start of the project to mid January 2009 369 conversions from older solid fuel burners to clean heating appliances had taken place under the 'Pay as you Heat' scheme. Of those 40% converted to heat pumps, 55% to low emitting wood burners, two percent to pellet burners and three percent to flued gas. The 'Pay as you Heat' scheme is expected to continue until 2013, with a 'tail' through to 2023 when the last of the 10 year 'loans' are repaid. Some funding is also provided by EECA as part of the 'Warm Up New Zealand: Heat Smart' programme (see section 2.1), and the EECA 'Clean Heat' programme that provides a 50% grant for CSC households in airsheds ranked as having the worst air quality in New Zealand. Nelson City Council has contracted an independent energy management company to administer the incentives programme.

2.5 Otago Regional Council

The Otago Regional Council Clean Heat Clean Air Appliance and Insulation Programme was established in 2007 in response to regulations to reduce PM_{10} concentrations to meet the NES by 2013. The programme operates in Alexandra, Clyde, Cromwell, Arrowtown and Milton. The programme provides for insulation and clean heating appliances – approved heat pumps, low emission burners, pellet fires and approved gas heaters. Wood burners must have an emission test result of 0.7g/kg or less on the Ministry for the Environment approved wood burner list. The Council has also negotiated price reductions for 0.7 g/kg burners. Otago Regional Council also specifies the type of heat pumps and flued gas heaters that are included in the assistance programme.

The project is funded by Otago Regional Council, EECA, community trusts, Energy Companies, District Councils in Otago and the Arrowtown Warm Homes Trust. The programme is administered by Otago Regional Council.

In 2008 an interest free loan for landlords to convert to clean heat was established. However the uptake rate was low and the programme was changed to a subsidy.

During the 2008 to 2009 financial year 150 homes were fitted with clean heat and 900 were installed with installation. The insulation of 900 homes was due to a temporary 80% subsidy from EECA and were throughout the Otago Region, not just in Airzone one and Milton.

The 'Clean Heat Warm Home Appliance Package' has two main packages, the 'Insulation Package' and the 'Heating Appliance Package'.

Otago Regional Council is a registered service provider to the EECA 'Warm up New Zealand: Heat Smart' programme and has developed the 'Insulation Package' that implements the funding under the 'Warm up New Zealand: Heat Smart' programme. The Council has a contract with EECA to undertake insulation and clean heat retrofitting and subcontracts this to Otago Regional Council approved service providers. No additional funding is provided by Otago Regional Council for the 'Insulation Package'.

The 'Heating Appliance Package' subsidies the installation of approved clean heating appliances in the main living area. This programme is subsidised by the Council and its funding partners. The eligibility criteria is that homes must be owned and occupied, built before 2000, meet insulation requirements, and have a solid fuel burner that does not comply with the requirements in the Regional Air Plan and the removal or decommissioning of the burner is agreed.

Homeowners that have a community services card are not required to pay more than $500 towards an approved heat pump, pellet burner, flued gas heater or low emission burner (0.7g/kg). A $2000 subsidy for clean heat appliances is provided for homeowners that do not have a Community Services Card but meet the eligibility requirements for the 'Heating Appliance Package'.

Otago Regional Council has a full time staff member that administers the incentives programme. One of the aims of programme is to encourage homeowners to apply for the programme during spring and summer as the Council has found that bottle necks have occurred during autumn as this is the period when people begin to consider winter home heating options.

2.6 Hawke's Bay Regional Council

In December 2008, the Hawke's Bay Regional Council (HBRC) notified Plan Change 2 and Variation 2, to introduce new air quality provisions and change existing air quality provisions within the Regional Resource Management Plan and the Regional Coastal Environment Plan.

The Plan Change and Variation include a number of regulatory and non regulatory methods to assist Council in reducing PM10 concentrations within the Napier and Hastings Airsheds to NESAQ levels. New rules in the Plan will phase out the use open fires and non-compliant woodburners in Airzone 1 of the Napier and Hastings Airsheds between 2012 and 2020. Non-regulatory methods compliment these rules and focus on

educating the public, developing a best practice guide for the sale of wood by accredited wood merchants and providing financial incentives to encourage homeowners to upgrade their burners.

By 2020, around 21,000 solid fuel burners and open fires will be phased out in the Hastings and Napier airsheds. The 'Heat Smart Hawke's Bay' incentives programme has been developed to assist with the movement from open fires and older solid fuel burners to clean heating appliances. The incentives programme commenced in November 2009. Clean heating appliances include: low emission wood burners (Hastings 1.0g/kg, Napier 1.5g/kg), pellet fires, heat pumps and flued gas heaters. The incentives programme aims to target 16 529 burners over a four year period.

Hawke's Bay Regional Council 'Heat Smart Hawke's Bay' incentives programme has a similar eligibility criteria to the EECA 'Warm Up New Zealand: Heat Smart' programme, although HBRC has introduced different criteria for households with incomes of more than $100,000.

The 'Heat Smart Hawke's Bay' programme provides additional assistance beyond the funding available through the EECA programme via a grant or either aloan where the interest is subsidised or a loan where the homeowner is required to pay interest and fees. Where there is an EECA entitlement of 60% of the total cost of insulation, HBRC provides a loan option to meet the total cost of the project. A grant or loan with a subsidy on interest repayments is offered to homeowners with a household income of less than $100,000 in the Hastings and Napier Airsheds to install a clean heating appliance.

In regards to heating, homeowners that have a Community Services Card are entitled to a top up loan of up to $2,800 and the Council will subsidise 50% of interest payments.

A $700 grant toward a clean heating appliances or loan of up to $3500, with a 50% interest subsidy are available for rental properties where the tenant has a Community Services Card and for owner occupied households that have an income of under $100,000 and no Community Services Card. A loan with interest and fees is available to this group for insulation purposes.

For houses that have an income of over $100,000 a loan with interest and fees is provided by the Council for insulation purposes but not heating.

The incentives programme covers all households in the Hawke's Bay region, however homes outside the Hastings and Napier Airsheds are not elegible for funding toward clean heating.-The additional funding available from HBRC is shown in Tables 2.2 and 2.3.

Table 2.2: Funding available as part of the HBRC 'Heat Smart Hawke's Bay' programme in the Hastings and Napier airsheds that is additional to the EECA 'Warm Up New Zealand: Heat Smart' programme. Source: HBRC, 2009.

Eligibility criteria	**Additional HBRC funding**
Community Services Card holder	**Insulation** Top up loan and interest and fees **Heating** Up to $2,800 loan with 50% interest subsidy
Landlords where the tenant is a CSC holder	**Insulation** Top up loan and interest and fees **Heating** Grant of $700 or up to $3,500 loan with 50% interest subsidy
Household income under $100,000	**Insulation** Top up loan and interest and fees **Heating** Grant of $700 or up to $3,500 loan with 50% interest subsidy
Household income over $100,000	**Insulation** Top up loan and interest and fees **Heating** Not covered by HBRC

Table 2.3: Funding available as part of the HBRC 'Heat Smart Hawke's Bay' programme outside the Hastings and Napier airshed is additional to the EECA 'Warm Up New Zealand: Heat Smart' programme. Source: HBRC, 2009.

Eligibility criteria	**Additional HBRC funding**
Community Services Card holder	**Insulation** Top up loan and interest and fees **Heating** Not covered by HBRC
Non Community Services Card holder	**Insulation** Top up loan and interest and fees **Heating** Not covered by HBRC

The incentives programme is administered by HBRC. Service providers are required to have service contracts with HBRC and EECA. Applicants for the 'Heat Smart Hawke's Bay' incentives programme are advised to contact EECA approved service providers to undertake energy and home heating assessmentsand provide a quote for insulation and clean heat retrofitting. If the service provider is contracted to the HBRC Heat Smart programme the service provider is required to assist the applicant with an application and request them to sign declarations regarding the replacement heating appliance being in the primary living area,confirmation of Community Services Card if necessary and agreement to disable the non-compliant burner or open fire being replaced.

The emissions rating of the new heating appliance is also checked against regulatory requirements by the service provider. Ratepayer eligibility is checked by HBRC staff and ratepayer loan agreements are prepared. The service provider is engaged by HBRC to provide the quoted measures and once completed, the service provider supplies an invoice to EECA and HBRC. The homeowner is invoiced for any costs greater than the total funding available from EECA and HBRC.

Service providers are audited by EECA. In order to reduce costs and administrative requirements, HBRC do not undertake formal audits of the service providers, however a Post Installation Audit (PIA) must be supplied with each invoice and random audits can be undertaken as required.

The 'Heat Smart Hawke's Bay' incentives programme has required new administrative systems to be established by Hawke's Bay Regional Council. The Council employes a Healthy Homes Programme Manager and programme administrator. The programme administrator (0.75 FTE) assists with public and service provider enquiries and is responsible for processing all applications, contract administration, EECA reporting and service provider payments. The Healthy Homes Programme Manager has overall responsibility for the design and management of the Council's incentives programme in addition to managing and negotiating funding for externally fundedHealthy Homes Coalition programmes targeting low income households.

2.7 Incentives programmes in Australia

A number of incentives programmes to encourage the installation of clean heating appliances have been developed in Australia.

During 2001 and 2002, the New South Wales Environmental Trust provided $1 million for the Environmental Protection Authority to implement a pilot programme to encourage households using older solid fuel burners to convert to clean heat appliances. Eligible household were offered up to $700 to switch heating appliances. The programme

included smoke patrols and Council officers also followed up complaints regarding smoky chimneys. Council officers provided individual instruction on correct burner operation. There was also the potential for enforcement action in accordance with each council's policies (NSW EPA, 2002).

The Western Australian Department of Environment and Conservation established an incentives programme in 2004 that offered cash rebates for the replacement of old wood burners with gas heating. The uptake rates were high for the first two years of the programme, but decreased in 2007, most likely because eligible wood burners were captured in previous years (Vincent, et al, 2009).

In 2008 the 'Wood Heater Rebate Program' was established to remove non compliant wood burners in the Perth metropolitan area. The programme involved provision of a $150 rebate for the removal of old wood burners and delivery of them to recycling centres. The programme also sought to improve public awareness of air pollution issues and encourage the community to take action to improve air quality in their community (Vincent, et al, 2009).

A memorandum of understanding was developed between the Department of Environment and Conservation and local authorities to establish a process for accepting wood burners at recycling sites and determine how they would be recycled. Once wood burners were dropped off at the recycling centre, participants were provided with an application form for the rebate and a programme brochure. In addition, a gas appliance manufacturer supplied four gas heaters that participants of the programme could win (Vincent, et al, 2009).

Two thousand wood burners were targeted under the 'Wood Heater Rebate Program'. A total of 207 rebates were made during the duration of the programme (Vincent, et al, 2009). A possible reason for the low uptake rate is the limited advertising for the programme. Although the programme was promoted through media releases, council newsletters and web pages, it was not officially opened by a Minister. Previous programmes had been opened by a Minister and had television coverage. Also all advertising for the programme was withdrawn when problems with gas pipelines occurred, because it was thought that households with wood burners would consider changing to gas.

A survey was taken of ten percent of programme participants to gauge the effectiveness of the programme. The survey identified the reasons that participants decided to replace their wood burners:

- Inconvenience of accessing and collecting firewood (47.6%).
- Not using wood heater or wanted a more efficient wood heater (19%).

- Air pollution (14.3%).
- Health reasons (9.5%).
- Receiving the rebate (9.5%).

A total of 1,442 wood burners have been removed under the Western Australian Department of Environment and Conservation incentives programme since 2004.

2.8 Integration of Council incentives programme objectives and EECA objectives

EECA's programme is very relevant to this Good Practice Guide because it has obvious and important synergies and overlaps with all regional council air quality plans. The objective of the 'Warm Up New Zealand: Heat Smart' programme is to improve the energy efficiency of New Zealand homes through insulation and clean heat. The focus is on home insulation and houses are required to meet insulation standards before they are eligible for assistance with clean heating appliances.

There are a number of approaches that a council could take to integrate the objectives of the EECA programme with their own incentives programme objectives.

If the council incentives programme objective is to reduce PM_{10} concentrations via incentives and only focus on clean heating appliances then it may be difficult to effectively integrate funding under the EECA programme for clean heating appliances as this funding is tied to households meeting insulation standards. The programme could be designed to include clean heat and insulation but uptake is likely to be limited by the additional cost to the householder of the insulation component than if the programme were for clean heat alone.

If the council incentives programme objective is to mitigate the social and economic impacts that may arise from regulatory measures for reducing PM_{10} the design of the programme should include a focus on insulation to reduce energy requirements and home heating costs, then a combination of council and EECA funding is appropriate. However, EECA only provides for a maximum of 60 percent funding for low income households. Additional funding would need to be provided by Councils or other organisations such as charities.

If the incentive programme objective is to reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from reduction strategies through insulation and clean heat then EECA funding should be accessed for insulation and clean heat purposes to mitigate social impacts but may not be effective for households targeted for

PM_{10} reduction strategies. This objective is designed in two tiers, one focusing on mitigating social and economic impacts, the other on reducing PM_{10}:

- Mitigating impacts: EECA funding could be used but additional funding may be required to increase the uptake rate, especially for low income households for the incentives programme.
- Reducing PM_{10}: Integration with ECCA funding may not be the most cost effective method for reducing PM_{10}. Requirements to tie insulation to clean heat means that the uptake rate may be affected.

Table 2.4 shows how funding from EECA could be used to meet the objectives of a council incentive programme and identifies the extra funding that would be required by councils.

Table 2.4: Council incentive programme objectives, EECA funding, and identification of extra funding requirements.

Council incentive programme objective	**EECA funding**	**Extra funding required by councils**
Reduce PM_{10} concentrations via incentives – focus on PM_{10} reductions only.	EECA funding is only available if integrated with insulation. This is may limit uptake and capacity to deliver a cost effective incentives programme.	A council would need to provide independent funding to meet this objective or integrate with EECA but provide additional funding to minimise barriers to uptake[1].
Mitigate social and economic impacts that may arise from regulatory methods.	EECA funding available for insulation and clean heat.	A council could integrate EECA funds in to their incentives programme. More funding could be provided to minimise barriers to uptake.
Reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from regulatory methods.	EECA funding available for insulation and clean heat.	A council could integrate EECA funds in to their incentives programme. More funding could be provided if substantial PM_{10} reductions were required to minimise barriers to uptake

2.8.1 Linkages between council incentives programmes and EECA funded programmes.

Environment Canterbury has aligned the 'Clean Heat' project eligibility criteria to match the EECA 'Warm Up New Zealand: Heat Smart' programme criteria. Additional funding is provided by the council for households that have solid fuel burners that do not comply

[1] Note, the requirement of additional funding by the Council to improve uptake will depend on the required uptake rate of the incentives programme. If only a small proportion of households require conversion then it is probable that no additional funding by Council would be required. If Council required a large proportion of households to use the programme then they may need to contribute to the programme to mitigate the cost barrier created by the insulation requirement. If this supplement was larger than the cost of incentivising to clean heat in the absence of insulation it may be more cost effective for Councils not to integrate with EECA subsidies.

with the regulations in the Air Chapter of the Natural Regional Resource Plan. This has reduced the overall cost to Environment Canterbury for the 'Clean Heat' project (pers. comm., Mike Gaudin, Environment Canterbury, 2009). Environment Canterbury is intending to work with other agencies (for example, power companies and charities) to access further funding for the 'Clean Heat' project.

Nelson City Council has changed the 'Clean Heat Warm Homes' project to align with the 2009 changes to EECA programme. Previously EECA contributions involved a number of programmes. Some consisted of cash grants to eligible households (reducing the capital cost of insulation and/or heaters) and one involved an EECAa subsidy on the interest component of the interest free loan. It was not allowable to mix the interest subsidy and the grant schemes. That is both types of EECA assistance were not available to the same household. The interest subsidy scheme ceased when the 'Warm Up New Zealand: Heat Smart' programme commenced. In 2009 all EECA funding changed to a cash grant for household,. Councils can access these EECA grants on behalf of eligible households, except as contracted Service Providers. For Nelson City Council this means it has to borrow less money due to the higher levels of the EECA grants per house , but without the EECA subsidy the interest costs are higher.

Consultation with Regional Councils during the development of the 'Warm Up New Zealand: Heat Smart' programme found that councils identified that energy projects should be cost neutral with minimal administrative requirements (pers. comm., Ben Dunbar Smith, EECA, 2009). A voluntary targeted rates mechanism was established as a response to this request.

The implementation of a voluntary targeted rate involves councils establishing a targeted rating mechanism through their Annual Plan and Long Term Council Community Plans (LTCCP). This is a targeted rate for the provision of insulation and clean heating that can be used by householders and paid back over a number of years. Once established, Councils can use a voluntary targeted rate in a number of ways. Options include allowing households to borrow funds and paying it back at full interest rate as well as paying for administration fees, or the council may elect to cover all or part of the interest costs, or the cost of administrative fees to encourage participation.

Hawke's Bay Regional Council has established a targeted rating mechanism to allow ratepayers to repay the cost of installation via the property's rates over 10 years. In some cases, where the household is within an airshed and the household income is under $100,000 per year the Council provides interest subsidies, in other cases householders are required to pay for interest costs.

The development of a voluntary targeted rate is the main mechanism that councils can access EECA funding. Figure 2.3 shows the funding arrangements for the 'Warm Up New Zealand: Heat Smart' programme through the development of a targeted rate.

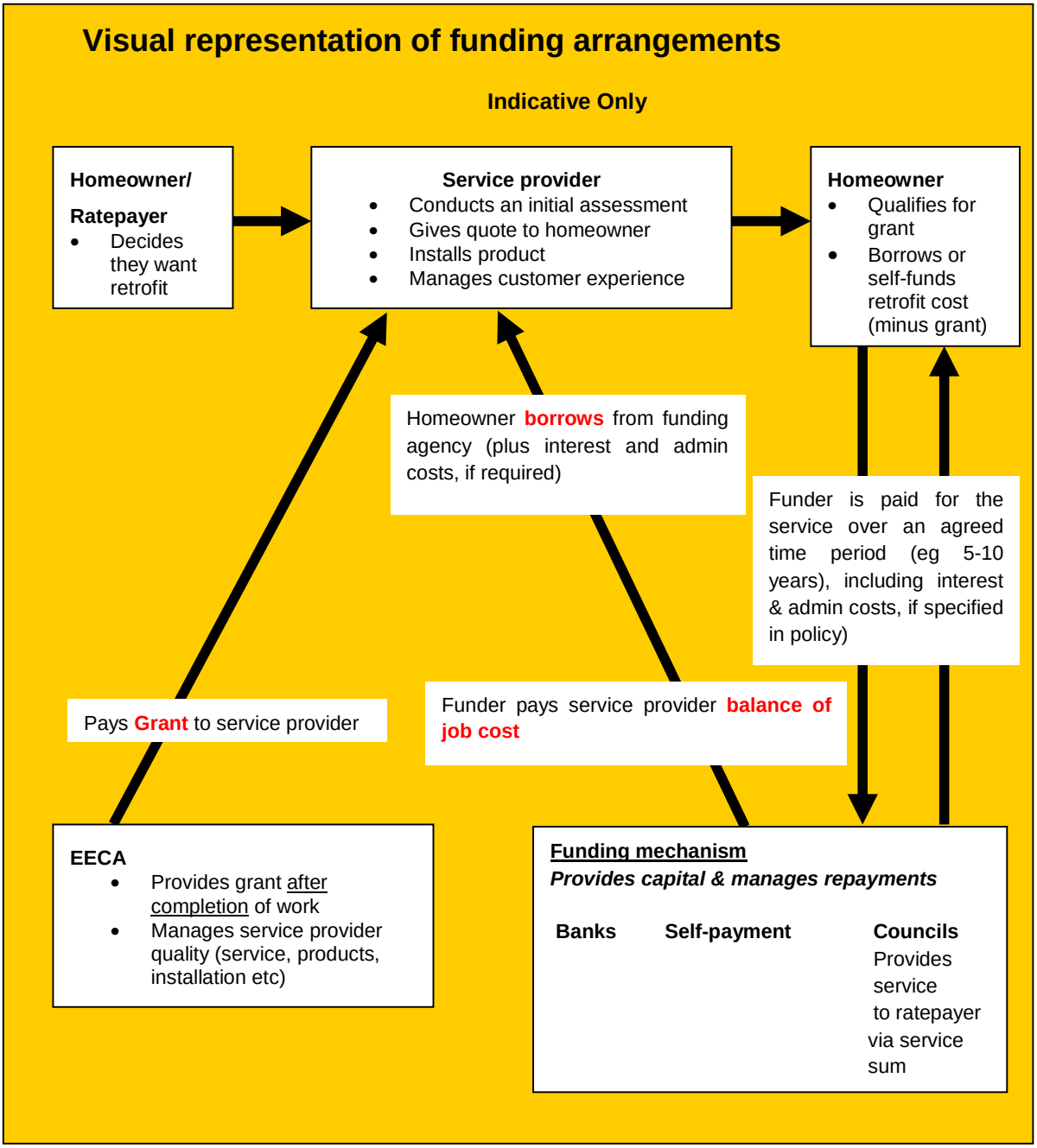


Figure 2.3: Funding arrangements for the 'Warm Up New Zealand: Heat Smart' (source EECA, 2009)

Another option for councils to access EECA funding is for the council to become a service provider and undertake installation and clean heat work. Councils can access EECA funding for council owned housing through the landlord subsidy that offers 60% of insulation costs and $1200 towards clean heating appliances if tenants have a Community Services Card. There is also the option of third party funding where councils allocate funding towards EECA programmes that will be administered by EECA. However it should be noted that if the objective of the Council is to only offer incentives for clean heat without an insulation requirement (as might be the case under a reduce PM_{10} only objective) then it is unlikely that EECA would administer the programme due to EECA requirements to incorporate insulation with clean heating appliances.

Appendix E: Linkages between EECA and council funding for incentives programmes shows how Environment Canterbury, Nelson City Council, Hawke's Bay Regional Council and Otago Regional Council have designed their incentives programmes to incorporate EECA funding. The eligibility criteria developed by EECA or the Regional Council are described. The Table identifies where Councils have allocated funding in addition to EECA funds. Councils developing incentives programmes will be assisted by Appendix E to identify the eligibility criteria that they can use to access EECA funding and identify any other criteria that may assist them to meet the objective of their incentives programme.

3 Social and economic impacts of PM_{10} reduction strategies

This section provides a review of the research that has been conducted in New Zealand on the potential social and economic impacts of implementing regulations to reduce PM_{10} emissions. The key social and economic impacts are identified for the purposes of incorporating these issues into the mitigation strategies provided in this Good Practice Guide.

3.1 Identification of social and economic impacts

Social impact assessments are a tool that can be used to determine the intended and unintended effects of regulatory intervention (Taylor et al, 2008). Social impact assessments usually include the identification of mitigation strategies that could be implemented to reduce the impact of regulations that may have an adverse effect on a community (Taylor et al, 2008).

A social impact assessment regarding air quality management was undertaken by Taylor Baines and Associates on behalf of Environment Canterbury during 2001. The brief for the project was to determine the social impacts of the proposed rules in the Air Quality Chapter of the Natural Resources Regional Plan. The brief also included analysis of issues surrounding financial incentives and assistance programmes as well as the development of criteria for an incentives programme to mitigate negative impacts that were identified during the social impact assessment (Taylor Baines and Associates, 2001).

Taylor Baines and Associates also completed a social impact assessment on regulations proposed by Nelson City Council to reduce PM_{10} concentrations. The research brief included identifying the social impacts that were likely to result from the proposed strategies and provision of advice regarding how negative social impacts could be mitigated through financial assistance and incentives (Taylor Baines and Associates, 2003).

The social impact assessments found that a number of positive social and economic impacts can be expected through the reduction of PM_{10} concentrations. The positive impacts included;

- Reduced health effects caused by PM_{10}
- Reduced medical costs
- Reduction in the number of restricted activity days
- Reduction in nuisance effects

- Protection and improvement of a Maori taonga
- Improvement to the image of urban areas for residents and visitors

However, Taylor Baines and Associates concluded that in Christchurch and Nelson the health benefits gained from reduced PM_{10} concentrations could be outweighed by the adverse health effects from cold homes unless sufficient mitigation was undertaken (Taylor Baines and Associates, 2001, 2003).

In the Christchurch study, Taylor Baines and Associates found that Environment Canterbury did not have responsibility for addressing the social impacts associated with existing cold homes but would be responsible for addressing the effects that could result from the introduction of regulations that controlled home heating (Taylor Baines and Associates, 2001).

In Nelson, it was found that four percent of households would be at risk of suffering from the effects of cold homes if financial assistance was not provided (Taylor Baines and Associates, 2003).

The social impact assessments indicate that due to the danger of introducing a cold home problem through regulations to control home heating, it is necessary to focus on methods to improve the warmth of homes overall. The reports found that it was not sufficient for a regulatory body to only consider providing assistance to cleaner forms of heating without giving consideration on how to improve the overall warmth of the house through insulation and energy efficiency measures (Taylor Baines and Associates, 2001, 2003).

Affordability was identified as a key issue that determined whether the social impacts in terms of household temperature, moisture level, ambience and fuel handing were positive or negative. The report found that households that could afford to replace open fires were likely to experience positive impacts including increased household temperature resulting from the removal of these appliances (Taylor Baines and Associates, 2001).

Research found that households unable to afford to replace open fires would ignore regulations and continue to use open fires or experience cold homes through the loss of their ability to heat their homes. This problem was found to be exacerbated if houses also had poor insulation. Taylor Baines and Associates found that a mitigation strategy that offered financial incentives and assistance could result in an increased temperature of the home (Taylor Baines and Associates, 2001).

In regards to enclosed burners, the ability to achieve a similar household temperature without using solid fuel was found to depend on the level of funding available to each

household. Households that could not afford to change to enclosed burners would either continue to use their appliance or suffer from cold homes. The social impact assessment research found that the introduction of a mitigation strategy that offered financial incentives and assistance could assist households to avoid cold homes (Taylor Baines and Associates, 2001).

A further negative social impact from the introduction of clean heat measures is the potential for an increase in the use of unflued gas heaters. This is due to their relatively low capital costs and the fact that bottled gas can be purchased in affordable quantities, making expenditure more controllable. Unflued gas heaters are not recommended due to their release of air contaminants that can affect asthmatics, and water vapour that results in dampness and mould and are known to have adverse health effects (Taylor Baines and Associates, 2001, 2003).

The social impact assessments highlight the benefits of working with all affected parties in the development of proposals to address any negative social impacts. An interagency approach that can identify sectors of the community that are most at risk and require intervention is advocated in these assessments (Taylor Baines and Associates, 2001, 2003).

Consultation undertaken by Taylor Baines and Associates with the residential property investment sector identified concerns that landlords could be unduly targeted with requirements to change their properties to clean heating and increase energy efficiency. Studies have shown that there is a sector of property investors who have only one or two properties that represent their retirement savings and these investors have little surplus income to invest in their rental properties (Taylor Baines and Associates, 2001, 2003).

The need to mitigate potential adverse health effects from reduction strategies to reduce PM_{10} concentrations have been the basis for the development of the incentives programmes for Christchurch and Nelson. Table 3.1 identifies the type of households that are likely to be affected by income category.

Table 3.1: Negative social and economic impacts that may arise from the regulation of the domestic sector to manage PM_{10} concentrations and identification of the extent income groups are likely to be affected (partly based on Taylor Baines and Associates, 2001 and 2003)

Regulation	**Negative social and economic impacts**	**Level of affect of regulations on income group**
Prohibit open fires	• Reduced temperature level in houses as a result of the removal of open fires which may lead to adverse health and lifestyle effects. • Increased medical costs as a result of cold homes. • An increase in demand for social services due to cold homes. • Loss of ambience provided by open fires. • Increased probability of adverse health and safety impacts related to the use of unflued gas heaters. • Reduction in the choices available for home heating appliances. • Potential for reduction in demand for wood and coal. • Capital and costs required for alternative heating methods. • Increased running costs, especially if wood had been sourced free of charge and replacement heating method was electricity or gas.	<u>Low income home owners</u> Most affected <u>Middle income home owners</u> Some affect <u>High income home owners</u> Minimal affect <u>Rental properties</u> Most affected
Phase out of old wood burners – fifteen years after installation.	• Removal of current means of cooking for households with wood or coal fired cooking devices. • Reduced temperature level in houses as a result of the removal of old wood burners which may lead to adverse health and lifestyle effects if the homeowner cannot afford to replace the wood burner. • Increased medical costs as a result of cold homes. • An increase in demand for social services due to cold homes. • Increased probability of adverse health and safety impacts related to the use of unflued gas heaters. • Potential reduction in demand for wood and coal. • Capital and costs required to convert to alternative heating methods.	<u>Low income home owners</u> Most affected <u>Middle income home owners</u> Some affect <u>High income home owners</u> Minimal affect

Regulation	**Negative social and economic impacts**	**Level of affect of regulations on income group**
	• Increased operating costs, especially if wood had been sourced free of charge and replacement heating method was electricity or gas.	Rental properties Most affected
Prohibit the installation of solid fuel appliances in new dwellings	• Reduction in the choices available for home heating appliances. • Potential increases in operating costs for gas and electricity. • Future risk of cold homes associated with electricity or gas prices or electricity shortages.	Low income home owners Some affect Middle income home owners Some affect High income home owners Minimal affect Rental properties Some affect
Prohibit the installation of solid fuel appliances in dwellings which do not already use a solid fuel appliance	• Reduction in the choices available for home heating appliances. • Increased operating costs, especially if wood had been sourced free of charge and replacement heating method was electricity or gas. • Potential increases in operating costs for gas and electricity. • Future risk of cold homes associated with electricity or gas prices or electricity shortages.	Low income home owners Some affect Middle income home owners Some affect High income home owners Minimal affect Rental properties Some affected

Regulation	**Negative social and economic impacts**	**Level of affect of regulations on income group**
Introduction of a new emission standard for all solid fuel appliances	• Reduction in the choices available for home heating appliances. • Loss of existing means of cooking in some dwellings.	Low income home owners Some affect Middle income home owners Some affect High income home owners Minimal affect Rental properties Some affect

3.2 Development of mitigation strategies

For Councils that are intending to develop an incentives programme to reduce PM_{10} concentrations, it is not considered necessary to undertake a full social impact assessment as the likely impacts have been well documented by Taylor Baines and Associates in the Christchurch and Nelson studies. Instead, it is recommended that Councils consider the negative social impacts for specific regulations to manage PM_{10} concentrations that are identified in Table 3.1 (see above). The extent that social and economic impacts will be experienced as a result of regulations will partly depend on household income.

For each Council, consideration of social and economic impacts will depend on the objective of the incentives programme and the extent to which a Council chooses to mitigate impacts. The text box below shows an example of how social and economic impacts might be considered under different project objectives.

Objective 1: Reduce PM_{10} concentrations via incentives. A Council can use non regulatory or regulatory means to reduce PM_{10} concentrations. If a Council chooses to use non regulatory methods (e.g., incentives) then it is unlikely that adverse social and economic impacts will occur. If a Council decides to implement regulations that have very few negative social impacts, such as the introduction of a new standard for wood burners then minimal consideration of social and economic impacts will be required. However if a Council decides to implement regulations that are likely to have negative social and economic impacts such as regulations to prohibit the use of open fires, then consideration of how to mitigate the negative social and economic impacts may be required.

Objective 2: Mitigate social and economic impacts that may arise from regulatory measures. If the Council objective is to mitigate the social and economic impacts that are likely to arise from regulatory measures, then more consideration will be required to identify the adverse impact and develop strategies to address them. Regulations that prohibit the use of open fires and wood burners have the potential to cause the greatest amount of negative social impact. Mitigation strategies should to take into account these issues to minimise potential social and economic impacts.

Objective 3: Reduce PM_{10} and mitigate the social and economic impacts that may arise from regulatory measures. If the Council objective is to reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from regulatory methods then Councils may choose to consider the negative social impacts that have been identified for each regulation in Table 3.1.

4 Heating Choices Guide

This section provides a review of home heating method options that are commonly used in New Zealand and highlights their respective pros and cons in the context of incentives programmes. This section also presents the results of research that investigates the association between the heating methods used and household demographics. Finally this section reviews the factors that influence people's choice of heating method. All three of these issues have significant consequences that need to be considered in the design of an incentives programme.

4.1 Types of heating methods

4.1.1 Solid fuel burners

Open fires

Open fires are an inefficient method of home heating. The maximum efficiency for open fires is assumed to be around 15% as most of the heat is lost through the chimney and open fires draw warm air towards the fireplace (Strategic Energy & EnergyConsult, 2005). The heat output from open fires is difficult to accurately control and is not constant. Open fires are labour intensive as they require constant refuelling and can result in increased indoor PM_{10} concentrations.

Open fires tend to have high PM_{10} emissions both on a gram per kilogram (g/kg) basis and because the increased oxygen available for combustion means the wood is typically burnt faster than on an enclosed appliance. For open fires burning wood the PM_{10} average emission factor is 10 g/kg compared with around 3 g/kg for burners meeting the NES design criteria for wood burners (Smith, et. al., 2008).

Traditionally, incentives programmes have targeted the conversion of open fires to clean heat in the first instance. This approach has merit in that it can quickly remove the most inefficient form of heating and therefore effectively target both warm homes and air quality objectives. In most areas, however, only a small proportion of households use open fires and there may not be time to implement a staged campaign that targets only a small proportion of the population that use open fires as well as meet emission reductions targets.

Wood burners

The main advantage of wood burners is that on average they provide higher levels of home heating when compared to alternative options including electricity and gas (Taylor

Baines and Associates, et. al., 2005). Possible reasons for this include the availability of appliances that have higher heat outputs and lower heating costs of fuel for wood burners, especially if wood is obtained free of charge (Taylor Baines and Associates, et. al., 2005). Inbuilt wood burners tend to be 3% to 5% less efficient than the equivalent freestanding model (Strategic Energy & EnergyConsult, 2005). A further advantage of wood burners is that they have lower green house gas emissions than electricity or gas heating. The burning of firewood collected from plantation timber is likely to be considered carbon neutral as new growth will absorb CO_2 from the atmosphere at the same time it is released by combustion of the previous harvest. The burning of firewood from other sources for example, natural forests are not considered carbon neutral based on methods to calculate carbon emissions under the Kyoto protocol (Baynes, M. et. al, 2009).

Data from home heating surveys suggest that in many areas around half of householders that use wood to heat their home collect it for free (Millichamp & Wilton, 2002). The sources of free wood include untreated off-cuts from timber yards, manufacturers, building contractors, forestry, demolition timber and supplies from farms. Once gathered, wood must be stored correctly, dried, cut to the appropriate size to fit in the burners and restocked. Wood must also comply with Council regulations; Environment Canterbury and Nelson City Council require the water content of wood to be less than 25% by weight.

Emissions of PM_{10} from wood burners largely depend on its age and on how it is operated. Older wood burners have higher PM_{10} emissions on average. For example, pre 1994 wood burners emit around 11g/kg of PM_{10} on average (Smith & Wilton, 2006). Operational factors such as wet wood, and the dampening down of wood burners can effect PM_{10} emissions.

The NES requires that all wood burners installed on properties of less than two hectares meet the standard of 1.5g/kg when tested to NZS 4013, and have a thermal efficiency of at least 65%. The average 'real life' emissions from these burners appear to be around 3 g/kg (Smith, et. al., 2008). The Ministry for the Environment has developed a national list of authorised wood burners that identifies approximately 110 burners that meet the NES standard. Around 10 percent of the authorised wood burners also have water heaters; all are freestanding appliances. Recently an inbuilt wood burner with a water heater has been tested to NZS 4013, and the results indicate that the NES criterion is complied with. Christchurch and parts of the Otago region have more stringent requirements than the NES standard.

The inclusion of NES compliant wood burners in incentives programmes is recommended by Taylor Baines and Associates et. al. (2005). This is particularly

important for low income households that are currently using solid fuel to heat their homes and who obtain fire wood free of change. The inclusion of NES compliant wood burners may also be appropriate in other situations where the required reductions in PM_{10} concentrations allow for the installation of these burners when replacing older solid fuel burners. The promotion of low emission wood burners as part of an incentives programme may also assist Councils to meet climate change objectives as required by Section 7 of the Resource Management Act (see Appendix F: Resource Management Act) (Baynes, M., et. al, 2009).

In some situations, PM_{10} concentrations may be so high that the emission reductions that would be achieved by upgrading existing burners to NES compliance burners will not allow the NES to be achieved by 2013. In this instance alternatives to solid fuel burners will need consideration.

Pellet burners

Pellet burners appear similar to conventional wood burners and are available in free standing or inbuilt models. Pellet burners are fired by specifically designed wood pellets that are mechanically fed into the fire via a hopper. Good levels of heating efficiency can be achieved with pellet fires, through the ability to adjust the rate that pellets are consumed, control room temperature through a thermostat and using timers to turn the heating appliance on and off. The approximate heat output for pellet burners ranges from 10 to 30 kilowatts (kW), and the price of the burners range from $3500 to over $6000 as well as installation costs (pers. comm., Smiths City, 2009).

Real life testing of emissions from pellet burners shows average emissions from the testing of three pellet burners of around 1.4 g/kg on average (Kelly, et. al., 2007). Laboratory emission test data indicate a range of emissions from pellet burners with some burners achieving test results of less than 0.3 g/kg.

The possible disadvantages of pellet burners is that they require electricity to power the fuel feed auger, although some models include battery back up to ensure operation during times of power black outs. Another possible disadvantage is the risk of increased prices for fuel as pellets are manufactured by a limited number of firms (Strategic Energy & EnergyConsult, 2005).

Pellet burners are considered to be appropriate clean heating appliances to be included in an incentives programme, provided that the airshed can absorb the expected emissions without breaching the NES. A further advantage of pellet burners is that they have low greenhouse gas emissions, and Council's could promote low carbon forms of heating through their incentives programme (Baynes, M. et. al, 2009). Target groups include high income households who may be able to more readily absorb potential price

increases for pellet fuel and those households that are not dependent on obtaining free firewood.

Multi fuel burners

Multi fuel burners are designed to burn wood and coal and tend to have higher PM_{10} emissions than wood burners. The NES does not control multi fuel burners and therefore there are no restrictions on the installation of multi fuel burners unless specified in an air plan.

In 2007 Smith et. al., undertook research to determine if any multi fuel burners in New Zealand met the NES design criteria for wood burners of 1.5 g/kg of total suspended particulate (TSP). Their report found that laboratory tests for some multi fuel burners using a mix of wood and coal have been undertaken in New Zealand. Two multi fuel burners were identified that met NES requirements when tested to AS/NZS4013 and AS/NZS4012. In these appliances fuel is delivered through an automated process and it is expected that there is little variation between laboratory and real life testing. However, these appliances are considered cost prohibitive for inclusion in an incentives programme as the estimated cost per appliance is between $7000 and $15000 (Smith, et. al., 2007).

If, in the future, multi fuel burners were developed that had a significantly lower real life emission rate for PM_{10}, then in some airsheds consideration could be given to including these burners in an incentives programme. In airsheds where coal use in multi fuel burners is high and coal is easily and cheaply accessed then it may be appropriate to encourage a movement towards low emission multi fuel burners, provided that the emissions reduction scenarios allow for some PM_{10} emissions from solid fuel burning. In this instance, further consideration of issues surrounding the promotion of coal use and the implications that this would have on greenhouse emissions would be necessary. Coal cannot be recommended as a suitable form of home heating in regards to the reduction of green house gas emissions (Baynes, M. et. al, 2009).

4.1.2 Non solid fuel burners

The most effective way to reduce PM_{10} emissions is to change heating types to non solid fuel burners. Options include diesel burners, flued and unflued gas heaters, heat pumps and electric heating.

Diesel burners

Diesel fired burners can be a cleaner heating option, with a PM_{10} emission rate of 0.3 g/kg, when compared to wood burners and pellet fires under laboratory test conditions. However a number of wood burners and pellet fires have emission rates that are similar or lower than diesel fired burners (see http://www.mfe.govt.nz/laws/standards/woodburners/authorised-woodburners.html#list).

The capital cost of diesel fired burners tend to be more expensive than most wood burners and pellet fires, and cost around $4200 installed (pers. comm., Smiths City, 2009). Anecdotal evidence suggests that in recent years the demand for diesel heaters has declined. This is most likely due to the increase in the price of diesel (pers. comm., Smiths City, 2009).

Diesel fired burners are included in the Canterbury 'Clean Heat' project, but not in the Nelson 'Clean Heat Warm Homes' project or as a heating option for EECA projects. Diesel burners only account for 0.2 % of conversion to clean heat under the Environment Canterbury 'Clean Heat' project. The main advantage of including diesel heaters in an incentives programme is to allow homeowners to have a wider choice of heating appliances. However, in airsheds that require significant PM_{10} reductions, consideration would need to given to the appropriateness of this heating method.

Gas heaters

Gas heaters are available in either unflued or flued appliance type. Unflued gas heaters and portable gas cabinet heaters are not recommended as home heating methods, as without proper ventilation, they may cause adverse health effects.

Flued gas heaters can be flame effect and appear similar to an enclosed burner, space heaters, or central heating units. Flame effect heaters tend to have a lower efficiency than gas space or central heating units (EECA, 2009). In New Zealand gas is available either through the reticulated natural gas network that covers parts of the North Island, through bottled LPG, and in some areas, through piped LPG.

During recent years the use of gas heaters has become less popular, mainly due to the large increase in gas prices (Wilton & Baynes, 2009). For example, research undertaken by Wilton and Baynes (2009) found that by that by 2008 around 200,000 households (13%) that used gas as a heating method in their main living area in 2006 were no longer using it. The main decrease was in households with unflued bottled LPG methods (e.g., portable gas heaters), with a 57% reduction in use, although a substantial reduction (30%) in unflued reticulated gas heating was also observed. Natural gas is less expensive than LPG (Wilton & Baynes, 2009).

Flued gas heating appliances are offered in existing incentives programmes and do provide a viable method of clean heat. In terms of emissions reductions, they provide a good alternative to solid fuel heating, although gas heaters emit more greenhouse gases than wood and electricity (Baynes, M. et. al, 2009). However gas heaters do not appear to be popular choices, for example the Christchurch 'Clean Heat' project has only had a three percent uptake in gas heating (pers. comm., Mike Gaudin, Environment Canterbury, 2009). Along with the increases in the price of gas and a New Zealand wide decrease in the use of gas heating, it is expected that Councils may find it difficult to persuade members of the community to switch to this form of heating. Potential sectors of the community that may be interested in switching to gas heating include high income homeowners who still want the aesthetic value of flame fires and can afford to pay higher fuel costs. To reduce greenhouse gas emissions incentives programmes should focus on promoting wood and electricity in the first instance.

Heat pumps

Switching from solid fuel to electric heating is the most effective method of reducing PM_{10} in areas where domestic heating is the major cause high PM_{10} concentrations.

A heat pump uses electricity to provide heat. Heat pumps work by extracting heat in the air from outside a house and bringing it inside. Through the use of refrigerant gas, heat pumps shift more heat than the electrical energy consumed in the operation of them (www.consumer.org.nz). This makes them a highly efficient form of heating, and can produce up to five times as much energy in optimal operating conditions (EECA, 2009). Heat pumps are thermostatically controlled to bring the temperature of a room to a certain level and maintain it within one to two degrees of that temperature. Prices range from around $2500 to $5000 installed (pers. comm., Smiths City, 2009).

The main advantages of a heat pump include:

- An energy efficient form of home heating. Some heat pumps can produce up to 5kW of heating for every 1 kW of electricity they use.
- Lower heating costs if the temperature of the room is not increased to a higher temperature than before the heat pump was installed.
- Reducing PM_{10} concentrations and other contaminants caused by the use of solid fuel.
- If appropriately sized, they can quickly bring a room up to a comfortable temperature.
- Can be used as a dehumidifier to reduce moisture in the home.
- Improvements to the quality of indoor air through washable filters.
- The potential to add value to a house.

There are also a number of disadvantages that may require consideration before a heat pump is installed. These include:

- The ongoing increasing costs of electricity.
- Reliance on one type of energy source for home heating, and concerns about how to heat homes during power blackouts.
- Requirement for cleaning of filters and maintenance.
- The need to be selective in choice of certain heat pumps that should be avoided:
    - models that do not work effectively in low temperature areas if installing in a low temperature.
    - noisy models.

The Energy Efficiency Conservation Authority recommends that temperature of heat pumps should be set at 18° to 22° celsius while a s pace is being used and if required, set at 16° celsius overnight (EECA, 2009). The Worl d Health Organisation (1987) has found that *'there is no demonstrable risk to the health of healthy sedentary people living in air temperatures of between 18℃ and 24℃. This temperature range applies under conditions of appropriate clothing, insulation, humidity, radiant temperature, air movement and stable physiology'* (WHO, 1987).

The inclusion of heat pumps in incentives programmes is recommended. For airsheds where the required reductions in PM_{10} concentrations mean that an overall reduction in the number of solid fuel burners is necessary, heat pumps and other forms of non solid fuel heating may be the only available options. The use of electricity for home heating has higher greenhouse gas emission than wood burning. However as heat pumps are more efficient than other forms of electricity, they are preferable to other electric heating methods in terms of greenhouse gas emissions (Baynes, M. et. al, 2009).

For airsheds that can sustain a limited number of solid fuel burners, a change to heat pumps should be promoted, in the first instance, to groups that may be able to better afford and manage reliance on electricity as their main form of heating, for example; high and middle income home owners. Where possible, low income home owners who are reliant on free wood, should be the last sector of the community where an incentives programme would promote the uptake of heat pumps.

Other electric heaters

Other electric heater types include radiant, convector, fan, under floor, and night store heaters. The main advantages of radiant, convector and fan electric heating include low capital costs and the convenience of quickly heating a small room or particular area. A basic fan heater costs around $60 (pers. comm., Noel Leeming, 2009). Disadvantages include the increasing cost of electricity, increased demand on the electricity network,

and the limited way they can be operated, most only have a on or off setting, although some models do have basic thermostatic controls. These types of heaters are not recommended to be included in an incentives programme because they are not cost effective and are unlikely to be consistent with Councils strategic planning for energy.

Electric underfloor heating is a heating option for new homes. It is not practical to retrofit underfloor heating into existing houses. The main advantage of underfloor heating is that it provides a warm, comfortable radiant heat. Underfloor heating tends to be expensive to install and operating costs are high. Many households that use underfloor heating reduce electricity costs by using night rates. However such rates are vulnerable to price increases in the electricity market (Strategic Energy & EnergyConsult, 2005).

Night store heaters operate by storing heat from night rate electricity and release it during the day. They are most advantageous for households that are occupied during the day and in locations where there is a cheaper night rate for electricity. Apart from vulnerability to price increases, one of the main disadvantages is that they have to be run all of the time, which can mean that they are heating areas during the day when there is enough warmth outside to heat the house without requiring heat from the night store heater. This lowers their efficiency (EECA, 2009).

Night store heaters are the only type of conventional electric heaters that are included in the Canterbury 'Clean Heat' project. However since the project has been in operation, less than 10 conversions to night store heaters have occurred (pers. comm., Mike Gaudin, 2009, Environment Canterbury). Night store heaters are not included in the Nelson or EECA incentives programmes.

As these forms of heating are less efficient than heat pumps they are not recommended as a heating form that will assist to reduce greenhouse gas emissions.

4.1.3 Insulation

Home insulation works by slowing the rate of heat loss from homes. Heat is lost from the inside of a house through walls, ceilings, windows and doors, unblocked chimneys and through any cracks in the house, In an average un-insulated house; 30-35% of heat is lost through the roof, 21-31% is lost through the windows, 18-25% is lost through the walls, 12-14% is lost through the floor and 6-9% is lost through gaps and draughts (for example, around doors and windows) (New Zealand Consumer Magazine, 2008).

The benefit of insulation is that it reduces heat loss which makes houses cheaper to heat and homes should become healthier. Home insulation projects normally include ceiling and floor insulation. Walls are more difficult to insulate and often occurs during

renovation projects or when new houses are being built. A well insulated home will reduce the energy required to heat homes and will assist with a reduction in greenhouse gas emissions.

Recently the types of underfloor insulation products recommended by EECA have changed. Reflective foil stapled along floor joists are no longer recommended as, among other reasons, the performance of the foil depends, to a large extent on how well it is installed (EECA, 2009). Underfloor insulation products such as polystyrene, wool, or polyester that can be fitted to the underside of the floor are now recommended.

Other insulation methods include thermal backed curtains, double glazing of windows, blocking off unused open fire places, using caulking and weather strips to block off draughts, and filling gaps in ceiling insulation.

Studies in New Zealand have found that homes that were insulated to meet the requirements of the Building Code for ceilings, floors and walls are on average, 1 to 1.5 degrees warmer and the energy savings during the first year that the insulation was installed were, on average, 19% (Taylor Baines and Associates, et. al., 2005).

All current incentives programmes for reducing PM_{10} include requirements for home insulation. This is because the health benefits of achieving clean air are unlikely to be realised if it comes at the expense of warm homes (Taylor Baines and Associates et. al., 2005).

Taylor Baines and Associates, et. al., 2005 found that requiring compliance for insulation with changes to clean heat was a disincentive for the middle income sector of the community to participate in the Canterbury 'Clean Heat' project. This sector of the community did not qualify for full assistance that would include home insulation, but did not have the financial discretion to afford the capital cost of upgrading insulation.

The research also found that requiring home insulation as part of an incentives programme was an attractive option for high income households (Taylor Baines and Associates, et. al., 2005).

4.1.4 Recommended home heating methods

An analysis of home heating options available in New Zealand suggests that the best home heating and insulation choices are:

- Energy efficiency. home insulation.
- NES Wood burners. (if the required PM_{10} reductions for an air shed allow for some solid fuel burning)

- Pellet burners. (if the required PM_{10} reductions for an air shed allow for some solid fuel burning)
- Heat pumps.
- Flued gas burners.
- Diesel burners.

4.2 Heating methods by household demographics

An analysis of 2006 census data was undertaken to determine wood and coal use in New Zealand (Statistics New Zealand, 2009). The analysis used the criteria for the Target Groups[2] (see section 1.1.3) to determine the characteristics in terms of household income and home ownership status for wood and coal use. The analysis was undertaken at the Territorial Local Authority level and results for each local authority area are in Appendix G: Wood and Coal use by Territorial Local Authority in New Zealand.

Results are presented as:

- The proportion of households within each income category that use wood or coal. These graphs show the use of wood and coal heating within each income category.
- The distribution of wood and coal use across different income groups. These graphs indicate which income categories have the greatest numbers of households using wood and coal.

4.2.1 Total wood and coal use in New Zealand.

Table 4.1 shows the total number of owner occupied households that use wood or coal by income type, where as Table 4.2 shows the total number of rental properties that use wood or coal by income type. This is of value when designing an incentives programme because it provides an indication of the target group for clean heat conversions.

For all of the households that use wood in New Zealand, 75% are owner occupied and 25% are rental properties. Of the households that use coal in New Zealand, 69% are owner occupied and 31% of are rental properties.

[2] Target Group – Low income – household income less than $50,000
Target Group – Middle income – household income between $50,000 and $100,000.
Target Group – High income – household income over $100,000.
Target Group - Rental properties

There are around 417,000 owner occupied households that use wood and around 140,000 rental properties that use wood for home heating. There are around 65,000 owner occupied households that use coal and around 30,000 rental properties that use coal for home heating.

In terms of income category there are around 252,000 households that use wood or coal and have an income of less than $50,000 in New Zealand. There are around 203,000 households that use wood or coal and have an income between $50,001 and $100,000 and around 112,000 households that have an income greater than $100,001. A number of households that use wood or coal did not state their income.

Table 4.1: Total number of owner occupied households that use wood or coal by income type[1] (Source: Statistics New Zealand, 2009).

	$20,000 or Less	$20,001 - $30,000	$30,001 - $50,000	$50,001 - $70,000	$70,001 - $100,000	$100,001 or More	Not Stated	Total
Wood	36111	39915	69360	69282	69381	85668	47445	417162
Coal	6798	6825	11454	10827	9906	11751	7725	65280

1. Shading of income levels shows income type for Target Groups (low income, middle income, high income). Light grey is the low income Target Group, mid grey is the middle income Target Group, and dark grey is the high income Target Group

Table 4.2: Total number of rented properties that use wood or coal by income type[1] (Source: Statistics New Zealand, 2009).

	$20,000 or Less	$20,001 - $30,000	$30,001 - $50,000	$50,001 - $70,000	$70,001 - $100,000	$100,001 or More	Not Stated	Total
Wood	20865	17352	28944	20874	15693	12318	24948	140985
Coal	5151	3801	6045	3999	2964	2175	5619	29757

1. All rental properties fall within the landlord Target Group and are shaded a very light grey.

4.2.2 Wood

In New Zealand, 46% of owner occupied houses use wood, and 31% of rental properties use wood as the main source of heating.

Figure 4.1 shows the proportion of owner occupied households by income category that used wood in New Zealand in 2006. The figure indicates that 51% of middle income households with an income of between $50,001 and $70,000 used wood to heat their homes, with 49% of middle income households with an income between $70,001 and $100,000 using wood to heat their homes in 2006. Low income households with an

income of less than $20,000 have the lowest proportion of wood use for owner occupied houses, with 36% of this category of households using wood.

Figure 4.2 shows the proportion of rented properties by income category that used wood in New Zealand in 2006. The income category with the highest proportion of households using wood was the middle income, $50,001 to $70,000 category, at 36%. Low income households (less than $20,000) living in rental properties had the lowest proportion of wood use, with 24% using wood to heat their homes.

The distribution of wood use by income category for owner occupied and rental houses in New Zealand are shown in Figures 4.3 and Figure 4.4.

Figure 4.3 indicates that owner occupied high income earning households ($100,001 or more) had the most households using wood, with 21% of all houses using wood falling into this income bracket. Within this group, wood use is not more predominant as a heating choice than other groups as only 44% of owner occupied households in this income bracket use wood, compared with around 50% for middle income households (Figure 4.1).

Figure 4.4 indicates that the greatest number of households using wood in rental properties are low income home owners in the $30,001 to $50,000 category, with 21% of all households using wood being in this income category. It is noted that 18% of respondents in this category did not state their income details.

Table G.1 in Appendix G shows the number of households that use wood to heat their homes by Territorial Local Authority by income range for owner occupied and rented properties. This is of value when designing an incentives programme because it provides an indication of the target group for clean heat conversions. For owner occupied households, the areas that have a high (greater than 80%) rate of wood use include the predominately rural areas of Mackenzie District (90%), Carterton District (88%), South Wairarapa District (87%), Central Hawke's Bay District (87%), Tararua District (86%), Hurunui District (84%), Ruapehu District (83%), Waimate District (82%), Wairoa District (82%) and Rangitikei District (80%).

The only districts that have wood use at over 80% of households for rental properties are the Hurunui District (83%) and Ruapehu District (80%).

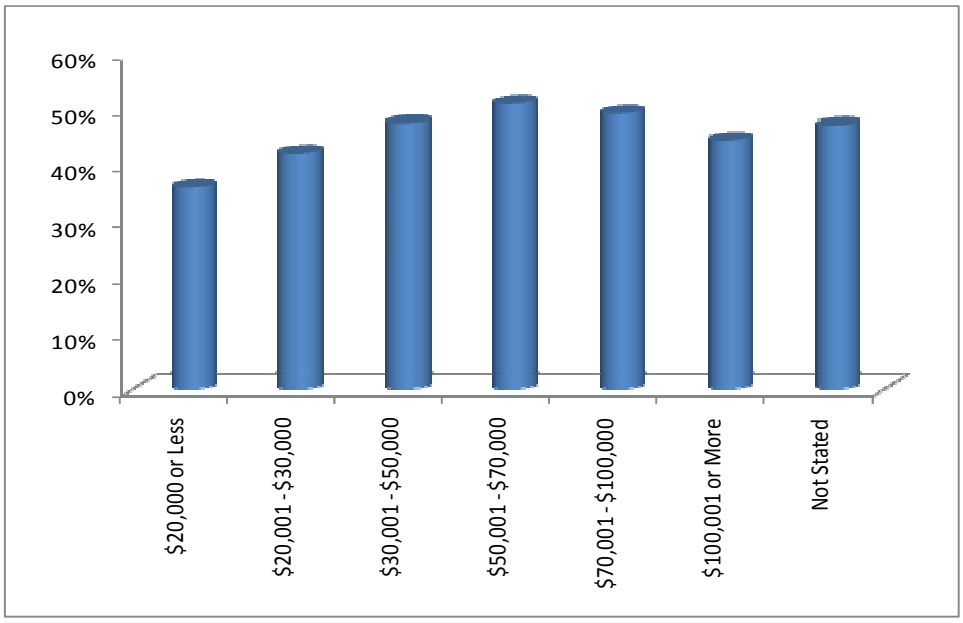


Figure 4.1: Proportion of owner occupied households in each income bracket that used wood in 2006 in New Zealand.

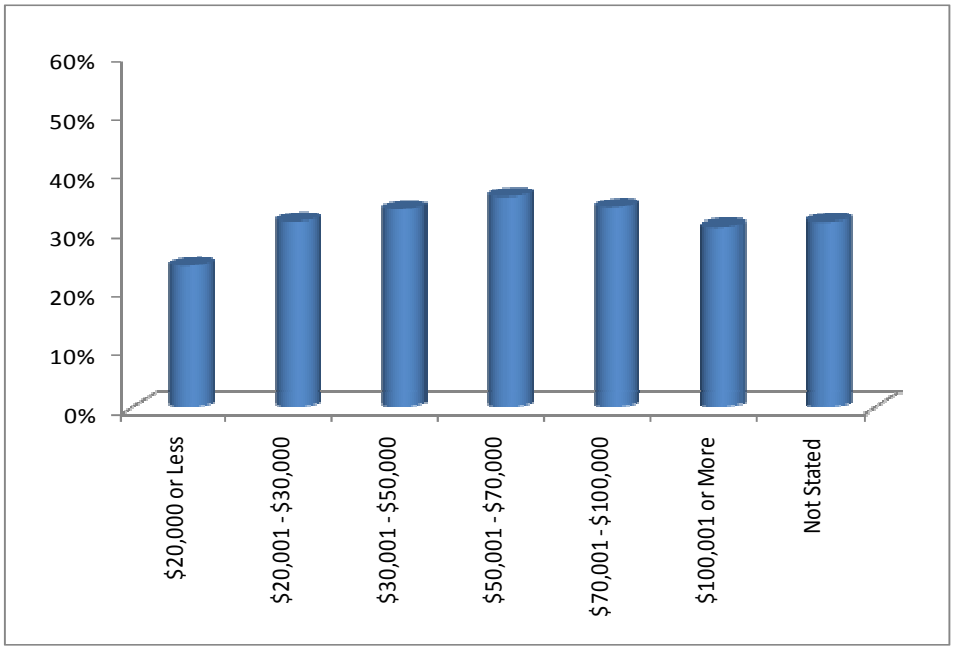


Figure 4.2: Proportion of rented households in each income bracket that used wood in 2006 in New Zealand.

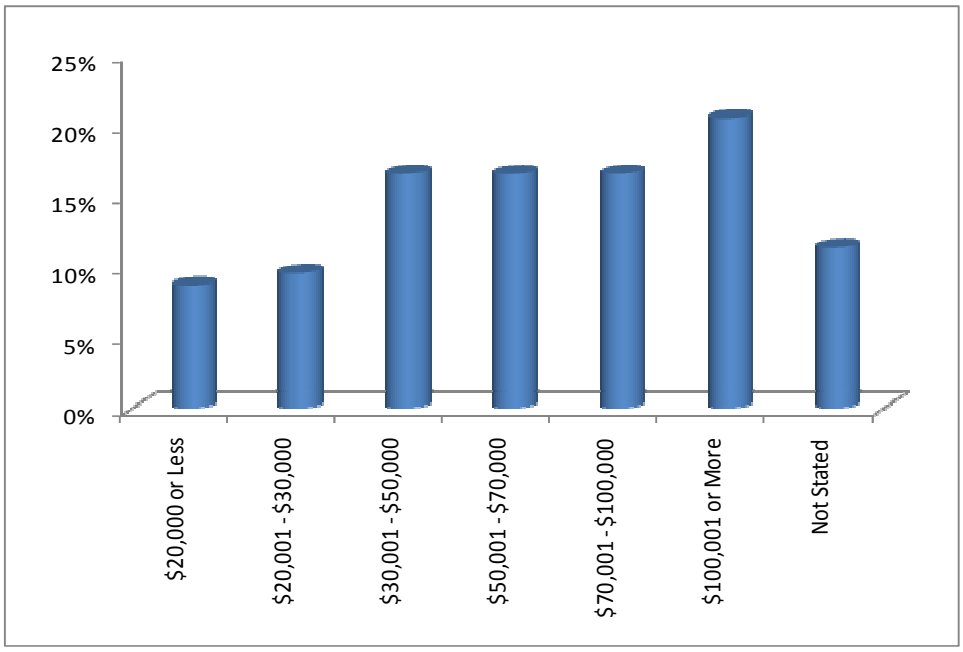


Figure 4.3: Distribution of wood use by income bracket for owner occupied houses in New Zealand.

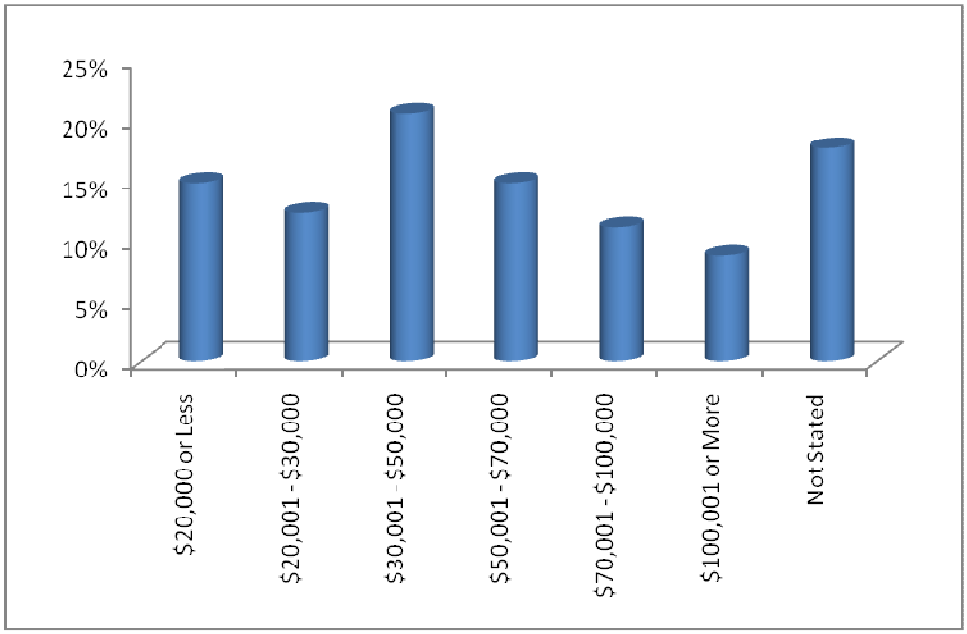


Figure 4.4: Distribution of wood use by income bracket for rental properties in New Zealand.

4.2.3 Coal

Coal use is significantly less than wood use with only seven percent of households that are owner occupied using this type of fuel to heat their homes in New Zealand. The analysis also indicates that seven percent of rented properties use coal for home heating purposes.

Figure 4.5 indicates that low income ($30,001 to $50,000) and middle income ($50,001 to $70,000) households have the highest proportion using coal for owner/occupied properties. A similar distribution is observed for rented properties with a slightly lower incomes using coal (Figure 4.6).

The distribution of coal use by income category for owner occupied houses in New Zealand is shown in Figure 4.7. The greatest number of households using coal are in the low income ($30,001 to $50,000) and high income ($100,001 or higher) categories for owner/occupier properties. For rental properties the greatest number of households that use coal are in the $30,001 to $50,000 income bracket (Figure 4.8).

Table G.2 in Appendix G shows the number of households that use coal to heat their homes by Territorial Local Authority by income range for owner occupied and rented properties. This is of value when designing an incentives programme because it provides an indication of the target group for clean heat conversions. Coal use is higher in the South Island than in the North Island. For owner occupied households, Grey District has the highest rate of coal use, with 71% using coal to heat their homes. This is followed by Buller District with 68% of households in owner occupier category using coal. Other Territorial Local Authorities that have more than 50% of owner occupied households using coal include: Gore District (60%), Westland District (54%), Clutha District (54%) and Southland District (53%). The Territorial Local Authority that has the greatest coal use for owner occupied households in the North Island is the Waikato District, with 16% coal use. Ruapehu District has the second highest rate of coal use for owner occupied houses in the North Island with 11% coal use. All other Territorial Local Authorities in the North Island have less than nine percent coal use for owner occupied households.

For rental properties the same territorial local authorities have the highest rates of coal use. Of those local authorities, in the South Island, most districts have a lower rate of coal use than for owner occupied households (Buller 63%, Grey 61%, Gore 58%, Clutha 50%, Westland 45%). In the North Island, coal use is higher in rental properties than in owner occupied houses in Waikato District (19%) and the Ruapehu District (18%). All other territorial local authorities in the North Island have less than 10% coal use for rented households.

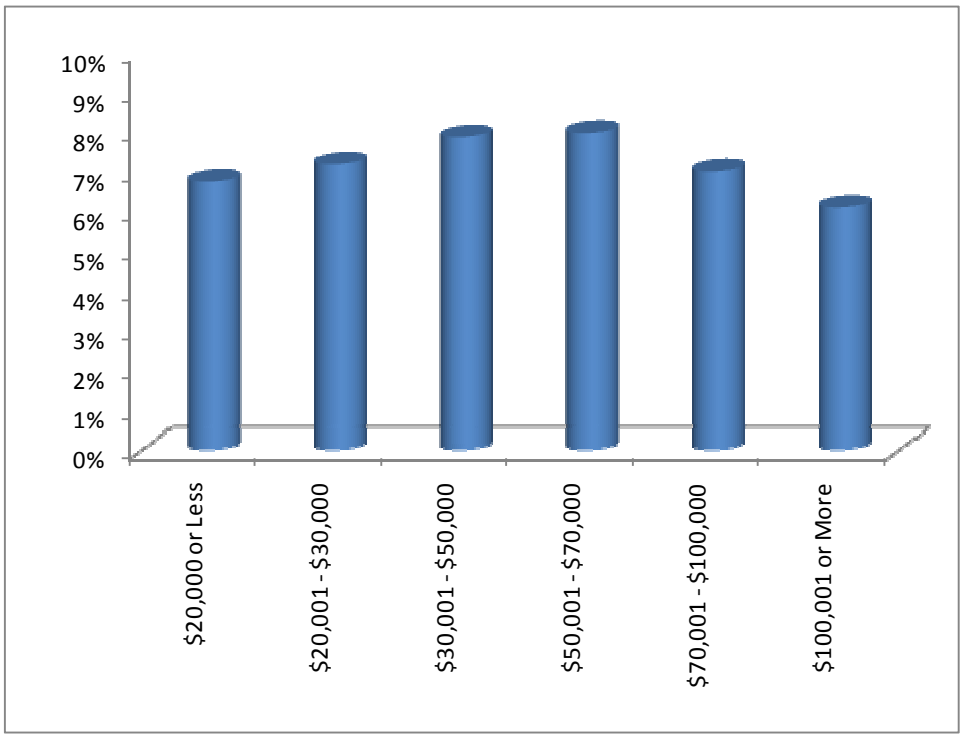


Figure 4.5: Proportion of owner occupied households in each income bracket that used coal in 2006 in New Zealand.

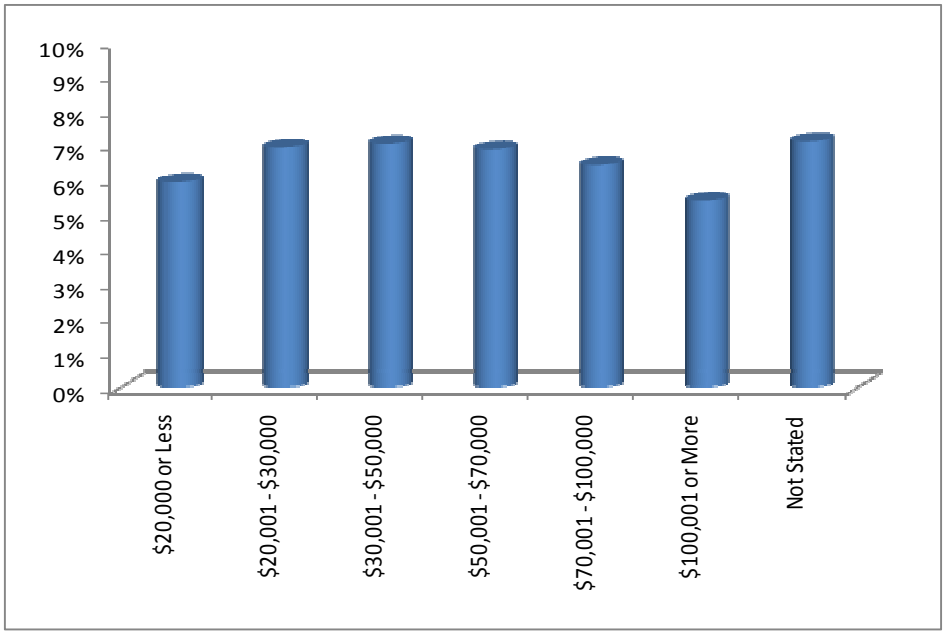


Figure 4.6: Proportion of rented houses in each income bracket that used coal in 2006 in New Zealand.

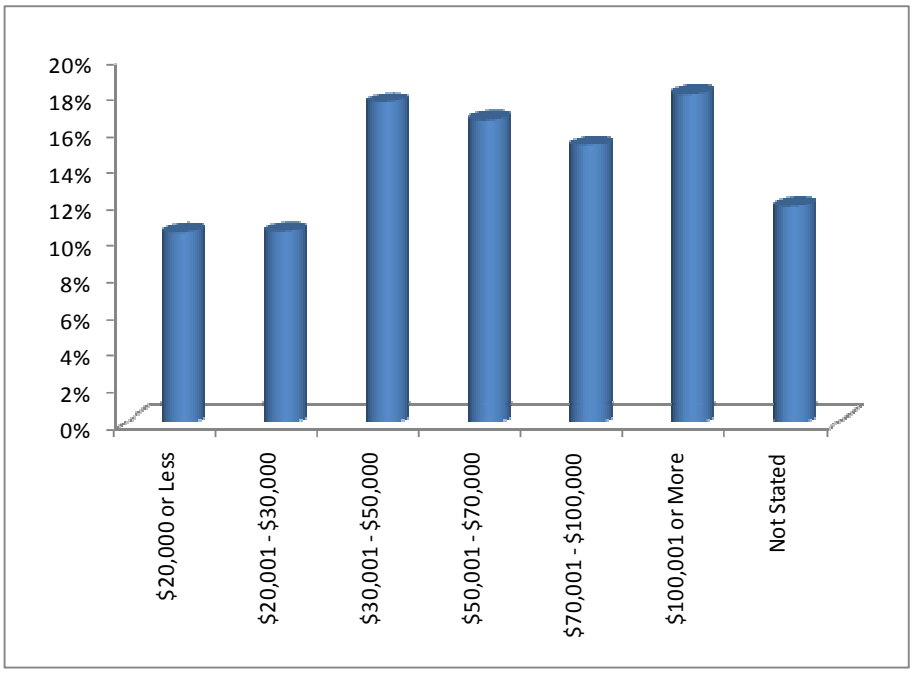


Figure 4.7: Distribution of coal use by income bracket for owner occupied houses in New Zealand.

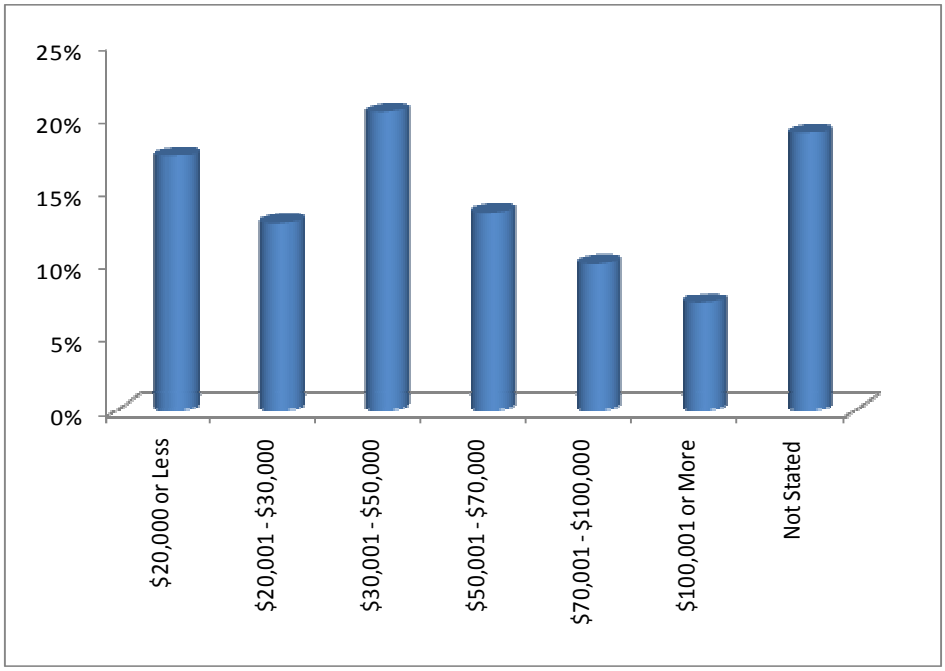


Figure 4.8: Distribution of coal use by income bracket for rentals properties in New Zealand.

4.2.4 Summary

The analysis of 2006 census data on home heating using wood and coal shows that:

- In New Zealand 46% of owner occupied houses use wood, and 31% of rental properties use wood.
- In New Zealand seven percent of owner occupied houses use coal, and seven percent of rental properties use coal.
- Of those households that use wood, 75% are owner occupied and 25% are rental properties.
- Of those households that use coal, 69% are owner occupied and 31% of are rental properties.
- The highest rate of coal use is in the West Coast and the southern part of the South Island.

The information in this section, and the tables in Appendix G that provide home heating information at Territorial Local Authority level will provide assistance to Councils developing an incentives programme by:

- Providing a profile of wood and coal use for owner occupied and rental properties by income category for New Zealand and by Territorial Local Authority.
- Providing information that can be used for initial screening in the development of an incentives programme by determining the number of households that use wood or coal by income type. For example, if the required reductions in wood burners are similar to the number of households that have an income of more than $100,001 then it may be possible to design an incentives programme that targets this group through a partial subsidy. However, further analysis through the spatial model (Section 5) and the decision trees (Section 7) would be required to complete the design of an incentives programme.
- Assisting with consideration of any social and economic impacts that may arise from the development of an incentives programme, for example identification of low income category households that use wood or coal.

4.3 Factors influencing heating choices

A number of studies have been undertaken regarding the choices people make for home heating as well as research to determine the factors likely to increase the likelihood of changes in home heating methods. The findings of these studies are summarised in the following sections.

4.3.1 Ministry for the Environment

The Ministry for the Environment has completed research on the social drivers for the uptake of energy efficiency and home heating improvements in New Zealand. Social drivers are 'the mix of influences and factors that result in people behaving the way they do (Taylor Baines and Associates et al, 2005(a)). The research was completed for the Warm Homes programme that investigated how New Zealanders could reduce the effect of pollution from home heating while ensuring they had warm homes.

Two reports were prepared in 2005. The phase one report focused on developing a framework for an incentives programme to make homes warmer and healthier, undertaking a literature review, and reporting on social drivers in New Zealand (Taylor Baines and Associates et al, 2005(a)). The phase two report involved analysing issues regarding the design of a national programme for improving energy efficiency and clean heating (Taylor Baines and Associates et al, 2005(b)).

The five social drivers that Taylor Baines and Associates found to influence the way people heat their homes identified in the phase one report include:

- The individual's immediate day-to-day circumstances.
- The individual's capabilities, knowledge, understanding and skills.
- Home heating and related commercial services.
- The public policy environment.
- The community and the immediate social environment (Taylor Baines and Associates et al, 2005(a)).

Table 4.3 identifies social drivers that would encourage or inhibit change to clean heating. Table 4.4 identifies social drivers that would encourage or inhibit improvements in energy efficiency in homes.

Table 4.3: Social drivers that encourage or inhibit change to clean heating (from Taylor Baines and Associates (et al) 2005(a)).

Encourage change to clean heating	**Inhibit change to clean heating**
Relatively low residential electricity tariffs.	The severity of local winter conditions.
The desire for 'concrete' results[1].	Household tenure – rental accommodation.
Increase in the number of two income households.	Recent increases in residential tariffs for electricity.
Demographic transition[2].	Residential electricity tariff structures.
Fashions in housing and home heating.	Reliability issues for electricity supply.
Publicity around health and housing.	Entrenched attitudes[3].
Publicly funded programmes stimulating the general market for energy efficiency and clean heat options.	Rising house prices.
Central government intervention to cap electricity prices and ensure reliable supply.	Cost and affordability of change.
Policy to encourage more women into paid employment.	A lack of information and 'understanding'.
Public lobbying by social agencies on the links between health morbidity and warm homes.	The absence of a practical, assessable minimum standard for warm homes that is easily understood.
Improved range of technology options available.	Gas industry restructuring and the ability of gas suppliers to offer financial incentives.
Capability of firms providing commercial services.	Lack of protection for tenants with regard to the condition of some rented properties.
Geographic coverage of firms providing commercial services.	The absence of any general tax incentives related to home heating.
Solid Energy's decision to stop coal sales to the domestic sector.	Firms touting particular products.
	'Cowboy' operators'[4].
	Lack of reliable 'real life' standards for clean heating/efficient appliances.
	The lack of financial products designed to facilitate the market for clean heating options.

1. The satisfaction that people get from upgrading the way they heat their home, e.g., from open fire to wood burner.

2. As the demographic of New Zealand culture changes there will be less elderly people with entrenched attitudes towards frugality. As time goes on elderly people are likely to prefer a higher level of home comfort.

3. There is a deeply entrenched attitude in New Zealand that it is alright to live in cold homes.

4. Operators that use cheap imported brands/models or insulation materials, cut corners in installation and lack technical knowledge on the products.

Table 4.4: Social drivers that encourage or inhibit change to improved energy efficiency and warmer homes (from Taylor Baines and Associates (et al) 2005(a))

Encourage improved energy efficiency and warmer homes	**Inhibit improved energy efficiency and warmer homes**
The severity of local winter conditions.	Household tenure – rental accommodation.
Increases in residential electricity tariffs.	Relatively low residential electricity tariffs.
Demographic transition[1].	Residential electricity tariff structures.
The increasing range of information sources available on energy efficiency.	Entrenched attitudes[2]
Increasing exposure of New Zealanders to international experience of well-heated homes.	Change is invisible.
Publicity around health and housing.	Rising house prices.
Publicly funded programmes stimulating the general market for energy efficiency and clean heat options.	Cost and affordability of change.
Social agencies and NGOs putting pressure on government to address the energy poverty gap.	A lack of information and 'understanding'.
Improved range of technology options available.	The absence of a practical, assessable minimum standard for warm homes that is easily understood.
Capability of firms providing commercial services.	No independent, credible and widely available information resources.
Innovative practices to develop the market.	No public/private sector strategic partnership to transform the market.
Leadership in social responsibility.	Government focus restricted to low-income households.
	Insecure funding regime for many NGOs.
	Firms touting particular products.
	'Cowboy' operators'.
	The lack of financial products designed to facilitate the market for clean heating options.
	No provider of residential energy services providing the 'complete package'.

1. As the demographic of New Zealand culture changes there will be less elderly people with entrenched attitudes towards frugality. As time goes on elderly people are likely to prefer a higher level of home comfort.
2. There is a deeply entrenched attitude in New Zealand that it is alright to live in cold homes.
3. Operators that use cheap imported brands/models or insulation materials, cut corners in installation and lack technical knowledge on the products.

4.3.2 Environment Canterbury

A number of public surveys have been completed by Environment Canterbury to gauge community views about home heating. In 2002 a survey of Christchurch residents' opinions of proposed air pollution control methods and clean air incentives and assistance was undertaken (Lamb, 2002). The survey size was 1484 households with a margin of error of ±2.5 percent at the 95 percent level of confidence.

In part, the survey focused on predicting likely behaviours for householders using solid fuel as the main form of heating. In particular the survey focused on:

- The intention to change the main home heating method.
- When any likely change was going to take place.
- If changing, the type of home heating appliance that was likely to be installed.
- The likely uptake of proposed incentives and assistance funding (including identifying which incentive stream they would fit into).

The survey found that around 42% of the households interviewed used solid fuel (enclosed wood burners and open fires) for home heating. Of those using solid fuel to heat their homes, 74% of respondents were not considering changing to cleaner forms of heating. The main barriers to change were identified as; cost efficiency and security of supply. The respondents considering change were more likely to choose gas (47%) or electricity (36%) (Lamb, 2002).

Several variables were identified that matched various behaviours regarding changing from solid fuel. These are outlined in Table 4.5.

Table 4.5: Variables that were more likely or less likely to result in changes from solid fuel heating (from Lamb 2002).

Variable	More likely to change from solid fuel	Less likely to change from solid fuel
Age	Respondents aged in their 30's and 40's, or would not disclose their age	Respondents in their 20's and 50 to 69. Those who were more uncertain were aged in their 20's, 50's and 70+.
Occupation	Respondents where the main income earner worked in trades or labourer, professional managerial, and sales vocations, or would not indicate their occupation.	Respondents where the main income earner were service workers, self-employed, technical or administration workers or those working in agricultural and farming vocations or those who were retired, super annuitants, unemployed or beneficiaries.
Number of income earners	Households with one income earner.	Households with multiple income earners.
Number of people in households	Households that would not disclose the number of occupants, and households with 3, 4 and 7 occupants.	Households with 2 and 6 occupants. Single occupant households tended to be more undecided.
Homeownership status	Homeowners	Renting
Gender	Female respondents	Male respondents
Community Services Card		Those holding a Community Services Card are less likely to change to an alternative, cleaner form of heating.

In 2006, Environment Canterbury undertook a public survey of homes in Timaru, Ashburton, Geraldine, Rangiora and Kaiapoi on home heating methods and pollution (Lamb, 2006). The survey involved determining the change in heating over the past 10 years and found that Kaiapoi had the highest change with 32% of households changing their heating methods in the last 10 years, other towns varied from 26% to 29%. The most common change was from log burners to electricity. The survey found that a large percentage of households in all towns did not want to change from their current form of heating. Households that were prepared to change stated that they would want subsides to do so. Of those who had changed, the main changes had been a move from log burners to electricity (Lamb, 2006).

In addition the survey found that 75% of households in Ashburton and 80% of households in Timaru and Kaiapoi were opposed to increasing rates to subsidise clean heating. Nonetheless the majority stated they would use subsidies for clean heating if they were available. These households assumed that someone else would pay for the subsidy (Lamb, 2006).

Since 2006, there have been a number of changes that may affect the opinions that people have about home heating choices. In particular the increased cost of living, including electricity supply, uncertainty in electricity supply as a result of low water levels in hydro lakes during winter 2008 and increased concerns about reducing individual green house gas emissions may mean that people now have differing views.

4.3.3 Nelson City Council

In 2009 Nelson City Council commissioned a telephone survey to determine the number of households that had changed to clean heat and ascertain how many people were considering using the Council incentive programme to change their home heating type. A total of 639 people in the three Nelson airsheds were surveyed and the error rate was ±3.9%.

The survey found that 40% of respondents used an enclosed burner as the main form of heating their living room during winter 2008. Heat pumps were the second most popular form of heating, with 32% of respondents using them (Versus Research Limited, 2009).

Of the 60% of respondent households that did not use an enclosed burner during winter 2008, 15% had changed from using an enclosed burner to a different form of heating in the last five years. Thirty eight percent of respondents who no longer had an enclosed burner said that the reason for changing heating type was ‘Council incentive’ (Versus Research Limited, 2009). Although not specifically mentioned in the report, it is likely that the other 62% no longer use solid fuel heating for other reasons such as lifestyle factors.

The survey found that there was a high level of knowledge about the council incentive programme. Around three quarters of the respondents that were eligible for assistance to replace their old enclosed burners were aware of the Council incentives programme, but had not yet accessed it. Eleven percent of respondents had already used the Council incentives programme, whereas 15% had not heard about it (Versus Research Limited, 2009).

The results from the survey show that 55% of respondents who were aware of the Council incentive programme intended to use it, 25% didn’t know if they would use it and

20% had no intention of participating in the programme. The reasons for choosing not to participate in the incentive programme included:

- Lack of choice for Council replacement heating options.
- In the process of selling the property.
- The administration requirements of the incentives programme were too difficult to comply with.
- Did not want Council assistance as they could afford to change their heating type themselves.
- Did not want to pay the Council loan back overtime, and would prefer to make a one off payment (Versus Research Limited, 2009).

4.3.4 Otago Regional Council

In 2006, Otago Regional Council commissioned a survey on home heating and air pollution in the Central Otago towns of Alexandra, Arrowtown, Clyde, Ranfurly and Cromwell (Advanced Business Research Limited, 2006). Two thousand surveys were sent to residents in these areas and the Council received 836 completed surveys. The survey took place after a very cold period during June 2006.

The most common form of home heating within the respondents was enclosed wood burners (39%), followed by electrical heaters (36%) and heat pumps (32%). Around four percent of respondents used open fires. Most households used more than one form of heating (Advanced Business Research Limited, 2006).

Respondents were asked what type of home heating they would change to if they were going to change their heating type. Around 29% of respondents said that they would prefer not to change their heating type. About 43% of those respondents who were willing to change the way they heat their home indicated that a change to heat pumps was their preferred choice. Around 15% of respondents indicated that they would choose flued gas (Advanced Business Research Limited, 2006).

The main reasons for changing the way respondents heat their homes included:

- Heating efficiency.
- Easy to operate.
- Cost efficiency.
- Availability of fuel or power.

The main reasons that would prevent respondents from switching to electrical heating were identified as:

- Price (including the capital cost of new appliances).
- Reliability (including the possibilities for power outages).
- Enjoy having a fire.

Depending on the location, between around eight percent (Ranfurly) and 33% (Alexanda) of respondents expressed interest in being contacted by the Otago Regional Council to assist with planning their heating options (Advanced Business Research Limited, 2006).

4.3.5 Tasman District Council

A market research report on 'Air Quality in Richmond' was prepared for Tasman District Council in 2005 (Opinions Market Research Limited, 2005). Three hundred residents were surveyed, with a margin of error ± 5.6 percent.

Table 4.6 shows the types of heating that were mainly used in their homes. Table 4.7 shows the use of insulation in Richmond. Around a quarter of respondents were renting or already had fully insulated homes. Just over half of the respondents stated that they would not insulate their homes more, however around 20% said that they would insulate their homes more. The main reasons why some homeowners did not have insulation were that homeowners thought that it was not necessary, would not make a difference or was too expensive (Opinions Market Research Limited, 2005).

Table 4.6: Main type of heating in Richmond (from Opinions Market Research Limited, 2005).

Main type of heating	Percent
Wood	45%
Electricity	40%
Gas	14%

Table 4.7: Types of insulation in Richmond homes (from Opinions Market Research Limited, 2005).

Insulation	Percent
Ceiling or roof	92%
Wall	72%
Underfloor	55%
Double glazing	10%

Respondents that had wood burners were asked about their attitudes toward changing to cleaner forms of heating including electricity and flued gas. Most respondents had negative options towards changing to electricity and gas. The main reasons for respondents not being willing to change from wood to electricity or gas was that wood was considered cheaper than other forms of heating and that they liked wood. Other issues included not being dependent on one form of heating and the perception that electricity and gas were not as efficient as wood. Almost one fifth (17%) of respondents indicated a willingness to change to electricity or gas (Opinions Market Research Limited, 2005).

Twenty seven percent of respondents that used wood for home heating stated that they would definitely not change to an alternative form of heating. Seven percent said they would change to alternative forms of heating. The rest of the respondents said they would change, subject to certain conditions including:

- Other forms of heating being cheaper than using wood.
- If financial help (including incentives and subsidies) were offered to them.
- If they could no longer access free or cheap firewood.
- If it was the law (Opinions Market Research Limited, 2005).

4.4 Factors influencing incentives uptake

4.4.1 Low income households

Environment Canterbury has found that uptake of incentives is highest in low income households, largely because these households are fully funded under the 'Clean Heat' project (pers. comm. Mike Gaudin, Environment Canterbury, 2009). Environment Canterbury targets low income home owners to improve their participation in the incentives programmes in Christchurch. The full subsidy programme has not been

extended to other locations in Canterbury where the 'Clean Heat' programme is running. Only the interest free loan option is available in these locations. The most cost effective approach to identifying low income households that been identified by Environment Canterbury is door knocking in areas that have a high number of burners (pers. comm., Mike Gaudin, Environment Canterbury, 2009).

In Nelson, anecdotal evidence suggests that it took longer to reach some low income households than others, however uptake increased as householders became more familiar with the full assistance programme, primarily through word of mouth (pers. comm., David Jackson, Nelson City Council, 2009).

The introduction of full subsidy for householders entitled to rates rebates has had a slow uptake (pers. comm., David Jackson, Nelson City Council, 2009).

4.4.2 Middle income households

Environment Canterbury targets middle income households through the interest free loan and subsidy options as part of the 'Clean Heat' project. The interest free loan option was introduced in 2007 and has been a popular choice (pers. comm., Mike Gaudin, Environment Canterbury, 2009). In Nelson, anecdotal evidence suggests that middle income households were the first group to access the incentives programme (pers. comm., David Jackson, Nelson City Council, 2009).

4.4.3 High income households

In general, incentives programmes in New Zealand have not targeted high income households. Encouraging high income households to change to clean heating options can be difficult, as this sector can more readily afford to pay for their heating costs so information regarding how to reduce energy costs through insulation and efficient appliances may not be as effective (pers. comm., Mike Gaudin, Environment Canterbury, 2009). Of those households with high incomes that are prepared to change to clean heat, the reasons for making changes included energy efficiency and warm home considerations, more than air quality issues (pers. comm., Mike Gaudin, Environment Canterbury, 2009). Research in Nelson has identified that some householders were not interested in participating in an incentives programme as they had the financial capacity to change to clean heat without assistance (Versus Research Limited, 2009).

Anecdotal evidence suggests there has been a low uptake for the interest free loan option from high income households. Possible reasons for this include limited choice of heating methods and the waiting period for clean heat appliances to be installed under

Council incentives programme (pers. comm., David Jackson, Nelson City Council, 2009).

4.4.4 Lifestyle issues

Lifestyle issues can also influence home heating choices. Heat pumps tend to heat rooms faster and require less human input than wood burners. Other lifestyle advantages include safety considerations – not having exposed flames, the opportunity of using the heat pump as an air conditioner, and the advantage of being able to pre programme heat pumps to turn on while householders are away. Consideration of lifestyle issues are also a factor that influence householders choosing wood burners. Access to cheap or free firewood, enjoyment of fires, and the desire to not be reliant on the electricity network are all considerations that will affect the choice that homeowners make when heating their homes.

In the Environment Canterbury incentives programme, heat pumps are the most popular home heating choice, with 60% of participating households choosing this form of home heating compared with 19% installing wood burners. In Nelson, low emission wood burners and heat pumps have had the highest uptake through the Clean Heat Warm Homes Project, with 46% and 47% of households choosing these heating types respectively. In Nelson, reasons for deciding to change to heat pumps from wood burners include convenience, for example not having to store, organise and cut wood, stoking fires, becoming older and less able to manage firewood, and wanting more space in their living rooms (Versus Research Limited, 2009).). However, as the scheme have progressed the Council is finding a high proportion of people opting for the low emission wood burner and the uptake of heat pumps falling. This is thought to because all the households participating in the scheme now have woodburners as their current heating method – the households with open fires having all been done by 2008. Houses with woodburners tend to be more open plan, heating larger areas, which residents may perceive as too hard or too costly to heat with a heat pump. Also, and again anecdotally, the householders who leave replacing their burners until the last allowable minute may be those most attached to them and likely to choose another burner as their replacement option (pers comm., David Jackson, Nelson City Council, 2010).

Research was undertaken by the authors to determine if the cost of firewood was a factor in explaining the higher uptake of wood burners in the Nelson and Christchurch incentives programme. The average wintertime price for three cubic metres of delivered blue gum in Christchurch was $279. The average wintertime price for a cord (3.6 cubic metres) of delivered blue gum in Nelson was $233. For pine, the average wintertime price for three cubic metres in Christchurch was $185 delivered, whereas a cord of delivered pine in Nelson was $162. Based on this evaluation it appears firewood in

Nelson is cheaper than in Christchurch and this may have some influence in determining household heating choices.

4.4.5 Uptake data from existing programmes

Data from the Nelson 'Clean Heat Warm Home' programme and the Environment Canterbury 'Clean Heat' project for Christchurch were evaluated to determine additional information on incentives uptake by household demographic.

Nelson Clean Heat Warm Homes programme

Additional analysis was undertaken on the rateable value of the dwellings taking up the 'Clean Heat Warm Home' incentives programme. Table 4.8 shows the distribution of dwellings within Nelson by rateable value and the distribution of rateable values within the uptake of incentives for households replacing open fires and replacing wood burners.

Results suggest uptake in a similar proportion for households replacing open fires, i.e., no bias in uptake by house value. However, households replacing wood burners are over represented in the lower house value categories (less than $300,000) and under represented for households with rateable values over $300,000 suggesting less enthusiasm for incentives by people in higher value properties. Households changing from open fires without using incentives are over represented by highest value properties but under represented by properties in the $300,000 to $400,000 category. Overall results suggest there may be a slightly lower uptake of incentives for higher value properties.

Table 4.8: Summary of incentives uptake data for Nelson by rateable value of the dwelling.

	Percent of households in each classification by rateable valuation (RV)			
Classification of households	**RV - Less than $200k**	**RV - $200k to $300k**	**RV - $300 k to $400k**	**RV - More than $400k**
Total houses in Nelson	16%	41%	22%	21%
Houses using incentives for open fires	16%	41%	20%	23%
Houses using incentives for older wood burners	19%	56%	16%	9%
Houses changing from open fire – no incentives	19%	42%	14%	26%
Houses changing from wood burner – no incentives	13%	42%	23%	22%

Christchurch 'Clean Heat' project

The Christchurch 'Clean Heat' project database was also analysed for demographic uptake of an incentives programme. The evaluation was based on 'area' because no demographic information was available within the programme. Areas of Christchurch with a greater predominance of high or low income home owners were identified using 2006 census data on household income.

High income areas were identified by the proportion of households earning more than $100,000 per year. A total of 29 census area unit (CAU) areas were identified as high income of which around 20850 households owned or partly owned the house. Lower income areas were similarly identified based on the proportion of households with a combined household income of less than $50,000. A total of 39 CAU areas were included in this group of which around 9,558 households owned or partly owned the house. High income and low income CAU areas were matched to the areas in the 'Clean Heat' database.

Uptake of the incentives programme within the 'high income' and 'low income' areas was obtained from the 'Clean Heat' database for each year from 2003 to 2009 for each programme type. The different programme types include partial subsidy, loan, full subsidy and rental properties.

A comparison of uptake of the partial subsidy and loans programmes was considered most relevant for evaluating demographic differences in incentives uptake and preferences. Comparison of the uptake of full subsidy programmes within the high and low income areas was not considered relevant because only low income households were eligible. Uptake of incentives within rental properties was also not considered useful because landlord demographics could not be inferred by the location of the rental property. Table 4.9 shows the uptake of different programmes by low income and high income households as a proportion of households in each area that own or part owns the dwelling[3].

Table 4.9:'Clean Heat' project - comparison of incentives uptake for high and low income areas

	High income areas	**Low income areas**
Number of households	20850	9558
Incentives uptake - Partial and Loan	804	1582
Percent – incentives uptake	4%	17%
Partial subsidy uptake - 2003-2009	2.6%	7.7%
Partial subsidy uptake - 2006-2009	1.8%	5.6%
Loan uptake – 2006 – 2009	1.2%	8.8%

The evaluation supports the conclusions of previous sections in that there is less uptake of incentives programmes by higher income households. However, marketing of the programme across the two groups differed, with less door knocking in higher income areas and this is likely to have impacted on programme uptake. There was a slight preference for the partial subsidy in higher income areas than for the loan. The opposite was observed in the lower income areas where the uptake of the loan was higher than for the partial subsidy.

[3] This includes dwellings held in a family trust by usual residents.

4.5 Application to designing an incentives programme

There are a number of environmental, lifestyle and economic considerations that influence home heating choices and a range of options should be provided to households within an incentives programme.

An incentives programme that targets low income households is likely to be high cost but the most effective in mitigating social and economic impacts and ensuring a high uptake rate. It is likely that high income households would require fewer incentives to change to clean heat, but research shows that the uptake rate for an incentives programme for high income home owners is likely to be low.

Consideration of the type of loan structure is also required, as there will be less cost to Council if a loan structure is established based on the targeted rate model developed by EECA in conjunction with participating regional councils (see Section 2.2), compared to an interest free loan where Council pays the interest costs.

Table 4.10 provides a summary of clean heat appliance suitability for reducing PM_{10} concentrations and the appropriateness for inclusion in an incentives programme and identification of first priority Target Group.

Table 4.11 provides an analysis of the cost effectiveness of reducing PM_{10} concentrations for different types of incentives programme by Target Group. Table 4.12 shows the cost effectiveness of mitigating social and economic impacts for different types of incentives programme by Target Group. Table 4.13 provides an estimate of the potential uptake rate for different types of incentives programmes based on data from existing programmes. In many cases no information was available and numbers are the authors' best guess. It is also noted that marketing will play a key role in programme uptake as could other location specific factors and therefore data based on existing data should also be treated as indicative only.

Table 4.10: Heating appliance suitability for reducing PM_{10} concentrations, appropriateness for inclusion in an incentives programme and identification of first priority Target Group.

Replacement heating appliance	**Effectiveness in reducing PM_{10} concentrations**	**Include in incentives programme?**	**Recommended Target Group as first priority**
Open fires	Not effective.	No	
NES Wood burners	Somewhat effective.	Yes*	Target Group: Low income households that collect fire wood.
Multi fuel burners	Not effective.	No	
Pellet burners	Somewhat effective.	Yes*	Target Group: High income households that are better able to absorb higher fuel costs.
Diesel burners	Somewhat effective.	Yes	Target Group: High income.
Flued gas burners	Very effective.	Yes	Target Group: High income households that are better able to absorb higher fuel costs.
Electric heaters	Very effective.	No**	
Heat pumps	Very effective.	Yes	All Target Groups.
Insulation	Effective if solid fuel is used and house uses less wood as a result.	Yes	All Target Groups.

* If the required PM_{10} reductions for an air shed allow for some solid fuel burning

**This method has low capital costs but high operation costs. This report recommends full subsidy for low income households for capital costs.

Table 4.11: Cost effectiveness of reducing PM_{10} concentrations for different types of incentives programme by Target Group.

		Programme Type			
Target group	**Rank[1]**	**Full Assistance**	**Partial subsidy**	**Loan**	**Interest free loan**
Low income home owners	4	Highest cost Highest uptake.	Medium cost Low uptake	Least cost, Low uptake	Medium cost low uptake.
Middle income home owners	2	Highest cost Highest uptake.	Low/ Medium cost Medium/Low uptake	Least cost, Low uptake	Medium cost Medium uptake.
High income home owners	1	Highest cost Highest uptake.	Low/ Medium cost Medium uptake	Least cost, Low uptake	Medium cost, Low/ medium uptake
Rental properties	3	Highest cost Highest uptake.	Low/ Medium cost uptake uncertain	Low cost, uptake uncertain	Medium cost uptake uncertain

[1] Rank identifies the most cost effective group to target with rank 1 being the most cost effective.

The shaded areas identify the most cost effective programme type for each Target group.

The cost model using default input parameters suggests a partial subsidy is more cost effective for Councils than an interest free loan for subsidies of around $1400.

Table 4.11 suggests the most effective option to reduce PM_{10} concentrations taking into account both cost and probable uptake is:

- Middle income target group: Interest free loan
- High income target group: Partial subsidies
- Rental properties – Partial subsidies, or interest free loan.

The selection of interest free loan over partial subsidy for middle income households is based on the assumption that the former is much more appealing to this Target Group and will therefore result in greater uptake. This is largely based on qualitative data including information from existing programme providers. The cost model suggests the partial subsidy is more cost effective up to subsidies of around $1400 for default input variables. If only a small number of middle income households were to be targeted it is probable that the partial subsidy would be the most effective option.

Note that the least cost option is the loan which has potential for being cost neutral through the voluntary targeted rate model. This is not included in the above summary because no information is available on the likely uptake and it is probable that the uptake rate will be lower than for other programme types. Notwithstanding this it could be the most cost effective option in scenarios where the numbers requiring conversion are very low.

Table 4.12: Cost effectiveness of mitigating social and economic impacts for different types of incentives programme by Target Group.

		Programme Type			
Target group	**Rank[1]**	**Full Assistance**	**Partial subsidy**	**Loan**	**Interest free loan**
Low income home owners	1	High cost. Mitigates most impacts	Minimal effectiveness due to low uptake	Minimal effectiveness due to low uptake	Minimal effectiveness due to low uptake
Middle income home owners	3	High cost. Mitigates most impacts	Low/ medium cost Medium/Low uptake	Least cost, Low uptake	Medium cost Medium uptake.
High income home owners	4	No mitigation required	No mitigation required	No mitigation required	No mitigation required
Rental properties	2	High cost. Mitigates most impacts	Low/ medium cost Uptake uncertain	Least cost, Uptake uncertain	Medium cost Uptake uncertain

[1] Rank identifies the most cost effective group to target with rank 1 being the most cost effective.
The shaded areas identify the most cost effective programme type for each Target group.

Table 4.12 also identifies that the most cost effective option to mitigate social and economic impacts is:

- Low income home owners target group: Full subsidy utilising EECA incentives with additional funding provided by Councils or third party funders.
- Rental properties – Utilising EECA incentives or third party funders (with additional funding where tenants are low income).

- Middle income target group: Utilising EECA incentives with consideration given to including interest free loans. Councils would have to provide the additional funding for interest free loans.

Table 4.13: Indicative uptake rates for incentives programmes by Target Group

	Programme Type			
Target group	**Full Assistance**	**Partial subsidy**	**Loan**	**Interest free loan**
Low income home owners	No information Probably <80%[1]	No information <1%[2]	No information <1%[2]	No information <2%[2]
Middle income home owners	No information Possibly 70%-90%	10-30%[3]	No information 1-10%	10-40%[3]
High income home owners	N/A	4-10%[4]	No information 1-5%	4-8%[4]
Rental properties	No information Possibly 70%-100%	No information Possibly 10-30%	No information Possibly 5-10%	No information Possibly 10-30%

1. Achievement of >80% uptake could be challenging because of difficulties accessing eligible households and because some low income households may be put off by administration and contractual requirements.
2. Low uptake likely because of additional capital or payback required.
3. Estimates based on 17% uptake of programme within low income areas of Christchurch and a slight preference for the interest free loan.
4. Estimates based on 4% uptake of programme within high income areas of Christchurch and a slight preference for partial subsidies.

5 Emissions and Socio-Economic Spatial Model (ESESM)

5.1 Introduction

An Emissions and Socio-Economic Spatial Model (ESESM) has been developed on a Geographic Information System (GIS) platform. The model presents the spatial distribution of PM_{10} emissions from domestic solid fuel heating on census area unit (CAU) and mesh block scales. The model contains emission information specific for every CAU in New Zealand and can be used to analyse emissions from all 42 gazetted airsheds.

ESESM enables the easy identification of areas that have relatively high PM_{10} emissions from home heating sources. The model defines the number of houses (private and rental) burning wood or coal within any particular CAU. The model also provides social and economic indicators of the households contained within each CAU.

ESESM is an integral part of the Good Practice Guide's toolkit for designing and implementing an incentives programme. This section provides an overview of the model's structure and function. Details are provided on the sources, scale and type of both input and output data.

5.2 Objectives of ESESM

The model has been designed to assist Regional Council staff to maximise the benefit of funding allocated to financial incentives programmes by achieving the greatest possible reduction in PM_{10} emissions for each dollar that is spent on incentives. The outputs from ESESM will support the process for determining the most effective incentives programme for achieving PM_{10} reductions from home heating over a range of emission management scenarios and spatial scales. It is also anticipated that ESESM will reduce costs and resources required for the development of s32[4] documents that are required to support the implementation of an incentives programme.

Specific outputs from ESESM include:

- Defining domestic PM_{10} emission rates at a relatively fine spatial resolution (CAU and mesh block level).
- Specifying the relative contribution of wood and coal to total emissions of $PM_{10.}$
- Defining the number of private and rental properties.
- Profiling the total income of households burning solid fuels.
- Profiling the number of beneficiaries and rates rebate recipients burning solid fuels.
- Identifying the social deprivation index of each CAU.

[4] Section 32 of the Resource Management Act requires Councils to undertake a comprehensive consideration of costs, benefits and alternatives during the development of policies and regulations.

ESESM is a tool that can be used to:

- Identify areas of relatively high (and low) domestic PM_{10} emissions
- Estimate the number of 'low income' or benefit dependant households that use solid fuel heating within a defined spatial area.
- Define the probable extent (city-wide or CAU-specific) of financial incentives required to change heating methods and hence reduce PM_{10} emissions.

ESESM resides on a NIWA server that is accessible via the internet at http://wrenz.niwa.co.nz/webmodel/emissions. It is designed to be user-friendly and it is built upon the commonly-used Google Maps functionality. As a spin off output, it is anticipated that this model will highlight the potential benefits for presenting other air quality data and analyses in a geo-spatial framework.

5.3 Overview of ESESM

ESESM is essentially a web based interface that displays data in a geo-spatial framework and that facilitates queries to a database that contains nation wide information on emissions from domestic use of solid fuel heaters and on social and economic indicators. Figure 5.1 shows a schematic diagram of the structure and functionality of ESESM.

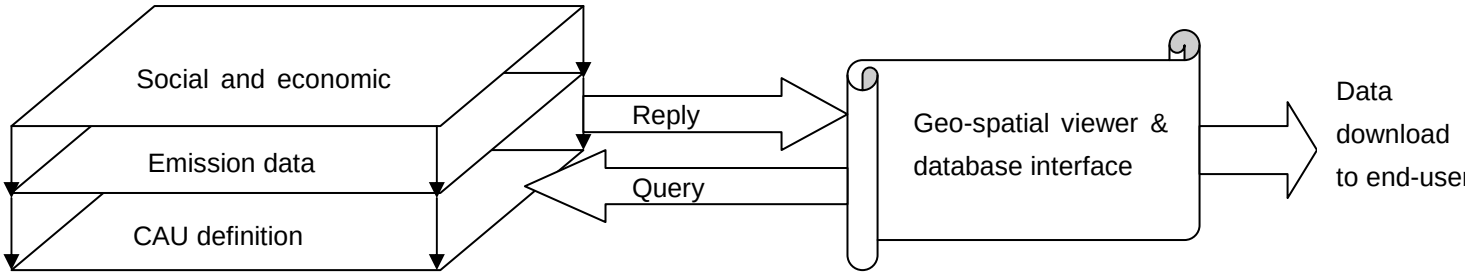


Figure 5.1: Schematic diagram of the structure and functionality of ESESM

5.4 Sources, Scale and Type of Input Data

5.4.1 Sources of Data

Every five years Statistics New Zealand (SNZ) makes an official count of the population and dwellings in New Zealand. SNZ conducted the 2006 Census of Population and Dwellings on 7 March 2006. A full description of SNZ's 2006 census can be found at http://www.stats.govt.nz/Census/2006CensusHomePage.aspx. All the baseline data contained in ESESM's databases are taken from or based on the information collected in the 2006 census.

5.4.2 Spatial Scale of Data

The data output by ESESM is provided at one of two spatial scales know as mesh block and census area units.

Mesh blocks are a small geographic units used in New Zealand for defining the extent of specific land areas. In urban areas, mesh blocks are roughly the size of several street blocks. SNZ estimates of the number of people and dwellings in each mesh block throughout New Zealand on census night. Mesh blocks are the smallest geographic units used by SNZ. There are 39,300 mesh blocks (boundaries at 30 June 2006) with an average population of 110 people.

Census Area Units (CAUs) are aggregations of mesh blocks, with a maximum population of approximately 5,000. In urban areas CAUs are roughly the size of suburbs. 1,927 area units (boundaries at 30 June 2006) cover New Zealand. The median size of area units is 2,000 people, and three quarters of area units have a population between 100 and 4,000.

5.4.3 Number and Ownership of Houses

ESESM uses the 2006 census data to report the total number of houses within each census area unit that burn wood or coal as their principal source of heating. ESESM breaks down the total number of houses burning wood and coal into owner/occupier or rental properties.

5.4.4 PM_{10} Emissions from Domestic Solid Fuel Heaters

The PM_{10} emission estimates used in ESESM are based on household census data for 2006 for heating methods used in a dwelling and the application of emission factors and fuel use factors to these data. The heating method options for this question include: electricity, mains gas, bottled gas, wood, coal, solar heating, no fuels and other fuels. Households are required to indicate home heating methods within the dwelling. In many cases more than one heating method is used. ESESM estimates the emissions from houses that use wood or coal burners as their principal form of heating.

The fuel use factor is the average amount of wood or coal used per household per night and is required to estimate the amount of PM_{10} emitted when combined with a PM_{10} emission rate expressed as grams of particulate per kilogram of fuel burnt. The amount of fuel used by households using wood or coal on open fires, wood burners or multi fuel burners has been evaluated using two techniques:

1. Home heating survey data of household estimates of the number of logs used per day from a 2005 survey of 31 urban areas of New Zealand and applying an average log weight to average estimated daily wood consumption (Wilton, 2005).
2. Measurements of the weight of wood loaded onto burners during a ‘real life’ emission testing programme conducted in 2007 including 92 days of wood burning across 18 households in Nelson, Rotorua and Taumaranui (Wilton, et. al., 2009).

The average kilograms of wood used per day based on the 31 study areas survey in 2005 is 19 kilograms and is based on an average log weight of 1.6 kilograms. This compares with 21 kilograms per day actual measured wood weight from the real life emission testing programme in 2007. The default fuel factors setting for the spatial model is 20 kilograms, which is the average of the two above studies.

For coal use the fuel factor was based on the home heating survey of 31 urban areas of New Zealand. The average coal use per household per day from this study was 16 kilograms.

Emission factors refer to the amount (in grams) of particulate (PM_{10}) produced through the burning of one kilogram of fuel and are expressed as g/kg. Table 5.1 shows emission factors for domestic solid fuel burners based largely on testing of appliances in New Zealand (Wilton, 2007, Smith et. al., 2008). Specific appliance information is not available for the spatial model, as statistics data is limited to the presence of fuel types only (in this case wood and coal). Consequently the derivation of an emission factor relies on weighting of the emission rates from Table 5.1 based on the proportion of different appliances used nationally. The method used to do this for the spatial model was the national survey results from Wilton (2005). However, Table 5.1 shows the wood burner category is further differentiated in terms of the age of the appliances, with older appliances showing higher particulate emissions. The age distribution used for wood burners was 31% pre 1994, 54% 1995-2004 and 15% post 2005. This was based on age distributions from emission inventories conducted during 2007 and 2008 (Wilton & Baynes, 2007, Wilton & Baynes, 2008) adjusted for the above year categories.

Table 5.1: Average PM_{10} emission factors for solid fuel burning (from Wilton & Baynes, 2008).

Appliance type	Emission factor - g/kg
Open fire - wood	10
Open fire - coal	21
Wood burner -pre 1994	11
Wood burner - 1994-1999	7
Wood burner - post 1999	5
Wood burner 1.5 g/kg	3
Multi fuel – wood	13
Multi fuel – coal	28

The average emission factor used for wood burning households for the spatial model was 8 g/kg. For coal the average (default) emission factor for the spatial model was 25 g/kg.

Within ESESM the emissions of PM_{10} are calculated using the following equations:

- **PM_{10} from burning wood (kg/day)** = number of wood burning houses x ((Emission factor (8 g/kg) x weight of fuel burned per day (20 kg/day)).
- **PM_{10} from burning coal (kg/day**) = number of coal burning houses x ((Emission factor (25 g/kg) x weight of fuel burned per day (16 kg/day)).
- **Total PM_{10} emissions (kg/day**) = PM_{10} from burning wood + PM_{10} from burning coal.

The PM_{10} emission data output from ESESM is mapped at both mesh block and census area unit levels. However, ESESM is limited (at this stage) to reporting emission data at census area unit. To make it possible to compare emissions between census area units, the total emissions are divided by the area of the CAU. This approach gives the estimate of emissions of PM_{10} from each CAU as kg/hectare/day and facilitates the comparison of PM_{10} emission densities between CAUs.

5.4.5 Social and Economic Indicators

Four indicators are used to assess the social and economic status of the people living within each CAU; income, rates rebate, benefits and social deprivation index. Each of these indicators is detailed below.

Table 5.2 shows the income classification system used in ESESM.

Table 5.2: Income classification used in ESESM.

Income classification	Income range (per annum)
Low	Less than $50 000
Middle_A	$50 000-$70 000
Middle_B	$70 000-$100 000
High	Greater than $100 000

Houses eligible for a rates rebate were defined as those houses which were owner/occupier and had an annual income of less than $20,000. As far as practical, these are consistent with the criteria used to identify Target Groups as detailed in Section 1.4. There is a small difference in income level ($20,000 versus $21,180) as the census data available did not allow the differentiation of incomes to that level of resolution.

Four different benefit types were selected as indicators of the number of households reliant on benefits. The benefits used in ESESM are; unemployment, sickness, domestic purposes and invalid benefits.

The Social Deprivation Index (SDI) is a measure of social and economic status calculated for CAUs. The SDI was developed by the Department of Health at the Wellington School of Medicine and Health Sciences (Ministry of Health, 2001). The SDI uses a range of variables from the 2006 Census of Population and Dwellings that represent nine dimensions of social deprivation. The nine variables in used to calculate the index for an area are displayed in Table 5.3. The SDI is provided as an ordinal scale[5] that ranges from one to ten, where one represents the areas with the least deprived scores and ten the areas with the most deprived scores. It is important to note that the SDI applies to areas rather than to individuals who live in those areas.

Table 5.3: Variables used to calculate the Social Deprivation Index.

Variable	Criteria
Income	People aged 18–59 receiving a means tests benefit
Employment	People aged 18–59 years who are unemployed
Income	People living in equivalised[6] households with income below an income threshold
Communication	People with no access to a telephone
Transport	People with no access to a car
Support	People aged less than 60 years living in a single parent family
Qualifications	People aged 18–59 years without any qualifications
Living Space	People living in equivalised households below a bedroom occupancy threshold
Owned Home	People not living in own home

5.5 Output from ESESM

ESESM outputs information for individual census area units. With the exception of the emission rate of PM_{10} (g/ha/d), all other data output from ESESM indicates the number of households within the CAU that meet the specified criteria for the variables being considered. e.g., type of fuel burned – wood will return the number of houses within a

[5] Measurements with ordinal scales are ordered in the sense that higher numbers represent higher values. However, the intervals between the numbers are not necessarily equal. For example, on a five-point rating scale, the difference between a rating of 2 and a rating of 3 may not represent the same difference as the difference between a rating of 4 and a rating of 5.

[6] Equivalisation is a method used to control for household composition.

particular CAU that use wood fuel as their principal heat source. Table 5.4 lists the types of information that can be extracted from ESESM.

Table 5.4: Information that can be extracted from ESESM.

<table>
<tr><th>Number of households</th><th>Emission rate of PM_{10} (kg/day/ha)</th><th>Type of solid fuel used</th><th>House Ownership</th><th>Income</th><th>Rates Rebate</th><th>Benefits</th><th>Social Deprivation Index (SDI)</th></tr>
<tr><td rowspan="4">Total number of houses within a CAU that burn wood or coal</td><td rowspan="4">Amount of PM_{10} emitted from CAU over a typical winter day</td><td rowspan="2">Wood</td><td rowspan="2">Owner – occupier</td><td>Low</td><td rowspan="2">Eligible</td><td>Unemploy-ment</td><td rowspan="4">SDI of CAU</td></tr>
<tr><td>Med_A</td><td>Sickness</td></tr>
<tr><td rowspan="2">Coal</td><td rowspan="2">Rental</td><td>Med_B</td><td rowspan="2">Not-Eligible</td><td>Domestic purposes</td></tr>
<tr><td>High</td><td>Invalid</td></tr>
</table>

ESESM has been designed and built to provide easy access to information that will support the process for determining the most effective incentives programme for achieving PM_{10} reductions from home heating over a range of emission management scenarios and spatial scales. A detailed description of how to use ESESM and examples of output from ESESM are provided in Appendix G: Guide to Emission and Socio-Economic Spatial Model.

6 Cost Model

This section provides an overview of the Cost Model that has been designed to assist Councils to determine the operational cost of undertaking an incentives programme. The costs required to design an incentives programme are not considered here. Establishing a robust estimate of the operating costs of any incentives programme is an important issue because it will have to fit within the resources that each council has made available for that particular programme.

The Cost Model has been designed to assist Councils to determine the cost of incentives programmes.

The costs to consider when determining the total cost of an incentives programme include:

- The capital costs of clean heat appliances.
- The removal cost of old burners or blocking up of open fire places.
- The installation costs of clean heat appliances (including building consent costs where applicable).
- Administrative costs including; interest costs for interest free loans and staff costs for administering programmes.
- Publicity campaigns (including the cost of advertising).

Other costs that may occur as a result of regulatory measures to reduce PM_{10} include operating costs associated with fuel switching, costs to other organisations such as burner manufacturers as well as intangible costs such as changes in convenience, choice, ambience and uncertainties such as issues relating to the supply of power. It is assumed that the operating costs for clean heating appliances will be met by households and that no provision for these will be made in the incentives programme. The exception to this is the extent to which operational costs are considered in the recommended heating appliances in Table 4.10.

The capital and energy costs of different home heating methods are shown in Table 6.1. This suggests that solid fuel burners and heat pumps cost less per kWh when compared to other heating appliances, although both have relatively high capital costs. Households that have access to free firewood will not be well represented by the cost comparisons shown in Table 6.1. These households are likely to be significantly disadvantaged financially relative to their current situation if they were unable to burn wood.

Table 6.1: Home heating costs (installed costs, efficiencies, and running costs for different heating appliances (from Community Energy Action, August 2008).

Fuel	Heating Type	Energy Efficiency (Energy in/Heat out)	Cost (to install)	Capacity (kw)	Fuel cost (av)* $	Cost: $ per kWh	Cost per hr ($ per kWh x capacity (kw))
Electricity	Fan heater	100%	$30	2	0.21	0.21	0.42
	Oil column	100%	$30	1	0.21	0.21	0.21
			$190	2.4	0.21	0.21	0.50
	Radiant (bar)	100%	$35	1.5	0.21	0.21	0.31
			$140	2.4	0.21	0.21	0.50
	Nightstore	80%	$1050	2.5	0.15	0.18	0.46
			$1150	3.4	0.15	0.18	0.62
	Heatpump (wall)	300%	$1,700	3.2	0.21	0.07	0.22
			$2,650	8.6	0.21	0.07	0.60
	Heatpump (floor)	300%	$2,400	3.4	0.21	0.07	0.24
			$3,400	8.3	0.21	0.07	0.58
	Heatpump (central)	250%	$2,900	5.6	0.21	0.07	0.39
	Central ground-source heat pump	400%	$15,000	15	0.21	0.08	1.25
			$30,000	15	0.21	0.05	0.78
Gas	Flued gas	68%	$2,700	4.2	2.65	0.30	1.28
			$3,300	8.2	2.65	0.30	2.50
	Unflued gas	90%	$185	4	3.18	0.28	1.10
			$196	6	2.28	0.198	1.19
	Gas Central Heating	95%	$12,000	15	2.65	0.22	3.27
Solid fuel	Logburner - wood	Free-standing 79%	$2,845	16	60.00	0.05	0.73
		Enclosed 68%	$3,295	14	60.00	0.05	0.74
Wood Pellet	Pellet Fire	85%	$4,000	5	0.47	0.10	0.52
		85%	$5,000	10	0.47	0.10	1.04
	Central heat-pellet	85%	$18,000	15	0.47	0.10	1.56
Diesel	Diesel - cabinet	93%	$4,500	9.5	1.44	0.16	1.48
	Diesel - central heat	95%	$14,000	15	1.44	0.15	2.29

*electricity: price per kWh (including GST).

*gas: price per kg (including GST).

*wood: price per m^3 (including GST).

*pellets: price per kg (including GST).

*diesel: price per litre (including GST).

The purpose of the Cost Model is to assist councils to design an incentives programme through estimating the costs of incentivising households to cleaner heating options for a

range of programme types and subsidy levels. The model is an excel workbook and includes calculations to ascertain costs to councils, householders and EECA costs associated with conversions but does not include other costs such as marketing and publicity material, databases or staff time except to the extent that these costs may be recovered through use of a administration fee. Its intended use is for project design purposes and results should be treated as indicative only. It is not a financial model for accounting or rating purposes. Note that the EECA funding for clean heat stipulates that insulation must be installed either prior to the heating device, or at the same time as the heating device. EECA's rationale is that there is no purposes to heating the home, if the heat is all going out the ceiling because the house is not adequately insulated. The Cost Model is available at www.niwa.co.nz/our-science/atmosphere/research-projects/all2/envirolink/air-quality.

The Cost Model can be used in two ways:

1. The amount of Council funding available for the programme is inserted into the workbook and the output is the number of households that can be converted based on different assumptions regarding EECA uptake, programme splits or subsidy levels, or;
2. The number of households that you wish to incentivise are inserted into the workbook and the output is the cost of the programme split by Council, EECA and householder for different programme types or subsidy levels.

The programme types included in the Cost Model are:

- Full subsidy.
- Fixed cost to homeowner (insulation and clean heat conversion).
- Partial subsidy.
- Interest free loan.
- Landlord subsidy.

Estimates of the cost splits for a non-interest free loan can also be made by adding the council cost to the householder cost for the 'interest free loan' output in the Cost Model.

A detailed description of how to use the Cost Model are provided in Appendix I: Guide to Cost Model.

7 Designing an incentives programme

This section provides technical detail on how to design an incentives programme that integrates programme objectives, PM_{10} considerations, appropriate heating choices, cost effectiveness issues and social and economic considerations. Advice is provided on the implementation of an incentives programme to meet Council objectives, the role of energy assessors and administration of the incentives programme.

7.1 Defining the objective

The three objectives that Councils can consider when developing an incentives programme are:

- Reduce PM_{10} concentrations via incentives.
- Mitigate the social and economic impacts that may arise from regulatory methods.
- Reduce PM_{10} and mitigate the social and economic impacts that may arise from regulatory methods.

The following sections provide objective specific decision trees that outline the stepwise process for designing an incentives programme. If reducing PM_{10} is the sole objective then the process in 'Objective 1: Reducing PM_{10} concentrations via incentives - Decision Tree' should be followed (Sections 7.2 to 7.3). If mitigating social and economic impacts is the objective then 'Objective 2: Mitigating social and economic impacts – Decision Tree' should be followed (Sections 7.4 to 7.5). If the objective is to reduce PM_{10} concentrations and mitigate the social and economic impacts then Councils are advised to determine the proportion of the budget to spend on reducing PM_{10} and mitigating social and economic impacts, then follow the decision trees for Objective 1 and Objective 2 (Sections 7.2 to 7.5) within budget limitations.

7.2 Objective 1: Reduce PM_{10} concentrations via incentives - Decision Tree

Figure 7.1 shows the decision tree that illustrates the stepwise process for designing an incentives programme to meet Objective 1: Reduce PM_{10} concentrations via incentives.

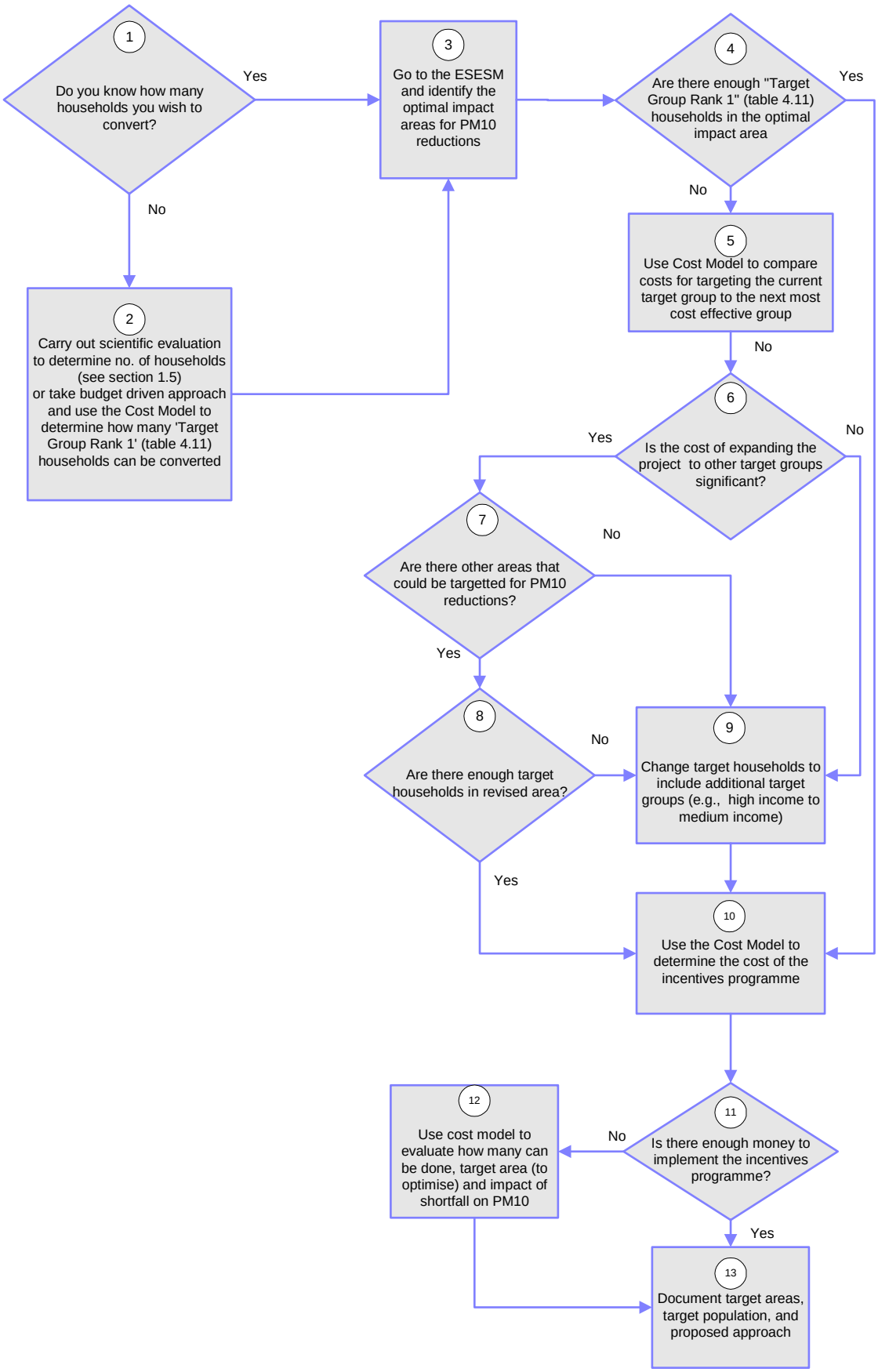


Figure 7.1: Decision tree for designing an incentives programme to meet Objective 1: Reduce PM_{10} concentrations via incentives.

7.3 Reducing PM_{10} concentrations via incentives decision tree description

This section details the individual steps illustrated in the decision tree for Objective 1: Reduce PM_{10} concentrations via incentives (Figure 7.1).

1. Do you know how many households you wish to convert?

> Explanation: In many areas an evaluation of the effectiveness of management options in reducing PM_{10} from domestic heating will have been carried out. The modelling that underpins this assessment can be used to determine the number of solid fuel burner removals for a particular management scenario. Alternatively you may know, based on your budget, that you cannot afford to convert as many households as you would like to and therefore your starting point may be to use the Cost Model to determine how many households you wish to convert.
>
> Yes - Go to Step 3.
>
> No - Go to Step 2.

2. Carry out scientific evaluation to determine the number of households (see section 1.5) or take budget driven approach and use the Cost Model to determine how many 'Target Group Rank 1' households can be converted.

> Explanation: If you do not know the number of households you need to convert to achieve your objective and you have a defined budget for the programme you could enter your budget amount into the Cost Model, select your most cost effective target group and the Cost Model will advise how many households you can afford to convert.
>
> Proceed to Step 3 in the decision tree.

3. Go to the Emissions and Socio-Economic Spatial Model and identify the optimal impact areas for PM_{10} reductions.

> Explanation: The Emissions and Socio-Economic Spatial Model shows an indicative emission density for PM_{10} emissions. This information should be used in conjunction with an understanding of the direction of wind on high pollution nights to identify areas that have the greatest impact on worst case PM_{10} concentrations. This evaluation requires an understanding of wind flows in the area and specialist expertise may be required.
>
> Proceed to Step 4 in the decision tree.

4. Are there enough Target Group Rank 1[7] households in the optimal impact area?

Rerun the Emissions and Socio-Economic Spatial Model for the selected areas using the relevant demographic outputs (see Section 5) and determine the approximate number of target households in these areas. This number should be adjusted downwards based on the indicative uptake of the programme within this demographic (Table 4.11).

Yes - If there are enough target households likely to take up the incentives in the optimal impact area then proceed to Step 10 and use the Cost Model to determine the cost of the programme.

No - Proceed to Step 5.

5. Use the Cost Model to compare the current target group incentive type to the next most cost effective incentive type (e.g., partial subsidy to low interest loan).

Explanation: Table 4.11 ranks different household demographics in terms of their cost effectiveness in achieving PM_{10} reductions. Depending on the number of households that require converting, the incentives group may include 1, 2, 3 or all four of the different target groups.

Identify the next most cost effective target group / incentive type and proceed to Step 6.

6. Is the cost of expanding the project to other target groups significant?

Explanation: The purpose of this step is to consider expanding the demographic being targeted. If there is a big difference in the cost per household converted of expanding to the next target group it may be more effective to expand the area to be targeted. Note that the cost of expanding from partial subsidy to interest free loan will depend on the extent of the subsidy.

Yes - If the costs of expanding the project to different Target Groups are significant (e.g., >50% more per household) proceed to Step 7.

No - Proceed to Step 9.

7. Are there other areas that could be prioritised for PM_{10} reductions?

Explanation: Evaluate the decision making around Step 3 using the Emissions and Socio-Economic Spatial Model and wind direction information to determine if there

[7] Target Group rank 1 households are the group identified as having the number 1 ranking in section 4.5 as being most cost effective to target.

are other areas that could be prioritised for alternative PM_{10} reductions. In particular, there may be additional upwind households further away from the high impact area than those currently specified that could be included in the target area. These houses may have less impact than those originally identified but would still need to contribute to PM_{10} concentrations in worst case areas.

Yes - If the evaluation finds that there are other areas that could be prioritised for PM_{10} reductions then proceed to Step 8.

No - Proceed to Step 9.

8. Are there enough target households in revised area?

Explanation: The objective of revising the spatial area is to be able to stick with targeting the most cost effective group for reducing PM_{10} emissions. As with Step 4 the demographic output of the Emissions and Socio-Economic Spatial Model can be used to determine whether there are sufficient target households in the spatial area. Note as with Step 4 data should be adjusted based on the likely uptake of the programme.

Yes - If there are enough target households in the revised area then proceed to Step 10 to use the Cost Model to determine the cost of the incentives programme.

No - Proceed to Step 9.

9. Change target households to include additional target groups (eg high income to medium income).

Explanation: At this point there will need to be more than one household demographic group included in the programme (e.g., high and middle income home owners). Thus the incentives programme might include different options to best target each group (e.g., partial subsidy and interest free loan). Proceed to Step 10.

10. Use the Cost Model to determine the cost of the incentives programme.

Explanation: By now you should know how many households you need to target in each of the household demographic groups. The cost of the programme can now be assessed using the Cost Model.

Proceed to Step 11.

11. Is there enough money to implement the incentives programme?

Yes - If there are sufficient funds to implement the incentives programme then proceed to Step 13.

No - Proceed to Step 12.

12. Use the Cost Model to evaluate how many households can be done, target area (to optimise) and impact of shortfall on PM_{10}.

Explanation: If the level of funding required is not available to change enough households to clean heating to meet the required reductions in PM_{10} concentrations, then rework the Cost Model to determine how many changes to clean heat could be made.

Note that if the number of houses to be incentivised is limited by budget, additional resources from future budgets may be needed to allocated to an on-going incentives programme to ensure that the total target reductions are eventually met.

13. Document target areas, target groups, target population and proposed approach.

Refer to Section 7.6 of this Good Practice Guide to implement the incentives programme.

7.4 Objective 2: Mitigating social and economic impacts – Decision Tree

Figure 7.2 shows the decision tree that illustrates the stepwise process for designing an incentives programme to meet Objective 2: Mitigating social and economic impacts.

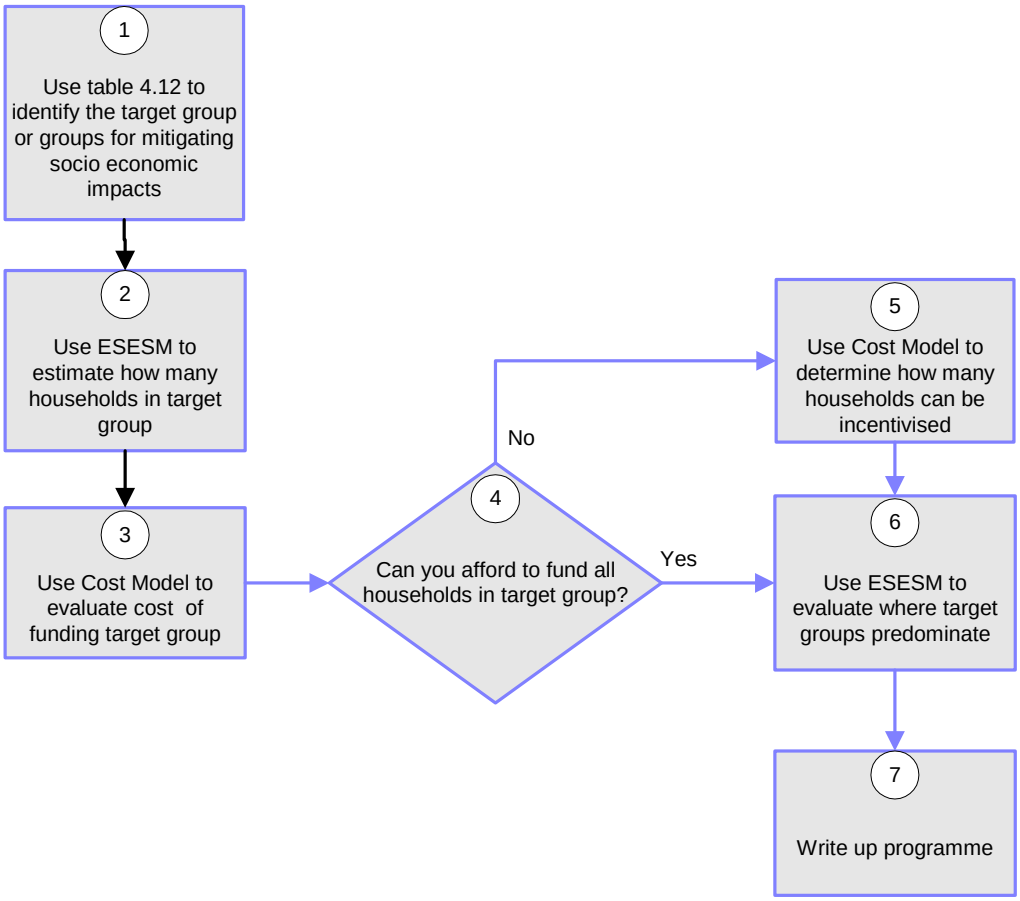


Figure 7.2: Decision tree for designing an incentives programme to meet Objective 2: Mitigating social and economic impacts.

7.5 Mitigating social and economic impacts decision tree – description

This section details the individual steps illustrated in the decision tree for Objective 2: Mitigating social and economic impacts (Figure 7.2).

1. Use Table 4.12 to identify different Target Group Rank 1 groups for mitigating social; and economic impacts.
   The low income group could be further broken down as described in Table 1.1. The lowest social and economic group identified is those eligible for rates rebates (earning less than $21 180 per year). This group is also captured in the Community Services Card classification that is a slightly larger group and in the income less than $50,000 group that is larger still. Choice of group to target may depend on a number

of factors including the amount of funding available and integration with other programmes (e.g., EECA). Go to Step 2.

2. Use the Emissions and Socio-Economic Spatial Model to determine how many households in Target Group Rank 1.
   The Emissions and Socio-Economic Spatial Model includes all of the groups in Table 1.1 as separate layers and the number of households likely to be eligible identified using the information request function (see Step 4, Appendix G). Use the Emissions and Socio-Economic Spatial Model (http://wrenz.niwa.co.nz/webmodel/emissions) to determine how many households are likely in the target group or groups you have identified in Step 1. See Section 5 for further information on how to use the Emissions and Socio-Economic Spatial Model. Go to Step 3.

3. Use the Cost Model to evaluate cost of funding Target Group Rank 1.
   Use the Cost Model and the Emissions and Socio-Economic Spatial Model to estimate the cost of incentivising all households in the Target Group by entering the number of households in each target group into the cost model. The Cost Model will include the average cost per household for each target group and will give you an estimate of the total cost for all households. Go to Step 4.

4. Can you afford to fund all households in Target Group Rank 1?
   Compare the total cost to the budget available. If your target group cannot be completely funded you may wish to continue with that target group and fund a proportion of it or select a smaller target group. For example, if your target group is households eligible for Community Services Cards you may wish to change to target just households eligible for rates rebates, which is a harder criterion to meet and therefore includes less households. Note that household numbers from the Emissions and Socio-Economic Spatial Model are approximate only and also that it may not be possible to get all households eligible on board so being approximate with budgets is appropriate.
   Yes - If you have adequate funding for your target group go to Step 6.
   No - If your budget is not adequate got to Step 5.

5. Use the Cost Model to determine how many households can be incentived.
   Note again you may decide to refine your target group to ensure you target the most in need households. Go to Step 6.

6. Use the Emissions and Socio-Economic Spatial Model to evaluate where target groups predominate.
   You can use the Emissions and Socio-Economic Spatial Model to determine where the most at need households are. Low income households may be harder to reach and methods such as door knocking may be effective in increasing programme

participation. The Emissions and Socio-Economic Spatial Model can assist in identifying areas with high density target group households. Go to Step 7. ‘

7. Write up programme.
   Write up details of the programme including identifying target groups, likely costs, best areas to target and other implementation aspects as detailed in section 7.6.

7.6 Implementation of Incentives Programmes

The following sections outline the major issues that councils will need to consider and address as they implement an incentives programme.

7.6.1 Administration of an Incentives Programmes

The approach that councils take and the amount of effort required to administer their incentives programme will be influenced by the degree of required reductions in PM_{10} concentrations, the Council objectives for the incentives programme and the incentives that are offered, for example a targeted rate, full assistance or subsidy.

For councils where the required PM_{10} reductions are small enough that they will be achieved if households that meet eligibly criteria for the EECA - ‘Warm Up New Zealand: Heat Smart’ clean heat incentive of $500 (or $1200 for community services card holders) participate in the EECA programme, there will be minimum administrative requirements.

For the targeted voluntary rate option (see Section 2.2) administrative requirements include consideration of the EECA model.

For councils that require more PM_{10} reductions than either accessing EECA funding or topping up the funding offered by EECA and administered through a targeted rate, then councils will need to become more involved in the administration of their region specific incentives programme.

The main advantage of a council deciding to become the lead agency to administer an incentives programme is that it would be easier to focus on the air quality objectives of an incentives programme, rather than the energy efficiency objectives of the EECA - ‘Warm Up New Zealand: Heat Smart’ programme. If councils were to be the lead agency to administer their incentives programme, then they would have more flexibility regarding where community funding was directed. Councils could choose to become EECA service providers, or contract EECA service providers and EECA funding could be used to undertake insulation and clean heating retrofitting where EECA eligibly criteria were met. Councils would be able to decide if they wanted to provide more funding towards clean heating, and the funding mechanism that they could use, for example, full assistance, or subsidies.

Administrative requirements for councils that choose to administer their own incentives programme include; organising energy and heating assessments, contracting out the

insulation and heating appliance work, managing and assessing the performance of the contractor, providing information to Councillors about the project and ensuring that funding is available for the project, managing budgets and assessing success of the programme.

7.6.2 Energy and heating assessments

All types of incentives programme will require an in home assessment of energy and heating requirements. The home assessment is arguably one of the most important parts of implementing an incentives programme. The assessment provides a point of entry at the decision making process that occurs when choices are made about home heating options.

Most home energy and heating assessments involve measuring the floor area of the house, checking the ceiling and underfloor space and making recommendations on options for insulation and heating improvements.

At this point in the process information on the goals of the programme, for example improved health, warmers homes, and the need for individuals to make clean heating choices are supplied to the programme recipients.

All EECA Service Providers conduct a full assessment for energy efficiency under Warm Up New Zealand: Heat Smart, including the MfE heater sizing tool.

An assessor could assist with achieving a higher uptake of, for example, heat pumps instead of solid fuel burners if this were a necessary outcome of the programme. This will be of particular importance for councils that find that a reduction in the number of solid fuel burners is necessary to ensure compliance with the NES by 2013. Any information provided by assessors that lead towards the uptake of preferred heating options would have to be based on the objectives of the council's incentives programmes. Obviously there are significant benefits of having skilled and well informed staff undertaking the assessments.

7.6.3 Selecting the type of heating appliances to include in incentives programmes

Councils will need to consider which type of heating appliances to include in the incentives programme. Table 4.10 in Section 4 of this report provides guidance on appliance types and their suitability for Target Groups. Councils will need to consider if the required reduction in PM_{10} concentrations allows for the replacement of solid fuel burners.

7.6.4 Implementation specific to Objective 1: Reducing PM_{10}

Targeting more than one household demographic group

If a council decides to convert 20,000 Target Group ranked 1 households and 2,000 Target Group ranked 2 households it may be necessary to stage the programme so that the 20,000

Target Group ranked 1 households are completed first and then once that is done increase the funding available to get the remaining Target Group ranked 2 households.

Selection of area to apply the incentives programme

The Emissions and Socio-Economic Spatial Model can be used to identify high density emission areas. It may also be used in combination with meteorological data to identify areas with the greatest impact on PM_{10} concentrations in areas where the highest PM_{10} occurs. This evaluation requires an understanding of wind flows in the area and specialist expertise may be required. Targeting the incentives to areas with the greatest impact will provide a more cost effective approach to reducing PM_{10}. However, it may not be considered appropriate to limit the incentives programme to this specific area.

Consideration is needed on how to apply the incentives programme to the area that the Emissions and Socio-Economic Spatial Model has identified. One option is to apply the incentives programme only to the area that the Emissions and Socio-Economic Spatial Model has identified. The other option is to apply an incentives programme to a whole airshed or areas where regulations apply and prioritise, through communications work, areas where the Emissions and Socio-Economic Spatial Model identifies would be the most effective. In this case the resources for encouraging uptake of the programme could focus on this area. This may include door knocking, advertisements targeting local newspapers, pamphlet drops in the area or greater engagement of community groups.

7.6.5 Implementation specific to Objective 2: Mitigating social and economic impacts

Maximising the benefits of free wood

A key consideration when deciding which group to target is how fuel for home heating is sourced. Households that are dependent on free wood to heat their houses during winter maybe disadvantaged if they are required to change from heating from wood burning to other forms of heating including electricity, gas and pellet fires. In addition households in the lower social and economic demographic may use wood as it is low cost relative to other forms of heating and these households may be vulnerable to required changes from wood burning. It is advised that these households are identified by councils and that they are prioritised for maintaining wood use for home heating. A council could implement this by requesting that low income households who are dependent on free wood sign a declaration to state that they use free wood. It is also recommended that consideration of providing advice on the benefits of dry wood and the correct operation of burners be included in the implementation of incentives programmes. The next step would be to examine how the incentive programme could assist with the upgrade of that households' wood burner to meet the NES design standard for wood burners.

Targeting low income households

There are two possible existing central Government mechanisms that councils can use to determine the social and economic status of the community. These are eligibility for Community Service Cards, administered by Work and Income New Zealand and eligibility for rates rebates, where the Department of Internal Affairs determines the eligibility criteria. Councils are encouraged to use either one of these existing mechanisms as opposed to undertaking work themselves to determine the social and economic status of the community.

More people are eligible for a Community Service Card than for rates rebates. Eligibility for having a Community Service Card is one component of the criteria for low income home owners for some funding streams for EECA, Environment Canterbury, Otago Regional Council and Hawke's Bay Regional Council projects.

Nelson City Council uses eligibility for rates rebate as the criteria for determining council assistance to repay the interest free loan that it offers under the 'Clean Heat Warm Homes' programme. Rates relief is an eligibility criterion for the full assistance financial plan for the Environment Canterbury 'Clean Heat' project.

Special attention may need to be given to reducing PM_{10} concentrations in households that are particularly vulnerable to the social impacts of moving to clean heat. These households are likely to be homeowners that have a Community Services Card or would be eligible for rates relief but, without direct assistance, would find it difficult to participate in an incentives programme. Possible barriers for entry include lack of trust for bureaucracy, difficulties in completing written requirements and not being able to access information about an incentives programme in the first instance.

An interest free loan may not be appropriate for this sector of the community, even if repayments for clean heating were spread over a number of years and were relatively low as vulnerable members of the community still may not be able to afford repayments or want to participate in a long term programme.

7.6.6 Monitoring and evaluation of incentives programme success

The monitoring and evaluation of an incentives programme will need to be undertaken to highlight the areas of success and identify aspects of the programme that may need to be refined. The approaches that can be undertaken to assess the performance of a programme can be output or outcome based.

The outputs of the incentives programme can be easily measured by comparing the target households with the actual uptake of the incentives programme.

If targets are not being met then users are referred back to the Decision Trees to either extend the spatial areas or identify new target groups. Other considerations may be the success in reaching target groups and whether additional work is required to engage the targeted groups or wider community.

Emissions inventories can be used to determine the age and the number of solid fuel burners and calculations can be made to determine PM_{10} emissions. Over time, subsequent emissions inventories should show the impact of an incentives programme on PM_{10} emissions. However if this approach was used it would be necessary to separate solid fuel burners that were replaced by an incentives programme, solid fuel burners that were replaced at the end of their life, or replacements required by regulations where incentives were not used.

Using air quality monitors to measure reductions in PM_{10} concentrations over time and using the reductions to assess the success of an incentives programme can be very useful but it is a complex task and time consuming task. This is mainly due to the effects that meteorology can have on PM_{10} concentrations, for example an area may experience several years of warm and windy winters that do not cause high pollution events. In this instance measured lower PM_{10} concentrations could be interpreted as an impact of policy intervention rather than the impact of the meteorological conditions. It is therefore recommended that using air quality monitors to measure reductions in PM_{10} concentrations over time is only undertaken if the council has a good quality long duration (greater than 5 years) PM_{10} record and has access to the technical expertise to undertake a trend analysis.

Outcomes tend to be more achievement or performance based. Outcomes from the incentives programme may be better health for households participating in the incentives programme that were previously cold, damp and heated by an open fire. Wider outcomes are likely to be improved community health, a reduction in medical costs, fewer sick days, a more positive image of a city and an increased sense of belonging to a community as a result of participating in the programme.

8 Communication Strategies

This section provides guidance on how a council could develop a communications strategy to promote an incentives programme. The type of communications strategy will depend on the scope of the incentives programme, the target areas, the Target Group and the required changes in home heating.

Ensuring that the community has the knowledge, skills and understanding to change to clean heating will lead to improved acceptance and uptake of an incentives programme (Taylor Baines and Associates et al, 2005). Working with community groups, finding local champions, developing appropriate communication strategies, providing information through trusted sources (for example, doctors surgeries), and council's leading by example are methods that will ensure long term community acceptance of the benefits of reducing PM_{10} emissions through changing to clean heating appliances.

Communications strategies can assist with informing the community of a specific issue, encourage community engagement and assist with the promotion and implementation of incentives programmes. The development of a communication strategy has been identified as critical to the effective implementation of the Nelson City Council incentives programme (pers. comm., David Jackson, Nelson City Council, 2009). The focus should be on the promotion of the incentives programme in a simple, clear and concise manner (Taylor Baines and Associates et al, 2005).

8.1.1 Development of a communications strategy

Scope

The scope of the communications strategy will be determined by of the scale of the PM_{10} problem, the extent of regulation to manage PM_{10} concentrations and the objectives of the incentives programme. In general, a greater reduction in PM_{10} emissions will create a larger scope for the communications strategy. For example, there will be different communication requirements if there are no regulations to require the phase out of open fires or old wood burners.

Communication Objective

The objective of a communications strategy should be based around the outcome that the council wants to achieve. It should effectively communicate:

- The issue and explain why it is important e.g., poor wintertime air quality creates health problems.
- That the council has an incentives programme that may help specific Target Groups homeowners to change to clean heat to reduce PM_{10} emissions.

As a secondary objective, communications strategies that focus on promoting incentives programmes to change to clean heat can also be a valuable way to promote low carbon

emitting heating appliances such as pellet burners and low emission wood burners. For example an objective to promote this could be:

- To effectively communicate that the best home heating appliance to reduce PM_{10} and greenhouse gas emissions is to choose a pellet fire or low emission wood burner.

Target Groups

Communication strategies are likely to be more successful if their target group is clearly defined. The tools developed alongside this Good Practice Guide allow councils to identify target groups using a number of social and economic factors. For example the target group; low income home owners, middle income home owners, high income home owners and rental properties have been used throughout this Good Practice Guide and can be used in the development of a communications strategy to identify groups of the community that could be targeted. There are several key organisations that could assist as pathways to access these groups. Tables 8.2 to 8.7 identify these community organisations.

Consideration will also need to be given on how to engage Iwi in the incentives programme process, and whether additional measures will be required to ensure their participation in the programme. One option could be to work with members of papakainga developments to implement multiple household changes to clean heat.

Communication methods

Table 8.1 identifies a number of communication methods that could be used in a communications strategy to promote an incentives programme, including selecting project champions, developing roadshows, meetings with stake holders and other communication methods. The communication method, and the benefits and limitations of each method are described and an effectiveness rating for each method is provided. The effectiveness rating is a qualitative evaluation of the benefits verses limitations. The communication methods that councils choose to use through the development of their communications strategy will depend on the projects scope, objective, target audience and key messages and the amount of budget allocated to the communications strategy.

Figures 8.1 and 8.2 provide a number of suggestions for print media and radio that could become part of a communications strategy. Figure 8.3 shows a ‘how to change to clean heat – best heating choice’ message that promotes reductions in PM_{10} concentrations and reductions in greenhouse gas emissions that has been developed to assist with the promotion of clean heating through incentives programmes.

Table 8.1: Communications methods, benefits, limitations and effectiveness ratings.

Communication method	Benefits	Limitations	Effectiveness
Project champions Identify a Councillor that will be the 'face' of the incentives programme. As much as possible tie other communications methods in with the project champion, for example, use photos of the Councillor visiting families that have participated in the incentive programmes. Identify other project champions, e.g., local sports personalities, media personalities, families and business people.	Council seen to be leading and promoting the incentives programme. Easily identifiable person that the community can link to the programme.	Depends on the commitment and time availability of the project champion for the promotion of the incentives programme. If the programme is going to be implemented over several years then project champions may need to change.	Very effective.
Incentives Programme Roadshows The development of a 'roadshow' package that will promote the incentives programme, for example Powerpoint presentations, information brochures and forms to apply for the incentive programme. Attendees can be requested to take the forms and assist others to participate in the incentives programme.	Roadshows are an effective means to reach the target audience and control the agenda of a meeting. Specific information and views can be collected, findings can be disseminated and feedback can be sought. Good opportunity to promote 'good news stories' of families that have used the incentives programme to change to clean heat, and promote the role of the project champions.	This approach can be expensive and resource intensive. Depending on how many roadshows take place, it may reach a small audience.	Very effective.
Council publications, including brochures, articles etc	Publications can be referred to during presentations or when members of the community request	Expensive and time consuming to produce and distribute. Costs could be reduced if incentives	Very effective.

Communication method	Benefits	Limitations	Effectiveness
In house staff can produce publications that promote incentives programmes. Publications can be made available on Council web pages and can be distributed through email.	information on cleaning heating or incentives. They can be used as a 'calling card' and to aid credibility during meetings and presentations. Some features may be picked up on other news organisations and appear in publications with wider circulation. See Figure 8.1 and 8.2 for feature ideas.	information was included in existing publications.	
Incentives newsletter Single publication that is dedicated to the incentives programme. The newsletter could outline the benefits and the experiences that householders have had from participating in the programme and promote clean heat options. Otago Regional Council produces 'Air Zone' a quarterly newsletter that features air quality issues and promotes the Otago incentives programme.	A dedicated incentives newsletter would demonstrate the importance of this issue to the community.	Expensive and time consuming to produce and distribute. Distribution costs could be reduced by sending newsletters at the same time that rate notices are sent.	Very effective.
Meetings with key stakeholders Meetings with important stakeholders to describe and promote incentives programmes. If possible, project champions should attend meetings.	One to one meetings are an effective mechanism to target and develop relationships with specific influential individuals or groups. It is easy to control the agenda and one to one meetings provide an appropriate setting for the	Many meetings with key stake holders may be resource and time intensive. However, if the meeting is well organised and planned, preparation time and costs may be reduced.	Very effective.

Communication method	Benefits	Limitations	Effectiveness
	target audience to communicate their knowledge requirements.		
Static images Development of a series static images to promote incentives programmes. Possible locations for incentives programme static images include movie theatres, road sides, outside Council offices, home shows, trade shows, etc. Nelson City Council has found that static images in movie theatres is a very good means of promoting the Nelson incentives programme.	Reaches large audience. Good for getting a single points across.	Likely to be expensive to produce, but could be used repeatedly over a long time period.	Very effective.
Council Websites Accessibility of all incentive programme information on Council websites and mechanisms to allow people to apply for the programme on line.	Having incentives information available through the internet is an important 'shop-front' and easily accessible to members of the community. Existing Council resources can be used. The internet can be a flexible and adaptable means of communication that can store large amounts of information and documents as well as bite-sized pieces of information in attractive web pages. Can be used over a long time period.	Time and resources are required to establish and maintain websites. Costs can be reduced by using Council staff involved in the management of the Council web page. There is a risk that the web pages are not updated at the rate that changes occur in real time.	Effective.
Radio Project champions can be used to	Targets large audiences. Good approach to target people who rely on audio	For interviews, there is only communication at one time, unless follow up can be arranged.	Effective.

Communication method	Benefits	Limitations	Effectiveness
produce sound bites that describe the benefits of changing to clean heat and promote incentives programme. Interviews could also be used to profile changes to clean heat, or Councillors could explain the eligibility criteria for incentives programmes. Community radio stations may be used to target very specific audiences.	information and are not comfortable with written information. Radio advertisements can be an effective means of promoting incentives programmes.	Could be expensive.	
Home heating 'reality show' Environment Canterbury uses this communications tool to profile families that have changed to clean heat as part of the Council incentives programme. A family had a 'clean heat makeover' before winter and the 'control' family had a 'clean heat makeover' after winter. The families' experience of winter, including the warmth of their homes, their health of their families and their heating bills were reported through Environment Canterbury publications	Real life example on the benefits of changing to clean heat. Examples could be provided on how the families accessed the incentives programme and how it was implemented in their home, e.g., home assessments, how they chose their heating type, installing insulation and the time frame involved. This would allow for people to see the whole process involved in accessing the incentives programme.	Only targets people who read Council publications May be expensive as it could be expected that the Council would have to pay for the full cost of the 'clean heat make over' for each family. Potential for participants to be dissatisfied with the incentives programme.	Effective.
'0800 Clean Heat' telephone number Establishment of a telephone number that is operated by council staff members.	Provides a point of intervention to influence home heating choices. Should assist in promoting an incentives programme.	Requires qualified staff resources and time.	Effective.

Communication method	Benefits	Limitations	Effectiveness
Has been used by councils including Environment Canterbury for their incentives programme.			
Blogging Councils could use blogging to demonstrate that they are in tune with latest technology and social trends and is willing to use all possible avenues to communicate with the public. For example, this approach may involve council staff members blogging good news stories about how families are now better off with clean heating, and have a warmer home. Over time this could be extended to include Twitter and other social network sites.	New approach that may connect with members of the community that are otherwise difficult to reach. Demonstrates council commitment to reaching all member s of the community.	This is a new idea and may be viewed with scepticism. However some Government organisations including http://www.sustainability.govt.nz use blogs.	Somewhat effective.
Gauging community views Ongoing community feature: 'what do locals say about air pollution and the Council incentives programme'? Short profile from people in the community on what they think about air pollution and the incentives programme operating in their area. This would	Lets people gauge community opinion and determine what other people are thinking about issues. This approach may encourage people to change to clean heat if community change is evident.	The wrong message could go out to the community, for example some people may think that changing to clean heat and improving insulation may not to lead to warmer homes.	Somewhat effective.

Communication method	Benefits	Limitations	Effectiveness
include, the persons name, where they are from, their occupation and what they think about air quality in their area and how much they know about the incentives programme. This could be published in Council publications, community newsletters, or newspapers.			
Newspapers Promotion of incentives programme and air quality issues through newspapers.	Can reach a large audience and contribute to public debate. Project champions could be very effective in this area.	Risk of being misrepresented, however media statements may be used to reduce this risk. It would be necessary to consider council policy on interactions with the media.	Somewhat effective.
Television Promotion of incentives programme through television.	Reaches large audience.	Very expensive use of rate payer money, and may cause ratepayer concern.	Less effective.
Establish a Clean Heat Store A Clean Heat Store to provide access to clean heat options was opened in Kaiapoi, Canterbury and was supported by the local community development trust and the district council. The Clean Heat Store promoted the council incentives programme, provided information on PM_{10} concentrations, pollution forecasts, and demonstrations	Practical example of how people can change to clean heat and opportunity to promote incentives programmes.	Expensive and would require substantial planning and resourcing to establish. Waimakariri District Council operated the Clean Heat Store with support and assistance from Environment Canterbury. The store operated for less than six months.	Less effective .

Communication method	Benefits	Limitations	Effectiveness
of heat pumps, pellet fires, and flued gas heaters.			

Feature idea	**Feature description**
Incentives programme:	Describe the incentives programme, including the purpose, eligibility criteria, and the target number of households. Provide details on how to apply for the incentives programme and promote the organisation to contact regarding the incentives programme, either the council or EECA. Run the story several times using different communications tools, e.g., media statements, council newsletters, the internet and other publications, including brochures etc.
Profile families that have changed to clean heat through accessing the incentives programme.	Profile households that have changed to clean heat using the incentives programmes. Possible examples include change from: • From open fires or old wood burners to low emission wood burners. • From open fires or old wood burners to pellet fires. • From open fires or old wood burners to heat pumps. • From open fires or old wood burners to flued gas. • From open fires or old wood burners to diesel. Discuss the benefits that households gained from changing to clean heat, focusing on statements from the household, for example 'its great to not have to spend my time splitting wood', or 'now that we have insulation there is much less condensation in the house'.
Home Heating Choices: efficient wood burners.	Outline NES requirements for 1.5g/kg burners with 65% thermal efficiency and explain that lower emitting appliances are also available. Explain that PM_{10} emissions are higher from open fires and old burners. Encourage householders to change to clean heat and participate in the incentives programme if they are eligible.
Home Heating Choices: Pellet fires.	Promote pellet fires, including: benefits of not using blocks of firewood, how the pellets are made and, how long a bag of pellets lasts. Highlight that pellet fires are the cleanest form of solid fuel heating and they have low greenhouse gas emissions.
Home Heating Choices: Heat pumps.	Provide information on heat pumps including: types of system, size requirements, energy efficiency ratings. Otago Regional Council has a list of approved heat pumps as part of its incentives programmes.

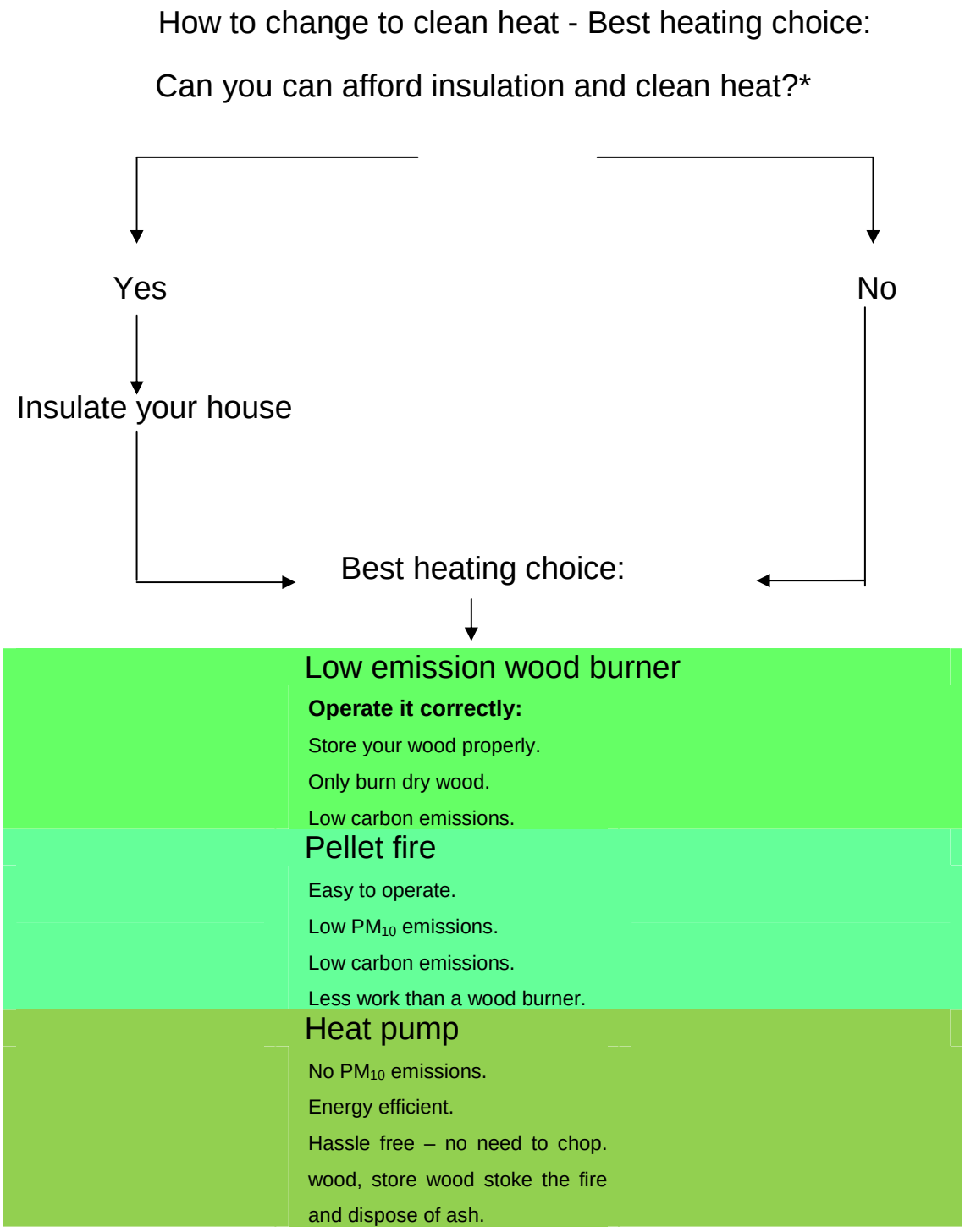
Home Heating Choices: Flued gas heaters.	Outline the benefits of flued gas heaters, including less PM_{10} than open fires, wood burners or pellet burners, but more greenhouse gases. Promote pellet burners more than flued gas heaters. Ensure that the dangers of unflued gas heaters are outlined.
Home insulation.	Promote the benefits of home insulation when households decide how they are going to heat their homes. Outline the EECA requirements to have a house that meets insulation requirements before funding for clean heat is provided. Promote home insulation and clean heating through incentives programmes, e.g. Energywise.govt.nz and the Energy Spot ™.
Explain how to minimise heat loss from houses.	Describe where heat loss takes place in the home. For example; 30-35% of heat is lost through the roof, 21-31% is lost through the windows, 18-25% is lost through the walls, 12-14% is lost through the floor and 6-9% is lost through gaps and draughts (for example, around doors and windows) (New Zealand Consumer Magazine, 2008). Provide information on how to prevent heat loss, e.g., insulation, thermal curtains and double glazing.
Reduction in PM_{10} concentrations will improve the health of the community.	Describe PM_{10}. Identify the health effects and note that most PM_{10} is from old burners and open fires. Promote the councils incentive programme as a way to clean up the air and improve the health of the community.
The way that you heat your home affects your greenhouse gas emissions.	Introduce climate change. Outline that efforts by the community are needed to reduce the amount of greenhouse gases that are emitted. State that there are high levels of PM_{10} and that changes are needed in the way that people heat their home. Describe that one way to reduce PM_{10} and greenhouse gas emission is to consider how homes are heated. Promote low emission wood burners and pellet fires as a good heating solution that reduces PM_{10} and greenhouse gas emissions. Note that multi fuel burners that burn coal are not good for the environment.
Wood no longer required.	Profile a family that has upgraded their home heating from an open fire or an old wood burner to a non solid fuel burner, e.g., heat pump or gas. Focus on the benefits of no longer having to worry about finding firewood, including time savings, flicking a switch to get automated heat, using

	timers to heat the house before getting home, not having to go to the woodshed to get more wood during cold nights. Describe the costs associated with the change in heating and feature families that have used the incentives programme.
Air quality monitoring at school	Arrange for a council staff member to take an air quality monitor to a local school and show students how it works. Feature this in an article along with promoting the incentives programme to reduce PM_{10} concentrations.
Energy saving tips	Feature energy saving tips and how much money can be saved – e.g., use cold water when washing clothes, turn off appliances at the wall, install energy efficient shower heads etc.
How double glazing works	Describe the benefits of double glazing –e.g., reduces energy loss. Describe government regulations that require double glazing on new houses in some areas e.g., South Island and Central Plateau. Describe how double glazing works e.g., it operates just like fibreglass insulation and woollen clothing. It traps a layer of air between two panes, reducing condensation etc. Include statements from professional installers of double glazing.

Figure 8.1: Suggestions for feature ideas to be used to promote an incentives programme and clean heat messages through written media.

Radio idea	Detail
Project champions.	Identify local champions, e.g., Councillors from the Regional and District Councils, sports heroes and community leaders. Organise for them to talk on the radio about the benefits of changing to clean heat and their intentions to change to clean heat.
Air pollution update.	During winter, organise for PM_{10} 24 hour data to be announced once a week. At the same time promote the incentives programme.
Scientists and other experts to discuss health effects, PM_{10} and other technical air quality issues. If possible include project champions.	Identify scientists who are involved in air quality in New Zealand and invite them to comment on air quality in the region. At the same time, organise for project champions to promote the incentives programme.
Accessing the incentives programme to change to clean heat – family examples.	Identify a family that has participated in the incentives programme and arrange for them to discuss the process that they went through, e.g., contacting the Council, having home assessments, making their clean heat choice, having the appliances and insulation installed and the benefits that they have gained.
Medical doctors.	Comment on the health effects that they see at the community level and what they would expect to happen as the incentives programme is implemented. For example; high rates of asthma, people in cold homes, but since the incentives programme was established and people have warmer and drier homes then they are noticeably less sick.
Home heating and energy saving ideas.	Identify experts in home heating methods, e.g., insulation, double glazing, heat pumps, pellet fires etc and get them to discuss the benefits of these products.

Figure 8.2: Promotion of incentives programme and clean heat messages through radio.



* You may be eligible for assistance if an incentives programme is operating in your area and you meet the eligibility criteria.

Figure 8.3: 'How to change to clean heat – best heating choice' message.

8.1.2 Timeframes

A communications strategy needs to continue for the duration of the incentives programme and support the implementation of any regulatory requirements for the phase out of solid fuel. The communications strategy must be started as early as practical as there will be some lag between the start of promotion and the incentives uptake by people. Ideally the communications strategy would be introduced well before the start of winter to allow people to make changes before the start of the cold season. Publishing a summary of the uptake and successes of the programmes at the end of each winter may be beneficial.

An example communications strategy scenario is provided in Figure 8.4.

Council X developed an air quality management plan to reduce PM_{10} concentrations that involves phasing out the use of open fires in 2012 and all solid fuel burners installed before 1995 in 2013. Basic clean heat and incentives programme messages would have already started during the development of the regulations and incentives programmes. Clean heat and incentives programme messages would be promoted throughout the entire communications campaign, that would end when PM_{10} concentrations meet the NES. During the preparation of the air quality management plan, the Council identified that one objective was to mitigate adverse social and economic impacts and an incentives programme was developed to assist with this.

In 2010 communications work would commence to start to prepare the community for the ban on open fires and communications work would be focused on the areas that the Emissions and Socio-Economic Spatial Model identified as having the highest PM_{10} concentrations and that the Cost Model found to be the most cost effective. Communication resources would be focused at identifying Target Group Low income households in the first instance. From the start of 2012 communications work would be around reminding the community that open fires were banned.

In 2011 additional communications work would move towards preparing the community for the introduction of the next regulation – in this case it would be the ban of solid fuel burner installed before 1995. The Emissions and Socio-Economic Spatial Model and the Cost Model would assist the Council to determine which area that communications resources were focused at, and consideration of Target Groups would also be required.

This progress would be continued until all of the regulations in the air quality management plan were rolled out, or until the NES for PM_{10} was achieved.

Figure 8.4: Example of timeframes to use in the development of a communications strategy

8.1.3 Resourcing requirements

The level of resources available including staff time and funds to produce and disseminate communications information should be assessed when developing a communications strategy.

Regional Councils and Territorial Local Authorities throughout New Zealand are beginning to dedicate resources to promote incentives programmes and clean heat messages. In Nelson, a FTE 0.5 position was developed in 2007 to promote the clean heat message. The position is mainly educational and focuses on working within the community to advise homeowners of their obligations under the air plan rules and promotion of the incentives programme. This position is considered critical to the success of the Nelson air plan and promoting the uptake of the incentives programme (pers. comm., David Jackson, Nelson City Council).

Hawke's Bay Regional Council has 1.75 FTE positions, a Healthy Homes Programme Manager, to manage the Heat Smart Hawke's Bay incentive programme and a number of additional social programmes, and an administrator to process applications and assist with the high level of public enquiry.

8.1.4 Implementation of a communications strategy

Once decisions regarding the scope, objectives, clean heat messages, communication methods, communications tools, time frames and resource availability have been made the final step is to develop an implementation plan for each objective.

Tables 8.2 to 8.6 provide a template on how a communications strategy based on reducing PM_{10} concentrations through an incentives programme and assuming that there are regulations to control open fires and older wood burners could be implemented. Each of the Tables 8.2 to 8.6 detail five specific communication objectives:

- Gain community acceptance that there is an air quality problem and change is needed to fix it.
- Inform Target Group: 'Low income home owners' that there are new regulations for home heating and encourage participation in the incentives programme.
- Inform Target Group 'Middle income homeowners'
- Inform Target Group 'High income home owners'
- Inform Target Group: 'Rental properties'

The tables identify the key messages, the target groups and information that could be provided to the target groups. Suggested approaches that are based on the communications methods and tools identified in sections 8.1.1 and 8.1.2 are provided. The final column identifies the time frame for the communication work to be undertaken and responsible staff members. It is anticipated that Councils would fill in the areas that are in bracketed italics to suit their specific incentives programme and resource availability.

Table 8.2: Communications objective: Gain community acceptance that there is an air quality problem and change is needed to fix it.

Communications objective	All Target Groups	Information to the Target Groups	Suggested approaches	Timeframe and responsible staff member
There is a PM_{10} problem and this affects the health of people. Changes in the way people heat their homes are required to fix the problem.	Access the community through • General public. • Councillors. • Open fire and wood burner users (including landlords). • Medical officer of health. • School and kindergarten associations. • School principals. • President National Council of Women in local area. • Iwi leaders. • Industry representatives. • Journalists. • Local radio announcers. • Residents Associations. • Grey Power.	There is a winter air pollution problem that affects peoples health. A community response is needed to fix the problem. The council is developing regulations to improve air quality and protect community health by requires some changes to domestic heating. The council may be able to help households change through its incentives programme – contact the council to see if you are eligible. You can have a warmer, healthier home. Change to clean heat. Choosing a pellet burner or low emission wood burner will reduce PM_{10} and greenhouse gas emissions.	• Identifying key Councillors as project champions. • Find local champions who can influence the community, e.g., a sports hero. • Prepare material, e.g., radio and written advertisements, participation forms etc. • Develop powerpoint slideshows that can be delivered to Target groups. • Active promotion of the PM_{10} problem to ensure that it becomes part of the community agenda. • Organise leaflet drops and follow up phone calls etc. • Find good news stories – follow up on selected participants in the incentives programme. • Include information on Council website.	Timeframes should be linked to the implementation of regulations and introduction of incentives programme. *{Insert agreed time frames}* *{Insert the name oft the staff member who will be responsible for completing this work}*

Communications objective	All Target Groups	Information to the Target Groups	Suggested approaches	Timeframe and responsible staff member
	• Property Investors Associations. • Home Heating Association. • Housing New Zealand and Community Housing. • Businesses, especially restaurants and pubs. • Any other sector of the community who may be affected by high PM_{10} concentrations.		• Undertake public opinion surveys to determine changes in attitude throughout the community over time.	

Table 8.3: Communications objective: Inform Target Group: 'Low income home owners' that there are new regulations for home heating and encourage participation in the incentives programme.

Communications objective	Target Group: Low income home owners	Information to the Target Group	Suggested approaches	Timeframe and responsible staff member
There is a PM_{10} problem and the council has an incentives programme to assist those on low incomes to change to clean heat. The council has identified that low income houses in *{Insert location from the Emissions and Socio-Economic Spatial Model}* are invited to participate in the incentives programme Target number of households: *{Insert target number of households from the Emissions and Socio-Economic Spatial Model}*	**Low income home owners** General eligibility criteria: home owner, household income of less than $50,000 or Community Services Card, house built before 2000, and insufficient insulation Inform people about the incentives programme and get suitable participants Pathways to identify target audience include: • Housing trusts. • WINZ, Age Concern, Budget Advice. • Food banks. • Beneficiary and	There is a winter air pollution problem that affects peoples health. To reduce this we are *{insert council management options e.g., phasing out open fires by 20XX and older solid fuel burners}.* In *{insert location}* we need to change *{insert target number of households}* to clean heat. The Council will assist you to upgrade your home heating by *{insert incentive type, e.g., installing clean heat and new insulation}.* You can have a warmer, healthier home. Change to clean heat.	• The main focus to access Target Group: Low income households should be through developing links with community groups and individually identifying households. • Work with project Champions to promote incentives programme to low income households. • Organise leaflet drops and follow up phone calls in areas that have been identified through the spatial model. • Undertake door knocking – it is recommended that security measures such as two people working together are used. • Find good news stories – follow up on selected participants in the incentives programme and feature	Timeframes should be linked to the implementation of regulations and introduction of incentives programme. *{Insert agreed time frames}* *{Insert the name of the staff member who will be responsible for completing this work}*

Communications objective	Target Group: Low income home owners	Information to the Target Group	Suggested approaches	Timeframe and responsible staff member
	unwaged trusts. • Community employment groups. • Residents Associations • Journalists • Radio announcers • Iwi providers. • Kindergartens, schools. • Grey Power. • Retailers and installers. • District Health nurses, medical centres.	Choosing a pellet burner or low emission wood burner will reduce PM_{10} and greenhouse gas emissions.	these in community newspapers. • Focus on verbal communication tools and promote word of mouth interactions between households. • Include information on council website.	

Table 8.4: Communications objective: Inform Target Group 'Middle income homeowners' that there are new regulations for home heating and encourage participation in the incentives programme.

Communications objective	**Target Group: Middle income home owners**	**Information to the Target Group**	**Suggested approaches**	**Timeframe and responsible staff member**
There is a PM_{10} problem and the council incentives programme to assist those on middle incomes to change to clean heat. The council has identified that middle income houses in *{Insert location from the Emissions and Socio-Economic Spatial Model}* are invited to participate in the programme Target number of households: *{Insert target number of households from the Emissions and Socio-Economic Spatial Model}*	**Middle income** General eligibility criteria: home owner, household income of less than $100,000, house built before 2000, and insufficient insulation. Inform people about the incentives programme and get suitable participants Pathways to identify target audience include: • Resident Associations • Iwi providers. • Kindergartens, schools. • Grey Power. • Retailers and installers.	There is a winter air pollution problem that affects peoples health. To reduce this we are *{insert council management options e.g., phasing out open fires by 20XX and older solid fuel burners}*. In *{insert location}* we need to change *{insert target number of households}* to clean heat. The council will assist you to upgrade your home heating by *{insert incentive type, e.g., an interest free loan installing clean heat and new insulation}*. You can have a warmer, healthier home.	• Less resources may be required to promote an incentives programme to middle income, and the focus should be using existing information sources and where required additional communications tools, for example: • Articles in the media. • Find good news stories – follow up on selected participants in the incentives programme. • Include information on Council website. • Community newspapers and circulars • Radio advertisements. • Find local champions who can influence the community, e.g., a sports hero.	Timeframes should be linked to the implementation of regulations and introduction of incentives programme. *{Insert agreed time frames}* *{Insert the name of the staff member who will be responsible for completing this work}*

Communications objective	**Target Group: Middle income home owners**	**Information to the Target Group**	**Suggested approaches**	**Timeframe and responsible staff member**
	• District Health nurses, medical centres.	Change to clean heat. Choosing a pellet burner or low emission wood burner will reduce PM_{10} and greenhouse gas emissions.		

Table 8.5: Communications objective: Inform Target Group 'High income home owners' that there are new regulations for home heating and encourage participation in the incentives programme.

Communications objective	**Target Group: High income home owners**	**Information to the Target Group**	**Suggested approaches**	**Timeframe and responsible staff member**
There is a PM_{10} problem and there is a council incentives programme to assist those on high incomes to change to clean heat. The council has identified that high income houses in *{Insert location from the Emissions and Socio-Economic Spatial Model}* are invited to participate in the programme Target number of households: *{Insert target number of households from the Emissions and Socio-Economic Spatial Model}*	**High income** General eligibility criteria: home owner, household income of more than $100,000, house built before 2000, and insufficient insulation Pathways to identify target audience include: • Resident Associations • Iwi providers. • Kindergartens, schools. • Grey Power. • Retailers and installers. • District Health nurses, medical centres	There is a winter air pollution problem that affects peoples health. To reduce this we are *{insert council management options e.g., phasing out open fires by 20XX and older solid fuel burners}* In *{insert location}* we need to change *{insert target number of households}* to clean heat. The council will assist you to upgrade your home heating by *{insert incentive type, e.g., a $500 incentive towards installing clean heat and new insulation}.* You can have a warmer, healthier home. Change to clean heat.	• Articles in the media. • Find good news stories – follow up on selected participants in the incentives programme. • Include information on council website.	Timeframes should be linked to the implementation of regulations and introduction of incentives programme. *{Insert agreed time frames}* *{Insert the name of the staff member who will be responsible for completing this work}*

Communications objective	**Target Group: High income home owners**	**Information to the Target Group**	**Suggested approaches**	**Timeframe and responsible staff member**
		Choosing a pellet burner or low emission wood burner will reduce PM_{10} and greenhouse gas emissions.		

Table 8.6: Communications objective: Inform Target Group: 'Rental properties' that there are new regulations for home heating and encourage participation in the incentives programme.

Communications objective	**Target Group: Rental properties**	**Information to the Target Group**	**Suggested approaches**	**Timeframe and responsible staff member**
There is a PM_{10} problem and there is a Council incentives programme to assist those living in rental properties to change to clean heat. The council has identified that rental properties in *{Insert location from the Emissions and Socio-Economic Spatial Model}* are invited to participate in the programme. Target number of households: *{Insert target number of households from the Emissions and Socio-Economic Spatial Model}*	**Rental properties** General eligibility criteria: house built before 2000, and insufficient insulation. Inform people about the incentives programme and get suitable participants Pathways to identify target audience include: • Property investors association. • Adverts in Real estate magazines, real estate officers and auction rooms. • Property mangers	There is a winter air pollution problem that affects peoples health. To reduce this we are *{insert council management options e.g., phasing out open fires by 20XX and older solid fuel burners}*. In *{insert location}* we need to change *{insert target number of households}* to clean heat. The council will assist you to upgrade the home heating in your rental property by *{insert incentive type, e.g., providing a 60percent subsidy for incentive towards installing clean heat and new insulation}*. Your tenants can have a warmer, healthier home. Change to clean heat. Choosing a pellet burner or low	• Power point presentations to Property investors associations, and property managers. • Letter writing and meetings with property managers. • Leaflet drops in rental areas followed up by phone calls. • Articles in the media. • Find good news stories – follow up on selected participants in the incentives programme. • Include information on council website.	Timeframes should be linked to the implementation of regulations and introduction of incentives programme. *{Insert agreed time frames}* *{Insert the name of the staff member who will be responsible for completing this work}*

Communications objective	Target Group: Rental properties	Information to the Target Group	Suggested approaches	Timeframe and responsible staff member
		emission wood burner will reduce PM_{10} and greenhouse gas emissions.		

8.1.5 Amendments and Evaluation

Over time it may be necessary to amend the communications strategy to incorporate changes to air quality management or changes to the incentives programme. It is likely that amendments would be required when there are:

- Changes to air quality management at Central Government level.
- Changes to air quality management plans, including appeals to the Environment Court.
- Changes to partner organisations eligibility criteria and provision of funding for an incentives programme, for example the eligibility criteria for EECA assistance.
- Changes to council budgets that may increase or decrease the level of funding that is available for an incentives programme.
- Refinements or additions to the council's the target groups

Communications strategies should be developed so that it is relatively easy to incorporate changes into the communications framework, primarily through the use of templates. It is recommended that where possible, that same basic clean heat messages are retained to minimise the risk of sending mixed messages to the community.

It will also be necessary to evaluate the effectiveness of the communications strategy. The recommended approach is to undertake base line public opinion surveys to determine the current level of community understanding regarding air quality issues before the communications strategy commences. Public opinion surveys could be repeated over time to gauge changes in community understanding and could also include questions relating to uptake of incentives programmes. Changes could be made to the communications strategy if it was found that certain areas or groups needed additional resources.

Less resource intensive approaches to evaluating the effectiveness of the communications strategy include determining whether the expected uptake of the incentives programme corresponds with council expectations, and assessing if there is an increase in the number of complaints to pollution hotlines as people become more aware of the effect of solid fuel burners on air quality.

9 Summary

Table 9.1 provides a check list of the work required to design and implement an incentives programme as outlined in this good practice guide.

Table 9.1: Check list of information required to design and implement an Incentives Programme.

Required step for incentives programme	Reference	Tick if complete
Solid fuel burner profile is known.	Individual Council Emission Inventories.	
Required reduction in PM_{10} concentrations to meet NES are known.	Determined by research undertaken by individual councils.	
Objectives of council incentives programme are decided.	**Section 1.3.1** Reduce PM_{10} concentrations via incentives, or; **Section 1.3.2** Mitigate social and economic impacts that may arise from regulatory methods, or; **Section 1.3.3** Reduce PM_{10} concentrations and mitigate the social and economic impacts that may arise from regulatory methods.	
Determine if negative social and economic impacts are likely to arise from regulations to reduce PM_{10} concentrations and determine Council approach to mitigate any negative social and economic impacts.	General guidance provided in **Section 3**.	
Appliances to include in incentives programme have been determined.	**Section 4.1.4** Recommended home heating methods. Table 4.10.	

	Also see section 7.6.3: Appliances to include in the incentives programme.	
The factors that are likely to influence an incentives programme have been considered.	**Section 4.2** Consideration of heating methods by household demographics. **Section 4.3** Factors influencing heating choices. **Section 4.4** Factors influencing incentives uptake. **Section 4.5** Uptake data from existing programmes. Tables 4.11, 4.12 and 4.13.	
The Emissions and Socio-Economic Spatial Model is used to determine the most effective method to reduce PM_{10} concentrations.	**Section 5**.	
The Cost Model is used to determine the costs of an incentives programme.	**Section 6**.	
Complete the decision trees to design an incentives programme.	**Sections 7.1 to 7.5** (depending on Council objective).	
Develop framework to implement incentives programme.	General guidance provided in **Section 7.6**.	
Develop a communication strategy to assist with the implementation of the incentives programme.	**Section 8**.	

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Appendix A: Contribution of domestic heating to wintertime PM_{10} emissions

Table A1: Contributions of domestic heating to winter PM_{10} emissions, identified by inventory methods for New Zealand urban areas (from Wilton, et., al, 2009).

Location	Contribution*	Source
Christchurch	82%	Scott and Gunatilaka, 2004
Invercargill	96%	Wilton, 2005b
Gore	94%	Wilton, 2005b
Dunedin	92%	Wilton, 2006a
Mosgiel	90%	Wilton, 2006a
Alexandra	99%	Wilton, 2006a
Timaru	92%	Smithson & McCauley, 2006
Rangiora	78%	McCauley and Scott, 2006
Kaiapoi	95%	McCauley and Scott, 2006
Ashburton	81%	McCauley and Scott, 2006
Waimate	98%	McCauley and Scott, 2006
Blenheim	85%	Wilton, 2005c
Richmond	84%	Wilton, 2005d
Nelson central	92%	Wilton, 2006a
Masterton	94%	Wilton & Baynes, 2008
Upper Hutt	91%	Wilton, 2006b
Wainuiomata	87%	Wilton, 2006b
Hamilton	72%	Wilton,2006c
Tokoroa	86%	Wilton, 2007b
Te Kuiti	67%	Wilton, 2007b
Te Awamutu	59%	Wilton, 2006d
Turangi	89%	Wilton, 2006d
Ngaruawahia	85%	Wilton, 2006d
Whangarei	74%	Wilton, 2007c
Matamata	90%	Smith and Wilton, 2007
Putaruru	58%	Smith and Wilton, 2007
Waihi	58%	Smith and Wilton, 2007
Taupo	88%	Wilton, 2004
Reefton	93%	Wilton 2006e

*Note contribution estimates do not include natural source contributions to PM_{10}.

Appendix B: Historical incentives programme – Energy Efficiency Conservation Authority

Prior to 2009, the Energy Efficiency and Conservation Authority (EECA) had a number of home insulation and energy efficiency projects that were replaced by the 'Warm up New Zealand: Heat Smart' programme. Details of these programmes are provided below.

Home Grants programme for low incomes homeowners or tenants

Funding under the 'ENERGYWISE™ Home Grants' programme was provided by EECA and community organisations. Homeowners were required to be eligible for a Community Services Card, own a house built before 1 January 2000 and must have had insufficient ceiling or underfloor insulation to participate in the programme. In some cases a health referral was also required. Housing New Zealand houses were not eligible to take part in the programme.

Improvements available under this programme included:

- Ceiling and underfloor insulation.
- Hot water cylinder wraps.
- Pipe lagging.
- Underfloor moisture barrier.
- Draught proofing.

In some cases energy efficient fluorescent lights, low flow shower heads and the replacement of open fires and old solid fuel burners with clean heating appliances were also included. This occurred due to a synergy with the MfE Clean Heat programme generally – insulation part funded by EECA with heating under MfE Clean Heat.

The programme was administered by community groups with counterpart funding from EECA. During 2008 and 2009, approximately 40 programmes operated throughout New Zealand. The locations of the programmes ranged from Bluff in Southland to small settlements in Northland.

Landlords with rental properties that had low income tenants were offered a subsidy of 60% on insulation and other energy efficiency measures. Eligibility requirements were that the house had to be built before 1 January 2000 and have insufficient ceiling or underfloor insulation. Tenants were required to have a Community Services Card, although in some situations a property could have been vacant.

The improvements offered to rental properties were similar to those offered under the low income home owners project, except that clean heating appliances were not

included. This was because ENERGYWISE™ home grants covered rentals but MfE Clean Heat programme did not.

ENERGYWISE ™ Interest Subsidies and Grants

A funding stream for middle income households began in 2008. Under this programme, funding was available for homeowners whose house was built before 1 January 2000, and the home owners before tax income was less than $100,000 a year for one or two earners or less than $140,000 a year for three or more earners.

A one-off grant was offered under this programme that paid for one third of the costs of insulation, clean heating and other energy efficiency measures. The maximum grant available was $1125 (including GST) and improvement costs were required to total more than $1000. The other option available was an interest free subsidy. This involved the government paying the interest on a loan to improve the quality of a house of up to $1400 (including GST).

Eligible home owners were required to sign a declaration confirming that they meet the eligibility criteria. The next step was for an Energywise assessor to make an assessment of the home and provide a quote for energy efficiency and warm home improvements. The products available under the programme included:

- Ceiling, underfloor, hot water cylinder and pipes insulation.
- Heat pumps that meet specified energy efficiency levels.
- Low emission wood burners and pellet burners.
- Flued gas heaters - natural gas or LPG.
- Draught proofing.
- Low flow shower heads.
- Energy efficient lighting.

Appendix C: Historical incentives programmes - Ministry for the Environment

Warm Homes Project

In 2004 the Ministry for the Environment (MfE) commenced research on developing an approach to reduce PM_{10} emissions, improve energy efficiency and make homes warmer. This work was undertaken as a response to the introduction of the NES for air quality.

The 'Warm Homes' project was developed with the aim of ensuring that New Zealand homes were heated in a clean and efficient manner. The project attempted to provide a clear link between the benefits of improving air quality and warming up homes.

The Ministry for the Environment undertook research on a number of home heating issues including, the use of fuels and the possible heating options for New Zealand homes. The study also identified the social drivers required to promote environmentally sustainable home heating. The results of the research confirmed that New Zealand homes could be retrofitted to be warm, dry and comfortable without emitting pollution to the air, through a combination of insulation, and clean heating.

Three pilot schemes were trialled in Timaru, Tokoroa and Taumarunui. Work was undertaken by MfE with industries, local government and community groups to install clean heating appliances (including NES compliant wood burners, pellet fires and heat pumps) as well as retrofitting insulation. The houses selected for retrofitting were un-insulated and used an open fire, old wood burner or another form of inefficient heating. Low income households occupied by children and elderly people were also targeted.

The pilot projects were successful and had a high level of community support. Engagement with the local community ensured that community groups with local knowledge were the drivers of the project. This proved very successful in implementing the 'Warm Homes' project.

The key lessons taken from the pilot projects in Timaru, Tokoroa and Taumarunui included:

- Homes in New Zealand can be retrofitted to be warm and energy efficient. Ceiling and underfloor insulation, combined with an efficient heater, completes the warm homes package.
- Co-funding by local partners may be necessary to fund community warm home projects.

- Local knowledge is held within community groups and these groups have the skills to make them ideal partners in implementing a warm homes project.
- A one-size-fits-all approach will not meet the diverse needs of all people throughout New Zealand – each local area will have a unique solution.
- The pilot trials proved successful in raising awareness of air quality and energy efficiency issues.
- Participants reported that pellet burners, flued gas heaters and heat pumps are easy to use.

In 2006 MfE also ran seven workshops with a focus on raising awareness of cold homes and the need to address this issue at the community level. Representatives from health, housing, education and local government were bought together to discuss the implications of PM_{10} and cold housing.

As part of the 2007 to 2008 financial year budget, the 'Warm Homes' project was transferred to the 'Clean Heat' funding stream of the EnergyWise grants, administered by EECA.

Appendix D: Historical incentives programmes - Environment Canterbury

The 'Clean Heat' project was established in 2002. Below are details of the programmes that were in operation until changes were made in mid 2009.

Christchurch

In Christchurch, households were offered a free energy assessment to determine eligibility for the 'Clean Heat' project, as well as advice to determine the best clean heating option and energy efficiency measures to improve insulation.

Four incentives options were available under the 'Clean Heat' project.

Full assistance

Full assistance was provided to low income owner occupied houses and covers the full cost of the conversion to cleaner forms of heating. The conversion included:

- The removal or boarding up of the existing solid fuel burner or fireplace.
- The provision and installation of a 'Clean Heat Approved' heating appliance.
- The retrofitting of necessary insulation to meet building standards.

The eligibility for full assistance is determined by the property owner having a Community Services Card.

Subsidy

Under the 'Clean Heat' project a subsidy was provided for those home owners who did not qualify for full assistance. The subsidies provided under this programme are shown in Table D.2.

Table D.2: Environment Canterbury, 'Clean Heat' project subsidy assistance (adapted from Environment Canterbury, 2008).

Product	**Incentive (including GST)**
Electric heat pump	$500
Electric night storage appliance	$300
Clean Heat approved fixed-flued liquid or gas appliance	$500
Clean Heat approved solid fuel burner	$500
Ceiling and underfloor insulation R3.2	$3.50/m^2
Removal of existing fireplace or solid fuel appliance	$100

The appliances and energy efficiency measures were offered at contracted purchase rates obtained by Environment Canterbury. There were additional administration and project management fees.

Landlord subsidy

A subsidy was provided to encourage landlords to participate by offering a higher level of subsidy (40% of the cost of clean heating and required insulation). The landlord was required to sign a participation agreement and pay Environment Canterbury the remaining 60% share of the cost.

Interest free loan

An interest free 'Clean Heat Loan' was offered by Environment Canterbury as an alternative to subsidies. A loan to a maximum of $4200 was available for the capital cost of the installation project. Homeowners were required to repay the interest free loan over a period of 10 years through a targeted rate. This process included:

- The assessed cost of the installation of the recommended heating appliance.
- Any necessary insulation.
- Sealing or removing the existing open fire or solid fuel burner.
- $100 Environment Canterbury administration fee, and
- $50 Christchurch City Council rating administration fee.

Other areas in Canterbury

In mid 2008 Environment Canterbury extended the 'Clean Heat' programme to Kaiapoi, Rangiora, Ashburton and Timaru, all areas that have exceeded the NES for PM_{10}. Only the loan programme was offered in these locations. Until the end of January 2009, there had been very limited uptake of the loan programme in these areas (pers. comm., Mike Gaudin, Environment Canterbury, 2009).

Appendix E: Linkages between EECA and Council funding for incentives programmes

Table E1: Linkages between EECA and Council funding for incentives programmes.

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
1	Homeowners with houses built before 2000 and have insufficient insulation.	**Insulation** 33% of the total cost up to $1300 (including GST). **Heating** $500 (including GST).	**Insulation** Interest free loan for costs additional to EECA subsidy if homeowners have a non complying wood burner. **Heating** Interest free loan for costs additional to EECA subsidy if homeowners have a non complying wood burner.	**Insulation** Interest free loan for costs additional to EECA subsidy. **Heating** Interest free loan for costs additional to EECA subsidy. Up to $4999.	Council incentive depends on income type. See Criteria 4 and 5.		**Insulation** No additional Council funding. **Heating** Must have non-complying appliance to obtain programme funding
2	Homeowners with houses built before 2000 that	**Insulation** 60% of the total cost. **Heating**	**Insulation** Homeowner to pay $500 towards cost of insulation. ECan pays the difference between homeowner	**Insulation** Interest free loan for costs additional to	**Insulation** Top up loan and interest and fees. **Heating**	**Insulation** Top up loan and interest and fees. **Heating**	**Insulation** No additional Council funding. EECA Insulation

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
	hold CSC.	$1200 (including GST).	and EECA contribution if homeowners have a non complying wood burner. **Heating** Homeowner to pay $500 towards cost of heating. ECan pays the difference between homeowner and EECA contribution if homeowners have a non complying wood burner.	EECA subsidy **Heating** Interest free loan for costs additional to EECA subsidy Up to $4999.	Up to $2,800 loan with 50% interest subsidy.	Not covered by HBRC.	funding topped up by third parties as an agreement with ORC. **Heating** No funding unless replacing a non-complying appliance.
3	Houses built before 2000. Landlords with tenants who hold CSC.	**Insulation** 60% of the total cost. **Heating** $500 (including GST).	$100 towards the cost of removing burner or open fire if homeowners have a non complying wood burner.	**Insulation** Interest free loan for costs additional to EECA subsidy **Heating** Interest free loan. Up to $4999.	**Insulation** Top up loan and interest and fees. **Heating** Grant of $700 or up to $3,500 loan and 50% interest subsidy.		**Insulation** No additional Council funding
4	House built	**Insulation**		**Insulation**	**Insulation**		

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
	before 2000. Household income under $100,000	33% of the total cost up to $1,300. **Heating** Grant of $500.		Interest free loan for costs additional to EECA subsidy **Heating** Interest free loan for costs additional to EECA subsidy Up to $4999.	Top up loan and interest and fees. **Heating** Grant of $700 or up to $3,500 loan and 50% interest subsidy.		
5	House built before 2000. Household income over $100,000	**Insulation** 33% of the total cost up to $1,300. **Heating** Grant of $500.		**Insulation** Interest free loan. **Heating** Interest free loan. Up to $4999.	**Insulation** Top up loan and interest and fees. **Heating** Not covered by HBRC.		
6	House built before 2000.	**Insulation** 33% of the		**Insulation** Interest free		**Insulation** Top up loan and	**Insulation** No additional

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
	Not a CSC holder.	total cost up to $1,300. **Heating** Grant of $500.		loan for costs additional to EECA subsidy **Heating** Interest free loan for costs additional to EECA subsidy Up to $4999		interest and fees. **Heating** Not covered by HBRC.	Council funding **Heating** $2000 subsidy if replacing a non-compliant appliance.
7	Rates Rebate. House built before 2000*	**Insulation** 60% of the total cost. **Heating** $1200 (including GST).	**Insulation** 100% assistance for remaining cost if homeowners have a non complying wood burner. **Heating** 100% assistance for remaining cost if homeowners have a non complying wood burner.	**Insulation** No repayment requirements for each year that householder is eligible for rates rebate. **Heating** No			

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
				repayment requirements for each year that householder is eligible for rates rebate.			
8	Rates Rebate. House built after 2000.		**Insulation** 100% assistance if homeowners have a non complying wood burner. **Heating** 100% assistance if homeowners have a non complying wood burner.	**Insulation** No repayment requirements for each year that householder is eligible for rates rebate. **Heating** No repayment requirements for each year that			

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
				householder is eligible for rates rebate.			
9	Houses built after 2000 – CSC if homeowners have a non complying wood burner.		**Insulation** Homeowner to pay $500. ECan pays the difference. **Heating** Homeowner to pay $500. ECan pays the difference.	**Insulation** Interest free loan **Heating** Interest free loan Up to $4999.			**Insulation** Homeowner to pay $1200 for ceiling and floor $600 for either. ORC and partners pays the difference. **Heating** Homeowner to pay $500. ORC and partners pay the difference.
10	Houses built after 2000. Landlords with tenants who hold CSC if		**Insulation** 60% of the total cost. **Heating** $500 (incl GST). $100 towards the cost of removing burner or open fires.	**Insulation** Interest free loan **Heating** Interest free loan			**Heating** ARC pays $2000.

	Criteria	EECA	Environment Canterbury – within airsheds[1]	Nelson City Council - within airsheds[2]	Hawke's Bay Regional Council - within airsheds	Hawke's Bay Regional Council - outside airsheds	Otago Regional Council – Airshed 1[3]
	homeowners have a non complying wood burner.			Up to $4999.			
11	Landlords for tenants without CSC. House built before or after 2000 if there is a non complying wood burner.		**Insulation** Interest free loan. **Heating** Interest free loan.	**Insulation** Interest free loan. **Heating** Interest free loan. Up to $4999. (house built before 2000 only).			**Heating** ARC pays $2000.

1. Assumes that those eligible for Rates Rebates are also eligible for a Community Services Card. These grants are additional to the Council's interest free loan of $4999.

2. These grants are additional to the Council's interest free loan of $5200

3. Applies in Airshed 1 areas in Otago – Milton, Cromwell, Arrowtown, Alexanda and Clyde. Households in other areas could still apply for funding under the 'Warm Up New Zealand: Heat Smart' programme.

Appendix F: Resource Management Act

The Resource Management Act 1991 (RMA) is the main environmental management legislation for New Zealand. Part II of the RMA sets out the purpose and principles of the Act. The overriding purpose of the Act is to 'promote the sustainable management of natural and physical resources' (S5(1)). Sections 6, 7 and 8 contain the key considerations that a local government authority has to take into account when making decisions about how the environment will be managed.

Section 6 outlines matters of national importance, section 7 contains other matters that decision makers shall have particular regard to and section 8 requires that all persons exercising functions and powers under the RMA shall take into account the principles of the Treaty of Waitangi.

In regards to energy use and climate change, section 7, Other Matters is the most relevant. Section 7 states that:

> In achieving the purpose of this Act, all persons exercising functions and powers under it, in relation to managing the use, development, and protection of natural and physical resources, shall have particular regard to—
>
> - (a) Kaitiakitanga:
> - (aa) The ethic of stewardship:
> - (b) The efficient use and development of natural and physical resources:
> - (ba) the efficiency of the end use of energy:
> - (c) The maintenance and enhancement of amenity values:
> - (d) Intrinsic values of ecosystems:
> - (e) [Repealed]
> - (f) Maintenance and enhancement of the quality of the environment:
> - (g) Any finite characteristics of natural and physical resources:
> - (h) The protection of the habitat of trout and salmon:
> - (i) the effects of climate change:
> - (j)the benefits to be derived from the use and development of renewable energy.

Appendix G: Wood and Coal use by Territorial Local Authority in New Zealand

Table G 1: Proportion of households in each income category that use that use wood to heat their homes by Territorial Local Authority for owner occupied and rented properties (source Statistics New Zealand).[1]

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Far North District	50%	54%	57%	61%	61%	61%	54%	57%	32%	37%	38%	46%	49%	58%	35%	38%
Whangarei District	38%	45%	52%	57%	60%	60%	52%	52%	21%	32%	38%	43%	41%	47%	34%	34%
Kaipara District	54%	62%	64%	68%	70%	73%	65%	65%	35%	51%	55%	58%	66%	75%	46%	51%
Rodney District	33%	37%	43%	49%	51%	54%	50%	47%	21%	23%	27%	31%	30%	35%	30%	27%
North Shore City	19%	24%	26%	30%	32%	32%	27%	29%	11%	12%	15%	16%	20%	21%	18%	16%
Waitakere City	28%	34%	38%	42%	45%	46%	40%	41%	15%	20%	22%	26%	30%	35%	21%	23%
Auckland City	18%	24%	25%	27%	29%	31%	26%	27%	11%	13%	11%	12%	15%	17%	15%	14%
Manukau City	19%	24%	26%	29%	30%	30%	24%	27%	11%	14%	15%	16%	17%	19%	15%	15%
Papakura District	27%	31%	36%	41%	42%	44%	38%	39%	16%	20%	22%	26%	28%	31%	22%	22%
Franklin District	41%	46%	52%	56%	58%	59%	54%	54%	26%	35%	38%	40%	45%	48%	33%	37%
Thames-Coromandel District	46%	50%	58%	60%	59%	55%	55%	55%	31%	37%	40%	42%	55%	52%	44%	40%
Hauraki District	54%	62%	68%	69%	70%	69%	66%	65%	39%	53%	65%	66%	74%	75%	53%	56%
Waikato District	52%	56%	61%	67%	65%	64%	60%	62%	43%	46%	54%	60%	62%	63%	51%	53%
Matamata-Piako District	39%	46%	53%	58%	58%	57%	55%	53%	36%	51%	60%	69%	68%	76%	54%	58%
Hamilton City	14%	15%	20%	22%	21%	21%	21%	20%	9%	13%	14%	15%	16%	14%	17%	14%
Waipa District	33%	36%	45%	53%	53%	56%	50%	48%	30%	39%	45%	51%	56%	56%	43%	44%
Otorohanga District	54%	48%	68%	72%	71%	72%	68%	66%	45%	60%	71%	72%	70%	74%	64%	65%
South Waikato District	61%	58%	67%	71%	69%	70%	66%	66%	51%	61%	69%	78%	75%	75%	64%	65%
Waitomo District	61%	68%	72%	74%	74%	74%	68%	70%	46%	57%	66%	81%	82%	83%	59%	64%
Taupo District	56%	57%	64%	69%	66%	61%	70%	64%	46%	51%	61%	64%	63%	65%	63%	59%
Western Bay of Plenty District	44%	50%	61%	64%	66%	67%	60%	60%	28%	36%	44%	54%	57%	53%	43%	42%
Tauranga City	19%	21%	28%	33%	34%	33%	30%	29%	16%	20%	22%	23%	23%	23%	27%	22%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Rotorua District	44%	50%	58%	65%	61%	55%	60%	57%	38%	50%	51%	56%	59%	57%	55%	51%
Whakatane District	47%	50%	59%	62%	61%	59%	62%	58%	40%	50%	57%	57%	63%	59%	53%	52%
Kawerau District	63%	61%	63%	71%	71%	65%	67%	68%	49%	61%	63%	83%	71%	40%	58%	60%
Opotiki District	49%	62%	63%	68%	66%	76%	58%	61%	47%	53%	60%	57%	83%	67%	49%	53%
Gisborne District	52%	58%	66%	72%	72%	71%	67%	66%	37%	50%	53%	66%	66%	65%	52%	52%
Wairoa District	72%	81%	88%	88%	86%	93%	79%	82%	50%	69%	76%	79%	92%	91%	66%	69%
Hastings District	45%	55%	65%	74%	74%	75%	68%	66%	35%	44%	54%	60%	65%	67%	50%	50%
Napier City	38%	49%	59%	65%	67%	64%	64%	58%	29%	39%	42%	48%	54%	52%	45%	41%
Central Hawke's Bay District	75%	80%	89%	89%	94%	95%	87%	87%	58%	68%	82%	91%	93%	91%	81%	78%
New Plymouth District	28%	35%	44%	50%	52%	49%	48%	44%	22%	31%	37%	37%	38%	42%	32%	32%
Stratford District	52%	55%	65%	77%	81%	77%	74%	69%	48%	60%	70%	78%	78%	83%	64%	64%
South Taranaki District	40%	41%	52%	55%	55%	65%	53%	52%	37%	49%	62%	68%	66%	73%	46%	55%
Ruapehu District	77%	77%	84%	88%	87%	83%	86%	83%	61%	75%	88%	95%	93%	89%	80%	80%
Wanganui District	28%	30%	41%	47%	52%	55%	41%	41%	19%	26%	28%	36%	46%	38%	26%	26%
Rangitikei District	65%	77%	83%	84%	87%	89%	79%	80%	53%	73%	80%	85%	85%	92%	66%	72%
Manawatu District	51%	60%	70%	74%	76%	81%	70%	70%	35%	53%	56%	64%	72%	70%	55%	54%
Palmerston North City	18%	22%	30%	36%	36%	40%	34%	32%	15%	18%	18%	20%	22%	23%	19%	18%
Tararua District	73%	82%	87%	92%	91%	93%	86%	86%	58%	74%	82%	91%	88%	91%	75%	77%
Horowhenua District	39%	48%	57%	65%	63%	70%	60%	55%	30%	41%	46%	54%	56%	65%	42%	41%
Kapiti Coast District	31%	33%	40%	47%	53%	53%	49%	43%	23%	30%	36%	41%	33%	43%	30%	31%
Porirua City	30%	42%	39%	45%	46%	39%	39%	41%	24%	31%	30%	31%	35%	37%	30%	30%
Upper Hutt City	25%	32%	41%	47%	49%	47%	44%	43%	15%	18%	20%	31%	28%	34%	22%	22%
Lower Hutt City	22%	26%	32%	36%	34%	36%	33%	33%	20%	19%	22%	22%	24%	27%	24%	22%
Wellington City	18%	21%	23%	28%	31%	31%	29%	28%	6%	8%	9%	11%	12%	13%	11%	10%
Masterton District	59%	70%	80%	86%	88%	87%	82%	78%	52%	63%	75%	82%	80%	79%	68%	67%
Carterton District	82%	83%	86%	93%	88%	93%	88%	88%	57%	84%	80%	94%	92%	89%	70%	76%
South Wairarapa District	80%	83%	88%	87%	90%	89%	87%	87%	70%	76%	82%	88%	89%	94%	66%	79%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Tasman District	60%	64%	71%	73%	73%	70%	73%	69%	44%	50%	61%	70%	68%	63%	59%	57%
Nelson City	36%	42%	49%	58%	56%	55%	52%	50%	26%	33%	38%	37%	39%	43%	41%	35%
Marlborough District	49%	53%	63%	69%	68%	67%	66%	63%	38%	47%	56%	61%	62%	70%	53%	53%
Kaikoura District	76%	78%	71%	88%	73%	70%	72%	76%	59%	62%	74%	80%	92%	75%	67%	69%
Buller District	77%	82%	79%	83%	81%	79%	79%	79%	64%	65%	73%	76%	75%	71%	76%	70%
Grey District	72%	77%	82%	80%	75%	68%	81%	77%	55%	64%	67%	74%	77%	58%	67%	65%
Westland District	78%	79%	75%	83%	82%	72%	81%	79%	57%	67%	71%	70%	72%	64%	66%	66%
Hurunui District	82%	83%	85%	83%	83%	87%	86%	84%	73%	86%	84%	88%	86%	95%	82%	83%
Waimakariri District	47%	56%	65%	69%	67%	71%	70%	64%	41%	52%	59%	62%	58%	64%	55%	55%
Christchurch City	23%	29%	35%	41%	41%	39%	38%	36%	18%	25%	28%	32%	32%	29%	29%	26%
Selwyn District	59%	68%	72%	68%	66%	67%	70%	68%	57%	61%	69%	72%	72%	70%	67%	68%
Ashburton District	53%	59%	67%	70%	72%	69%	72%	66%	47%	57%	72%	72%	78%	80%	69%	66%
Timaru District	47%	57%	69%	73%	74%	77%	67%	66%	41%	56%	61%	68%	69%	67%	56%	55%
Mackenzie District	84%	93%	94%	93%	82%	100%	89%	90%	65%	81%	72%	83%	87%	89%	89%	77%
Waimate District	71%	78%	82%	86%	86%	88%	88%	82%	58%	67%	83%	88%	106%	85%	75%	76%
Waitaki District	60%	70%	78%	82%	81%	86%	76%	74%	47%	67%	71%	81%	78%	81%	69%	66%
Central Otago District	58%	63%	72%	75%	75%	69%	72%	70%	49%	65%	68%	76%	69%	60%	64%	64%
Queenstown-Lakes District	68%	67%	68%	68%	72%	68%	70%	69%	43%	47%	48%	53%	56%	64%	53%	53%
Dunedin City	39%	50%	56%	67%	68%	69%	64%	59%	26%	37%	39%	45%	46%	50%	39%	37%
Clutha District	62%	69%	79%	79%	76%	73%	80%	74%	53%	63%	73%	87%	86%	76%	75%	72%
Southland District	69%	67%	74%	77%	74%	69%	73%	72%	60%	63%	73%	78%	80%	77%	75%	72%
Gore District	47%	53%	65%	71%	65%	61%	62%	61%	50%	56%	69%	68%	77%	75%	58%	62%
Invercargill City	39%	51%	59%	66%	66%	58%	61%	58%	39%	52%	55%	60%	57%	55%	58%	51%
Total	36%	42%	48%	51%	49%	44%	47%	46%	24%	32%	34%	36%	34%	31%	31%	31%

1. Shading of income levels shows income type for Target groups (low income home owners, middle income home owners, high income home owners and rental properties).

Table G 2: Number of households that use wood to heat their homes by Territorial Local Authority by income range for owner occupied and rented properties (source Statistics New Zealand)[1].

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Far North District	939	948	1335	990	768	732	1032	6759	414	309	420	297	201	135	468	2244
Whangarei District	912	1056	1617	1545	1542	1551	1083	9306	333	369	591	417	270	192	501	2670
Kaipara District	405	417	606	438	336	348	345	2901	156	156	231	138	75	63	150	978
Rodney District	771	894	1458	1575	1920	2952	1179	10740	294	243	420	348	306	288	354	2244
North Shore City	789	822	1524	1815	2580	5145	1374	14073	306	219	519	477	603	669	564	3354
Waitakere City	984	999	2055	2415	3096	4278	1851	15672	453	408	762	642	648	513	819	4254
Auckland City	1176	1140	2058	2211	3066	8571	2016	20244	1038	642	1074	876	987	1704	1551	7872
Manukau City	813	888	1800	2091	2838	4587	1878	14892	513	411	795	621	648	591	1254	4836
Papakura District	216	210	435	513	699	939	363	3372	126	114	195	162	159	120	264	1131
Franklin District	456	495	990	1134	1392	2154	822	7434	213	207	357	267	270	243	297	1854
Thames-Coromandel District	555	597	798	585	465	426	441	3882	246	186	258	150	108	66	216	1236
Hauraki District	405	414	576	438	303	312	348	2796	180	141	237	165	93	90	174	1077
Waikato District	456	435	789	912	1038	1365	714	5703	318	252	450	351	285	213	462	2328
Matamata-Piako District	327	408	651	654	606	702	387	3744	213	225	450	387	288	222	294	2073
Hamilton City	339	339	828	873	999	1197	552	5124	312	270	447	348	273	180	516	2361
Waipa District	366	372	765	939	963	1230	540	5166	210	222	414	327	264	177	246	1854
Otorohanga District	111	87	252	198	180	219	153	1191	72	63	195	123	69	69	111	699
South Waikato District	432	363	561	516	474	417	420	3186	285	204	351	261	171	99	294	1668
Waitomo District	138	141	252	234	183	183	183	1311	108	81	177	141	81	57	153	801
Taupo District	450	456	840	810	720	663	570	4509	297	258	525	390	258	165	441	2340
Western Bay of Plenty District	519	660	1179	1104	1008	1131	678	6267	228	192	360	297	186	102	246	1614

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Tauranga City	624	741	1242	1305	1290	1257	750	7206	378	330	573	396	300	204	528	2700
Rotorua District	666	735	1362	1467	1392	1293	1023	7941	591	534	789	558	378	216	819	3885
Whakatane District	411	429	657	657	648	687	705	4197	285	249	363	243	186	132	438	1893
Kawerau District	144	150	159	141	144	93	162	1014	102	66	75	60	36	6	108	456
Opotiki District	165	165	210	150	111	132	183	1110	129	90	102	48	45	24	141	573
Gisborne District	573	606	1080	1020	870	807	909	5874	459	402	567	372	264	123	645	2835
Wairoa District	189	171	288	252	162	117	231	1398	123	87	159	99	66	30	183	744
Hastings District	885	1026	1821	1959	1815	1884	1272	10650	540	468	819	537	384	219	738	3708
Napier City	651	849	1536	1443	1440	1236	903	8052	441	384	549	384	276	144	522	2697
Central Hawke's Bay District	291	342	573	510	408	348	318	2784	138	153	270	201	114	60	192	1122
New Plymouth District	624	768	1404	1383	1356	1347	1062	7956	369	315	492	306	201	159	408	2250
Stratford District	168	153	273	285	216	216	219	1533	108	72	135	93	54	45	114	618
South Taranaki District	300	279	534	513	441	594	450	3105	225	213	429	297	183	168	279	1791
Ruapehu District	327	267	444	294	234	225	327	2106	219	165	324	231	159	99	297	1485
Wanganui District	465	483	885	792	684	603	507	4416	291	213	264	165	102	45	264	1341
Rangitikei District	324	378	555	498	363	330	357	2811	207	180	303	222	120	66	183	1281
Manawatu District	411	510	951	924	900	861	558	5133	198	198	327	237	165	93	216	1422
Palmerston North City	309	375	858	1005	1023	1212	540	5322	318	243	381	258	186	111	291	1779
Tararua District	420	486	795	636	522	456	405	3705	255	225	348	258	129	90	234	1536
Horowhenua District	564	696	903	747	561	441	513	4404	276	240	279	150	87	51	216	1293
Kapiti Coast District	600	618	996	951	993	1152	606	5916	249	234	324	201	105	87	180	1371
Porirua City	159	243	447	564	732	1125	405	3669	237	171	267	198	180	129	402	1587
Upper Hutt City	246	291	636	756	891	1023	411	4251	120	93	153	138	90	66	120	780
Lower Hutt City	429	477	1083	1200	1353	2106	789	7446	468	261	450	306	264	204	477	2424
Wellington City	435	453	975	1317	1974	4794	936	10872	225	171	387	366	447	657	354	2601
Masterton District	504	588	957	816	693	639	483	4677	324	276	378	225	111	69	276	1650
Carterton District	207	216	345	342	252	201	177	1740	84	81	105	87	33	24	57	468

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
South Wairarapa District	270	273	423	330	309	327	204	2154	141	96	159	114	72	51	81	714
Tasman District	987	1053	1710	1476	1221	999	927	8376	363	312	534	378	222	99	297	2205
Nelson City	528	618	1011	1047	924	840	573	5538	288	240	396	237	171	126	333	1800
Marlborough District	714	783	1347	1278	1095	1032	732	6987	315	270	504	375	261	165	342	2229
Kaikoura District	96	84	126	129	72	63	78	648	51	39	69	60	36	18	42	312
Buller District	402	390	360	315	201	135	273	2073	210	111	156	111	45	30	135	804
Grey District	378	339	543	480	348	252	303	2643	210	144	177	120	69	33	129	888
Westland District	249	204	282	264	228	162	189	1572	129	84	150	105	69	42	114	693
Hurunui District	297	315	501	378	294	291	267	2346	129	126	231	159	75	54	126	897
Waimakariri District	615	783	1407	1533	1359	1323	882	7905	249	225	357	246	159	84	219	1551
Christchurch City	2277	2739	5067	5628	5739	6039	3336	30831	1593	1395	2301	1656	1284	777	1833	10842
Selwyn District	375	462	945	1014	1122	1329	663	5913	168	150	345	297	249	144	237	1602
Ashburton District	483	585	1023	918	807	666	474	4956	234	225	522	351	231	135	246	1947
Timaru District	837	1044	1761	1629	1257	945	837	8310	468	351	498	324	183	87	336	2250
Mackenzie District	114	126	183	120	93	87	96	819	51	63	84	60	39	24	48	363
Waimate District	264	282	363	261	153	135	219	1689	105	72	150	87	51	33	72	573
Waitaki District	639	720	966	735	537	396	435	4422	252	216	330	171	96	78	195	1332
Central Otago District	363	441	672	618	465	321	372	3267	135	165	252	195	135	54	123	1050
Queenstown-Lakes District	231	255	516	507	570	837	360	3288	99	120	276	312	312	351	234	1704
Dunedin City	1431	1665	2955	3123	3048	2928	1998	17145	882	768	1038	708	429	288	774	4893
Clutha District	405	387	765	609	447	321	369	3300	168	162	321	225	132	66	174	1254
Southland District	564	573	1050	972	795	744	573	5277	243	222	552	372	258	162	249	2052
Gore District	222	246	450	444	282	186	228	2058	156	99	162	102	69	27	111	729
Invercargill City	741	876	1545	1545	1368	1035	873	7986	528	411	519	303	165	90	447	2475
Total	36111	39915	69360	69282	69381	85668	47445	417162	20865	17352	28944	20874	15693	12318	24948	140985

1. Shading of income levels shows income type for Target groups (low income home owners, middle income home owners, high income home owners and rental properties).

Table G 3: Distribution of wood use in Territorial Local Authority by income range for owner occupied and rented properties (source Statistics New Zealand)[1].

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Far North District	14%	14%	20%	15%	11%	11%	15%	100%	18%	14%	19%	13%	9%	6%	21%	100%
Whangarei District	10%	11%	17%	17%	17%	17%	12%	100%	12%	14%	22%	16%	10%	7%	19%	100%
Kaipara District	14%	14%	21%	15%	12%	12%	12%	100%	16%	16%	24%	14%	8%	6%	15%	100%
Rodney District	7%	8%	14%	15%	18%	27%	11%	100%	13%	11%	19%	16%	14%	13%	16%	100%
North Shore City	6%	6%	11%	13%	18%	37%	10%	100%	9%	7%	15%	14%	18%	20%	17%	100%
Waitakere City	6%	6%	13%	15%	20%	27%	12%	100%	11%	10%	18%	15%	15%	12%	19%	100%
Auckland City	6%	6%	10%	11%	15%	42%	10%	100%	13%	8%	14%	11%	13%	22%	20%	100%
Manukau City	5%	6%	12%	14%	19%	31%	13%	100%	11%	8%	16%	13%	13%	12%	26%	100%
Papakura District	6%	6%	13%	15%	21%	28%	11%	100%	11%	10%	17%	14%	14%	11%	23%	100%
Franklin District	6%	7%	13%	15%	19%	29%	11%	100%	11%	11%	19%	14%	15%	13%	16%	100%
Thames-Coromandel District	14%	15%	21%	15%	12%	11%	11%	100%	20%	15%	21%	12%	9%	5%	17%	100%
Hauraki District	14%	15%	21%	16%	11%	11%	12%	100%	17%	13%	22%	15%	9%	8%	16%	100%
Waikato District	8%	8%	14%	16%	18%	24%	13%	100%	14%	11%	19%	15%	12%	9%	20%	100%
Matamata-Piako District	9%	11%	17%	17%	16%	19%	10%	100%	10%	11%	22%	19%	14%	11%	14%	100%
Hamilton City	7%	7%	16%	17%	19%	23%	11%	100%	13%	11%	19%	15%	12%	8%	22%	100%
Waipa District	7%	7%	15%	18%	19%	24%	10%	100%	11%	12%	22%	18%	14%	10%	13%	100%
Otorohanga District	9%	7%	21%	17%	15%	18%	13%	100%	10%	9%	28%	18%	10%	10%	16%	100%
South Waikato District	14%	11%	18%	16%	15%	13%	13%	100%	17%	12%	21%	16%	10%	6%	18%	100%
Waitomo District	11%	11%	19%	18%	14%	14%	14%	100%	13%	10%	22%	18%	10%	7%	19%	100%
Taupo District	10%	10%	19%	18%	16%	15%	13%	100%	13%	11%	22%	17%	11%	7%	19%	100%
Western Bay of Plenty District	8%	11%	19%	18%	16%	18%	11%	100%	14%	12%	22%	18%	12%	6%	15%	100%
Tauranga City	9%	10%	17%	18%	18%	17%	10%	100%	14%	12%	21%	15%	11%	8%	20%	100%
Rotorua District	8%	9%	17%	18%	18%	16%	13%	100%	15%	14%	20%	14%	10%	6%	21%	100%
Whakatane District	10%	10%	16%	16%	15%	16%	17%	100%	15%	13%	19%	13%	10%	7%	23%	100%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Kawerau District	14%	15%	16%	14%	14%	9%	16%	100%	22%	14%	16%	13%	8%	1%	24%	100%
Opotiki District	15%	15%	19%	14%	10%	12%	16%	100%	23%	16%	18%	8%	8%	4%	25%	100%
Gisborne District	10%	10%	18%	17%	15%	14%	15%	100%	16%	14%	20%	13%	9%	4%	23%	100%
Wairoa District	14%	12%	21%	18%	12%	8%	17%	100%	17%	12%	21%	13%	9%	4%	25%	100%
Hastings District	8%	10%	17%	18%	17%	18%	12%	100%	15%	13%	22%	14%	10%	6%	20%	100%
Napier City	8%	11%	19%	18%	18%	15%	11%	100%	16%	14%	20%	14%	10%	5%	19%	100%
Central Hawke's Bay District	10%	12%	21%	18%	15%	13%	11%	100%	12%	14%	24%	18%	10%	5%	17%	100%
New Plymouth District	8%	10%	18%	17%	17%	17%	13%	100%	16%	14%	22%	14%	9%	7%	18%	100%
Stratford District	11%	10%	18%	19%	14%	14%	14%	100%	17%	12%	22%	15%	9%	7%	18%	100%
South Taranaki District	10%	9%	17%	17%	14%	19%	14%	100%	13%	12%	24%	17%	10%	9%	16%	100%
Ruapehu District	16%	13%	21%	14%	11%	11%	16%	100%	15%	11%	22%	16%	11%	7%	20%	100%
Wanganui District	11%	11%	20%	18%	15%	14%	11%	100%	22%	16%	20%	12%	8%	3%	20%	100%
Rangitikei District	12%	13%	20%	18%	13%	12%	13%	100%	16%	14%	24%	17%	9%	5%	14%	100%
Manawatu District	8%	10%	19%	18%	18%	17%	11%	100%	14%	14%	23%	17%	12%	7%	15%	100%
Palmerston North City	6%	7%	16%	19%	19%	23%	10%	100%	18%	14%	21%	15%	10%	6%	16%	100%
Tararua District	11%	13%	21%	17%	14%	12%	11%	100%	17%	15%	23%	17%	8%	6%	15%	100%
Horowhenua District	13%	16%	21%	17%	13%	10%	12%	100%	21%	19%	22%	12%	7%	4%	17%	100%
Kapiti Coast District	10%	10%	17%	16%	17%	19%	10%	100%	18%	17%	24%	15%	8%	6%	13%	100%
Porirua City	4%	7%	12%	15%	20%	31%	11%	100%	15%	11%	17%	12%	11%	8%	25%	100%
Upper Hutt City	6%	7%	15%	18%	21%	24%	10%	100%	15%	12%	20%	18%	12%	8%	15%	100%
Lower Hutt City	6%	6%	15%	16%	18%	28%	11%	100%	19%	11%	19%	13%	11%	8%	20%	100%
Wellington City	4%	4%	9%	12%	18%	44%	9%	100%	9%	7%	15%	14%	17%	25%	14%	100%
Masterton District	11%	13%	20%	17%	15%	14%	10%	100%	20%	17%	23%	14%	7%	4%	17%	100%
Carterton District	12%	12%	20%	20%	14%	12%	10%	100%	18%	17%	22%	19%	7%	5%	12%	100%
South Wairarapa District	13%	13%	20%	15%	14%	15%	9%	100%	20%	13%	22%	16%	10%	7%	11%	100%
Tasman District	12%	13%	20%	18%	15%	12%	11%	100%	16%	14%	24%	17%	10%	4%	13%	100%
Nelson City	10%	11%	18%	19%	17%	15%	10%	100%	16%	13%	22%	13%	10%	7%	19%	100%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Marlborough District	10%	11%	19%	18%	16%	15%	10%	100%	14%	12%	23%	17%	12%	7%	15%	100%
Kaikoura District	15%	13%	19%	20%	11%	10%	12%	100%	16%	13%	22%	19%	12%	6%	13%	100%
Buller District	19%	19%	17%	15%	10%	7%	13%	100%	26%	14%	19%	14%	6%	4%	17%	100%
Grey District	14%	13%	21%	18%	13%	10%	11%	100%	24%	16%	20%	14%	8%	4%	15%	100%
Westland District	16%	13%	18%	17%	15%	10%	12%	100%	19%	12%	22%	15%	10%	6%	16%	100%
Hurunui District	13%	13%	21%	16%	13%	12%	11%	100%	14%	14%	26%	18%	8%	6%	14%	100%
Waimakariri District	8%	10%	18%	19%	17%	17%	11%	100%	16%	15%	23%	16%	10%	5%	14%	100%
Christchurch City	7%	9%	16%	18%	19%	20%	11%	100%	15%	13%	21%	15%	12%	7%	17%	100%
Selwyn District	6%	8%	16%	17%	19%	22%	11%	100%	10%	9%	22%	19%	16%	9%	15%	100%
Ashburton District	10%	12%	21%	19%	16%	13%	10%	100%	12%	12%	27%	18%	12%	7%	13%	100%
Timaru District	10%	13%	21%	20%	15%	11%	10%	100%	21%	16%	22%	14%	8%	4%	15%	100%
Mackenzie District	14%	15%	22%	15%	11%	11%	12%	100%	14%	17%	23%	17%	11%	7%	13%	100%
Waimate District	16%	17%	21%	15%	9%	8%	13%	100%	18%	13%	26%	15%	9%	6%	13%	100%
Waitaki District	14%	16%	22%	17%	12%	9%	10%	100%	19%	16%	25%	13%	7%	6%	15%	100%
Central Otago District	11%	13%	21%	19%	14%	10%	11%	100%	13%	16%	24%	19%	13%	5%	12%	100%
Queenstown-Lakes District	7%	8%	16%	15%	17%	25%	11%	100%	6%	7%	16%	18%	18%	21%	14%	100%
Dunedin City	8%	10%	17%	18%	18%	17%	12%	100%	18%	16%	21%	14%	9%	6%	16%	100%
Clutha District	12%	12%	23%	18%	14%	10%	11%	100%	13%	13%	26%	18%	11%	5%	14%	100%
Southland District	11%	11%	20%	18%	15%	14%	11%	100%	12%	11%	27%	18%	13%	8%	12%	100%
Gore District	11%	12%	22%	22%	14%	9%	11%	100%	21%	14%	22%	14%	9%	4%	15%	100%
Invercargill City	9%	11%	19%	19%	17%	13%	11%	100%	21%	17%	21%	12%	7%	4%	18%	100%
Total	9%	10%	17%	17%	17%	21%	11%	100%	15%	12%	21%	15%	11%	9%	18%	100%

Shading of income levels shows income type for Target groups (low income home owners, middle income home owners, high income home owners and rental properties).

Table G 4: Proportion of households in each income category that use that use coal to heat their homes by Territorial Local Authority for owner occupied and rented properties (source Statistics New Zealand).[1]

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Far North District	2%	2%	2%	3%	3%	2%	3%	2%	2%	3%	3%	3%	3%	3%	4%	3%
Whangarei District	2%	2%	2%	2%	3%	2%	3%	2%	3%	4%	4%	3%	4%	4%	4%	3%
Kaipara District	3%	4%	3%	2%	2%	2%	2%	3%	2%	4%	4%	3%	3%	4%	5%	3%
Rodney District	2%	2%	3%	3%	4%	3%	3%	3%	2%	2%	2%	3%	2%	4%	4%	2%
North Shore City	3%	4%	3%	4%	4%	4%	4%	4%	2%	3%	3%	3%	4%	4%	4%	3%
Waitakere City	3%	4%	4%	4%	4%	5%	5%	4%	2%	3%	4%	3%	5%	5%	4%	4%
Auckland City	4%	5%	4%	5%	6%	6%	5%	5%	3%	4%	3%	3%	4%	4%	4%	4%
Manukau City	3%	4%	4%	4%	4%	4%	5%	4%	3%	3%	4%	3%	4%	4%	4%	4%
Papakura District	4%	5%	6%	7%	7%	5%	6%	6%	4%	4%	5%	6%	6%	5%	5%	5%
Franklin District	4%	4%	5%	5%	5%	5%	7%	5%	4%	5%	5%	6%	6%	5%	5%	5%
Thames-Coromandel District	4%	5%	6%	4%	4%	5%	5%	5%	5%	5%	6%	6%	5%	2%	7%	5%
Hauraki District	7%	8%	9%	8%	10%	6%	10%	8%	7%	9%	10%	10%	10%	8%	14%	9%
Waikato District	20%	16%	17%	18%	14%	12%	17%	16%	19%	19%	17%	16%	16%	14%	23%	19%
Matamata-Piako District	5%	5%	7%	6%	7%	4%	8%	6%	7%	8%	9%	9%	7%	5%	10%	8%
Hamilton City	3%	3%	5%	4%	4%	4%	5%	4%	4%	4%	4%	5%	4%	3%	6%	4%
Waipa District	4%	4%	5%	7%	5%	5%	6%	5%	7%	6%	7%	8%	6%	7%	7%	7%
Otorohanga District	1%	7%	8%	7%	6%	2%	9%	6%	8%	3%	5%	7%	6%	6%	10%	7%
South Waikato District	4%	4%	6%	5%	3%	4%	6%	5%	7%	3%	5%	4%	5%	2%	5%	5%
Waitomo District	12%	7%	10%	8%	7%	6%	10%	8%	5%	11%	7%	14%	9%	4%	10%	9%
Taupo District	4%	4%	4%	2%	2%	2%	6%	3%	4%	7%	4%	3%	4%	2%	5%	4%
Western Bay of Plenty District	2%	2%	2%	3%	2%	3%	3%	2%	3%	2%	4%	4%	3%	3%	3%	3%
Tauranga City	2%	1%	2%	2%	2%	2%	2%	2%	2%	1%	2%	2%	2%	2%	3%	2%
Rotorua District	4%	5%	4%	4%	4%	3%	5%	4%	5%	6%	4%	4%	6%	3%	6%	5%
Whakatane District	3%	2%	4%	3%	2%	3%	4%	3%	5%	4%	5%	5%	4%	5%	4%	5%
Kawerau District	1%	5%	4%	2%	1%	4%	5%	3%	3%	3%	5%	4%	0%	0%	8%	5%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Opotiki District	1%	2%	3%	3%	4%	2%	3%	3%	3%	5%	4%	4%	11%	0%	4%	4%
Gisborne District	2%	2%	3%	3%	2%	2%	2%	2%	3%	3%	2%	3%	4%	3%	4%	3%
Wairoa District	3%	3%	3%	1%	2%	2%	1%	3%	4%	5%	3%	0%	4%	0%	2%	2%
Hastings District	3%	3%	3%	3%	3%	3%	4%	3%	5%	5%	6%	4%	6%	6%	6%	6%
Napier City	2%	2%	4%	3%	3%	3%	4%	3%	4%	4%	5%	3%	5%	3%	6%	5%
Central Hawke's Bay District	5%	3%	3%	4%	2%	2%	6%	3%	3%	3%	5%	3%	5%	0%	5%	4%
New Plymouth District	2%	2%	2%	2%	2%	2%	2%	2%	2%	3%	2%	1%	4%	4%	3%	3%
Stratford District	6%	2%	4%	5%	4%	1%	6%	4%	5%	3%	3%	3%	4%	0%	3%	4%
South Taranaki District	3%	3%	3%	4%	4%	2%	4%	4%	3%	4%	5%	3%	2%	3%	4%	4%
Ruapehu District	14%	13%	8%	7%	9%	6%	14%	11%	15%	15%	18%	17%	23%	32%	18%	18%
Wanganui District	3%	3%	3%	3%	4%	4%	3%	3%	3%	4%	3%	3%	5%	0%	5%	4%
Rangitikei District	5%	6%	6%	5%	6%	5%	5%	5%	4%	7%	6%	8%	4%	4%	10%	6%
Manawatu District	3%	2%	3%	3%	3%	3%	4%	3%	3%	5%	3%	5%	5%	5%	5%	4%
Palmerston North City	2%	1%	2%	2%	2%	2%	2%	2%	3%	2%	2%	3%	3%	3%	2%	2%
Tararua District	5%	3%	4%	3%	2%	2%	4%	3%	3%	4%	4%	5%	2%	0%	4%	4%
Horowhenua District	3%	3%	2%	4%	3%	3%	4%	3%	3%	4%	3%	2%	4%	4%	5%	3%
Kapiti Coast District	3%	2%	3%	3%	4%	4%	5%	3%	2%	5%	3%	5%	3%	4%	4%	4%
Porirua City	4%	4%	4%	5%	4%	4%	4%	4%	8%	9%	8%	7%	6%	6%	9%	8%
Upper Hutt City	2%	2%	3%	5%	3%	4%	4%	3%	2%	3%	3%	3%	3%	3%	4%	3%
Lower Hutt City	3%	3%	4%	4%	4%	4%	5%	4%	6%	5%	5%	5%	6%	4%	6%	6%
Wellington City	4%	4%	4%	4%	4%	5%	5%	4%	2%	2%	2%	2%	2%	3%	3%	2%
Masterton District	3%	4%	4%	5%	4%	5%	5%	4%	4%	3%	5%	4%	4%	3%	6%	4%
Carterton District	4%	3%	4%	3%	6%	4%	3%	4%	4%	3%	9%	3%	8%	11%	4%	6%
South Wairarapa District	6%	6%	6%	3%	7%	2%	4%	5%	4%	2%	3%	9%	4%	6%	5%	4%
Tasman District	3%	3%	3%	3%	3%	3%	4%	3%	4%	5%	5%	4%	5%	4%	5%	5%
Nelson City	2%	2%	3%	3%	3%	3%	3%	3%	3%	3%	4%	4%	4%	3%	5%	4%
Marlborough District	5%	5%	5%	5%	5%	4%	5%	5%	5%	8%	9%	9%	8%	9%	8%	8%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Kaikoura District	7%	3%	5%	6%	3%	3%	3%	5%	10%	10%	10%	16%	15%	0%	10%	10%
Buller District	66%	70%	70%	74%	73%	63%	68%	68%	60%	60%	66%	63%	65%	57%	69%	63%
Grey District	67%	75%	73%	75%	70%	61%	74%	71%	54%	59%	64%	65%	70%	58%	64%	61%
Westland District	50%	53%	54%	57%	62%	45%	53%	54%	39%	43%	46%	50%	50%	41%	41%	45%
Hurunui District	8%	8%	8%	8%	6%	5%	12%	8%	17%	14%	12%	10%	17%	11%	12%	13%
Waimakariri District	5%	5%	6%	5%	5%	6%	6%	5%	5%	6%	10%	6%	8%	9%	10%	7%
Christchurch City	3%	3%	3%	3%	2%	3%	3%	3%	3%	4%	4%	4%	4%	3%	5%	4%
Selwyn District	11%	9%	12%	9%	8%	6%	9%	9%	16%	16%	15%	17%	18%	16%	22%	17%
Ashburton District	8%	9%	11%	12%	12%	11%	12%	11%	14%	11%	17%	15%	13%	18%	16%	15%
Timaru District	10%	10%	12%	12%	12%	12%	13%	12%	13%	15%	16%	16%	13%	7%	18%	15%
Mackenzie District	22%	18%	20%	16%	18%	10%	22%	17%	31%	27%	15%	21%	13%	11%	17%	20%
Waimate District	15%	14%	10%	11%	12%	10%	13%	12%	10%	6%	12%	9%	13%	8%	9%	11%
Waitaki District	16%	21%	22%	26%	20%	18%	22%	21%	18%	21%	23%	23%	15%	16%	24%	20%
Central Otago District	21%	22%	25%	26%	23%	20%	22%	23%	17%	26%	28%	29%	26%	20%	28%	26%
Queenstown-Lakes District	18%	17%	17%	15%	15%	16%	17%	16%	11%	13%	12%	14%	15%	18%	13%	14%
Dunedin City	19%	22%	25%	28%	26%	27%	28%	25%	16%	22%	22%	24%	23%	20%	21%	20%
Clutha District	48%	49%	57%	57%	56%	50%	56%	54%	35%	43%	53%	65%	57%	62%	56%	50%
Southland District	51%	50%	55%	57%	53%	50%	51%	53%	47%	48%	50%	58%	62%	61%	57%	54%
Gore District	50%	57%	62%	67%	66%	52%	63%	60%	55%	47%	63%	62%	67%	58%	59%	58%
Invercargill City	35%	42%	48%	54%	53%	44%	52%	47%	32%	44%	47%	46%	46%	42%	49%	42%
Total	7%	7%	8%	8%	7%	6%	8%	7%	6%	7%	7%	7%	6%	5%	7%	7%

1. Shading of income levels shows income type for Target groups (low income home owners, middle income home owners, high income home owners and rental properties).

Table G 5: Number of households that use coal to heat their homes by Territorial Local Authority by income range for owner occupied and rented properties (source Statistics New Zealand)[1].

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Far North District	45	30	48	42	36	21	60	270	30	24	36	18	12	6	51	171
Whangarei District	54	45	75	57	78	51	72	426	48	42	57	30	24	18	54	270
Kaipara District	24	24	27	15	9	9	9	114	9	12	15	6	3	3	15	57
Rodney District	45	48	87	87	135	186	69	660	24	18	39	36	18	30	42	204
North Shore City	120	135	198	270	318	723	183	1938	63	60	102	78	108	114	111	636
Waitakere City	120	108	231	231	282	429	228	1626	72	60	141	78	102	69	138	660
Auckland City	231	219	372	411	576	1803	399	4011	300	174	309	234	249	423	447	2145
Manukau City	120	141	246	312	417	618	363	2220	138	102	201	132	159	114	366	1209
Papakura District	30	36	75	84	111	111	60	501	33	24	48	36	36	18	63	255
Franklin District	48	42	93	96	132	183	102	690	36	27	45	42	36	24	45	264
Thames-Coromandel District	51	63	81	42	33	42	39	351	36	24	39	21	9	3	36	162
Hauraki District	51	54	75	51	42	27	51	348	33	24	36	24	12	9	45	177
Waikato District	177	126	225	243	228	249	204	1464	141	102	138	96	72	48	210	816
Matamata-Piako District	45	48	84	63	72	51	54	429	39	33	66	51	30	15	54	288
Hamilton City	81	63	198	141	189	222	132	1026	120	72	123	102	63	39	177	696
Waipa District	42	42	81	120	87	108	63	543	48	36	66	48	30	21	39	288
Otorohanga District	3	12	30	18	15	6	21	117	12	3	15	12	6	6	18	72
South Waikato District	27	27	48	39	21	24	36	222	39	9	27	15	12	3	24	126
Waitomo District	27	15	36	24	18	15	27	153	12	15	18	24	9	3	27	111
Taupo District	33	33	48	24	24	24	51	234	27	33	36	21	18	6	36	177
Western Bay of Plenty District	27	27	45	45	30	51	33	258	24	12	33	21	9	6	18	126
Tauranga City	57	51	81	75	81	93	54	474	42	24	63	42	30	18	69	285
Rotorua District	57	69	102	84	87	78	90	567	72	60	66	39	36	12	93	372
Whakatane District	30	15	39	33	24	30	51	210	36	18	33	21	12	12	36	168
Kawerau District	3	12	9	3	3	6	12	42	6	3	6	3	0	0	15	36

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Opotiki District	3	6	9	6	6	3	9	48	9	9	6	3	6	0	12	45
Gisborne District	24	18	42	42	30	27	30	204	36	24	21	15	15	6	45	168
Wairoa District	9	6	9	3	3	3	3	45	9	6	6	0	3	0	6	27
Hastings District	51	57	78	78	84	81	75	507	81	48	90	36	33	21	84	405
Napier City	33	42	96	69	54	54	51	402	57	42	69	27	24	9	66	300
Central Hawke's Bay District	18	15	18	21	9	9	21	105	6	6	18	6	6	0	12	54
New Plymouth District	48	39	66	54	57	66	54	387	39	30	30	12	21	15	36	186
Stratford District	18	6	15	18	12	3	18	81	12	3	6	3	3	0	6	39
South Taranaki District	24	21	36	36	33	21	30	210	21	18	33	12	6	6	24	120
Ruapehu District	60	45	42	24	24	15	54	276	54	33	66	42	39	36	66	339
Wanganui District	42	45	66	57	51	42	42	351	51	36	27	12	12	0	48	180
Rangitikei District	24	30	39	30	24	18	21	174	15	18	21	21	6	3	27	105
Manawatu District	24	21	42	39	30	27	30	198	15	18	18	18	12	6	18	105
Palmerston North City	30	15	63	54	63	69	39	318	57	27	48	42	27	15	36	243
Tararua District	27	18	36	24	9	9	21	135	15	12	15	15	3	0	12	72
Horowhenua District	42	45	36	48	24	18	36	237	30	24	21	6	6	3	24	108
Kapiti Coast District	48	33	72	57	69	81	60	429	27	39	30	27	9	9	21	165
Porirua City	21	24	45	63	72	114	45	387	78	51	72	48	30	21	129	426
Upper Hutt City	21	21	42	75	48	81	36	324	18	15	21	12	9	6	24	108
Lower Hutt City	66	48	144	147	147	252	108	903	138	63	111	72	72	33	111	606
Wellington City	93	78	165	210	258	780	153	1734	63	48	81	78	84	129	102	585
Masterton District	27	36	48	48	33	39	27	258	27	12	24	12	6	3	24	108
Carterton District	9	9	15	12	18	9	6	81	6	3	12	3	3	3	3	36
South Wairarapa District	21	21	27	12	24	9	9	129	9	3	6	12	3	3	6	36
Tasman District	57	57	78	69	51	48	45	408	33	30	48	24	15	6	24	180
Nelson City	36	33	63	57	51	48	30	312	33	24	39	27	18	9	42	189
Marlborough District	66	69	105	99	75	63	51	537	45	45	78	57	33	21	51	327

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Kaikoura District	9	3	9	9	3	3	3	39	9	6	9	12	6	0	6	45
Buller District	342	333	318	279	183	108	234	1788	198	102	141	93	39	24	123	723
Grey District	348	330	489	447	324	225	279	2451	204	132	168	105	63	33	123	840
Westland District	159	138	201	180	174	102	123	1071	90	54	96	75	48	27	72	468
Hurunui District	30	30	48	36	21	18	36	222	30	21	33	18	15	6	18	138
Waimakariri District	63	69	132	120	93	105	69	651	30	24	63	24	21	12	39	213
Christchurch City	273	294	474	417	330	396	273	2466	261	210	336	210	165	78	303	1563
Selwyn District	72	63	153	138	132	120	90	759	48	39	75	72	63	33	78	405
Ashburton District	78	90	162	159	129	102	81	798	72	42	123	75	39	30	57	435
Timaru District	177	174	300	276	210	153	159	1449	153	93	129	75	33	9	105	600
Mackenzie District	30	24	39	21	21	9	24	159	24	21	18	15	6	3	9	93
Waimate District	57	51	45	33	21	15	33	249	18	6	21	9	6	3	9	81
Waitaki District	168	219	273	231	132	81	126	1230	96	66	105	48	18	15	69	411
Central Otago District	135	153	234	213	141	93	114	1089	48	66	105	75	51	18	54	423
Queenstown-Lakes District	63	63	129	114	120	195	87	783	24	33	72	81	81	96	57	450
Dunedin City	693	744	1293	1293	1185	1134	867	7206	537	453	594	372	213	117	417	2691
Clutha District	312	276	549	441	330	219	258	2379	111	111	231	168	87	54	129	879
Southland District	417	432	774	720	567	534	402	3846	189	168	378	279	198	129	189	1530
Gore District	234	267	429	423	285	159	231	2019	171	84	147	93	60	21	114	684
Invercargill City	663	729	1260	1263	1092	789	741	6543	429	351	444	234	132	69	378	2046
Total	6798	6825	11454	10827	9906	11751	7725	65280	5151	3801	6045	3999	2964	2175	5619	29757

1. Shading of income levels shows income type for Target groups (low income home owners, middle income home owners, high income home owners and rental properties).

Table G 6: Distribution of coal use in Territorial Local Authority by income range for owner occupied and rented properties (source Statistics New Zealand)[1].

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Far North District	17%	11%	18%	16%	13%	8%	22%	100%	18%	14%	21%	11%	7%	4%	30%	100%
Whangarei District	13%	11%	18%	13%	18%	12%	17%	100%	18%	16%	21%	11%	9%	7%	20%	100%
Kaipara District	21%	21%	24%	13%	8%	8%	8%	100%	16%	21%	26%	11%	5%	5%	26%	100%
Rodney District	7%	7%	13%	13%	20%	28%	10%	100%	12%	9%	19%	18%	9%	15%	21%	100%
North Shore City	6%	7%	10%	14%	16%	37%	9%	100%	10%	9%	16%	12%	17%	18%	17%	100%
Waitakere City	7%	7%	14%	14%	17%	26%	14%	100%	11%	9%	21%	12%	15%	10%	21%	100%
Auckland City	6%	5%	9%	10%	14%	45%	10%	100%	14%	8%	14%	11%	12%	20%	21%	100%
Manukau City	5%	6%	11%	14%	19%	28%	16%	100%	11%	8%	17%	11%	13%	9%	30%	100%
Papakura District	6%	7%	15%	17%	22%	22%	12%	100%	13%	9%	19%	14%	14%	7%	25%	100%
Franklin District	7%	6%	13%	14%	19%	27%	15%	100%	14%	10%	17%	16%	14%	9%	17%	100%
Thames-Coromandel District	15%	18%	23%	12%	9%	12%	11%	100%	22%	15%	24%	13%	6%	2%	22%	100%
Hauraki District	15%	16%	22%	15%	12%	8%	15%	100%	19%	14%	20%	14%	7%	5%	25%	100%
Waikato District	12%	9%	15%	17%	16%	17%	14%	100%	17%	13%	17%	12%	9%	6%	26%	100%
Matamata-Piako District	10%	11%	20%	15%	17%	12%	13%	100%	14%	11%	23%	18%	10%	5%	19%	100%
Hamilton City	8%	6%	19%	14%	18%	22%	13%	100%	17%	10%	18%	15%	9%	6%	25%	100%
Waipa District	8%	8%	15%	22%	16%	20%	12%	100%	17%	13%	23%	17%	10%	7%	14%	100%
Otorohanga District	3%	10%	26%	15%	13%	5%	18%	100%	17%	4%	21%	17%	8%	8%	25%	100%
South Waikato District	12%	12%	22%	18%	9%	11%	16%	100%	31%	7%	21%	12%	10%	2%	19%	100%
Waitomo District	18%	10%	24%	16%	12%	10%	18%	100%	11%	14%	16%	22%	8%	3%	24%	100%
Taupo District	14%	14%	21%	10%	10%	10%	22%	100%	15%	19%	20%	12%	10%	3%	20%	100%
Western Bay of Plenty District	10%	10%	17%	17%	12%	20%	13%	100%	19%	10%	26%	17%	7%	5%	14%	100%
Tauranga City	12%	11%	17%	16%	17%	20%	11%	100%	15%	8%	22%	15%	11%	6%	24%	100%
Rotorua District	10%	12%	18%	15%	15%	14%	16%	100%	19%	16%	18%	10%	10%	3%	25%	100%
Whakatane District	14%	7%	19%	16%	11%	14%	24%	100%	21%	11%	20%	13%	7%	7%	21%	100%
Kawerau District	7%	29%	21%	7%	7%	14%	29%	100%	17%	8%	17%	8%	0%	0%	42%	100%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Opotiki District	6%	13%	19%	13%	13%	6%	19%	100%	20%	20%	13%	7%	13%	0%	27%	100%
Gisborne District	12%	9%	21%	21%	15%	13%	15%	100%	21%	14%	13%	9%	9%	4%	27%	100%
Wairoa District	20%	13%	20%	7%	7%	7%	7%	100%	33%	22%	22%	0%	11%	0%	22%	100%
Hastings District	10%	11%	15%	15%	17%	16%	15%	100%	20%	12%	22%	9%	8%	5%	21%	100%
Napier City	8%	10%	24%	17%	13%	13%	13%	100%	19%	14%	23%	9%	8%	3%	22%	100%
Central Hawke's Bay District	17%	14%	17%	20%	9%	9%	20%	100%	11%	11%	33%	11%	11%	0%	22%	100%
New Plymouth District	12%	10%	17%	14%	15%	17%	14%	100%	21%	16%	16%	6%	11%	8%	19%	100%
Stratford District	22%	7%	19%	22%	15%	4%	22%	100%	31%	8%	15%	8%	8%	0%	15%	100%
South Taranaki District	11%	10%	17%	17%	16%	10%	14%	100%	18%	15%	28%	10%	5%	5%	20%	100%
Ruapehu District	22%	16%	15%	9%	9%	5%	20%	100%	16%	10%	19%	12%	12%	11%	19%	100%
Wanganui District	12%	13%	19%	16%	15%	12%	12%	100%	28%	20%	15%	7%	7%	0%	27%	100%
Rangitikei District	14%	17%	22%	17%	14%	10%	12%	100%	14%	17%	20%	20%	6%	3%	26%	100%
Manawatu District	12%	11%	21%	20%	15%	14%	15%	100%	14%	17%	17%	17%	11%	6%	17%	100%
Palmerston North City	9%	5%	20%	17%	20%	22%	12%	100%	23%	11%	20%	17%	11%	6%	15%	100%
Tararua District	20%	13%	27%	18%	7%	7%	16%	100%	21%	17%	21%	21%	4%	0%	17%	100%
Horowhenua District	18%	19%	15%	20%	10%	8%	15%	100%	28%	22%	19%	6%	6%	3%	22%	100%
Kapiti Coast District	11%	8%	17%	13%	16%	19%	14%	100%	16%	24%	18%	16%	5%	5%	13%	100%
Porirua City	5%	6%	12%	16%	19%	29%	12%	100%	18%	12%	17%	11%	7%	5%	30%	100%
Upper Hutt City	6%	6%	13%	23%	15%	25%	11%	100%	17%	14%	19%	11%	8%	6%	22%	100%
Lower Hutt City	7%	5%	16%	16%	16%	28%	12%	100%	23%	10%	18%	12%	12%	5%	18%	100%
Wellington City	5%	4%	10%	12%	15%	45%	9%	100%	11%	8%	14%	13%	14%	22%	17%	100%
Masterton District	10%	14%	19%	19%	13%	15%	10%	100%	25%	11%	22%	11%	6%	3%	22%	100%
Carterton District	11%	11%	19%	15%	22%	11%	7%	100%	17%	8%	33%	8%	8%	8%	8%	100%
South Wairarapa District	16%	16%	21%	9%	19%	7%	7%	100%	25%	8%	17%	33%	8%	8%	17%	100%
Tasman District	14%	14%	19%	17%	13%	12%	11%	100%	18%	17%	27%	13%	8%	3%	13%	100%
Nelson City	12%	11%	20%	18%	16%	15%	10%	100%	17%	13%	21%	14%	10%	5%	22%	100%
Marlborough District	12%	13%	20%	18%	14%	12%	9%	100%	14%	14%	24%	17%	10%	6%	16%	100%

Area	Owned $20,000 or Less	Owned $20,001 - $30,000	Owned $30,001 - $50,000	Owned $50,001 - $70,000	Owned $70,001 - $100,000	Owned $100,001 or More	Owned Not Stated	Owned Total	Rented $20,000 or Less	Rented $20,001 - $30,000	Rented $30,001 - $50,000	Rented $50,001 - $70,000	Rented $70,001 - $100,000	Rented $100,001 or More	Rented Not Stated	Rented Total
Kaikoura District	23%	8%	23%	23%	8%	8%	8%	100%	20%	13%	20%	27%	13%	0%	13%	100%
Buller District	19%	19%	18%	16%	10%	6%	13%	100%	27%	14%	20%	13%	5%	3%	17%	100%
Grey District	14%	13%	20%	18%	13%	9%	11%	100%	24%	16%	20%	13%	8%	4%	15%	100%
Westland District	15%	13%	19%	17%	16%	10%	11%	100%	19%	12%	21%	16%	10%	6%	15%	100%
Hurunui District	14%	14%	22%	16%	9%	8%	16%	100%	22%	15%	24%	13%	11%	4%	13%	100%
Waimakariri District	10%	11%	20%	18%	14%	16%	11%	100%	14%	11%	30%	11%	10%	6%	18%	100%
Christchurch City	11%	12%	19%	17%	13%	16%	11%	100%	17%	13%	21%	13%	11%	5%	19%	100%
Selwyn District	9%	8%	20%	18%	17%	16%	12%	100%	12%	10%	19%	18%	16%	8%	19%	100%
Ashburton District	10%	11%	20%	20%	16%	13%	10%	100%	17%	10%	28%	17%	9%	7%	13%	100%
Timaru District	12%	12%	21%	19%	14%	11%	11%	100%	26%	16%	22%	13%	6%	2%	18%	100%
Mackenzie District	19%	15%	25%	13%	13%	6%	15%	100%	26%	23%	19%	16%	6%	3%	10%	100%
Waimate District	23%	20%	18%	13%	8%	6%	13%	100%	22%	7%	26%	11%	7%	4%	11%	100%
Waitaki District	14%	18%	22%	19%	11%	7%	10%	100%	23%	16%	26%	12%	4%	4%	17%	100%
Central Otago District	12%	14%	21%	20%	13%	9%	10%	100%	11%	16%	25%	18%	12%	4%	13%	100%
Queenstown-Lakes District	8%	8%	16%	15%	15%	25%	11%	100%	5%	7%	16%	18%	18%	21%	13%	100%
Dunedin City	10%	10%	18%	18%	16%	16%	12%	100%	20%	17%	22%	14%	8%	4%	15%	100%
Clutha District	13%	12%	23%	19%	14%	9%	11%	100%	13%	13%	26%	19%	10%	6%	15%	100%
Southland District	11%	11%	20%	19%	15%	14%	10%	100%	12%	11%	25%	18%	13%	8%	12%	100%
Gore District	12%	13%	21%	21%	14%	8%	11%	100%	25%	12%	21%	14%	9%	3%	17%	100%
Invercargill City	10%	11%	19%	19%	17%	12%	11%	100%	21%	17%	22%	11%	6%	3%	18%	100%
Total	10%	10%	18%	17%	15%	18%	12%	100%	17%	13%	20%	13%	10%	7%	19%	100%

1. Shading of income levels shows income type for Target groups (low income home owners, middle income home owners, high income home owners and rental properties).

Appendix H: Emissions and Socio-Economic Spatial Model user guide

Appendix I: Cost Model user guide

Introduction

The purpose of the Cost Model is to assist councils to design an incentives programme by estimating the costs of incentivising households to cleaner heating options for a range of programme types and subsidy levels. The model is an excel workbook and includes calculations to ascertain costs to councils, householders and EECA costs associated with conversions but does not include other costs such as marketing and publicity material, databases or staff time except to the extent that these costs may be recovered through use of a administration fee. Its intended use is for project design purposes and results should be treated as indicative only. It is not a financial model for accounting or rating purposes. The Cost Model is available at www.niwa.co.nz/our-science/atmosphere/research-projects/all2/envirolink/air-quality.

The Cost Model can be used in two ways:

- The amount of council funding available for the programme is inserted into the workbook and the output is the number of households that can be converted based on different assumptions regarding EECA uptake, programme splits or subsidy levels, or;
- The number of households that you wish to incentivise are inserted into the workbook and the output is the cost of the programme split by councils, EECA and householder for different programme types or subsidy levels.

The model automatically runs both of these outputs. Ignore the outputs from the mode that is not of interest.

The optional incentives programme types included in the Cost Model are:

- Full subsidy.
- Fixed cost to homeowner (insulation and clean heat conversion).
- Partial subsidy.
- Interest free loan.
- Landlord subsidy Clean Heat.

Estimates of the cost splits for a non-interest free loan can also be made by adding the council cost to the householder cost for the ‘interest free loan’ output.

All incentives programme types are detailed within tables contained in the body of this Good Practice Guide with the exception of the fixed cost to homeowner programme (insulation and clean heat conversion) that is discussed in section 2.1.5 of this Good Practice Guide. This programme type is most like the full subsidy programme in that council takes responsibility for insulating the house and providing clean heat, with the exception that the homeowner contributes a fixed amount towards the cost.

Description of the Cost Model workbook

The excel workbook contains five worksheets:

- Instructions – provides instructions on how to use the Cost Model.
- Inputs – contains all the data used in the calculations.
- Outputs – contains a summary of the costs or household numbers by programme type.
- Cost output by Heating Type – displays a breakdown of the costs by programme type and by heating choice.
- Interest free loan $NPV – contains the calculations for distributing the cost of an interest free loan by council and householder.

Step by Step Instructions

1) Enter the council budget into Cell C6 or the number of households to be targeted into cell H6.
2) Enter the data for the blue highlighted cells as detailed below.
3) Review the default parameters described below and change as desired.
4) Check all green shaded cells add to 100%. If not, select the green cell and a text box will appear advising which input parameters need changing.
5) Review outputs in 'outputs' worksheet to obtain cost of the programme (Table 2.2 in the worksheet) or number of households to target (Table 2.1 in the worksheet).

Input data:

The input data that requires user decisions are highlighted in the Cost Model in blue in the "inputs" worksheet. These include:

- Total council budget (cell C6 – Table 1.1) – this is the total Council budget available for the incentives programme. This is primarily used if your desired output is to determine the number of households that can be converted within the budgeted amount. However it may also be used to evaluate the impact of changing subsidy levels etc. The value in this cell impacts on Table 2.1 of the "output" worksheet This cell can be left as zero if your desired output is to determine the cost of converting a fixed number of houses (i.e., input data into Table 1.2).. OR
- Total household numbers (cell F6- Table 1.2) – this is the total number of households you wish to convert within the incentives programme. This is the required input parameter if you wish to evaluate the cost of converting a specific number of households. The value in this cell impacts on Table 2.2 of the "output" worksheet. If this is not your objective then any value above zero can be left in this cell. Council programme split (cells J6 – J10 – Table 1.3) – this is the proportion of households to be incentivised using different programmes. Note that the model has been set up to allow for different incentives amounts to be used for landlords versus homeowners for a partial subsidy. However, if these groups are treated the same within a programme then they can both be included under the partial subsidy programme (in which case you would set the landlord proportion to zero) or you can allocate a proportion of the programme to each and set the value amounts to be the same in

the council funding section. The sum of the programme splits should equal 100% (J11).

- Council funding for incentives (cells M6– M11 – Table 1.4) – this is the amount of subsidy offered for different incentives programmes. Insert the amount of funding that you have available for each household within the different programmes.
- Community services cardholders use by home ownership (householders) (cell Q13- Table 1.9) – this is the proportion of homeowners that have community services cards. Emission and Socio-Economic Spatial Model ESESM (see section 5 and Appendix G) can be used to provide an estimate of the proportion of homeowners that may have a community services card within the specific airshed being incentivised. Default data (35%) has been inserted in cell Q13 based on the proportion of owned houses across NZ where households use wood for heating and have a household income of less than $50,000.
- Community services cardholders use by home ownership (tenanted properties) (cell Q14- Table 1.9) – this is the proportion of tenants that have community services cards. ESESM can be used to provide an estimate of the proportion of homeowners that may have a community services card within the specific airshed being incentivised. Default data (48%) has been inserted in cell Q14 based on the proportion of rental houses across NZ where households use wood for heating and have a household income of less than $50,000.
- Proportion of households with no EECA grants (cells D-G, row 12 – Table 1.6) – an estimate is required of the proportion of households that may take up the programme that will not be eligible for EECA funding. These will include houses built after 2000 and households wanting an incentive for Clean Heat conversions who need to insulate to be eligible for EECA funding but do not wish to insulate. This is likely to be lower for the Full Subsidy Homeowner Contribution programme because the cost to householders is fixed and independent of the total cost of the retrofit. However, for other programmes the additional cost of insulating may restrict programme uptake to Clean Heat if this is an option that a Council chose to allow. Insert the estimated proportions in cells D-G, row 12 (Table 1.6). A judgement call is required for this component as default data currently contained in the spreadsheet have no basis. The key factor influencing this is the proportion of households likely to be unwilling to pay the “top up” amount required to insulate, which could be significant.
- The proportion of EECA funded households that want insulation only (cells D-G, row 21 – Table 1.6) – It is likely that only a very small proportion of households will use a Council incentives programme for insulation only. The reason for this is that a Council will most likely require the removal of a solid fuel burner. The proportion has been set to a default of 2% to allow for households converting from an unused heating system. To change from 2% go to the “name manager” (in the formulas function) and selected the cell named “EECAinslOnly”. Under “refers to” at the bottom of the box (just above the “close” button) change 0.02 to your preferred percentage.

Other input variables (not highlighted) can be changed when the user has airshed specific data or the default variables can be used:

These input variables include:

1. The average cost of insulation and heating choices (cells Q–V, row 6. Table 1.5).
2. The value of the administration component of the programme that is passed on to householders or paid by Council (cells Q–V, row 7. Table 1.5).
3. The proportion of full subsidy households eligible for EECA funding and the type of EECA funding (cells C –G rows 43 -47. Table 1.6).
4. Proportion of households with no EECA grants that want insulation only (cells C-G, row 18 -Table 1.6).
5. Proportion of households with no EECA grants that want insulation and clean heat (cells C-G, row 19 Table 1.6).
6. The types of heating methods selected by households (cells C–G, rows 34 – 38, Table 1.10).

The default variables have been set as follows:

1) The type of heating methods selected by households has been set based on the average appliance choice across the ECan Clean Heat programme. (Cells C34:G38, Table 1.10)
2) The average cost of heating methods and insulation is based on cost tables from section 6 of this report, the Energy Efficiency and Conservation Authority and from information supplied by existing Council programme coordinators. (Cells Q6:V6, Table 1.5)
3) The value of the administration component has been derived based on information supplied by existing Council programme coordinators. (Cells Q7:V7, Table1.5)
4) Default input parameters for the full subsidy programme assume that all households will take up both insulation and clean heat components and that all households will be eligible for EECA funding based on 100% having community services cards. The reasoning for this is that Councils will be directing any full subsidy programmes towards those most in need. Data can be changed if this assumption is not valid for the programme being designed. (Cells C12:C28, Table 1.6)
5) Proportion of households with no EECA grants that want insulation only has a default value of zero as only houses built after 2000 are not eligible for EECA insulation grants and these places should be adequately insulated. (Cells C18:G18,Table 1.6).
6) Proportion of households with no EECA grants that want insulation and clean heat (cells C-G, row 19 – Table 1.6) has a default value of zero as only houses built after 2000 are not eligible for EECA insulation grants and these places should be adequately insulated.

Cost Output by Heating Type:

This sheet provides a breakdown of costs by heating type chosen and by programme type. As with the outputs spreadsheet costs are also segregated into who the cost is met by and the total cost.

Other advice to consider when running the cost model:

Research undertaken in the development of this Good Practice Guide found that the most cost effective option for Councils is the partial subsidy and landlord subsidy. However the uptake for subsidy type incentives is most likely limited to high income households. Middle

income households appear to prefer interest free loans, therefore if a Council required a high uptake for their incentives programme then a more appropriate programme might be focused on interest free loans or provide the option of an interest free loan or a partial/ landlord subsidy.

The Cost Model can be used to determine the differences between providing for insulation as well as clean heat appliances. The advantage of providing for insulation is that costs may be met in part by EECA and the programme also contributes to energy efficiency objectives and warm homes objectives. The disadvantage is that the programme becomes significantly more costly, although a large proportion of the extra cost may be met by EECA funding.

For example, if a Council decided to target 50 households by providing for clean heating appliances through a partial subsidy of $500 then the total cost of the project would be around $185,000 (based on default input parameters) if insulation was not a requirement of the programme. The cost to Council would be around $25,000 and householders would pay $160,000. If insulation were also a requirement then the total cost of the programme is $306,000 with EECA contributing around $90,000 and the cost to householders is around $192,000. Research undertaken in the development of this Good Practice Guide found that the most cost effective option for councils is the partial subsidy and landlord subsidy. However the uptake for this incentives type is most likely limited to high income households. Middle income households appear to prefer interest free loans, therefore if a council required a high uptake for their incentives programme then a more appropriate programme might be focused on interest free loans or provide the option of an interest free loan or a partial/ landlord subsidy.

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