

Improving our Existing Homes – Retrofitting New Zealand’s Housing Stock



CHRANZ Housing Forum - Housing in an Ageing Society,
Wellington, New Zealand, 9 November 2009



Creating homes and neighbourhoods that work
well into the future and don't cost the Earth

NZ Housing

An average 6°C below WHO recommended minimum temperatures in winter

45% have visible mould

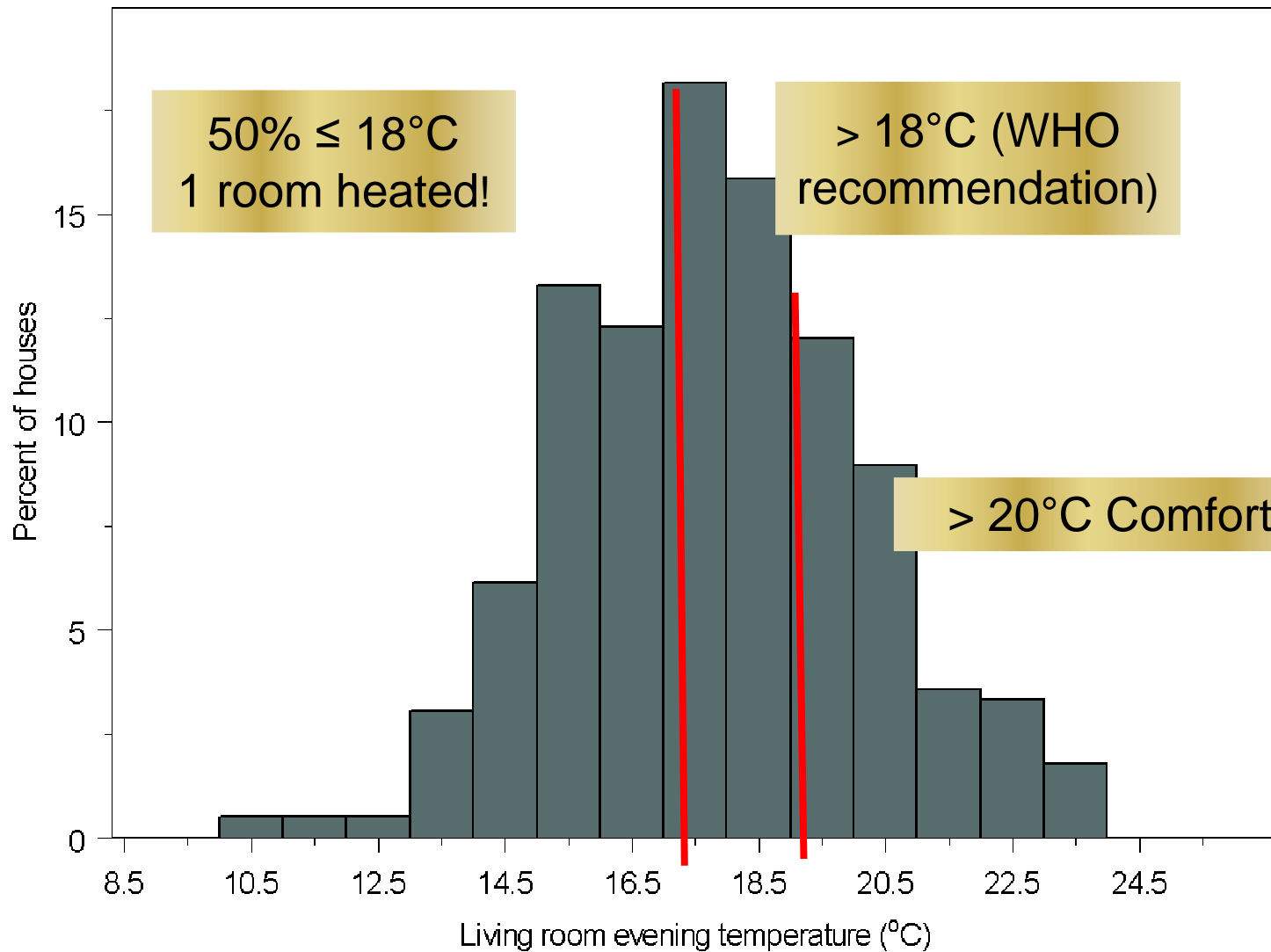
300,000 homes heated by unflued gas heaters

Implicated in our high rates of asthma, high winter mortality rate (1600 excess deaths/year)

AND

Many new houses still perform badly

New Zealand Homes Are Cold



Why are these things important?

Temperatures below 12°C affect heart function

Temperatures below 16°C affect respiratory function

Relative humidity impacts on growth of pathogens eg bacteria, viruses, mould; mite growth; chemical interactions; and respiratory infections

Our damp and mouldy (45%) homes occur across all socio economic groups and demographics

Many furnishings, finishes, glues, and building materials offgas VOCs – very toxic and cumulative impacts





What is a Sustainable Home?

One which works well now
and into the future
and doesn't cost the earth..

But what does this mean?



Performance is interdependent



What about affordability?

New homes are normally built to Building Code minimums – yet often fail to deliver a healthy environment and affordable living costs

Many aspects (passive solar design and ventilation, high efficiency fittings) come at no extra cost but standard practice is not to include them

Instead NZ practice is to increase the size of dwellings – and increasing also bedroom nos, yet occupancy is dropping

Even allowing for increased occupancy, larger homes consume more energy – and cost more to operate

Housing Typologies and Retrofit

Exploring a range of house types that make up >80% of New Zealand's housing stock

1. Villa (1880 - 1920)
2. Bungalow (1920 - 1930/40)
3. Art Deco (1925 - 1940)
4. State Housing / mass housing (1940 - 1960)
5. Pre 1960 Multi Unit Housing (1950-60s)
6. 1960/70 Multi Unit Housing (1960-70s)
7. Mass Housing (1970 - 1978 pre-insulation)
8. Mass 80's Housing (1978 - 1989)
9. Multi-unit housing 1980-90s
10. Early 90's (1990 - 1996 pre re-vamped building code)
11. Last decade housing (1996 - 2007) (post insulation upgrade)
12. Multi-unit dwellings (2000 - 2009)



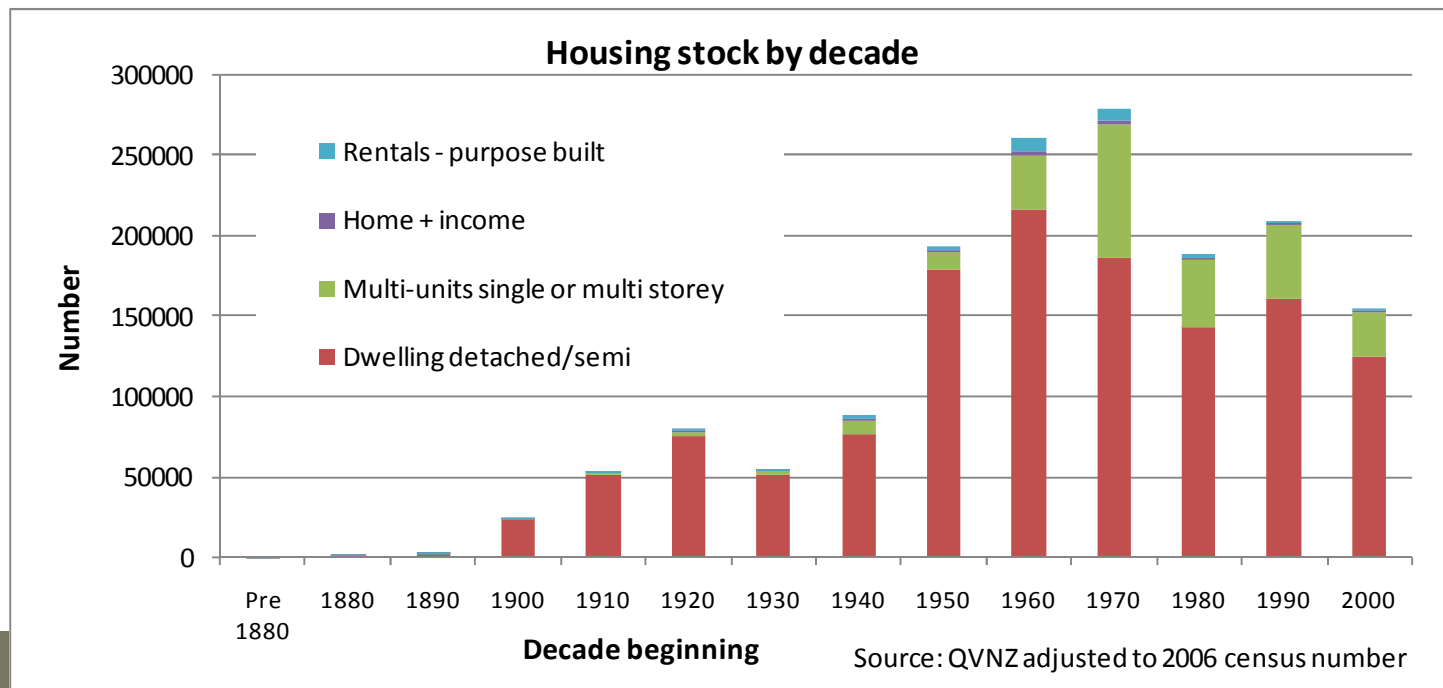
Typologies... the numbers game...

Typology summary

Numbers as at March 2006

Number of dwelling units (000)

	Art Bungalow	Mass housing	Multi units	Multi units	Mass housing	Multi Housing	Multi Housing	Multi Housing	Multi Housing	Total			
Villas	1920-36	1925-40	40s-60s	Pre-1960	1960-70s	1970-78	1978-80s	1980-90s	1990-96 post 96	2000s			
	86	113	18	479	34	133	151	182	68	112	201	28	1606



House Typology – selected findings

1970's Housing (1970 – 1978 pre-insulation)

- Large numbers, built before insulation required
- Variable cladding (asbestos fibre cement, stucco, concrete, plastics, weatherboard...)
- First aluminium, some glazing floor to ceiling, sliding doors
- Skillion roof... Exposed ceiling rafters... Retrofit... Renovate?



Beacon's Research Existing Homes

Papakowhai Renovations
Home*Smart* Renovations



Papakowhai Renovations

Suburb of Papakowhai, Wellington chosen:

- Predominantly 1960s-70s homes (pre-insulation)
- Era thought to be difficult for energy retrofit
- Middle income suburb
- Range of households and dwellings selected
- 10 homes initially, 1 pulled out

Pre-retrofit evaluation & monitoring

- House condition survey
- Temperature, humidity, energy, water use from mid 2006

2 post retrofit winters to measure take-back







Key Findings

A basic level of retrofit – or even the higher spec Warm Up NZ subsidised retrofit does make a difference BUT

Wall insulation/double glazing is needed to get healthy temperatures and reduce damp

Efficient heating needs to be included alongside full insulation to achieve energy efficiency gains



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Key Findings

Solar and instant gas hot water systems led to significant electricity savings – but instant gas was largely a fuel switching measure

Low flow shower heads need to accompany hot water conversions – switch from low pressure to high pressure systems

Hot water cylinder wraps & pipe lagging can be effective even on A grade cylinders

Low flow devices will reduce water use – but for substantial benefits a rainwater tank is needed



Case Study: House 10

Full insulation + double glazing + efficient wood burner

+15% heating energy use (wood burner) but -23% reticulated energy use

+2.5 °C mean minimum temperature overnight in family room and +2.9 °C mean minimum temperature overnight in bedroom

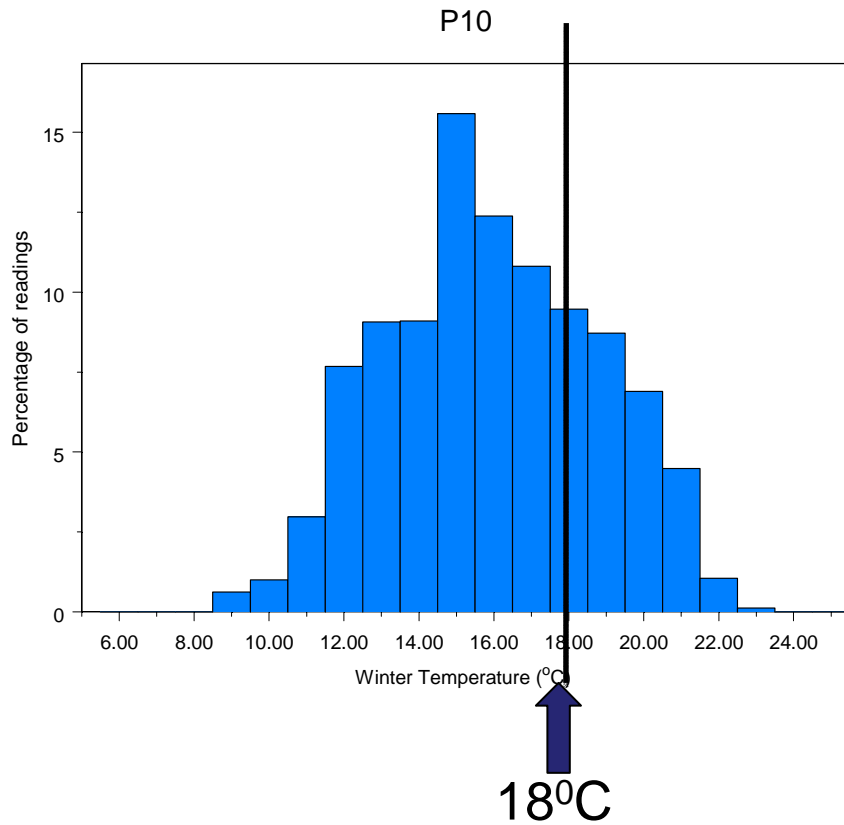
Mean temperatures above 18 °C (family room) and 15.7°C bedroom) overnight in winter

Heat transfer system could result in further improvements in bedroom temperatures

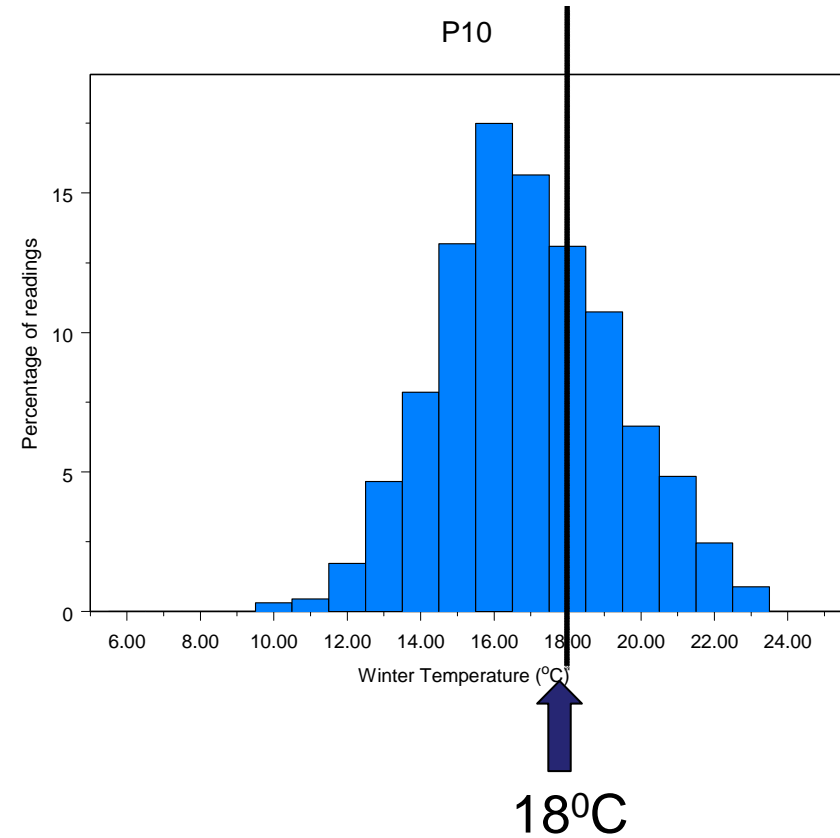


P10 Family Room Temperatures

Winter 2006

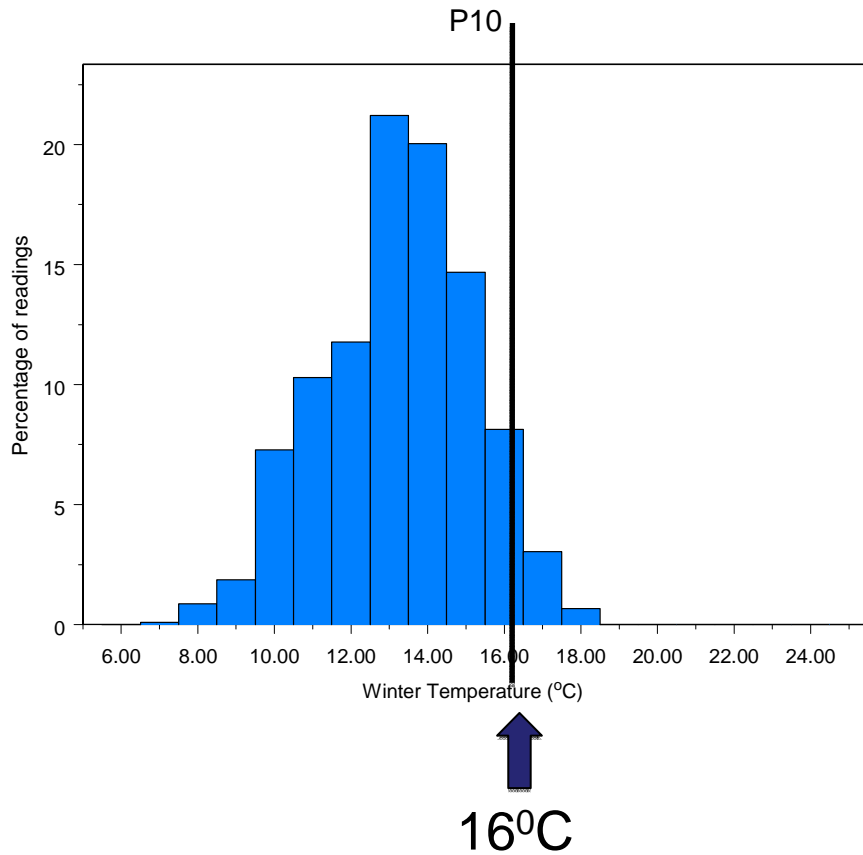


Winter 2008

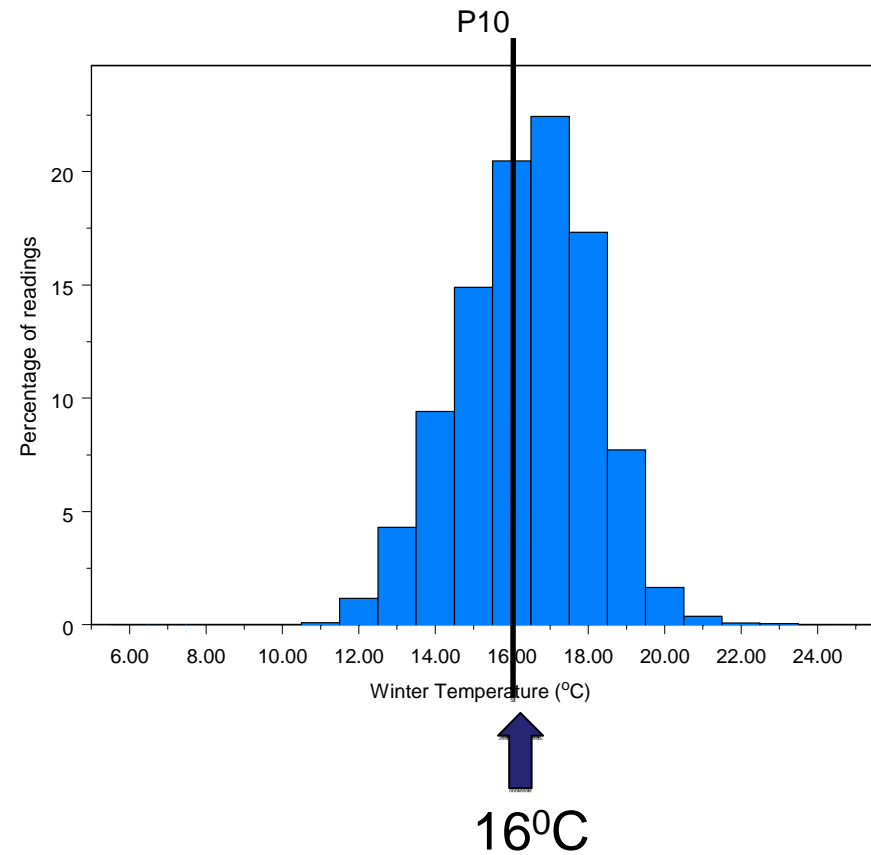


P10 Bedroom Temperatures

Winter 2006



Winter 2006



Retrofit for better performing homes

Technical appliance solutions for
'problems' not the way to go

Get the whole house to perform well

Consider a 'pathway' to sustainable
performance

A long term plan for the whole
house

Your Fuel Fuel Account - Estimate Reading

Estimated Payment Based Upon Last Account	\$ 475.00
Energy Release of Your Last Account	\$ 475.00 Cr
Service Discount - Thank You rate set by utility	\$ 0.00
Energy Estimate	\$ 0.00
Account Summary	
Current Natural Gas Charges (refer over for details)	\$ 188.52
All Electricity Charges (refer over for details)	\$ 250.23
Payment Discount	\$ 43.87 Cr
Total (refer over date 26 Aug 2008)	\$ 438.75
Net (paid by date 26 Aug 2008)	\$ 394.88
(\$43.87 refer over for details)	
After Prompt Payment Discount \$43.87	
We charge	
If last account payment is received by	



Plan basics... Thermal Envelope

Ceiling insulation top-up to high value (min R3.2 – ideally R5 or greater)

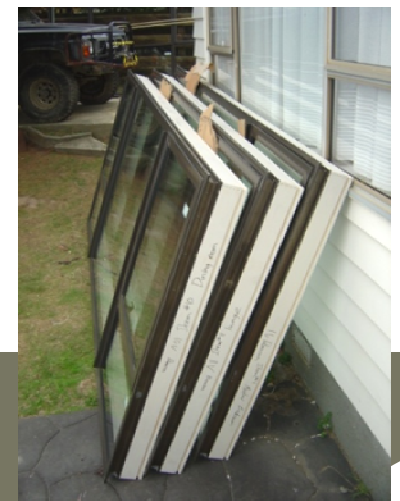
Skillion roof package (batten exposed rafters, insulate, plasterboard)

Under-floor insulation (bulk R2)

Curtains and thermal drapes, pelmets, basic draught stopping

Wall insulation (start with Sth facing walls for bedrooms / living spaces then other walls)

Secondary or double glazing starting with South facing windows



Plan basics... Space Heating

Aimed at reducing reticulated energy
(resilience and \$\$)

Efficient wood burner meeting MfE air
quality standards

Efficient wood pellet burner

Efficient Heat Pump with energy star rating

Get rid of un-flued gas heaters

Heat transfer system (to move the heat)



Plan basics... Water

Solar hot water system

Hot water heat pump

Cylinder wrap and pipe lagging

Low flow shower head/flow restrictors

Tap aerators on hot taps

Energy AND water savers...

Rainwater tank 2000 litres +
(garden/laundry/toilet)



Plan basics...Ventilation & Moisture

Modern houses are very tight – ensuring adequate ventilation is a key issue.

Wet area ventilation is key (bathroom, laundry, dryer, kitchen)

Underfloor vapour barriers are a cheap and effective way of reducing damp

The house should be able to be passively vented (window stays, strips in windows)

Outdoor undercover clothes line is a cheap and effective retrofit measure



Household Waste

Provide for good waste disposal behaviour to be easy

Space for recyclables storage near the kitchen (20 litres min)

Space for organic waste in the kitchen (5 litres min)

Compost/worm bin /communal composting



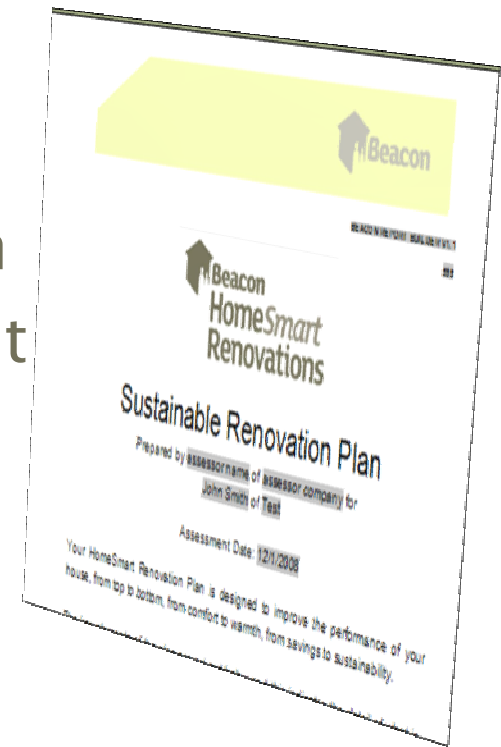
HomeSmart Renovation Project

Taking research findings have developed a range of tools, guidelines, procedures and training materials for sustainable renovation

Working with key community retrofit partners

Taking tools and guidelines and piloting in a 600 home renovation project across New Zealand

Homes monitored against Beacon's HSS[®] benchmarks

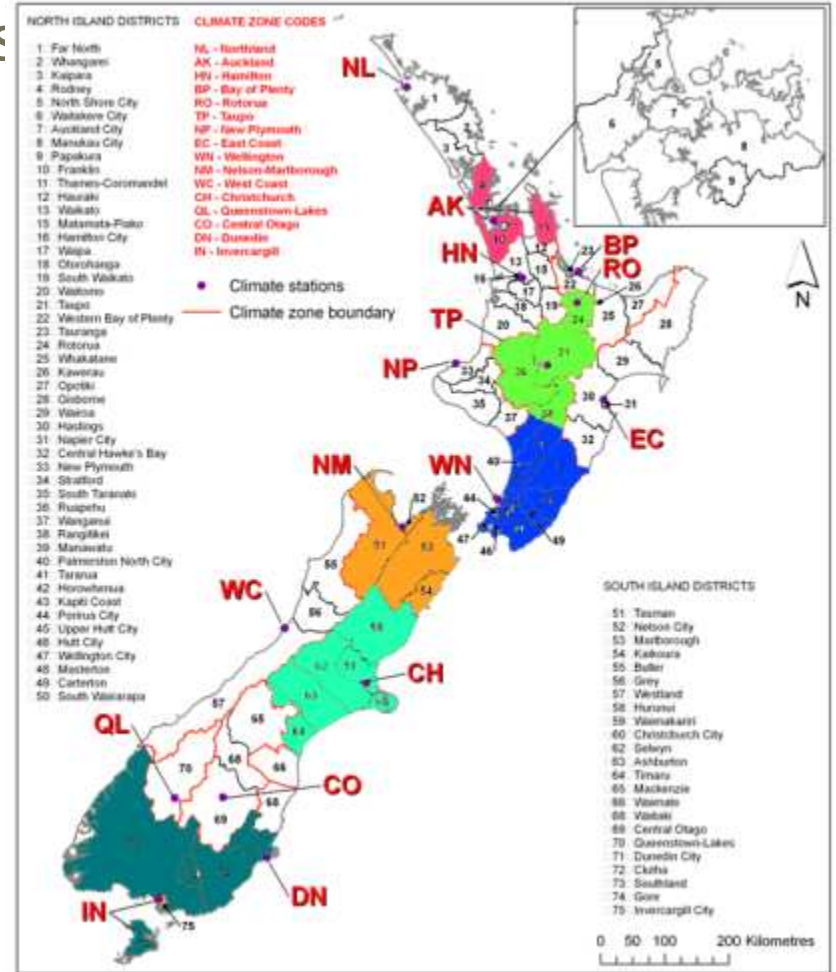


Pilot Locations

Houses in six locations across New Zealand

Locations based on EECA Home Energy Rating Scheme (HERS) Climate Zones

- Auckland Region
- Rotorua/Taupo
- Wellington
- Nelson/Marlborough
- Christchurch
- Dunedin/Invercargill



Households

Sample across household income range

- \$0-\$50,000
- \$50,000 - \$100,000
- \$100,000 +

Renovations funded by homeowners – but accessing subsidies and assistance where available eg Energywise, WarmUp NZ, Solar/Heat Pump Hot Water subsidies as well as local incentives e.g. Clean Heat and water efficiency programmes

Who is participating?

Requirement that people intend to renovate in the next year in order to participate – so interested *and* able to fund

Household profiles

- 2/3 aged 31-50 years
- **58% have household incomes >\$70,000;**
74%>\$50,000
- 62% households with 3 or more people
- **90% households with no-one older than 65**
- 75% households with no pre-school children



Questions?



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