

# Sustainable Air Quality in Auckland:

## Domestic Fires

Kevin Mahon

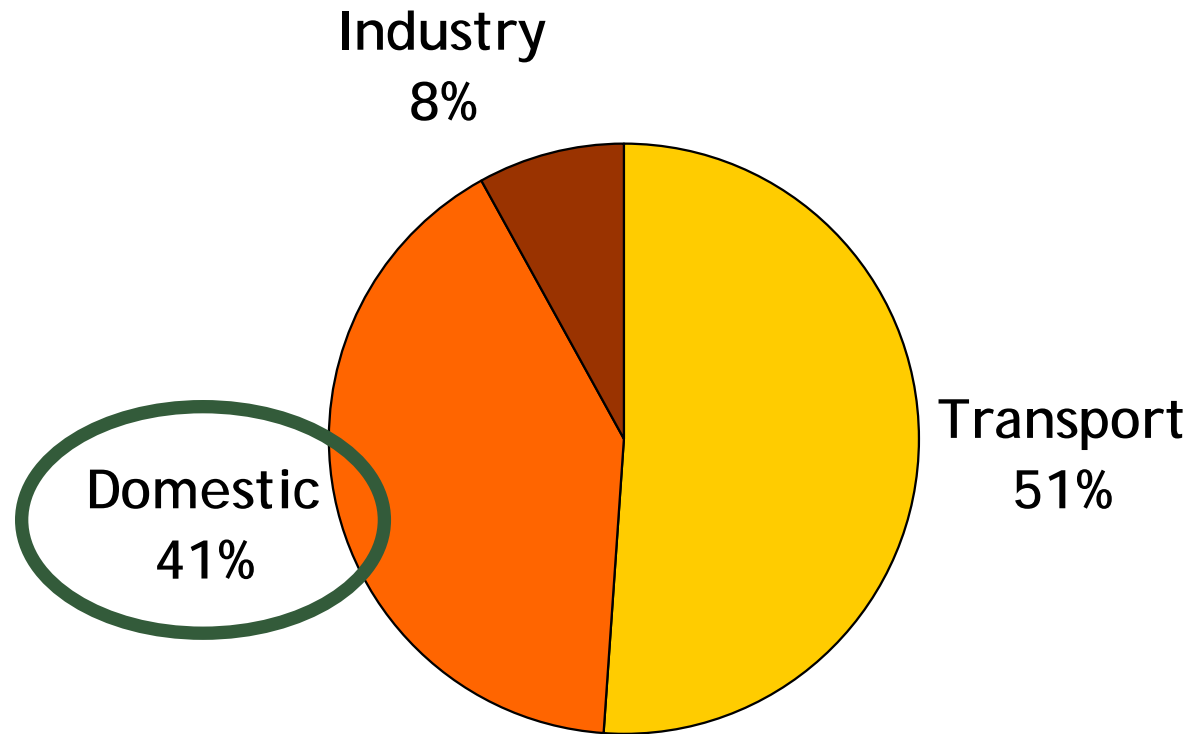
NZSSES AQ Seminar

18 September 2009



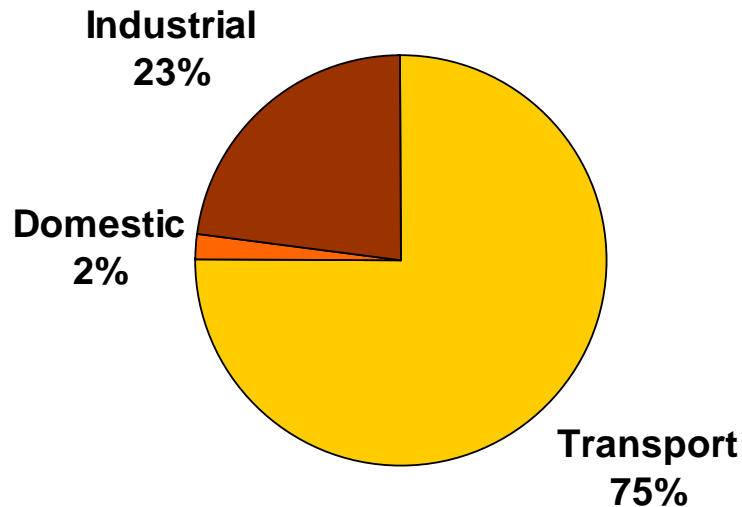
Auckland  
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# Contribution of Domestic Fires to PM<sub>10</sub> Emissions in Auckland



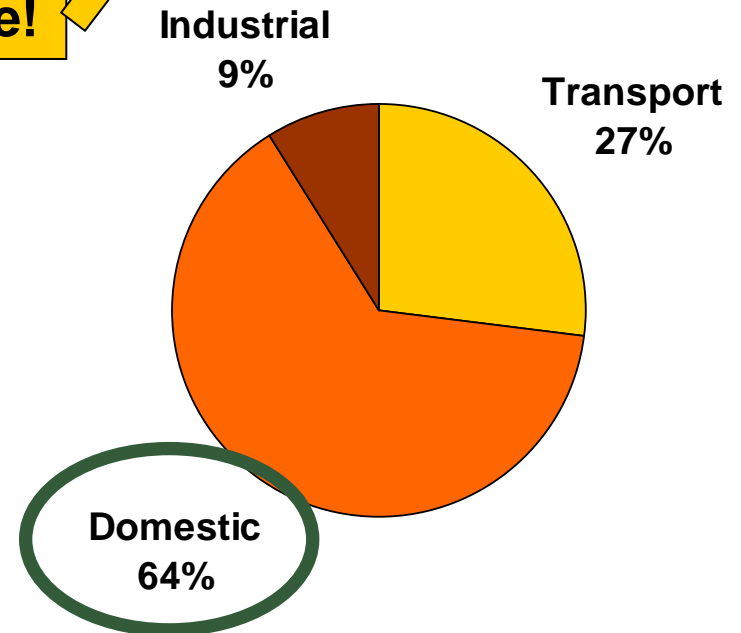
# But Emissions Vary Strongly with Season

**Summer PM<sub>10</sub>  
Emissions in 2004  
10 t/weekday**



**Winter PM<sub>10</sub>  
Emissions in 2004  
30 t/weekday**

**3 x more!**



# Concentrations Depend on Emissions and Meteorology

**Good Dispersion**  
e.g. windy, warm



**Poor Dispersion**  
e.g. calm, inversion, cold



# Domestic Fires Outline

- Where have we come from?
- Where are we now?
- What are the targets we need to achieve?
- What is the future looking like?

# Managing Domestic Fire Emissions

Clean  
Fuels

Operation &  
Maintenance

Demand  
Management

Clean  
Appliances

# History – Domestic Fuels

Pre 1970s - wood and coal (but low S <0.3wt%)

Early 1970s - reticulated natural gas arrived in Akl

From 1980s - increased use of electricity for heating

Early 2000s - wood pellets available

Clean Air Act 1972 regulated fuel quality in other NZ locations but not in Auckland as it wasn't a Clean Air Zone

Auckland Regional Plan: Air Land Water 2001 bans burning of "treated" wood/waste or fuels with S >0.5wt% or moisture >25%

# History – Solid Fuel Appliances

1900s - open fires, coal ranges

1960s - early woodburners

2000s - pellet burners, AQNES woodburners (2005)

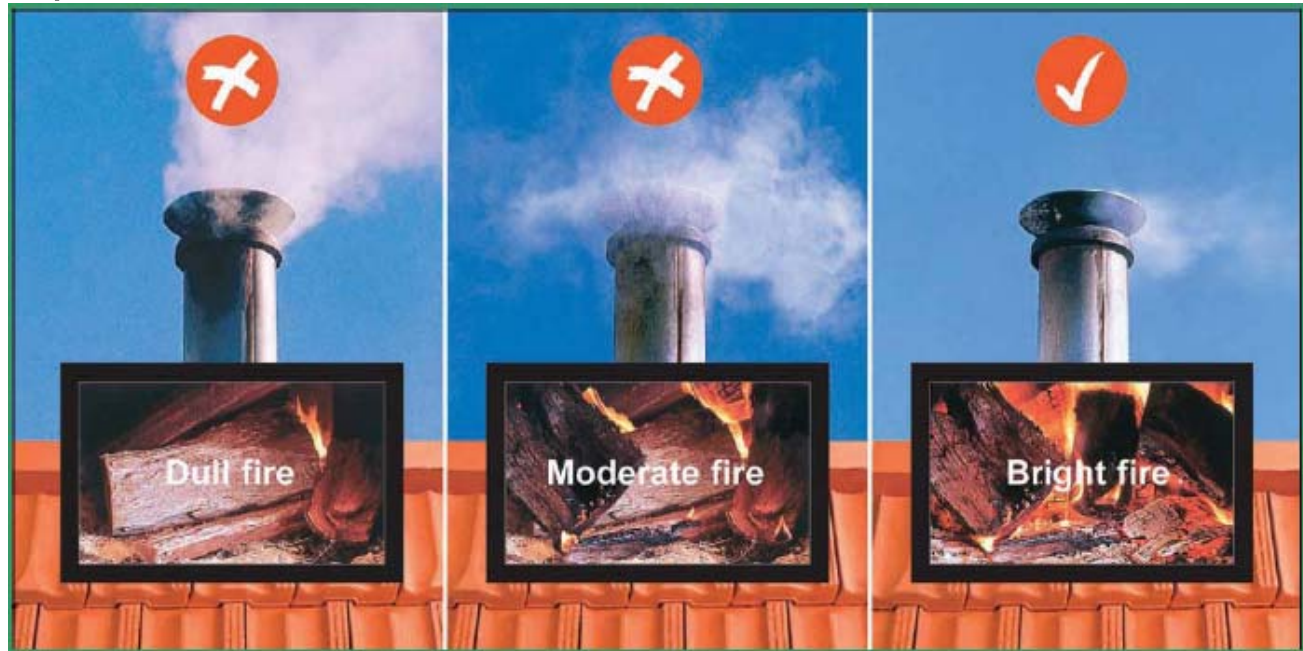
AQNES 2005 requires all woodburners installed on sections up to 2 hectares to emit no more than 1.5g PM<sub>10</sub>/kg wood

Auckland Regional Plan: Air Land Water 2001 requires all solid fuel appliances in urban, coastal and industrial to emit no more than 4.0 g PM<sub>10</sub>/kg fuel. This essentially bans most new potbellies, coal ranges and open fireplaces.



# History – Domestic Fire Operation

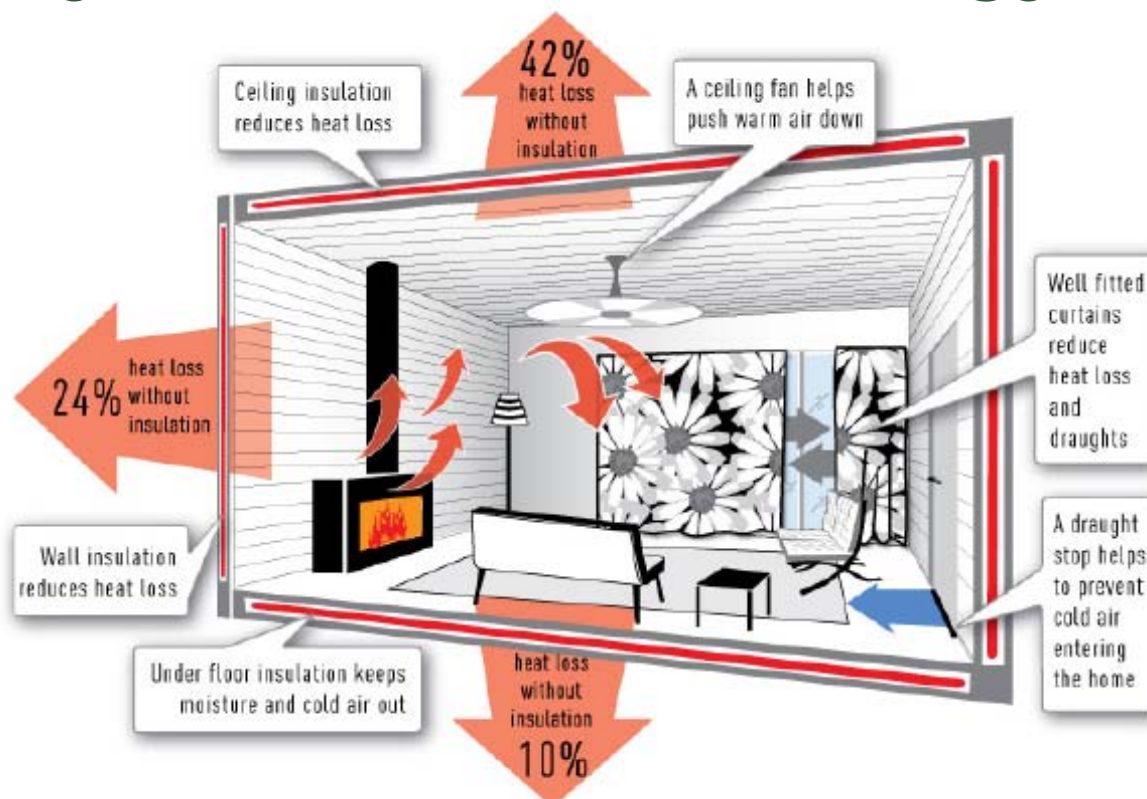
Damping down of fires used to be standard but the new appliances are tamper-resistant.



Source: Western Australia, Department of Conservation

Apart from pellet fires, very difficult to ensure good practice as lots of variables – fuel size, quality, feed rate etc. Education the key!

# History – Demand (= Energy) Mgmt



Source: ARC, NZ Home Heating Association

A combination of the “household insulation efficiency”  
plus “heating appliance efficiency”

# History – Demand (= Energy) Mgmt

Save \$\$\$

A fully insulated home requires 50% less heating.

## Energy Efficiency

Heat pump	300% to 400%
Electric heater	100%
Pellet burner	Average 80%
Flued gas heater	Average 70%
NES compliant woodburner	65% to 80%
Heat recirculating open fire	35 to 50%
Open fire	Less than 15%

Minimum insulation standards for Climate Zone 1 which includes Akl

Insulation Type	R-value of 1978 - 2008 Std	R-value of new Std (2008)
Ceiling	1.9	2.9
Walls	1.5	1.9
Floor	1.3	1.3
Windows	-	0.26
Skylights	-	0.26

Source: ARC

Big improvements have been made in appliance and insulation efficiency

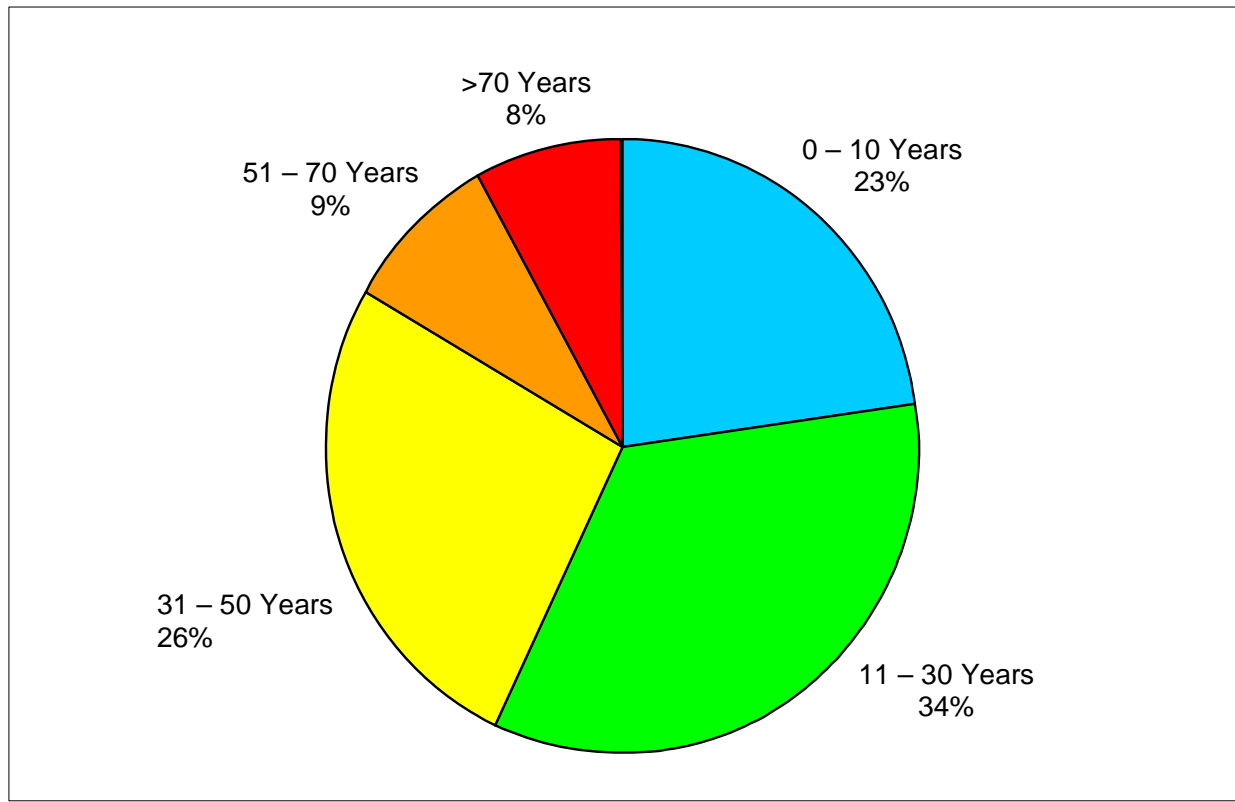
# Current Auckland Homes

- Have indoor environments that are cold\*, damp, mouldy and/or poorly ventilated
- Use high polluting heating appliances
- Are poorly insulated and use inefficient methods of domestic home heating

\* WHO recommends minimum indoor temperature of at least 18°C during winter

# Age of Auckland Homes

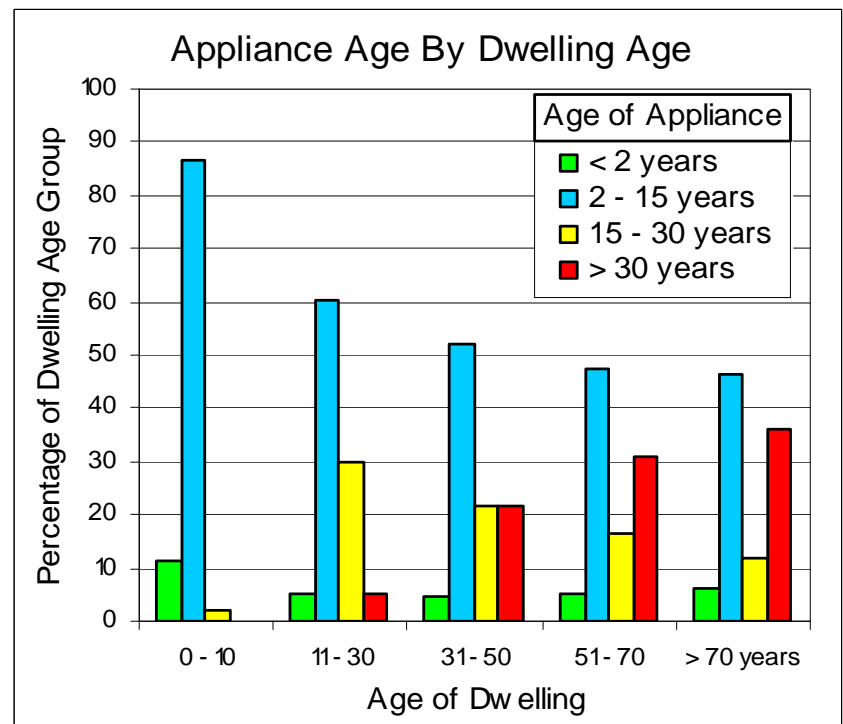
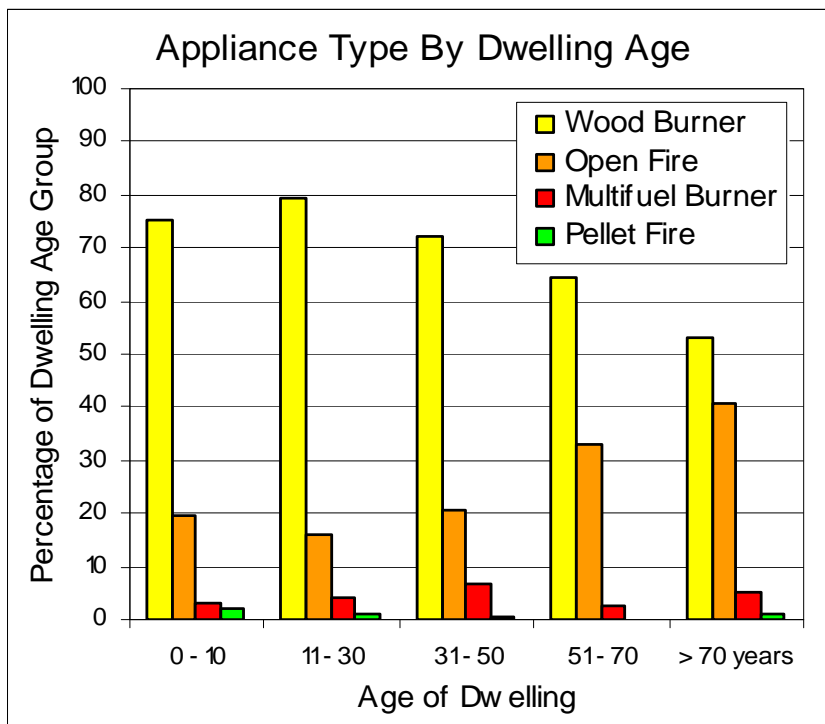
More than 43% of Akl homes built before 1978 insulation standard



Source: ARC Home Heating Survey 2007

# Age of Auckland Appliances

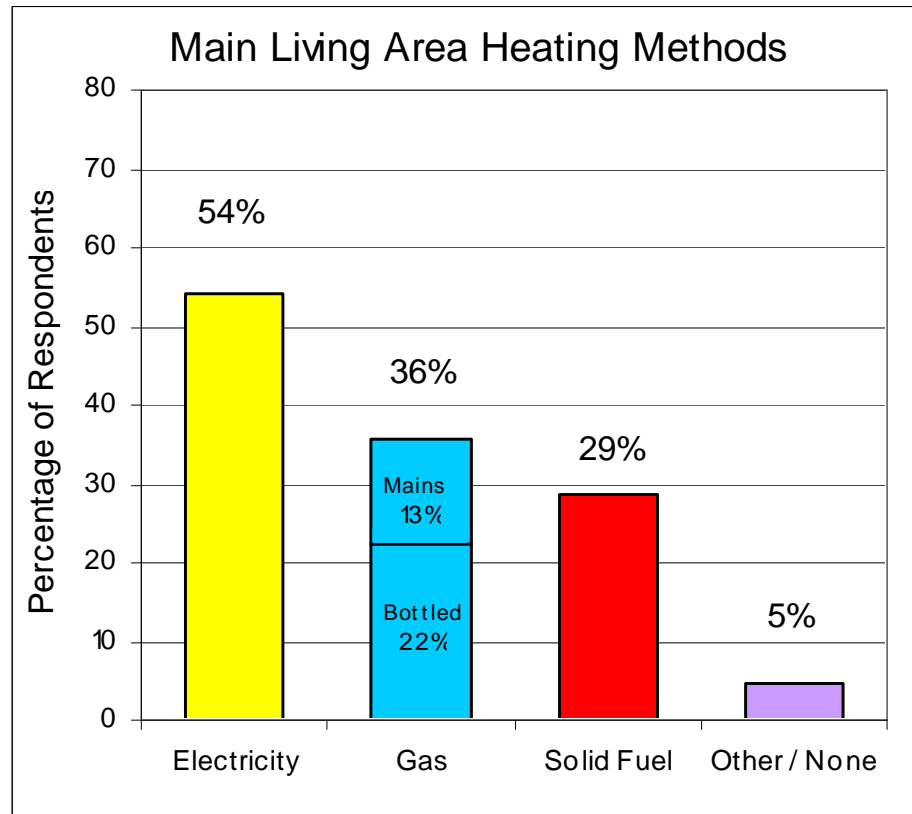
Older homes are more likely to have older & more polluting appliances



Source: ARC Home Heating Survey 2007

# Method of Home Heating 1

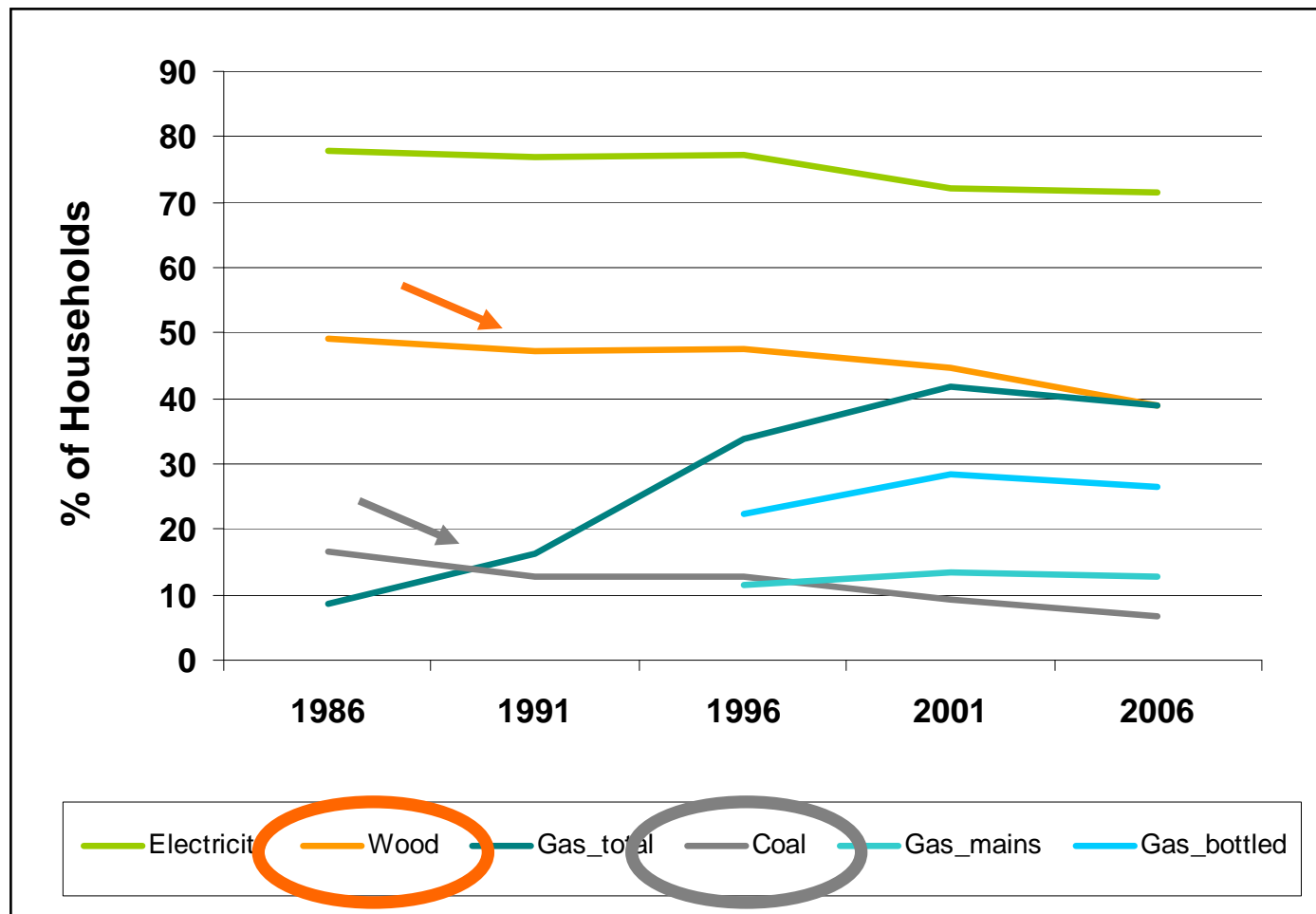
29% of Akl homes still use solid fuel (wood or coal) heating



Source: ARC Home Heating Survey 2007

# Method of Home Heating 2

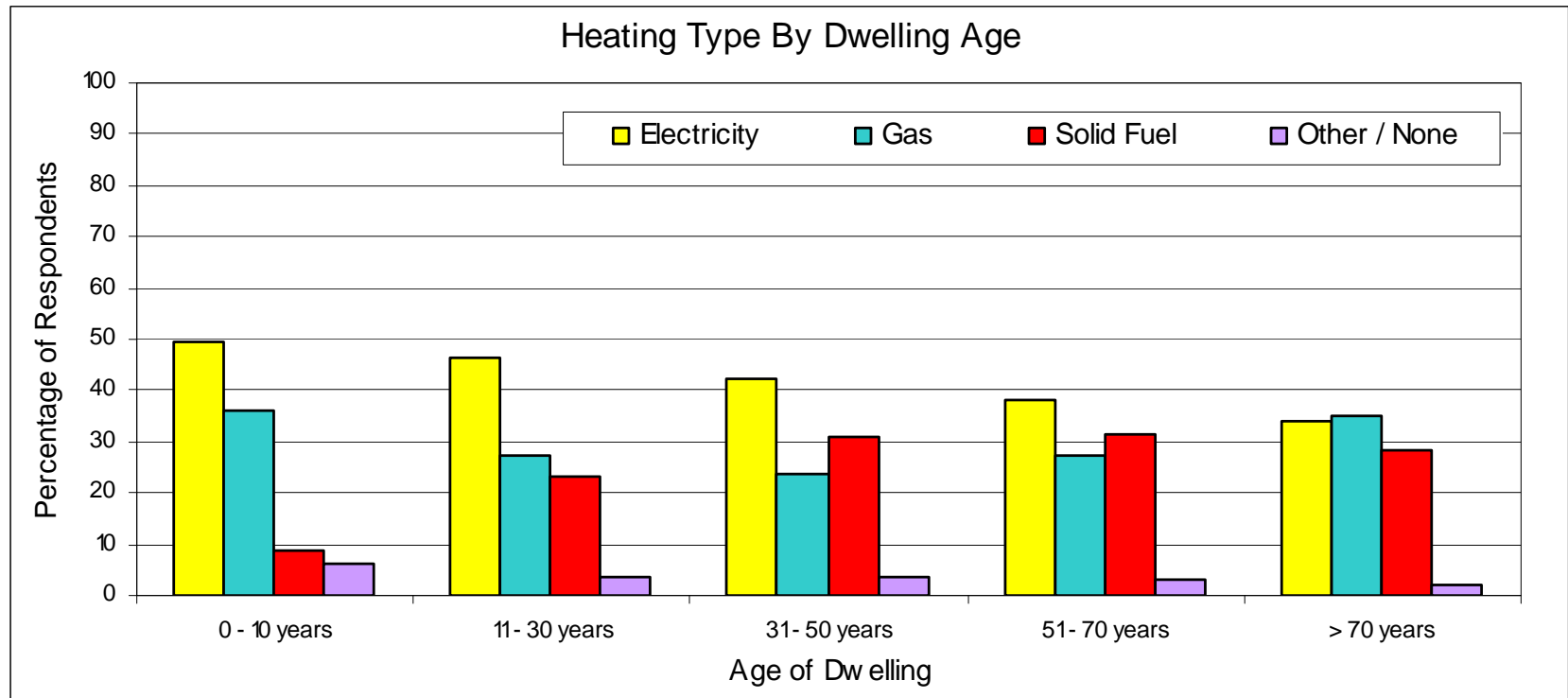
But use of solid fuel heating is declining nationally





# Method of Home Heating 3

Solid fuel heating more common in older (>50 yr) homes but electricity more common in newer (<30 yr) homes



Source: ARC Home Heating Survey 2007

# Current Reduction Targets for Akl

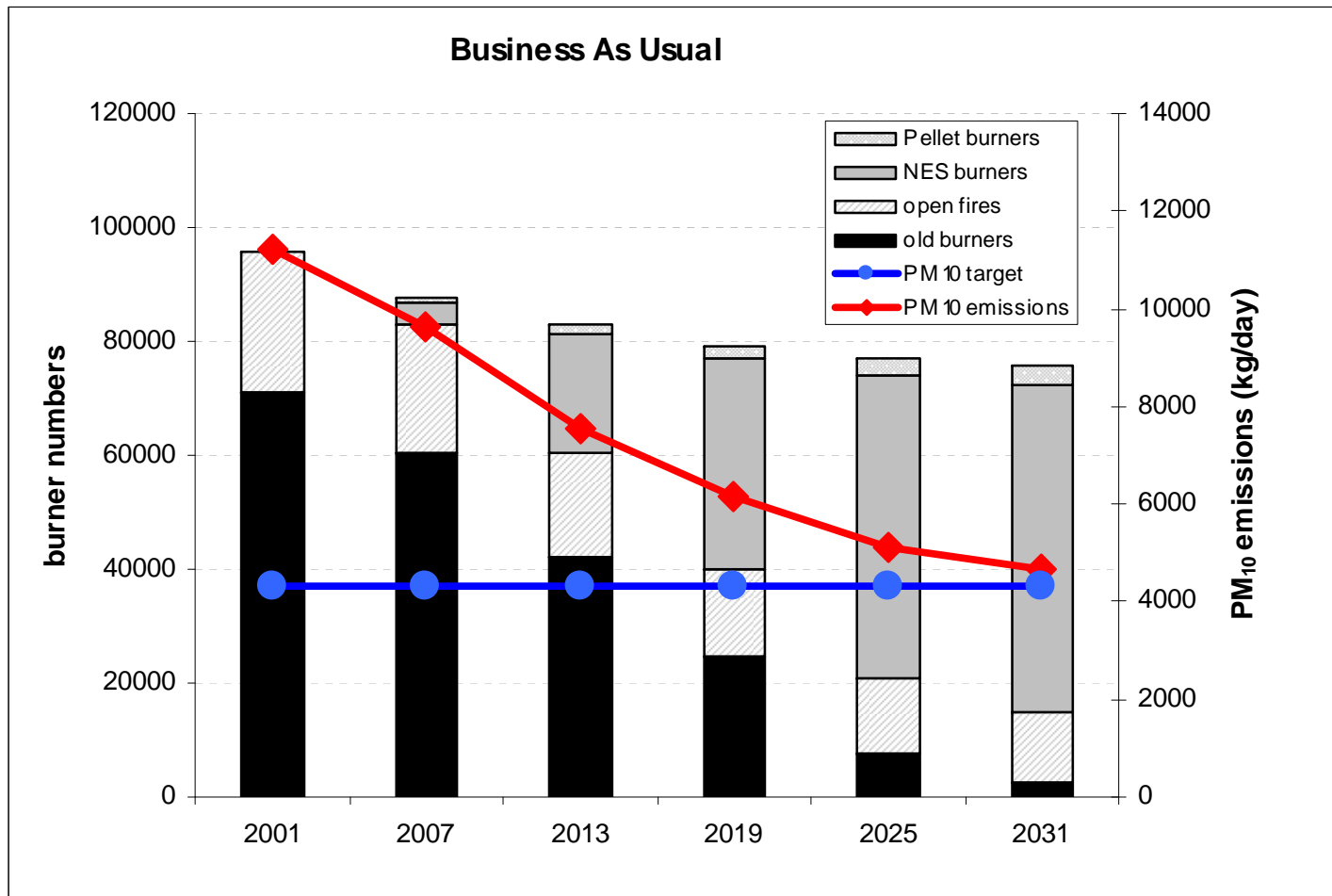
To meet PM<sub>10</sub> National Environmental  
Standard by 2013:

**Domestic emissions down ~58% (over 2005)**

**MANDATORY**

# Future Projections on Current Trends

Emissions will improve but not fast enough for 2013



# What More Needs to be Done

- Wood fuel quality standards  
*e.g. Good Wood scheme*
- Woodburner durability standards  
*e.g. guaranteed performance for 10 years*
- Better publicity of the co-benefits of clean heat / warm homes programmes  
*e.g. a \$5.8k investment can return benefits of \$30.8k in energy savings, air quality and public health alone as well as reduced GHGs and economic stimulus through job creation*



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