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# Multiple Benefits of Energy Efficiency

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New Zealand Government
EECA Energy Efficiency and Conservation Authority
Te Tari Tiaki Pūngao

# EECA Evaluation Tools

- Examining the potential – 5 tools
- Evaluative Requirements – 7 tools
- Methodologies – 4 tools and counting

# Programme Development is the key to good evaluation

- **Standardise the development of programmes**

- policy analysis, intervention logic, cost benefit analysis, identification of the co-benefits of the programme, value for money, Canadian Treasury template, the NZEECS, the EEC Act, Minister's Letter of Expectations and financial costs of the programme etc.

- establish workable monitoring and evaluative benchmarks

- get data to support programmes – assumptions, projections and modelling all have their limitations

# Case Study: Warm Up New Zealand: Heat Smart Programme

- established May 2009
- government initiative primarily aimed at saving energy
- with recognition that health improvements will also be significant
- $347 million in government funding
- 4 year programme to provide subsidies for insulation - under floor and ceiling, other cost effective energy efficiency measures and a clean heating device
- two levels of funding – general income and Community Service Card Holders
- target 188,500 homes built pre 2000
- roughly 20-25% of all houses built pre 2000

# Health Benefit Studies on Retrofitted houses

- **Results of the studies undertaken so far:**
- admissions to hospitals for respiratory conditions drop by 43%
- days off school reduce by 23%
- days off work drop 39%
- identified the costs of certain diseases
- causal links between cold and damp housing and poor health
- psychological and stress benefits
- quantitative risks to respiratory health established
- calculated the percentage of health outcomes resulting from indoor dampness and mould - PAFs
  - 25-35% in general population
  - Maori and Pacific Island People up to 35%
- Over 90% of benefits are health

# Evaluation 1 of the Warm Up New Zealand: Heat Smart Programme

- approved by Cabinet to start May 2009. As part of its approval Cabinet required that:
- MED in consultation with EECA evaluate the programme yearly for the first 2 years of operation to assess its effectiveness, and in particular:
  - uptake by the public
  - effectiveness of delivery
  - level of support from private sector partnerships
  - energy savings
  - health benefits; and
  - stimulating the supply and demand side of energy efficiency upgrades
- RFP to contact out this work. Successful tenderer a consortium of Motu who undertook the economic analysis; WSM undertook the health analysis and Covec looked at employment creation.

# Warm Up New Zealand: Heat Smart Cabinet Evaluation

- impact of retrofitted insulation and new heaters on health services utilisation and costs and pharmaceutical costs
- observational study which looked at the first 46,655 houses retrofitted in the programme
- health benefits the bulk of the benefits for this programme – over 90%
- retrofitted insulation has a significant impact on reducing hospitalisations and pharmaceutical costs and reduced mortality
- these results are in line with the NBM findings and the previously conducted community trials by Otago University WSM and CRESA fundings
- clear differences between low income earners and other households
- low income earners (CSC) have greater benefits

# Warm Up New Zealand: Heat Smart Cabinet Evaluation

- Measures the ***outcomes*** of the programme eg, energy savings, health outcomes and employment by fitting models to aggregate health and energy data.
- Energy use is complex and this evaluation only looks at the reticulated electricity and gas usage which means that an estimated 55-62% of energy use is not covered by this evaluation. The energy savings (in terms of avoided energy purchase) estimated is small when assessed over a 30 year period. This could be because of takeback as well as the unmeasured energy savings.
- Employment creation is determined by economic modelling. A better benchmark may have been existing number of people employed in the industry at the beginning of the programme compared with number of people employed in the industry at various monitoring points during the programme.

# Evaluation 2: EECA's Net Benefit Model (NBM)

- complementary to the Warm Up New Zealand: Heat Smart Cabinet Evaluation
- undertaken by Concept Consulting Ltd. Peer reviewed by PA Consulting Ltd., accepted by MED
- derived benefit to cost based on computer modelling
- PA Consulting approved the methodology, accuracy, processes, costs and benefits derived and other outcomes
- developed assumptions for measuring and valuing energy, health and employment benefits and can be used for:
  - reporting on the benefits of already insulated houses
  - evaluating proposals for funding particular housing insulation projects proposed
  - designing future EECA funding programmes allowing assessments of various different funding options

# The Net Benefit Model

- benefits are valued from a New Zealand Inc. point of view
- i.e. national benefit (not consumer benefit)
- the benefit is made up of energy, $CO_{2eq}$ emissions savings and health benefits winter living room temperatures increase from 17.7 to 19.1ºC. Regional variations show where the programme is most effective for health
- the NBM uses the ***outputs*** delivered by the programme to model the outcomes.
- it is more detailed and versatile than the larger Cabinet approved evaluation
- it can model benefits for:
  - specific subsets of the programme's work
  - for outcomes that have proved difficult to measure
  - for planning scenarios
- **Drawback** – it relies on assumptions for a range of factors and these are always open to being challenged

# How the NBM works

- it models before and after retrofit temperatures and the energy required to achieve those temperatures
- it then uses the before and after temperatures to model the health benefits
- inputs to the model include:
  - the specific characteristics of each house that has been retrofitted
  - this includes location existing levels of insulation, size, existing heat source, age and occupancy characteristics
- the model then compares the energy use before and after the retrofit
- the energy modelling is based on a database of heating energy loads for a large number of different situations (building thermal characteristics, climates, heating set points and schedules determined by energy data modelling software AccuRate NZ
- this allows energy saving to be modelled by time of use and energy market data and forecasts to be used to value the energy and CO2 eq emissions saved
- the health benefit valuation is derived primarily from Ministry of Health data for the costs to NZ of various health conditions

# Benefits of the Warm Up New Zealand: Heat Smart Programme

- the programme will produce benefits of at least 2:1 (old WSM new figures yet to be announced).
- significant improvements to health outcomes – and its **preventative health** directed at the top and middle of the cliff.
- improved energy efficiency of many households, 134,000 to date, expected to reach more than 188,500.
- Warm Up New Zealand: Heat Smart has created employment, of value to New Zealand during the recession.
- reduced carbon emissions improved air quality and better housing stock

# Conclusions

- EECA uses a wide range of tools for comprehensive evaluations of its programmes for multiple benefits.  The Warm Up New Zealand: Heat Smart is an example of this
- these tools have been shown to complement and support each other
- the NBM will continue to develop to add new benefits
- OPENZ will be developed particularly in the transport area
- cost benefit analysis will become standardised and integrated into programme development within EECA
- major work to be done in programme development to ensure programmes are developed to fulfill their potential
- this includes a common programme development plan and framework