

Sprinklers and sustainability

Recent BRANZ research has used Ecopoints for the first time in New Zealand to evaluate the cost effectiveness of domestic fire sprinkler systems.

By **Amanda Robbins** and **Colleen Wade**, BRANZ Fire Engineers and **Jonas Bengtsson**, Sustainability Scientist, Edge Environment

BRANZ recently re-evaluated the cost-effectiveness of fire sprinkler systems for houses (installed to NZS 4517:2002 *Fire sprinkler systems for houses*). In an attempt to also account for sustainability impacts, a lifecycle assessment approach was selected. This is the most useful way to provide a weighted single measure of a wide range of environmental issues for comparison with a cost-effectiveness analysis.

The study incorporated environmental issues by considering the cradle-to-site impact for fire sprinkler systems and the loss and replacement of the fire damaged building stock. It didn't include impacts relating to the replacement of building contents which would produce an even more positive contribution to the measure of environmental benefits. Therefore, the results of this study are conservative.

Ecopoints used for first time

A single metric (termed NZ Ecopoints) was used to measure the environmental and sustainability-related 'costs' and 'benefits'. The average yearly environmental impact of a New Zealander is represented by 100 NZ Ecopoints. The Ecopoint analysis was run in parallel to the economic analysis. If monetary estimates for the value of an Ecopoint were available, it may be possible to combine the sustainability and economic measures into a single metric.

Using Ecopoints as a quantitative metric for environmental impact is commonplace in the United Kingdom and elsewhere, but this is the first time the method has been used in New Zealand.

Building stock categories considered

Houses fitted with smoke alarms were taken as the base case. Scenarios considered included adding home sprinklers to residential building stock under the categories:

- all residential building stock
- owner occupied
- not owner occupied
- state (and council) owned
- Housing NZ owned
- privately rented.

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Data sets for fire incident, death and injury rates and the extent of flame damage were sourced from the New Zealand Fire Service incident statistics.

Sustainability aspects

With the inclusion of home sprinklers, all categories showed net environmental benefits – that is, a conservation of NZ Ecopoints – for each life saved. Negligible environmental impacts were reflected in the cost analysis and so the results from the sustainability module can be used in parallel with the economic results.

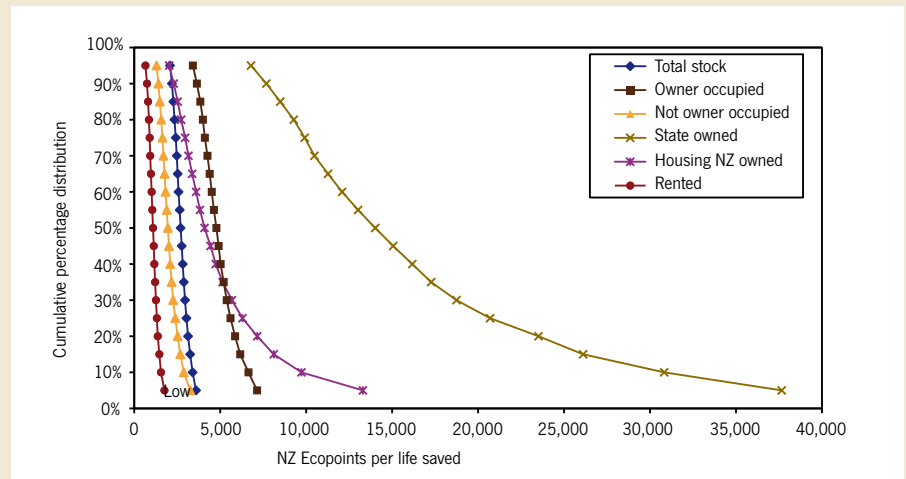


Figure 1: Distribution for the NZ Ecopoint conservation per life saved for various categories of residential building stock with sprinklers and smoke alarms present.

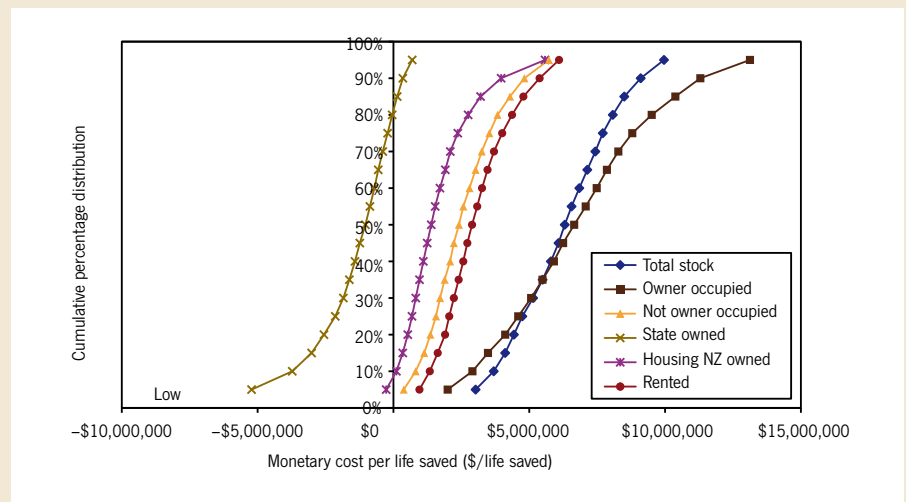


Figure 2: Distribution for the monetary cost per life saved for the total residential building stock with sprinklers and smoke alarms present for the base case.

The results for environmental benefits per life saved were calculated as distributions to account for input parameter uncertainty (see Figure 1). For example, 50% of state owned houses with sprinklers would conserve at least 14,000 Ecopoints per life saved. Other cases were considered for robustness, and the results are in the full report.

The model results for the base case, considering sprinklers and smoke detectors present, are reported in Table 1 as the 5th percentile environmental benefits per life saved (that is, 95% of the results indicated more environmental benefits). This equates to approximately 7–70 equivalent years of average

environmental impact of a New Zealander (that is 700–7,000 NZ Ecopoints) depending on the category considered.

Monetary benefits

The economic analysis considered both costs and savings. Costs were:

- installation of a home sprinkler system
- fire service intervention
- hospitalisation for the injured.

Savings were due to reduced fire and water damage.

The model results for the base case, considering sprinklers and smoke detectors present, indicate a range of mean monetary

benefits per life saved (see Figure 2). The range of approximately –\$1.5 to \$ 7.0 million depends on the category considered (see Table 2).

The differences in results are attributed to varying statistical trends for the categories considered. The average statistical trends are used for categories that are made up of other categories (for example, total building stock and not owner occupied). Over the 50-year analysis period, this can lead to reasonable differences.

Sensitivity analyses were conducted for both the sustainability and monetary models.

Results suggest groups to target

A wide range of monetary costs per life saved and an understanding of the influence of statistics on the model results were provided by looking at the residential building stock occupier categories, as well as the total residential building stock. The results also highlighted specific occupier groups where home sprinklers would be more beneficial by comparison.

The use of NZ Ecopoints to provide a measure of a wide range of environmental impacts allows broader sustainability aspects to be incorporated into current cost-effectiveness analyses. The results for all categories indicated that a saving of NZ Ecopoints (i.e. averted environmental impact) would be made for each home sprinkler system installed in New Zealand residential properties. The model results are presented in a form designed to allow direct comparison with net present value estimates of the value of a statistical life, and a monetary value for 100 NZ Ecopoints, as these estimates become available.

Research results can be found in 'Revision of cost effectiveness analysis of home sprinkler systems' incorporating Sustainability Aspects (2008) New Zealand Fire Service Commission Research Report No. 82.

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Table 1: Greatest environmental impact avoided per life saved attributed to a home sprinkler system.

Residential building stock occupier group	Mean equivalent person years ¹ of environmental impact averted per life saved	Mean number of NZ Ecopoints saved per household (over 50 years)	Mean cumulative ² equivalent person years ¹ of environmental impact averted (over 50 years)
State (and council) owned	70	16.00	1,100
Owner occupied	34	1.30	6,800
Total building stock	21	0.96	13,000
Housing NZ owned	20	3.50	700
Not owner occupied	13	1.50	7,200
Privately rented	7	0.89	5,600

¹ 100 NZ Ecopoints = 1 equivalent year of an average New Zealander's impact.

² Calculated using the mean number of lives saved.

Table 2: Monetary benefit per life saved attributed to a home sprinkler system.

Residential occupier group	Mean cost per life saved (NPV \$million/ life saved)	Mean number lives saved (50 years)	Mean total cost (50 years) (NPV \$million)
State owned	–\$1.5*	15	–\$23*
Housing NZ owned	\$1.9	35	\$67
Not owner occupied	\$2.7	560	\$1,500
Privately rented	\$3.1	800	\$2,500
Total building stock	\$6.3	620	\$3,900
Owner occupied	\$7.0	200	\$1,400

* Negative monetary costs are monetary savings.