Demand, supply and affordability of key sustainability features in housing

Two studies in 2012 and 2016 examined aspects of the sustainability features of new-built New Zealand houses and the services available to the industry and to homeowners. The results show an increasing number of eco-certified homes and home advisors, but from an extremely low base. Construction costs have increased significantly, as has the relative cost of ownership in Auckland.

A random selection of 210 house building consents was made from Auckland, Hamilton City and Christchurch City Councils, and the houses were assessed. This Research Now covers consumer demand, industry capacity and affordability of key sustainability features in housing.

Demand for solar water heating and environmental certification

Solar water heating is regarded as a sustainability feature because it can time-shift energy needs - the water tank is essentially a battery recharged at low cost when the sun shines. However, residential-based solar water heating may not be economically worthwhile for all homeowners.

Table 1 shows a low uptake of solar water heating in the random sample of Auckland, Hamilton and Christchurch houses. Although the sampled population is too small to be statistically representative, it provides useful indicative figures.

Table 2 shows environmentally certified homes. The New Zealand Green Building Council (NZGBC) certifies Homestar dwellings, and the Passive House Institute New Zealand (PHINZ) certifies Passive Houses. Living Building Challenge dwellings are certified by the International Living Future Institute. The number of houses with sustainability certification has increased considerably (over seven-fold) in the last 4 years but from an exceedingly low base. As a proportion of all new-builds, the numbers are still tiny.

Table 1. Solar water heaters specified in building consent documentation in 2012 and 2016.

LOCATION	SOLAR THERMAL WATER HEATING SYSTEMS SPECIFIED	
	2012	2016
Auckland (n=~70)	1.6%	2.6%
Hamilton (n=~70)	0	0
Christchurch (n=~70)	1.5%	2.2%

Table 2. Whole-house certified numbers by various organisations.

AWARD SCHEME	TOTALS FOR YEAR (ONLY FOR STAND-ALONE DWELLINGS)	
	2012	2016
NZGBC Homestar	18	134
PHINZ Passive House	1	13
Living Building Challenge	0	1
Total (per capita)	**19 (1/232,142)**	**148 (1/31,733)**

Supply of some key sustainability-related services

Sustainability-related building service providers play a critical role assisting with higher-performing homes.

Homestar is New Zealand's environmental certification scheme for all housing typologies run by NZGBC. It had two methods to accredit industry practitioners available in both 2012 and 2016. Homestar Practitioners can provide advice while Homestar Assessors can provide full certified Homestar ratings. The numbers of both grew significantly (Table 3).

PHINZ provides a whole-of-house energy and thermal efficiency building performance standard and certification system (Table 4).

Eco Design Advisors (EDAs) provide free independent advice on environmental issues on residential buildings. They are council-based and numbered seven full-time equivalents (FTEs) in 2016 (Table 5).

Home Performance Advisors (HPAs) became operational in late 2014. An initiative of the Community Energy Network, Toimata and Beacon Pathway, it provides a complementary advisory service nationally. There were 71 certified HPAs (including HPA trainers) at the end of 2016 (Table 5).

Lifemark champions the idea that environments should be accessible to all people of all abilities at any stage of life through universal design. Homes can be rated with Lifemark Design Standards. Lifemark runs an accredited partnership programme (Table 6).

The total number of residential building sustainability-related practitioners grew from 41 in 2012 to 584 in 2016. This is equivalent to one practitioner for every 8,040 New Zealanders in 2016, up from one for every 107,578 in 2012. Given that approximately 21,300 stand-alone houses were consented in 2016, the supply of sustainability-related services is still very small.

The **New Zealand Institute of Architects (NZIA)** actively promotes education and advice to members on sustainability issues. This has included presentations by NZGBC, PHINZ and individual designers and collaborative events with groups such as the IPENZ Sustainability Society. NZIA did not provide any substantial environmental-specific training as part of its continuing professional development in 2012 or 2016.

Architectural Designers New Zealand held 47 events for members during the year (71 sessions in various locations) with significant environmental aspects.

The **Real Estate Institute of New Zealand** said there was no environmental module in its continuing professional development, but it may consider this should an approach be made.

The **Superhome Movement** facilitates education, lobbies for change and encourages open-source sharing of new design ideas, technologies and building techniques throughout the industry. It has show homes that are periodically publicly accessible, all of which have a variety of attributes with low environmental impacts.

EcoSmart Electricians (NZ) promotes electricians who are upskilled in efficiency. It is an initiative of the Electrical Contractors Association of New Zealand and the Electricity Commission. At the time of the study, 67 businesses were registered.

Kiwibank had its Sustainable Energy Loan programme available in late 2012 and 2016. It assists consumers to fund micro-renewables (such as solar power) up to $2,000 over 4 years. There was a 37% increase in the number of loans drawn down between 2013 and 2016, with Kiwibank contributing over $330,000.

Trade Me Property, New Zealand's most visited online real estate website, provided no publicly accessible statistics on Homestar-certified homes in 2012 or 2016. A spot check on 30 August 2017 found 32 houses listed with 'Homestar' in their descriptions. Only seven were built, the remainder being potential design and builds.

Table 3. Homestar industry practitioners in 2012 and 2016.

NZGBC'S HOMESTAR	NUMBER OF INDUSTRY PRACTITIONERS	
	2012	2016
Practitioners	3	246
Assessors	6	174
Total (per capita)	**9 (1/490,078)**	**420 (1/11,182)**

Note: Per capita figures were based on the estimated New Zealand population of 4.4 million at year end 2012 and 4.7 million at year end 2016.

Table 4. PHINZ-accredited practitioners in 2012 and 2016.

PHINZ-ACCREDITED PRACTITIONERS	NUMBER OF INDUSTRY PRACTITIONERS	
	2012	2016
Designers/consultants	12	22
Tradespersons		24
Total (per capita)	**12 (1/367,558)**	**46 (1/102,096)**

Table 5. Combined HPA accredited and EDA practitioners in 2012 and 2016.

HPAs AND EDAs COMBINED	NUMBER OF INDUSTRY PRACTITIONERS	
	2012	2016
Total (per capita)	**7 (1/630,100)**	**78 (1/60,200)**

Table 6. Lifemark accredited practitioners in 2012 and 2016.

LIFEMARK	NUMBER OF INDUSTRY PRACTITIONERS	
	2012	2016
Builders	4	42
Designers	9	31
Total (per capita)	**13 (1/339,284)**	**53 (1/88,611)**

Housing affordability and cost of key enviro-features

The mean construction cost of an average house rose 28% over 2013-2018. New Zealand's house prices were rated among the most unaffordable in the world in 2016, based on median house price divided by median household income (5.9 in New Zealand). Auckland was rated the fourth least affordable among 92 international markets.

Beacon Pathway's 'cost tower' report examined actual costs of 69 affordable and social homes from five builders/developers in Auckland in 2015 (Table 7).

Land only made up a quarter of overall cost. Land development costs varied widely. The lowest quartile was approximately a third of the top quartile. Construction costs also ranged widely, from a lowest quartile median of $1,617/m² to a top quartile median of $2,569/m².

BRANZ has reported on three financial-related indices:

- A new-build index that captures movements in the purchase cost of new housing (Table 8).
- The cost of up-specifying sustainability features (Tables 9 and 10).
- The relative cost of ownership index, which expresses mortgage servicing costs relative to household incomes (Table 11).

For the period 2012-2016, the cost of new housing has grown 22.2%, based on a single-storey house of 200 m² on a 500 m² section.

Table 7. Cost categories for new affordable and social housing in Auckland (source: Beacon).

COST CATEGORIES	PERCENTAGE
Land	25.8
Development	1.8
Professional fees	4.1
Construction	51.4
Council fees	4.0
Finance, valuation and real estate	3.8
GST	9.0

Table 8. BRANZ new-build index.

YEAR	NEW-BUILD INDEX (AS A NATION)
2012	1000
2016	1222

Table 9. Purchase plus installation cost of thermal improvement features (house lot).

ITEM	IMPROVEMENT	2012 (COST INCREASE)	2016 (COST INCREASE)
Double glazing	Standard aluminium double glazing upgraded to a thermally broken frame and low-E coating	33%	30%
Thermal insulation	Wall (R2.2 upgraded to R2.8) in zone 1, 2	44%	96%
	Wall (R2.6 upgraded to R2.8) in zone 3	23%	34%
	Ceiling (R3.2 upgraded to R4.6) in zone 1, 2	31%	40%
	Ceiling (R3.6 upgraded to R5.0) in zone 3	49%	47%

The increase in cost for up-specifying double glazing (over the type of product commonly used) was approximately 33% ($6,210) in 2012 and 30% ($7,370) in 2016. In 2016, the average national cost of a new-build house was estimated to be $467,000. Assuming this reflects the typical house selected for this study, the up-specified double glazing would add 1.6% to the total new-build cost.

With thermal insulation, there is a considerable price premium for doing better than the minimum allowable in the New Zealand Building Code. This premium remained broadly unchanged for some insulation, but the upgrade from R2.2 to R2.8 wall product more than doubled in price, for reasons unknown.

What quantifiable effects do investments in sustainability features such as these have on the value of a property? There is little robust data. Work by Business and Economic Research Ltd (BERL) found that property valuations are holistic overviews largely based on market value. They are influenced by benchmarks against similar properties rather than individual home features.

Table 10 shows costs of LED lighting and rainwater tanks. (The latter have been included here for their resilience attribute.) The purchase cost of LED lighting dropped considerably from 2012-2016 while rainwater tank costs remained stable. To put these figures in context, first-quarter general building material costs rose by approximately 8% between 2012 and 2016.

Table 11 shows that the cost of ownership has increased in all three cities. This is based on the median sale price for existing housing, median household income and average floating mortgage interest rates. It assumes a 20% deposit and a 25-year term. Strong growth in the price of existing houses exceeded growth in household incomes. Auckland had the greatest increase, up by approximately 36%. Hamilton had approximately 15% increase, largely due to spill-over effects from Auckland. Christchurch remained steady, initially from a shortage of housing during earthquake recovery. Strong growth in incomes in Christchurch has suppressed the growth in house prices. Interest rates have remained relatively steady.

Table 10. Purchase-only cost of improving typical house specifications.

ITEM	SPECIFICS	2012 PRICE $	2016 PRICE $	% CHANGE	UNITS
Lighting	LED (5 W)	18.49	8.00	-56.7	$/lamp
	LED (10 W)	29.97	11.50	-61.6	$/lamp
Water collection	Rainwater tank (3,000 litre)	1,029	1,013	-1.6	$/tank
	Rainwater tank (5,000 litre)	1,363	1,410	+3.5	$/tank
	Rainwater tank (25,000 litre)	3,023	3,075	+1.7	$/tank

Table 11. BRANZ relative cost of ownership index (by city).

	AUCKLAND	HAMILTON	CHRISTCHURCH
2012	1000	1000	1000
2016	1362	1146	1002

Conclusion

There is low take-up of solar water heating systems. The number of houses with sustainability certification (such as Homestar) increased considerably (over seven-fold) in this 4-year period but from an exceedingly low base. As a proportion of all new-builds, numbers are still tiny.

The total number of practitioners giving advice on eco-building grew considerably from 41 in 2012 to 584 in 2016. This is up from one for every 107,578 New Zealanders in 2012 to one for every 8,040 people in 2016.

The mean construction cost of an average house rose 28% over 2013-2018. Specifying much better performing glazing is estimated to add 1.6% to the total new-build cost.

Considering house prices compared to incomes, New Zealand's house prices have been rated as 'severely unaffordable' compared to many other countries. The cost of ownership in Auckland grew by 36% between 2012 and 2016.

More information

BRANZ Research Now: Measuring our sustainability progress #1 *Energy use and CO_2 emissions*

BRANZ Research Now: Measuring our sustainability progress #2 *Indoor temperatures and the predicted impact of climate change*

The research outlined here is part of an ongoing BRANZ research programme - see:

Jaques, R. (2019). *Measuring our sustainability progress: New Zealand's new detached residential housing stock (first update)*. BRANZ Study Report SR426. Judgeford, New Zealand: BRANZ Ltd.

Jaques, R. (2015). *Measuring our sustainability progress: Benchmarking New Zealand's new detached residential housing stock*. BRANZ Study Report SR342. Judgeford, New Zealand: BRANZ Ltd.