



Levy in Action

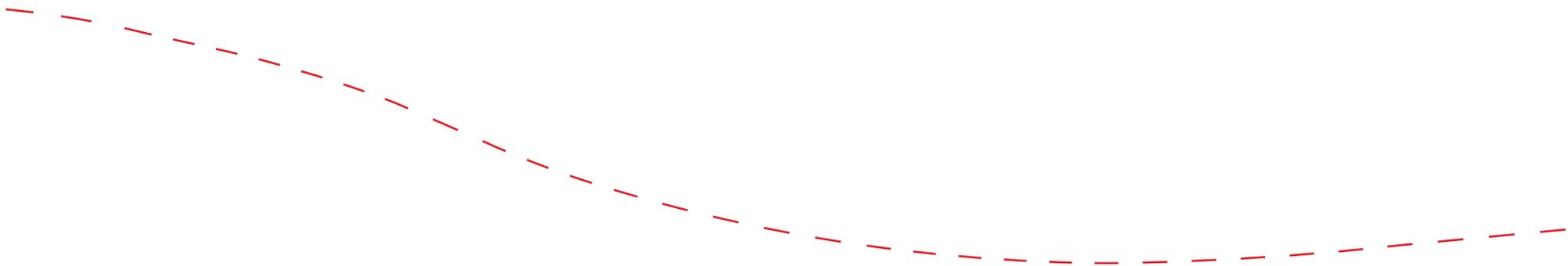
2017/2018

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Foreword

Building and construction is firmly in the spotlight in New Zealand. Demand continues to grow and the supply, quality and affordability of homes and buildings concerns many New Zealand families and businesses.

It's increasingly clear just how important the industry's performance is to our economy and society.

The level of industry activity is hitting new highs. The forecast pipeline of new homes and other buildings suggests that this uplift is going to be sustained for some years to come.

These are challenging times. The building industry is working hard to respond effectively. New types of houses and buildings are being designed and built. New materials and techniques are being used. Higher density homes are being developed requiring innovative design, engineering and construction practices.

Changes in practice are seeing the industry innovate, but these same changes are posing new questions about how materials and systems will perform. Such questions highlight the gaps in our knowledge and our capabilities.

The Building Research Levy plays an important role in supporting the industry to tackle such gaps. It acts as a catalyst in bringing the research community together with industry to focus on evidence based solutions to pressing issues.

This Levy in Action details the work being supported by investment of the Building Research Levy within BRANZ and with our partners. As a document, it sits alongside our Annual Review which showcases the wider range of work BRANZ is undertaking, including non-Levy work. The Annual Review 2017 also sets out information about the significant Levy investment we are making in new research facilities at our campus at Judgeford.

As I look at the year ahead, BRANZ is building on a strong platform. Last year's Levy in Action introduced four new programmes of work aimed at tackling areas identified as priorities for New Zealand and our built environment. It also showcased our strong, ongoing commitment to stand-alone research to address distinct industry issues.

I am pleased with the progress we have been making. Under our programmes BRANZ researchers have been forging new relationships with colleagues from universities, crown research institutes, private organisations, government and industry. Our programme teams are benefiting from bringing together expertise from across organisations and disciplines. We are sharing valuable information and insights. We are developing solutions that can help the industry deliver the better buildings New Zealanders are demanding. Twelve months on from the introduction of our programme approach and this Levy in Action reflects and reports on

some highlights and progress that has been made in these areas.

New Zealand's built environment is critical to our wellbeing as a country and society. Building research provides solutions for the industry that make a real difference to the lives of New Zealanders. I am confident about the work that is set out in this Levy in Action and how it can help address the challenges that New Zealand faces.



Chelydra Percy
Chief Executive Officer

Understanding New Zealand's needs and priorities

BRANZ delivers impartial and independent advice based on robust science and authoritative evidence.

The Building Research Levy plays a key role in investing in improving all aspects of New Zealand's building industry. Through the Levy investment needs across the industry – from design through construction – are addressed.

But the Levy can't fund or support everything. BRANZ can't solve all the issues facing the industry. Decisions need to be made to prioritise investment. BRANZ takes a considered, portfolio approach to investment and stewardship. Choices are made to deliberately balance investments across a range of priorities.

A number of key sources are used to help determine where Levy investment is made. BRANZ works hard to assess industry needs and this plays an integral part in shaping the work funded within the portfolio.

Industry Research Strategy

The overarching guide for Levy investment decisions is the Industry Research Strategy; Building a Better New Zealand (2014). This was co-developed by BRANZ with the Ministry of Business, Innovation and Employment (MBIE), the Construction Industry Council and the Construction Strategy Group. It is a high-level, collaborative government and industry strategy that sets out nine core research themes. Extensive consultation with industry and government identified key research directions within those themes. A review of this Strategy will be kicked off in late 2017.

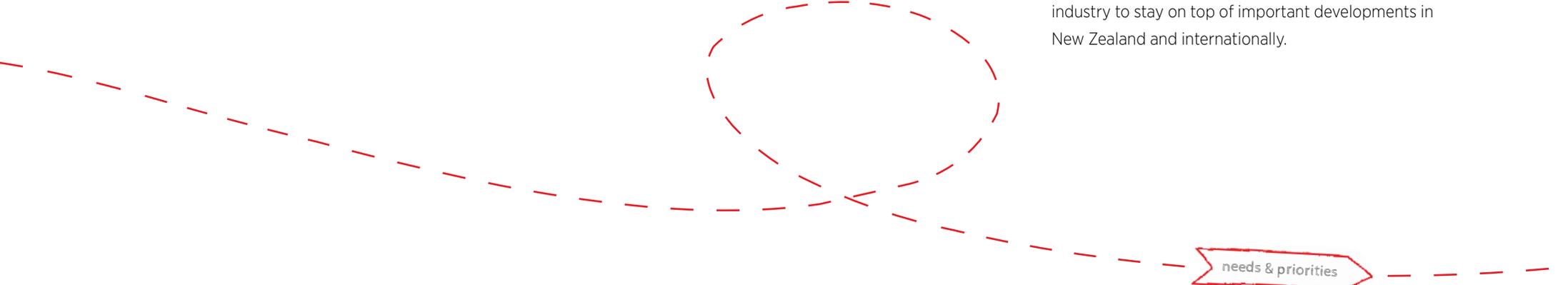
Industry needs survey

For over two decades BRANZ has systematically surveyed the industry to gain insight around research and information needs. In 2016 BRANZ again partnered with MBIE to undertake an Industry Needs Survey. The Survey tells BRANZ what the industry seeks and values from BRANZ. In 2016 the Survey signalled that the industry wants more information on weathertightness, housing affordability and the costs and benefits of alternative construction materials.

It also told us that BRANZ's investment in knowledge dissemination is important and that this is a go-to source of highly trusted information. It confirmed that BRANZ is the top choice for technical insights and industry good practice.

Working together to stay on top of developments

BRANZ also works closely with government and industry to stay on top of important developments in New Zealand and internationally.



needs & priorities

Understanding New Zealand's needs and priorities

Working with industry

Connections with industry are fundamental to the work BRANZ does. These connections help understand and establish the focus of industry research. They are used as industry and researchers work together during the research phase, sharing ideas and discoveries. They are used as BRANZ works with industry to make sure that findings and insights can be turned in to accessible, actionable knowledge. These connections are also used as BRANZ checks back in to test the difference that the work has made.

The strong connections BRANZ has with industry mean it can draw extensively on these networks to gather intelligence around emerging and ongoing industry concerns.

An important part of this is the Building Research Advisory Council (BRAC). BRAC members are drawn from across the key industry trade and professional bodies, and include representation from consumers and government. BRANZ is also a member of the Construction Industry Council (made up of senior figures drawn from industry bodies) and the Construction Strategy Group (made up of construction industry business leaders). These two industry peak bodies provide important forums for discussions on key industry concerns.

Many BRANZ researchers and teams are also engaged directly with the industry on specific initiatives and as

recognised experts on advisory groups. Researchers are consistently working with industry and government colleagues to tackle known issues and explore potential challenges that may require attention. Calls to the BRANZ industry helpline and discussions at BRANZ seminars and training events also provide the opportunity to talk and listen to those on the frontline.

needs & priorities



needs & priorities

Understanding New Zealand's needs and priorities

Working with government

Another key source of information about needs and priorities is government. BRANZ and MBIE work closely on building and housing issues. MBIE is represented on key BRANZ groups, such as BRAC and the groups that assess research proposals seeking Levy funding. The strong relationship with MBIE helps provide important insight around policy priorities. It enables sharing of information around industry concerns. It also supports sharing of key information about future Building Code and standards development. As BRANZ is a key provider of research in this space, this is particularly important.

Science sector linkages

Developments in the science sector can also have important implications for the focus of the Building Research Levy. As a research organisation BRANZ monitors key developments around science infrastructure and funding. This can influence Levy investment – for example, by highlighting new or changing capabilities. A key way BRANZ stays informed about these developments is through its connections with MBIE.

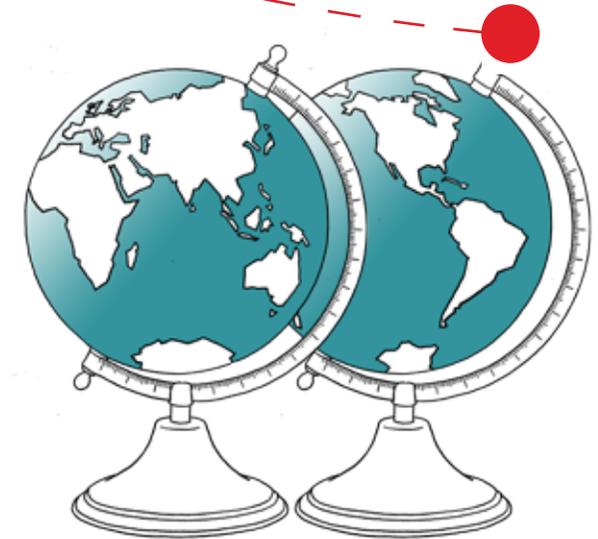
Relationships with universities, CRIs and other research organisations are also critical. BRANZ has ties to the Royal Society of New Zealand and is a member of the Independent Research Association of New Zealand (IRANZ).

International issues

BRANZ maintains a watching brief on key international trends and developments facing the building and construction industry. This is important in order to keep up with global trends and developments. Some of these can have immediate and direct implications for New Zealand, such as changes to shared international standards. Other developments can have less immediate implications. International information can highlight opportunities or issues that New Zealand may have to contend with in future.

BRANZ researchers and scientists maintain extensive networks and many are members of specific international collaborative groups. This enables our researchers to tap into global knowledge, capabilities and experience, bringing that back to New Zealand. BRANZ membership of the CIB, the international organisation of building research providers, also enables access to a wealth of other research and expertise. This includes information around the challenges facing other countries and the priorities they are focusing their efforts on.

Closer to home BRANZ is active in working with colleagues in Australia, recognising the many shared building and construction standards with New Zealand. We do this through our work with the Australian Building Codes Board.



Investing wisely - Stewardship of the Building Research Levy

BRANZ is committed to ensuring that the industry gets the greatest benefits possible from Levy investment

A core responsibility of BRANZ is effective stewardship of the Building Research Levy. This demands robust decision-making processes, a commitment to transparency and disciplined management of the Levy investments.

BRANZ gets its research income from Building Research Levy receipts, which are directly linked to the levels and values of building consents. This means Levy income is subject to the same boom-bust cycles as the industry. It requires careful and considered management. BRANZ has a long-term Levy utilisation policy in place that helps manage these ups and downs in Levy income. A 10-year rolling forecast model has been developed to create a stable, sustainable platform that enables BRANZ to invest the Building Research Levy effectively. In practice, this means when Levy income increases, BRANZ is prudent around expanding its investment so that when Levy income decreases BRANZ doesn't have to make unnecessary or drastic cuts.

The long-term Levy utilisation policy sets out how BRANZ will effectively manage the Levy by:

- determining a Baseline Levy Investment Sum using the 10-year model, this is incorporated into the annual BRANZ Group budget for investment in Levy-funded activities
- investing the Baseline Levy Investment Sum in internal and external research and knowledge dissemination
- investing the Levy in an open, transparent and contestable way
- ensuring that any investment in core internal capability is linked to BRANZ's long-term strategic priorities
- investing so as to avoid unnecessary duplication of capability and facilities across New Zealand
- ensuring availability of funding for maintenance and investment in property, plant and equipment
- maintaining appropriate cash reserves.

The long-term Levy utilisation policy is reviewed annually.



Investing to deliver value to the building industry

The BRANZ Inc. Board determines the amount of baseline Levy investment to be spent on research and knowledge dissemination activities.

Investment in BRANZ Ltd

BRANZ Ltd is New Zealand's primary building research provider and centre of expertise. It has the largest group of building industry researchers in New Zealand. It is a wholly owned subsidiary of BRANZ Inc. and operates predominantly out of its Judgeford campus in Wellington. The majority of its 105 staff are scientists and researchers or experts in knowledge transfer.

The annual Building Research Levy investment is split between BRANZ Ltd and external providers. A significant proportion is invested with BRANZ Ltd.

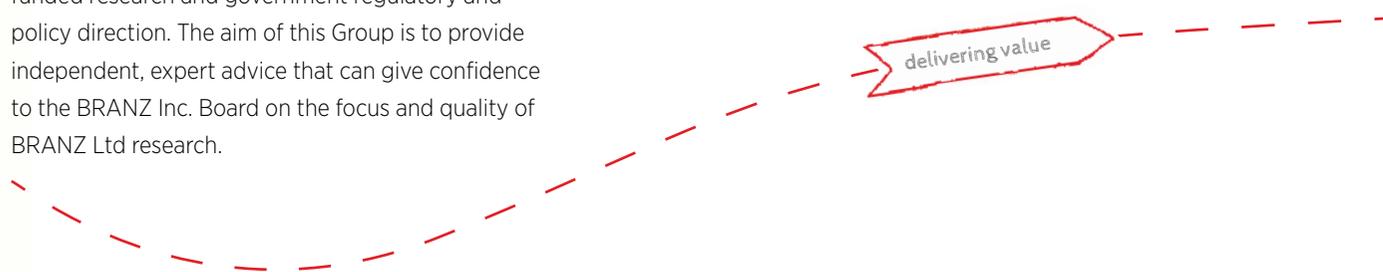
To ensure that the work funded by the Building Research Levy is of a high quality it is subject to robust scrutiny and proposals undergo a robust assessment process.

This process for BRANZ Ltd includes the use of independent assessors appointed by the BRANZ Inc. Board. This Levy Allocation Advisory Group (LAAG) is made up of leaders and experts drawn from the Building Research Advisory Council and wider industry. The Ministry of Building, Innovation and Employment (MBIE) also participates on this advisory group in recognition of the strong connections between Levy-funded research and government regulatory and policy direction. The aim of this Group is to provide independent, expert advice that can give confidence to the BRANZ Inc. Board on the focus and quality of BRANZ Ltd research.

Investment with external providers

There is significant expertise within universities, Crown Research Institutes and independent research providers, which complements BRANZ-based specialist teams. Working in partnership and collaborating with other providers is an important part of how BRANZ strives to deliver best value from the Levy for New Zealanders.

Sometimes this can be external providers directly accessing investment and being contracted by BRANZ Inc. to carry out projects. Other times, it can be through these providers acting as subcontractors to BRANZ Ltd as part of teams to deliver Levy funded work. Primarily BRANZ Inc. seeks out external proposals through the publication of a Research Prospectus. The Prospectus is sent out annually to the wider research community seeking proposals to help deliver on research priorities.



delivering value

Investing in young researchers

Each year BRANZ also puts aside Levy funding for outstanding postgraduate scholars in New Zealand tertiary institutions.

This scholarship programme is an important part of BRANZ's portfolio of investments. It not only funds early-stage researchers to bring their energy and ideas to bear on industry issues, but also supports the next generation of scientists and researchers. Through this investment BRANZ also deepens its ties to New Zealand's tertiary education providers, helping to leverage their expertise and inform each other's work.

Being an agile investor – tackling pressing needs

The majority of BRANZ's research investments are delivered through the annual funding rounds described above. But as part of its portfolio approach BRANZ also recognises the importance of being an agile investor, able to respond to opportunities and issues outside of these cycles.

BRANZ responds quickly to emerging industry issues and invests in discrete pieces of timely work such as a publication or guidance on a pressing issue. These 'out of cycle' investments can come from ideas identified and developed within BRANZ or from external organisations.

Strategic initiatives

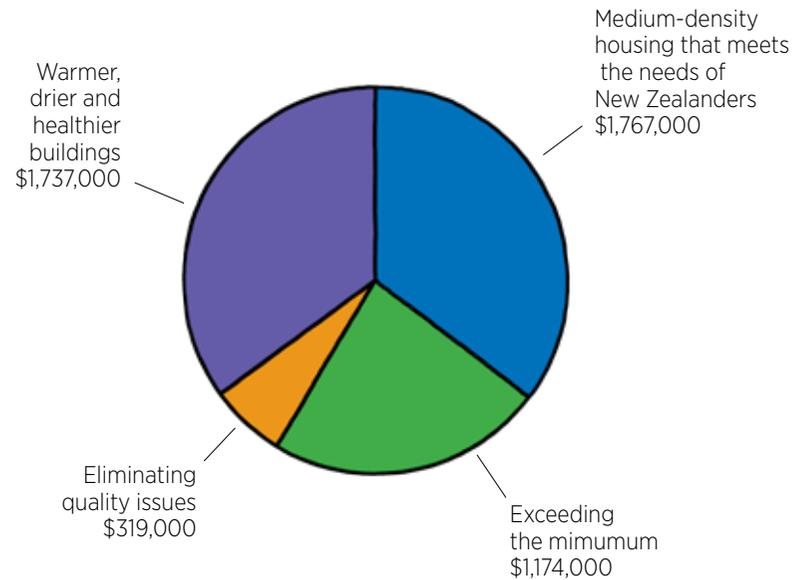
From time to time BRANZ also invests the Levy in strategic initiatives. These are initiatives above and beyond the core baseline investment in research. They are typically focused on national, strategic opportunities and are approved by the BRANZ Inc. Board. For example, BRANZ worked with industry in the development of the Homestar rating tool. It also partnered with the design and building community in the establishment of the national specification system Masterspec.

More recently, BRANZ has invested Levy in two major new strategic initiatives aiming to drive transformative change in the industry. One, Artisan, is looking to deliver a new direction around quality assurance for the built environment. As well as lifting practice and tackling quality issues, Artisan can provide an incomparable data set of building performance to inform future research and action. The other initiative is exploring the potential of a system-focused New Zealand Industry Transformation Agenda, inspired by Shaping the Future of Construction released by the World Economic Forum in 2016. This Agenda reflects many of the issues we face here, albeit on an international scale. We see it as having the potential to transform the industry in to a cohesive, productive contributor to the economic and social wellbeing of New Zealanders.

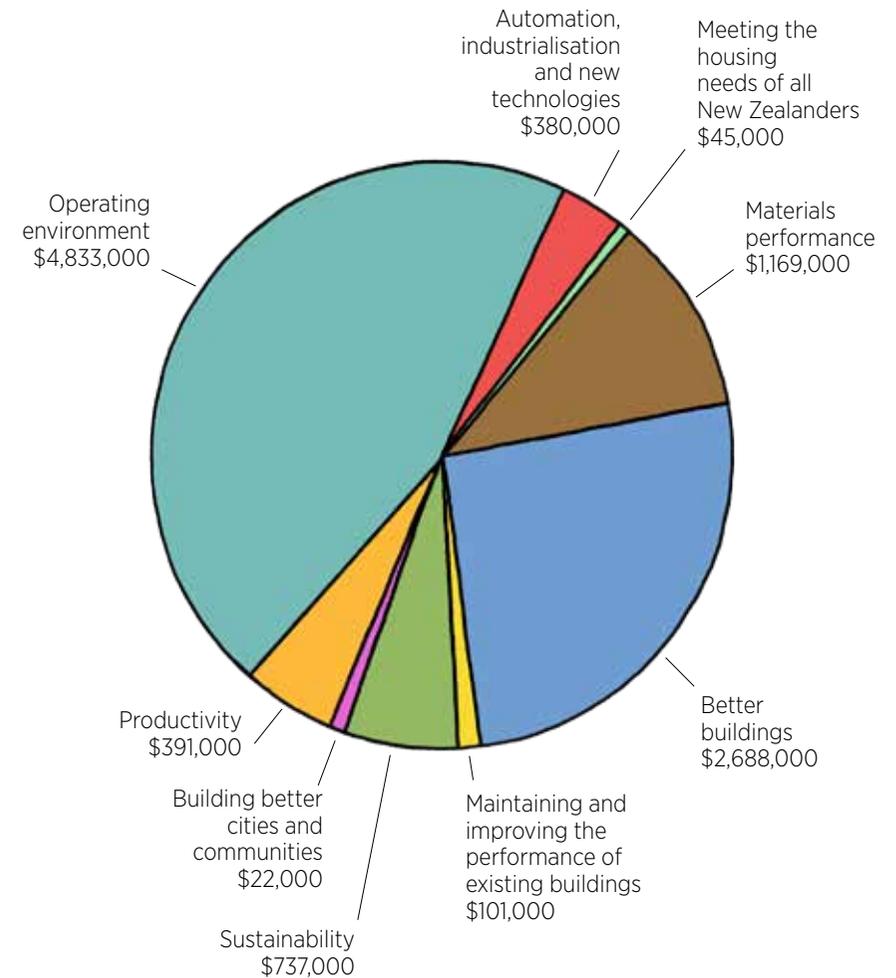


2017/18 allocation overview

This represents the total Levy investments made for 2017/18 at the time of publication. It includes new investments as well as budgeted expenditure for existing commitments planned during this 12-month period. That total amount is subject to change due to project variations and new investments are made in response to emerging issues. It excludes investments in the campus and other infrastructure assets. The Building Research Levy Investment allocation overview for 2017/18 is \$15,363,000.



BRANZ four priority programmes **\$4,997,000**



Distinct, Stand Alone Research **\$10,366,000**

Investing to tackle the issues that matter

The issues facing New Zealand require us to constantly challenge ourselves and ask how BRANZ can come up with better solutions and innovative approaches. As part of BRANZ's strategy, we are committed to playing our part.

We are working hard to stretch our thinking around how we can ensure the industry (and subsequently New Zealanders) gets the best possible benefits from Levy investment. We are continuing to develop our portfolio approach to investing the Levy.

Programmes established and delivering results

In the 2016/17 *Levy in Action* we talked for the first time about how a new programme approach was being implemented by BRANZ. The purpose of the programmes was to find and develop end-to-end solutions to some of the most pressing issues currently facing the industry.

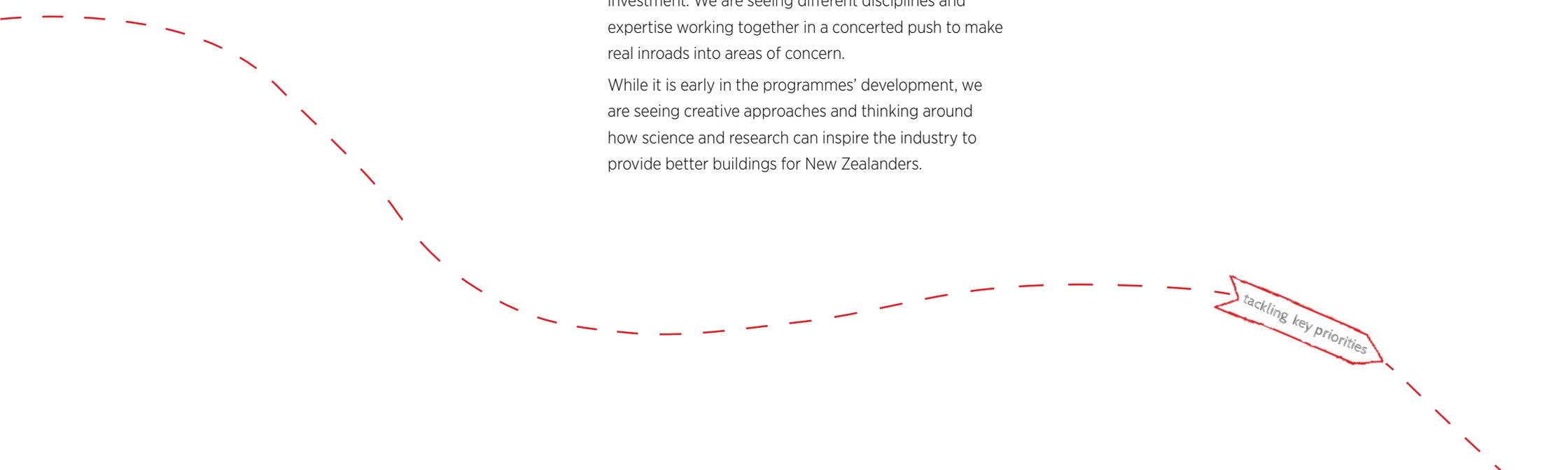
One year in and having reviewed the work of the programmes, we're encouraged with what we are seeing.

The programme approach is enabling BRANZ to work differently to unlock the right teams from across New Zealand and internationally. Our programmes are bringing government, researchers and industry together to work in new ways and with new levels of investment. We are seeing different disciplines and expertise working together in a concerted push to make real inroads into areas of concern.

While it is early in the programmes' development, we are seeing creative approaches and thinking around how science and research can inspire the industry to provide better buildings for New Zealanders.

We are pleased to be able to share some of the highlights from the first year of the programmes in the next section, as well as talk further about what the programmes are aiming to achieve in the year ahead.

The programme areas were originally identified from Industry Research Strategy priorities through consultation with industry and government. Throughout the year we've also sought feedback from industry and government on the programme activities and focus. We want to make sure that they remain dynamic, able to respond to changes in our environment and in industry needs. Programme advisory groups are instrumental in this. Feedback from these has confirmed the direction of travel and provided valuable information that continues to support adjustments to the programmes in year.



tackling key priorities

Tackling key priorities

Investing to tackle the issues that matter

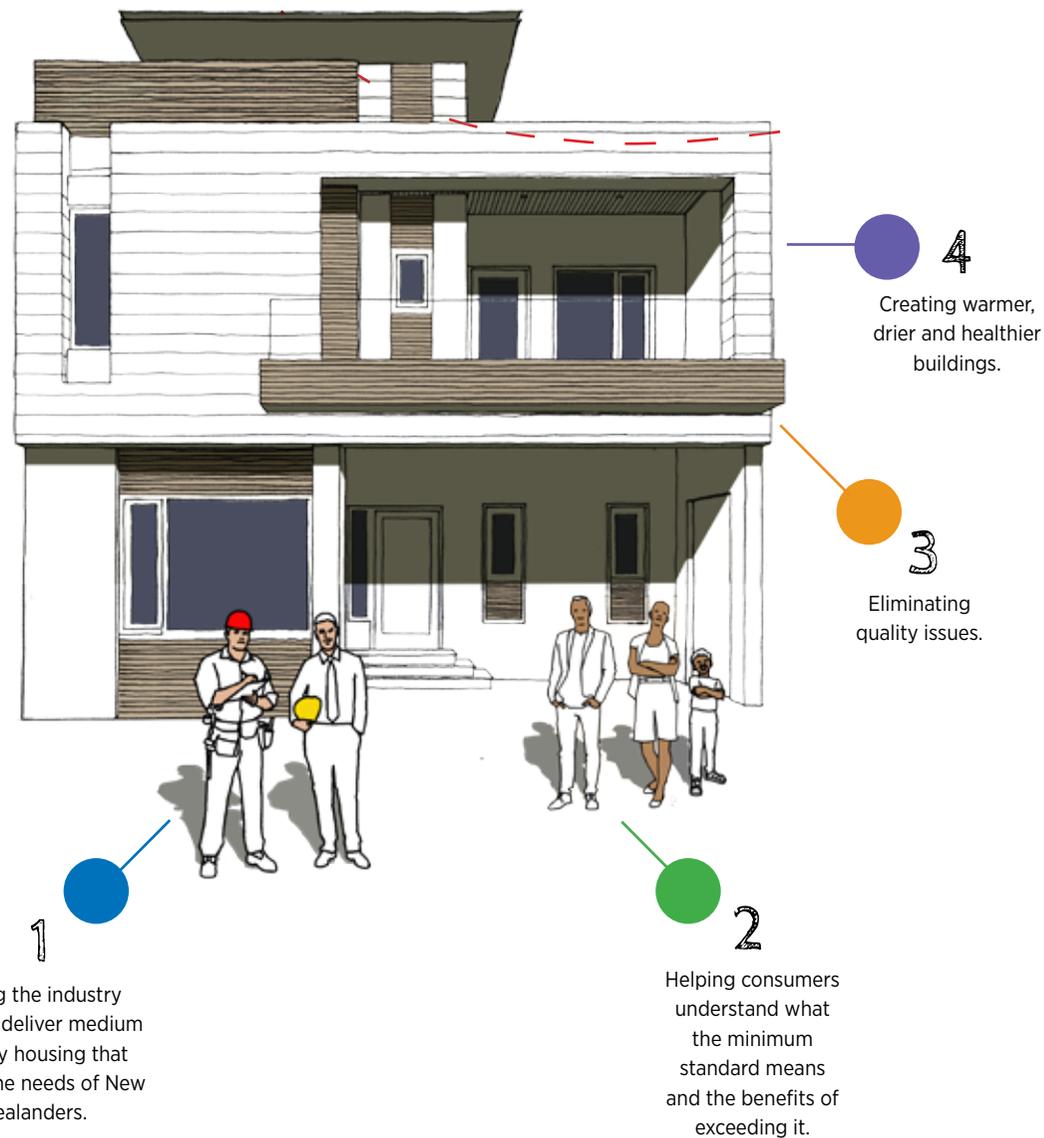
Accelerating our programmes

Building on this early success and feedback, in 2017/18 BRANZ will be continuing to invest a significant allocation of Building Research Levy in the four programmes of work. These four programmes are:

- Giving the industry tools to deliver medium density housing that meets the needs of New Zealanders.
- Helping consumers understand what the minimum standard means and the benefits of exceeding it.
- Eliminating quality issues.
- Creating warmer, drier and healthier buildings.

Distinct, Stand Alone Research

Looking beyond the programmes, we know distinct pieces of research into other industry needs still need support through Levy investment. This is part of BRANZ's commitment to maintaining a balanced portfolio of research investment and to maintaining investment in important research capability. These stand-alone projects must also demonstrate how they are addressing priorities from the Industry Research Strategy.



Embracing medium-density housing

Why this is a priority

New Zealand faces a critical shortage of homes to accommodate a rapidly growing population and building consents are barely keeping up with demand. (As at the end of March 2017, we had a national shortfall of 30,000 units, most of which were in Auckland.) This coincides with a well-documented lack of skilled labour to supply the need.

Complicating the picture is the issue of affordability, especially in Auckland, as soaring prices put home-ownership out of reach for many.

As New Zealand grapples with these pressures, medium-density housing (MDH) is emerging as an increasingly popular alternative to traditional stand-alone housing.

MDH is already part of New Zealand's housing landscape. However, many New Zealanders are still resisting it, as a recent BRANZ survey shows. This is partly historic: a preference for the traditional stand-alone housing model, the 'Kiwi quarter-acre paradise'. It is also due to negative perceptions: lack of visual appeal, weathertightness risks and variable quality.

Medium-density housing presents a huge opportunity for the building industry. But to fully realise it, they need to bring the public along with them.

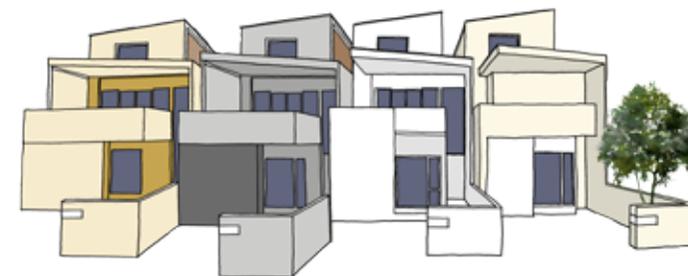
The story so far

While MDH is seen as a key tool to tackle the housing crisis, we didn't know how the push toward using it more as a living option would be received by New Zealanders. Our first year of work under the programme showed that while there may be an acceptance to the need, many still have reservations about living in it themselves.

BRANZ set about establishing a common definition for MDH. Our work showed that many New Zealanders didn't really understand the full scope of what MDH could be. Education is needed on the variety of forms MDH can take, the benefits and the mitigation of pre-conceived risks of MDH living.

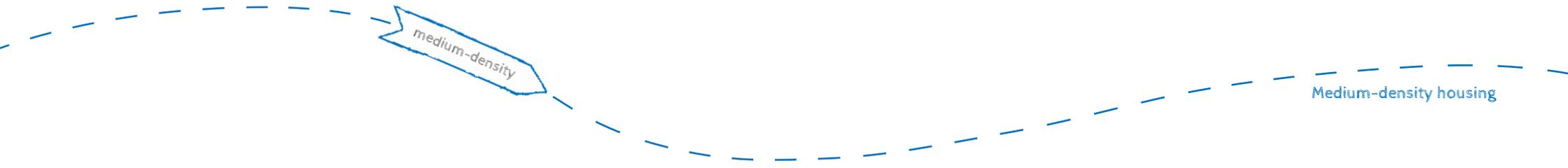
In fact education is the theme running through most of the work undertaken so far. Projects concerned with the value of building MDH compared with other forms and easing MDH projects through the consents process highlight how better information will help the New Zealand MDH story.

For those people already living in MDH in New Zealand, education is still required to maintain their homes for long-term performance. And given that quality is one of the top concerns in our attitudinal survey, long-term performance will be important in changing perceptions.



Medium-density housing is emerging as an increasingly popular alternative to traditional stand-alone housing




 medium-density

Medium-density housing

The next chapter

Over the next twelve months this programme looks into some of the issues raised and tackle more of the nuts and bolts of building medium-density housing. At the forefront of this work will be answering critical questions about quality standards and the building industry's capacity, practice, safety and attitudes. Continuing the conversation with homeowners will assist to build knowledge on where better MDH education for the public will assist in moving the general attitude toward it.

In 2017/18, the programme is looking at:

- designing MDH acoustics for shutting out internal noise
- measuring the quality and 'liveability' of new builds
- investigating where the skills gaps are, who is capable and interested in designing MDH, and what we can learn from those already building MDH successfully.

Making a difference

This programme will give the industry the tools it needs to build high-quality, affordable medium-density housing. It will also educate, incentivise and inspire the industry for this new wave of housing.

Medium-density housing in New Zealand will meet the needs of its occupants and be accepted by the wider community.

Critical success criteria

1. The building industry has the technical information needed for designing and building quality, affordable and desirable medium-density housing.
2. The building industry has the skills needed for designing and building quality, affordable and desirable medium-density housing.
3. Medium-density residential buildings are maintained to sustain long-term performance.
4. Everyone has a shared understanding of how to ease medium-density housing through the building and consents process.
5. Communities increasingly accept the reality and appreciate the benefits of medium-density housing.



Programme leader Kate Bryson
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Insights - Understanding attitudes to MDH

New Zealanders may favour stand-alone housing but medium-density housing is still a preferred option over high-rise living to meet housing needs. This first research out of the programme looked at two sides of the medium-density housing equation, probing perceptions of the current landscape and attitudes towards living in MDH in future.

Attitudes toward medium-density housing were often mixed. What was clear was that the more people experienced living in well-planned, well-built, visually

appealing MDH, the more they would accept it as a housing option for the future.

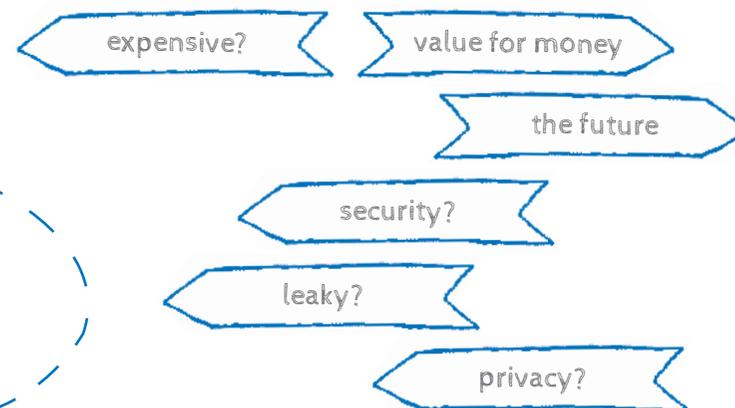
For example, respondents found MDH expensive, even though there was little understanding of the range of building sizes available in MDH. But it was still considered no less value for money than other housing options. Those who had already experienced MDH living were generally more accepting of it as a future option. And among the major urban centres, Wellingtonians were the least reluctant to embrace MDH.

When it came to concerns, the main focus was compromised security, a lack of privacy, lack of visual appeal, 'leaky homes' risk and the degradation of neighbourhoods.

Moving attitudes is a key challenge for the building industry. If it can educate New Zealanders on the variety of multi-unit dwelling options available, the benefits of medium-density living and the soundness of structural features, then acceptance of this form of living may become more mainstream.



Moving attitudes is the challenge for the building industry



Insights - Analysis of supply and demand

In recent years, we have seen a growing trend for New Zealanders – both renters and owner-occupiers – to live in multi-unit developments. At present, these make up about 29% of all new dwellings, and most are low-rise (below three stories).

BRANZ sought to define the scope of medium-density housing in New Zealand now and map its progress over the next decade.

About 6100 new medium-density homes are being built across New Zealand each year. Given the shortage of housing nationwide, the demand for medium-density housing remains strong. MDH is expected to grow steadily (6% a year) up to 2025. By that time it will represent a substantial share of the housing market.

Given this demand, the supply of MDH is constrained especially in Auckland – due to shortages of skilled labour and a lag in council inspections. However, the

industry capacity for building new housing in Auckland is still expected to expand by 30% up to the end of 2019.

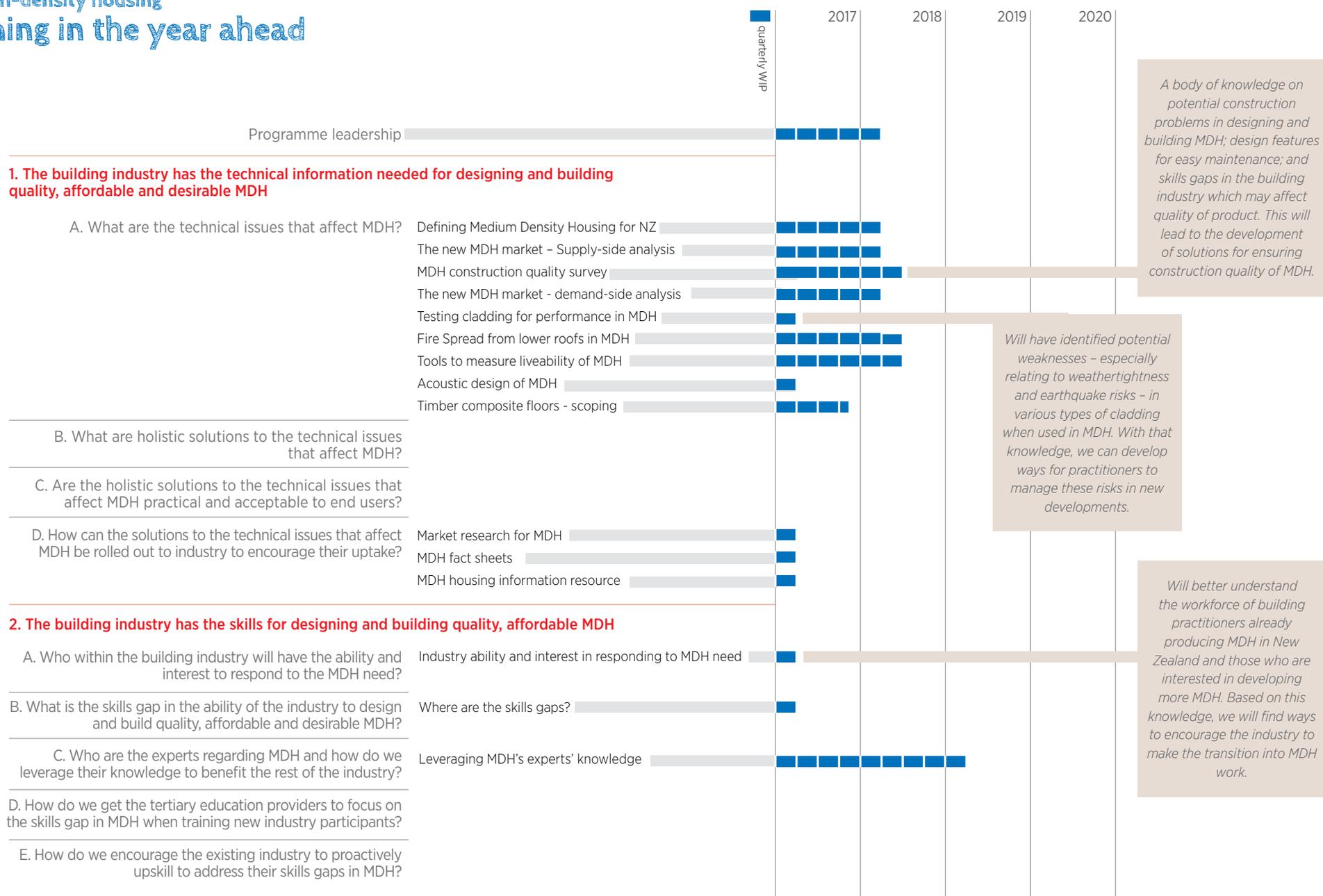
The report concludes that MDH, if affordable, desirable and of high quality, can help solve the looming crisis. The building industry has a big role in this, but a major shift in mindset is required. Practitioners will need to take on board new knowledge, acquire new skills and learn to communicate the benefits of MDH to clients.



MDH, if affordable, desirable and of high quality, can help solve the looming crisis



Medium-density housing Coming in the year ahead



Medium-density housing

3. Medium-density residential buildings are maintained to sustain long-term performance

- A. What are the maintenance requirements for MDH?
- B. What are the economic and social benefits of maintaining MDH during its lifecycle and how can we demonstrate these?
- C. How do we make designers and builders aware of what they need to do to ensure that MDH buildings are maintainable?
- D. What are the gaps in the knowledge for owners and residents around the maintenance requirements for their MDH buildings and how can these be closed?

Knowing enough to maintain



Owners and residents of MDH complexes will have complete information about how to maintain their homes. This will ultimately improve the buildings' long-term performance.

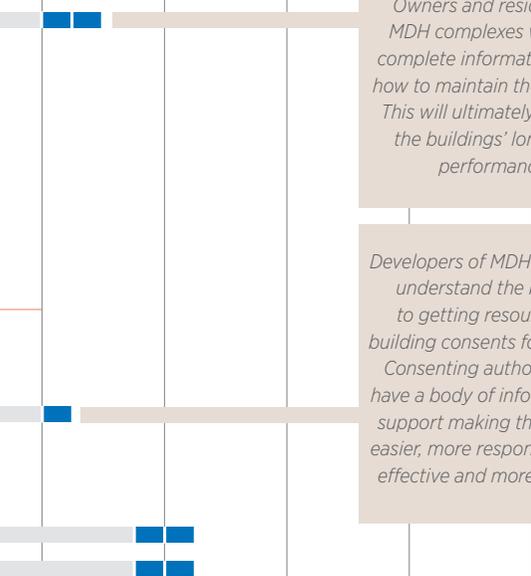
4. Everyone has a shared understanding of how to optimise the journey though the building and resource consent process for MDH

- A. What is the real situation surrounding the building and resource consent process for MDH, e.g. timelines and perceived barriers?
- B. What are the specific problems with the resource and building consent process for MDH, including the process and peoples' approach to the process?
- C. How can we resolve the problems that are associated with the building and resource consent process for MDH?

Getting MDH through the consenting process

Understanding resource consent processes in New Zealand

Industry perspectives on MDH consenting issues



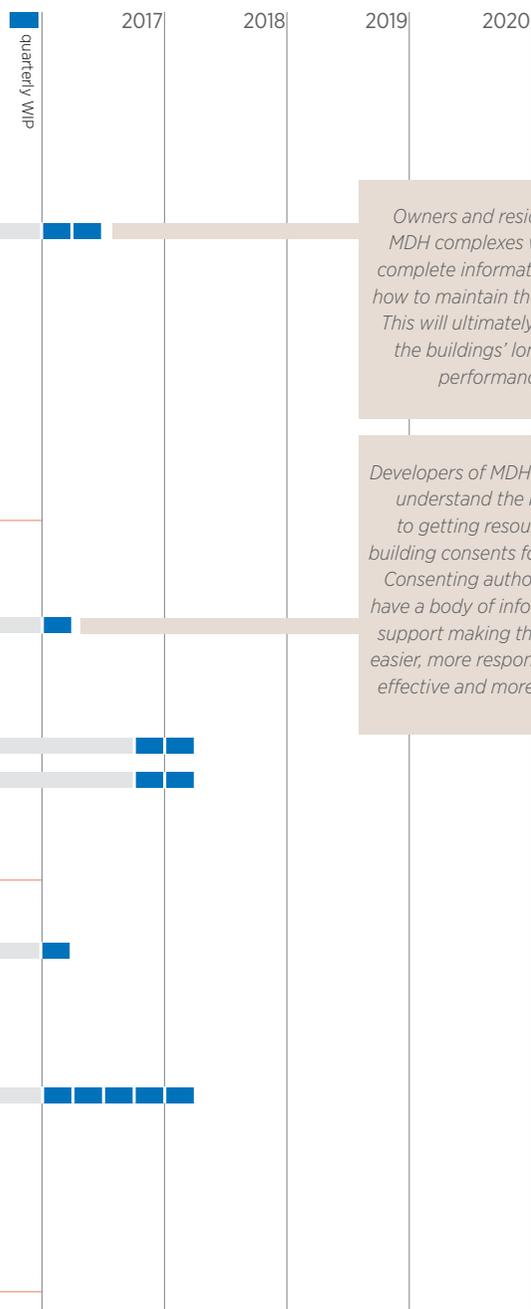
Developers of MDH will better understand the barriers to getting resource and building consents for projects. Consenting authorities will have a body of information to support making the process easier, more responsive, more effective and more efficient.

5. Communities increasingly accept the reality and appreciate the benefits of MDH

- A. What are the preferences of different demographics regarding MDH?
- B. How will the changing cultural diversity impact the demand for MDH?
- C. What are the perceived barriers or advantages to living in or near MDH, e.g. safety and security?
- D. How can we inform communities of the real benefits and costs of living in or near MDH?
- E. How do we leverage our knowledge of MDH's benefits to increase its acceptance in communities?

Understanding the drivers of MDH

Tools to measure liveability of MDH



Medium-density housing

New projects funded in 2017/18

Programme leadership

This investment supports delivery of the programme as a whole. It provides time and resources for engagement with key stakeholders, and the investment supports the operation of an advisory group. It also underpins communication of key programme-level insights to industry.

Levy investment \$124,000

Timeframe January 2017 – March 2018

Contact Kate.Bryson@branz.co.nz

Leveraging experts' knowledge

This project aims to identify and work with leading experts currently delivering exemplary medium-density housing (MDH). It will encourage adoption of the processes used on successful MDH projects. It sets out to identify the characteristics of successful MDH and who is producing instances of these. This information can then be shared, to encourage others to adopt these characteristics.

Levy investment \$150,000

Timeframe April 2017 – March 2019

Contact Ian.Page@branz.co.nz

Medium-density housing flooring solutions

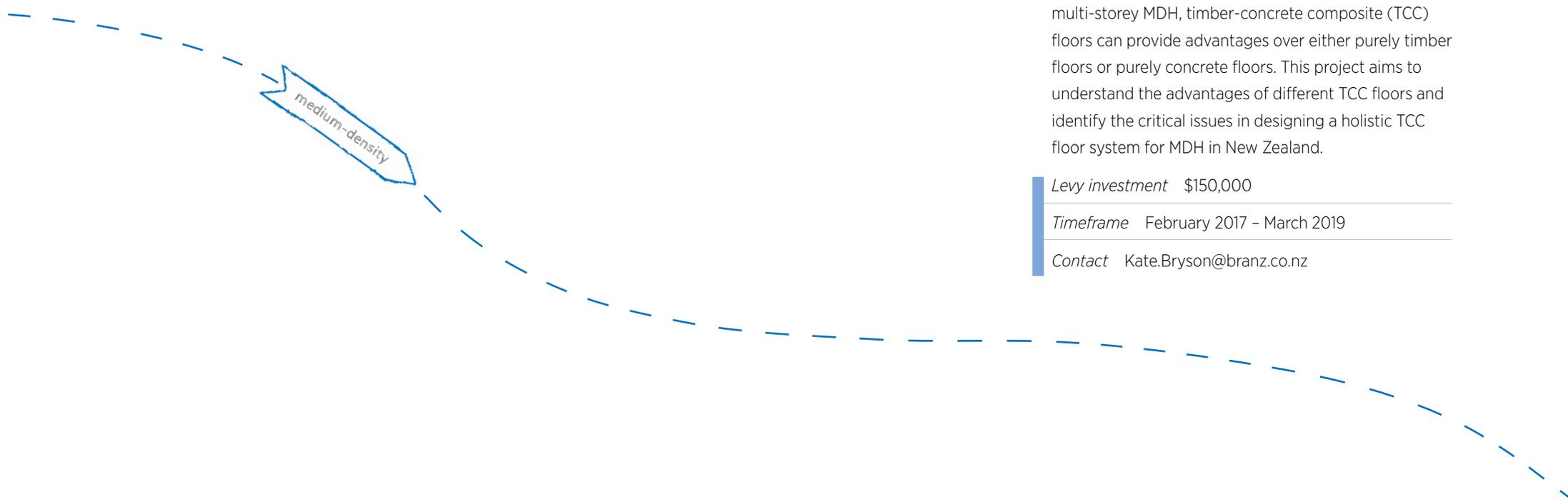
An emerging issue for medium-density housing is the many challenges in designing adequate floor systems. Structurally, conventional timber floor frames (timber joists) are not strong enough and are susceptible to vibration under gravity loading. The in-plane floor stiffness may be inadequate to diffuse seismic action across the building. Apart from structural requirements of floor systems in construction, there are other technical challenges. These include fire separation between floors and acoustic requirements between adjacent or upper/lower residential units.

Overseas research shows that, in the building of multi-storey MDH, timber-concrete composite (TCC) floors can provide advantages over either purely timber floors or purely concrete floors. This project aims to understand the advantages of different TCC floors and identify the critical issues in designing a holistic TCC floor system for MDH in New Zealand.

Levy investment \$150,000

Timeframe February 2017 – March 2019

Contact Kate.Bryson@branz.co.nz



medium-density

Liveability of medium-density housing

If medium-density housing is to succeed as a choice for New Zealanders, it needs to meet lifestyle requirements. International experience highlights the importance of liveability in ensuring MDH works for residents and the wider community.

This project seeks to understand how well we are meeting the needs and aspirations of residents and neighbours. It explores current and planned housing, seeking to understand how well occupants and communities can live in it and with it.

Levy investment \$150,000

Timeframe April 2017 - July 2017

Contact Kate.Bryson@branz.co.nz

Skills to deliver medium-density housing

This research will build on previous career-mapping work by BRANZ and analyse the required skills demand for delivering medium-density housing. Industry experts including the industry training organisations (ITOs) and Careers New Zealand will be consulted. The work will also build on existing MBIE analysis of construction employment and identify likely skill demand.

This work will be based on supply modelling work that was completed in early 2017. It will also evaluate expected skill demand against expected skill supply.

Levy investment \$150,000

Timeframe April 2017 - March 2018

Contact Lee.Bint@branz.co.nz

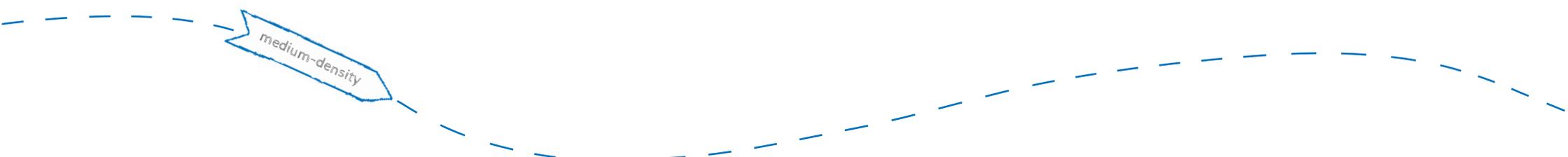
Who has the ability and interest to deliver medium-density housing?

A key question in looking at growth of medium-density housing supply is whether sufficient interest and capability exists to meet future demand. This project will assess who is likely, interested and able to meet the forecast demand. On the back of this research, we can determine whether there is enough capacity to meet the need. If the research shows a shortfall, this evidence can help quantify this. It can also support measures to address the problem.

Levy investment \$80,000

Timeframe February 2017 - December 2017

Contact research@branz.co.nz



medium-density

Understanding Resource Consent Processes in New Zealand

This research aims to shed light on whether resource management issues are creating problems for medium-density housing developments in New Zealand. Though many interested parties have expressed opinions that the planning environment creates problems for housing development, to date there have been no objective studies of resource consent processes for MDH.

This research will understand the nature of the issues that may be affecting the efficiency, effectiveness or quality of MDH developments. The findings will inform future policy decisions and process delivery at local and central levels.

Levy Investment \$92,190

Timeframe October 2017 – July 2018

Contact morten.gjerde@vuw.ac.nz

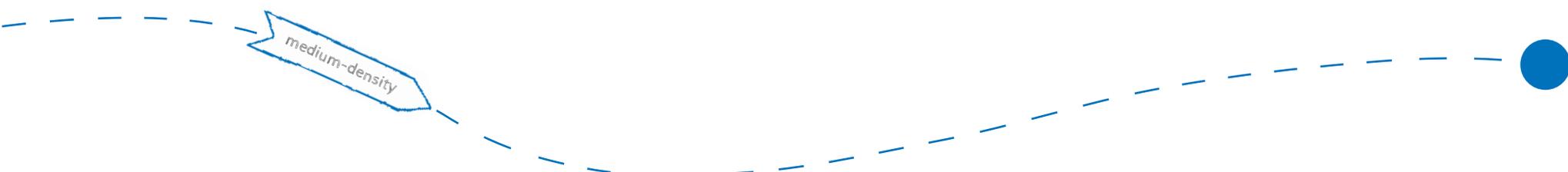
Industry perspectives on medium-density consenting issues

This proposal seeks to explore current building consenting from the perspective of developers and building professionals delivering MDH development as well as local consenting authorities. The research will seek to understand what the issues are, where current consenting rules/arrangements are having unintended consequences, and how successful efforts to reduce consenting costs/time have been implemented. It will also look at the potential cost and time delays across industry from the issues and challenges discovered, and what is working well or needs refinement for both special housing areas (SHAs) and proposed urban development authorities (UDAs), which provide potentially novel pathways for consenting processes.

Levy Investment \$86,990

Timeframe September 2017 – June 2018

Contact verneyr@beaconpathway.co.nz



medium-density

Helping consumers understand and exceed the minimum

Why this is a priority

Modern buildings in New Zealand are often designed and built to meet minimum compliance requirements set out in the Building Code and accompanying standards. These are set at a level deemed acceptable for our environment. Seldom does the design and construction of buildings strive to exceed this level. Nor is there any pressure from consumers for them to do so.

Consumers often focus their investment on visible features such as top-of-the-range bathroom and kitchen fittings. Yet for features integral to creating a warm, dry, healthy building – such as plumbing, insulation or ventilation – they will often accept the barest minimum. Building practitioners perpetuate such short-term thinking as they seek to satisfy their clients' wishes.

If consumers routinely opted for a standard above the minimum, the impact – structural, financial, environmental, social etc – could be significant. The immediate owners/occupants would benefit. It would also future-proof later generations against excessive risk.

However, moving to a norm of exceeding the minimum will take a major shift in mindset from everyone involved: consumers, designers, architects and builders.

The story so far

This past year we strove to understand a number of key questions. The programme set to establish some of the thinking around what exceeding the minimum could mean for those living in homes in New Zealand. By knowing which standards are already routinely exceeded and why, it helps to build an understanding of how consumers can be encouraged to look to do the same in other areas.

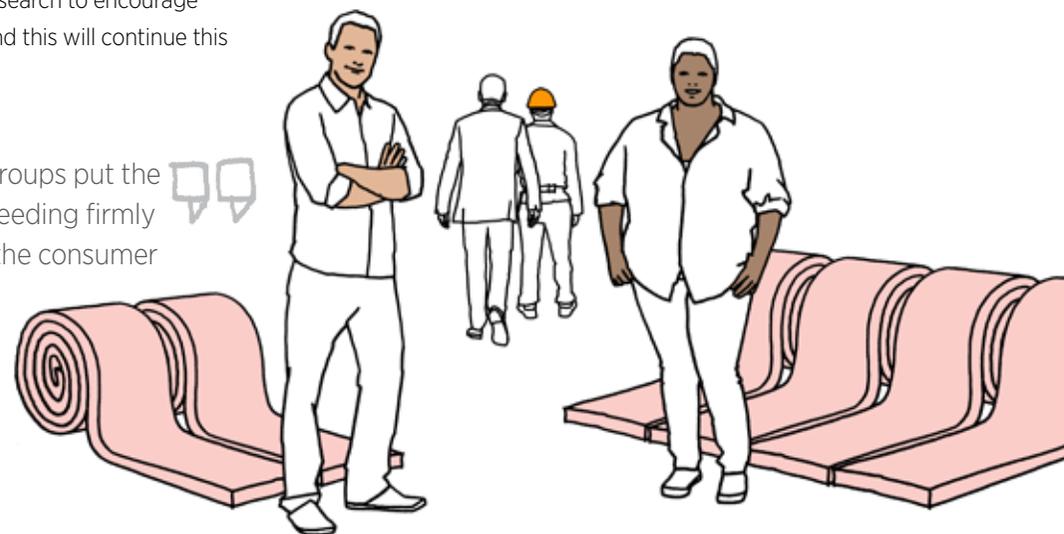
Information is fragmented and largely inaccessible by its intended audience and yet focus groups representing consumers and industry both said consumers need more information to help make impactful decisions.

Industry focus groups put the decision for exceeding firmly in the hands of the consumer. Work has started to look at how industry used research to encourage shifts in accepted minimums and this will continue this coming year.

 Industry focus groups put the decision for exceeding firmly in the hands of the consumer 

With more and more people renting as home ownership becomes harder the programme asked the question whether it is worth designing houses for New Zealand's increasingly high proportion of renters. Various opportunities were looked at including a shell and fit-out model, where the shell of a building is rented longer term and the tenant is responsible for the internal fit-out.

The programme now has a set of definitions for what constitutes the minimum in both existing and new builds. These definitions are not just focussed on what is implicit in the Building Code but also consider wider aspects such as access and environmental impact in design.



The next chapter

In 2017/18, the programme has a clearer understanding of some barriers to exceeding the minimum.

This year's research will help us understand:

- where consumers can go for information on exceeding the minimum, and how they perceive its credibility (for both new builds and refurbishments)
- who is likely to benefit most from living in houses that exceed minimum performance levels (such as thermal comfort)
- where the market already provides beyond-the-minimum options and why
- whether any other 'easy win' opportunities for exceeding the minimum are available
- whether research into exceeding the minimum can be undertaken and communicated effectively for take-up by the construction industry
- how we can incorporate environmental performance (including the impact of climate change) into design.

Making a difference

Through this programme, consumers will come to fully understand that New Zealand's Building Code and standards are a minimum only. They will appreciate the benefits to be gained from exceeding the minimum.

Better informed consumers will raise their expectations for new builds and upgrades. Ultimately, the industry will respond by delivering higher-performing buildings.

Research carried out in this programme may also contribute to future Building Code and standards development.

Critical success criteria

1. Consumers and industry understand that the Code and standards are a minimum that must be met but can be exceeded "where we are now and where we want to get to".
2. The benefits of exceeding the minimum can be clearly articulated based on meaningful terms "the limitations of what we have now and the benefits of exceeding the minimum are understood".
3. The barriers to exceeding the minimum have been addressed 'we understand the barriers to exceeding the minimum and the enablers for change'.

Helping consumers understand and exceed the minimum

4. Consumers expect and demand buildings that perform to a higher standard "we focus on breaking down barriers to exceeding the minimum and changing consumer expectations".
5. The industry delivers buildings that perform cost-effectively to a higher requirement "the industry is equipped to meet consumer expectations of higher performance".



Programme leader David Dowdell
David.Dowdell@branz.co.nz

exceeding minimum

Insights - The choice to exceed: consumer perspectives on building beyond the Code

BRANZ set out to explore how consumers in the market for a new home choose their level of quality.

In recent years, the industry has drawn much criticism about the poor quality of New Zealand's housing stock. At the same time, we have access to more new-build options that incorporate advanced design features, enhanced materials or cutting-edge technologies. These options can offer greater benefits for occupants – such as thermal comfort, energy saving and structural sustainability – than a lower-specified, 'code-minimum' house would.

Audited sources of consumer information about beyond-minimum building were fragmented and largely inaccessible by its intended audience.

Focus groups with consumers involved in various stages of the home-building process showed an even more

telling story, lack of information and communication held them back from looking where they might benefit going beyond the Code.

The groups told of frustration at inconsistent building quality, difficulty of communication with builders and even a lack of interest from builders in going beyond the Code. They admitted there was a reluctance to spend more on higher-performing features. They also complained that there was a lack of information on building levels required for varying climates, which was important given the diversity of New Zealand's regional climates. They also wanted to be able to assess the benefits of higher-performing features relative to the extra cost.

Industry looked to consumers to drive the change. A focus group representing members of the industry, government,

academia and media felt regulatory change would be too difficult and it should come from the consumers themselves. They needed to be able to make informed choices based purely on the benefits of above-Code building, such as better family health from living in a warmer, drier building.

The findings will inform a programme that:

- encourages consumers to make efficient choices about exceeding the minimum standard
- provides better consumer-focussed resources on the subject, from the government and industry
- educates the industry on how to address consumer barriers.

The goal is a higher percentage of new homes built with higher-performing features.

encouragement

better resources

education

= more homes with higher performing features

Insights - Building to rent

With house prices rising and lending conditions growing tighter, home ownership has become a challenge for many people. Thus, an increasing proportion of the population is having to rent.

The Building to Rent study looked at whether new housing should be designed differently for renters than for owner-occupiers. It also considered what renovations would make existing houses more appropriate for renting.

The current rental stock tends to be smaller and in worse condition than owner-occupied houses. Renting households are typically one-family or one-person. In many areas, rental properties are becoming less affordable – even though 30% of renting households earn above the median income.

The study predicted that more and more people over 65 would become renters. They will have different needs from the traditionally younger renting households. Also, the number of multi-family households is projected to increase, and they will have different needs again.

Analysis of data from the BRANZ House Condition Survey 2015 identified that rentals were poorly maintained compared with owner-occupied housing. The Building to Rent study found that, for more than half of the rental stock, bringing it up to the same standard of maintenance as owner-occupied housing would cost less than \$5000, and less than \$10,000 to a good standard overall.

The study explored opportunities to improve the suitability of rental housing. One opportunity is a shell and fit-out model, where the landlord rents out the shell of a building for 10 years and the tenant is responsible for the internal fit-out.

Larger rental houses will meet the growing demand from multi-family households. Incorporating lifetime design features will cater to individuals under the age of 65 with physical impairments and the rapidly growing group of 65-plus renters.

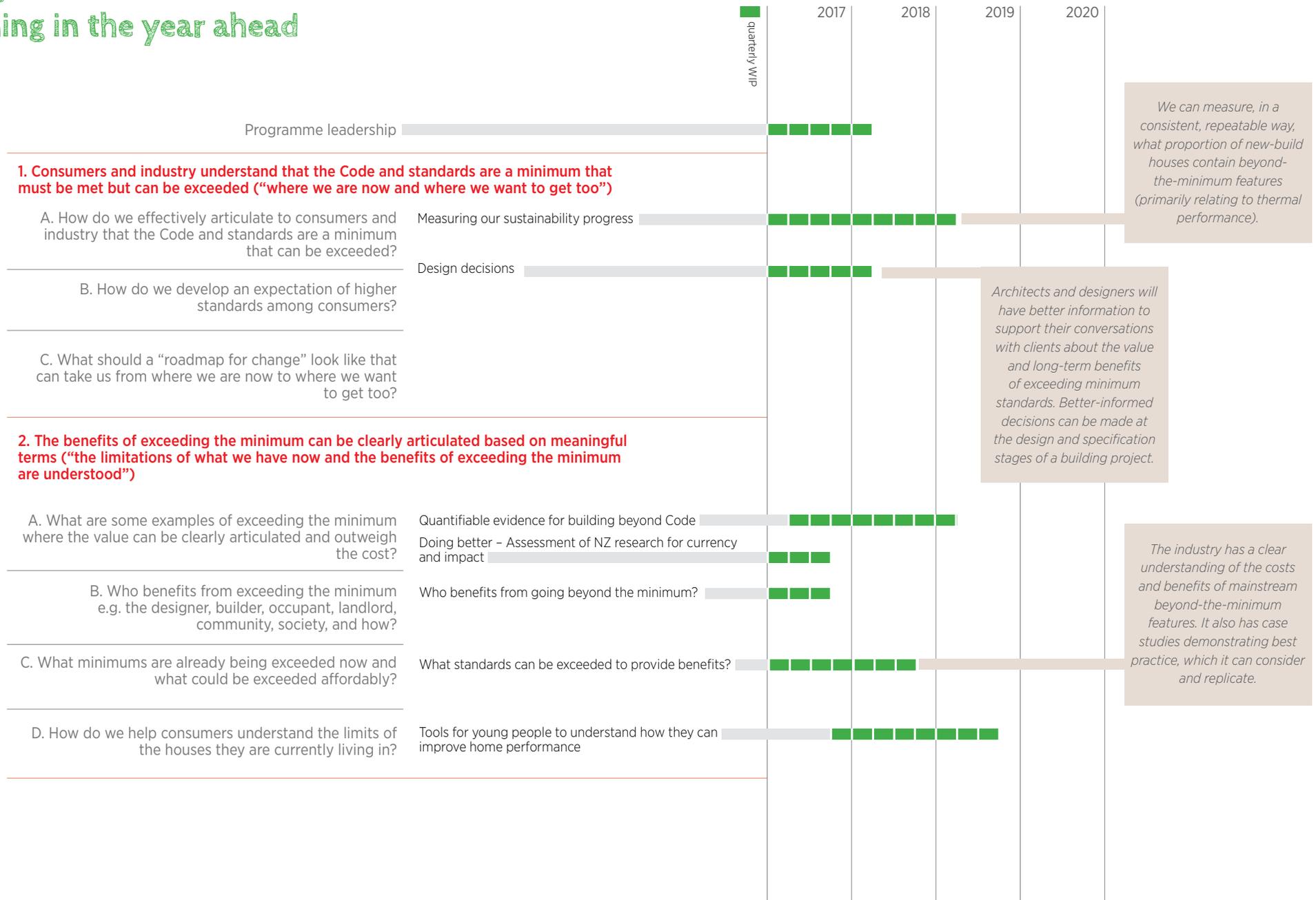


More and more people over 65 will become renters



exceeding minimum

Helping consumers understand and exceed the minimum Coming in the year ahead

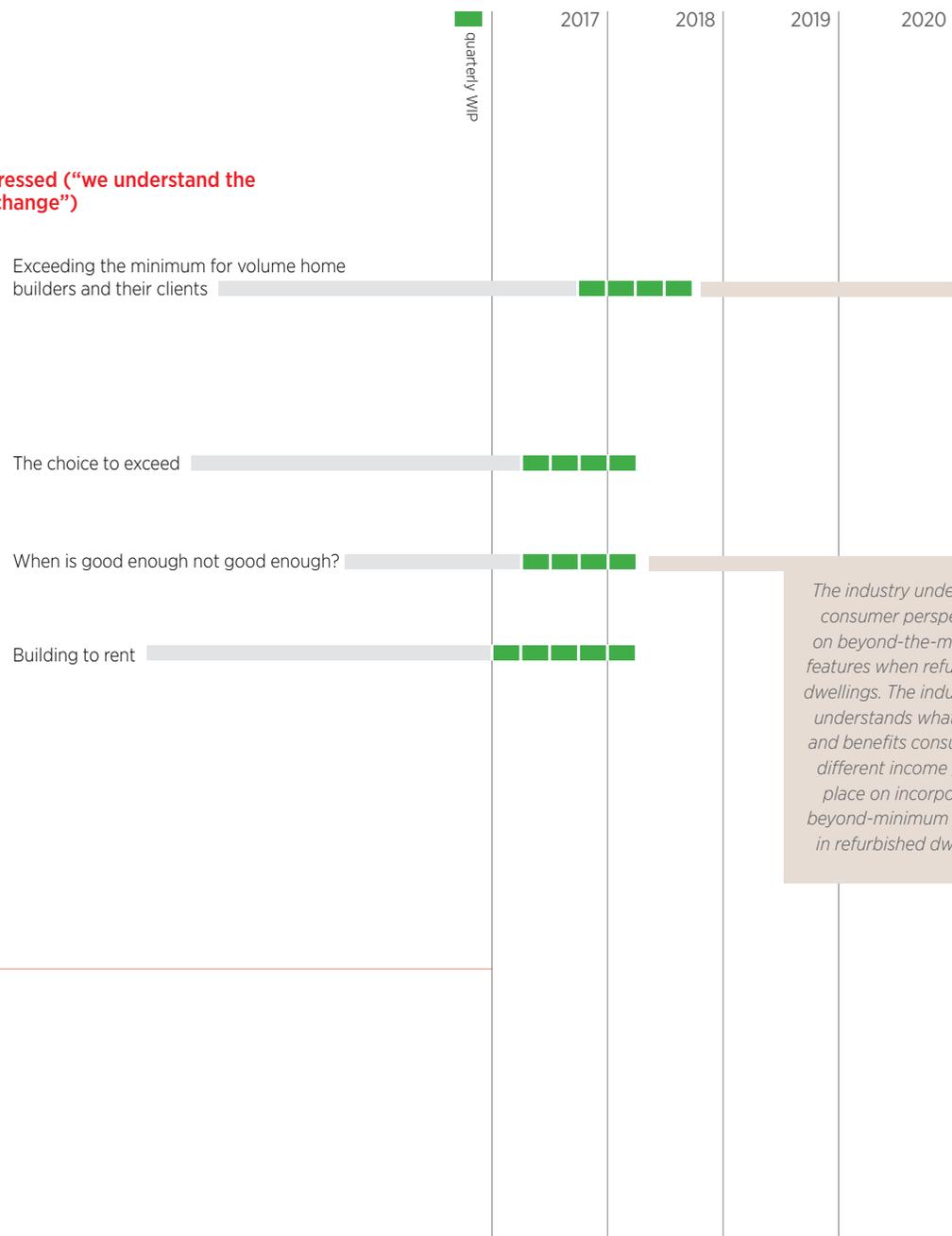


Helping consumers understand and exceed the minimum

Coming in the year ahead

3. The barriers to exceeding the minimum have been addressed (“we understand the barriers to exceeding the minimum and the enablers for change”)

- A. Why doesn't the industry talk with consumers about the benefits of exceeding the minimum for new build and what will encourage this?
- B. Why doesn't the industry talk with consumers about the benefits of exceeding the minimum for retrofitting of existing homes, and what will encourage this?
- C. What hurdles exist in the delivery of new build houses that exceed the minimum and how can these be overcome?
- D. What hurdles exist that make exceeding the minimum when retrofitting existing homes less attractive and how can these be overcome?
- E. Why doesn't the real estate industry value features that exceed the minimum and what will change this? Why don't landlords choose features that exceed the minimum, and what will change this?
- F. Why don't mortgage lenders and insurance companies take into account investment in features that exceed the minimum, and what will change this?
- G. What market mechanisms have been used internationally that have resulted in or are resulting in a shift towards exceeding the minimum, and what can we learn from these?



We understand what group home builders currently offer that exceeds the minimum, and the barriers to providing more. We test potential options for encouraging greater consideration of beyond-the-minimum features between the group home builder and the consumer.

The industry understands consumer perspectives on beyond-the-minimum features when refurbishing dwellings. The industry also understands what values and benefits consumers in different income groups place on incorporating beyond-minimum features in refurbished dwellings.



Better informed consumers will raise their expectations for new builds and upgrades



Helping consumers understand and exceed the minimum

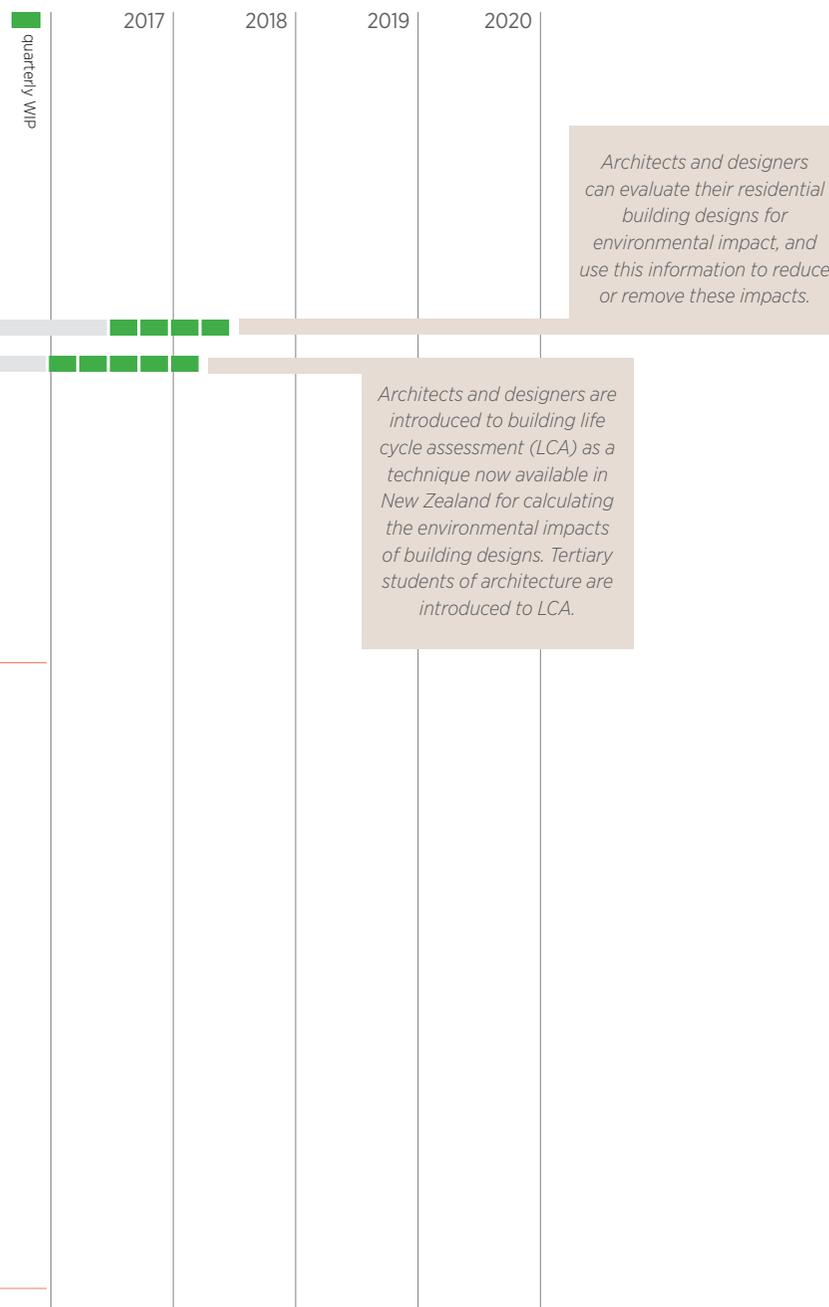
Coming in the year ahead

4. Consumers expect and demand buildings and communities that perform to a higher standard (“we focus on breaking down barriers to exceeding the minimum and changing consumer expectations”)

- A. How can we extend the range of market mechanisms available to assess houses in a location-specific and holistic way in order to help consumers find out about alternative options that available beyond the minimum standard?
- B. How can we help consumers request solutions that exceed the minimum by ensuring they receive targeted information at the right time?
- C. How do we improve the uptake of market mechanisms by consumers?
- D. How do we turn the industry into an advocate for the market mechanisms that are available to inform consumers about solutions that exceed the minimum?

5. The industry delivers buildings and communities that perform cost effectively to a higher requirement (“the industry is equipped to meet consumer expectations of higher performance”)

- A. What advice are industry professionals giving to various types of consumers about exceeding current practice?
- B. How current, applicable and impartial is the advice that industry professionals are giving to consumers about exceeding minimum standards?
- C. What is the credibility and skills base of the industry professionals who advise consumers about the minimum standard?
- D. How can the industry professionals who advise consumers about the minimum standard be educated and upskilled?
- E. How can we test building performance consistently, robustly and cost-efficiently, and how can achieved levels of performance be conveyed to consumers in a clear, understandable and meaningful way that facilitates easy comparison?



Helping consumers understand and exceed the minimum

New projects funded in 2017/18

Programme leadership

This investment supports the delivery of the programme as a whole. It provides time and resources for engagement with key stakeholders, and the investment supports the operation of an advisory group. It also underpins the communication of key programme-level insights to the industry.

Levy investment \$53,000

Timeframe January 2017 – March 2018

Contact David.Dowdell@branz.co.nz

LCA (Life Cycle Assessment) Quick – Residential

This project adapts a BRANZ-developed tool (LCAQuick Office) to enable architects and their clients to iteratively test and evaluate the life-cycle impacts of their residential designs and compare these with typical new builds. The robust, impartial assessment provides a holistic understanding of design decisions and highlights the benefits of going beyond the minimum.

Levy investment \$178,000

Timeframe July 2017 – July 2018

Contact David.Dowdell@branz.co.nz

Measuring our sustainability progress

This project aims to quantitatively understand the thermal, comfort, health, utility and economic performance of New Zealand's new-build detached houses. Fifteen core indicators will be examined. The project will provide a concise and transparent understanding of how the new housing stock is performing.

The project supports better data gathering on key aspects of new homes. This links with fundamental challenges we face as a nation, such as an ageing demographic and climate change. Key to this will be investigating how going beyond the Code affects the housing stock in terms of resulting cost, indoor comfort and resource use.

Levy investment \$150,000

Timeframe August 2017 – March 2019

Contact David.Dowdell@branz.co.nz

Which structure?

Engineers play a key role in design decisions and the choice of different structural approaches to delivering buildings. Considerable information now exists about choices to support different seismic engineering approaches.

This project looks to develop this platform and support engineers considering a range of structural choices relative to Code-compliance structures. This will cover areas such as life-cycle cost, seismic resilience and environmental impact.

Levy investment \$140,000

Timeframe April 2017 – March 2018

Contact David.Dowdell@branz.co.nz

exceeding minimum

Exceeding the minimum for volume home builders and their clients

This project will develop a framework of features and benefits that will help volume home builders and their clients better understand and communicate the importance of 'exceeding the minimum'. Written and visual communications material will be developed outlining 'code-better-best' options for typical volume home builder' dwelling specifications.

Levy Investment \$78,540

Timeframe September 2017 – August 2018

Contact verneyr@beaconpathway.co.nz

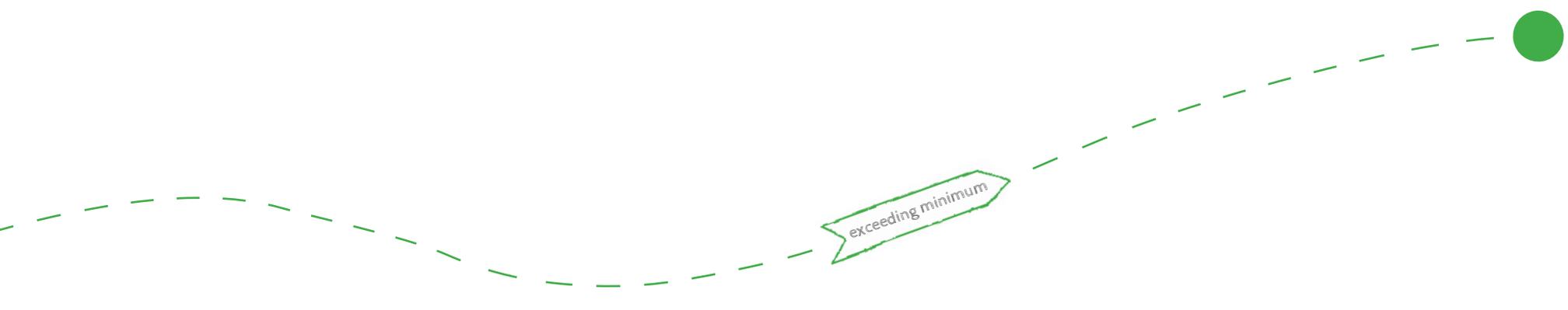
Tools for young people to understand how they can improve home performance

This project aims to test the effectiveness of home performance education targeted at young people (as both current and future home consumers, and as influencers of their own families) in enabling better understanding of the principles of home performance, energy and water use, and how to make their homes warmer, drier and healthier. This proposal brings together Beacon's expertise in home performance research, Toimata Foundation's network and expertise in child-centred learning and the Home Performance Advisor programme's knowledge base to develop a learning product specifically for young people.

Levy Investment \$99,880

Timeframe August 2017 – June 2019

Contact verneyr@beaconpathway.co.nz



exceeding minimum

Eliminating quality issues

Why this is a priority

New Zealand is experiencing a housing shortage. And the building and construction industry is building at a record level.

Unfortunately, this pressure carries the risk of declining quality of workmanship. Several studies have exposed recurring instances of poor building quality in recent years. Problems include poorly installed insulation, badly poured concrete slabs, non-compliant steel reinforcing and other materials, and non-compliant passive fire assemblies.

Simple solutions have been found and suggested to the industry to address some of these quality issues. However, these have not always been translated into building improvements.

For the industry to reverse that cycle, it will take a quantum shift in thinking and culture. Practitioners must be persuaded or inspired to adopt quality solutions – for the current boom and beyond.

The story so far

It is still early days for a programme grappling with a new, complex and untested approach to eliminating common quality issues. The first year was essentially about getting a shared understanding of quality among BRANZ and the industry.

Two initial pieces of work set the scene. One focusses on defining quality (and barriers to quality) in the building and construction industry. The other is a feasibility study into whether a building pathology system would work in the New Zealand context.

The next chapter

In the second year of the programme, the planned research will be identifying the most common quality issues.

This will lead into work on identifying solutions that have already been developed and analysing why these solutions have not resolved the issue.

Making a difference

The ultimate measure of success for this programme would be if the industry takes up all BRANZ-driven quality initiatives and achieves enduring change in its practices.

In the short term, the programme could be deemed successful if the industry fully understands all barriers to solving common quality issues. Ideally, the industry will also understand what it must do to change its practices and be clear about who needs to drive this process.

Critical success criteria

The building industry:

1. Has identified common quality issues that occur.
2. Understands why some previous work to solve common quality issues has not been successful.
3. Understands the need to change its practices.
4. Has determined the best way to reduce the incidence of common quality issues.
5. Has eliminated common quality issues by using existing knowledge.
6. Has eliminated common quality issues by designing new solutions.



Programme leader Matthew Curtis
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Insights - Defining quality

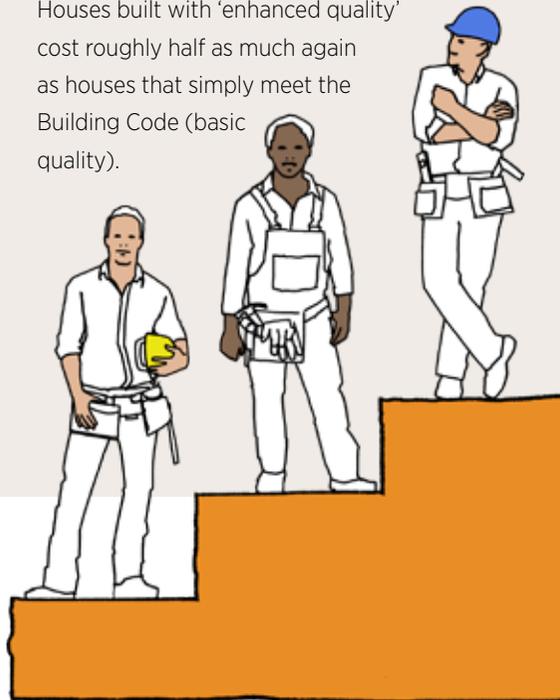
Before quality issues can be eliminated an understanding of what is meant by quality is needed. This work identified three levels of quality in building:

Basic quality: A building conforms to specifications, include the requirements of regulations, industry standards and contractual understanding. Regulations are 'performance-based' rather than rules-based. Compliance is shown through a building consent process.

Aesthetic defects can be avoided if:

- components are installed as per manufacturers' instructions and finished appropriately
- groups of components are installed consistently, whether horizontally or vertically
- joins between components are aligned and sealed.

Enhanced quality: A building incorporates features that cater for a range of users over time. It also interacts sustainably with the environment ('green buildings'). Commercial buildings are designed to be flexible for function of space, load and flux of inhabitants. Houses built with 'enhanced quality' cost roughly half as much again as houses that simply meet the Building Code (basic quality).



High quality: Based on claims about the building practitioners such as:

- superior skills and length of experience
- a quality-focussed work culture/ethos
- better products used
- building awards won
- client-focussed processes adhered to membership of professional associations.

Issues referred to in 'Eliminating quality issues' largely focus on ensuring we achieve basic quality.

Insights - A building pathology system in New Zealand - what is possible?

A pathology system is a way of identifying all existing and emerging trends in defects. With residential building, it is a critical first step towards fixing endemic problems or making sure they don't recur.

A pathology system would collate all information from a range of building practitioners about the causes, contributing factors and symptoms of known defects. This information is then analysed to support best-practice solutions, especially for the benefit of remediators, and to prevent future problems.

The pathology approach can also provide early-warning signs for problem materials, such as a new style of cladding.

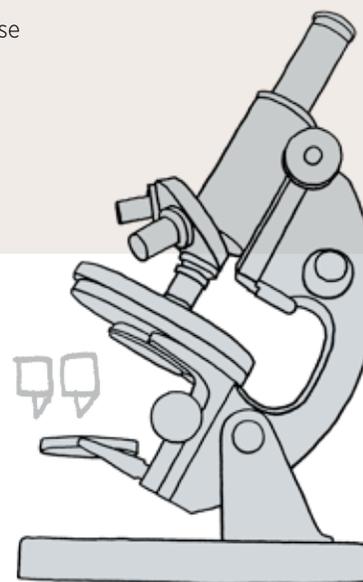
The study concludes that a building pathology system is a cost-effective proposition. It could work in New Zealand if it had buy-in from everyone involved in the design, building and monitoring of houses. It would need to be based on a comprehensive overview of defects in the housing sector, such as the BRANZ House Condition Survey.

Instituting a building pathology system in New Zealand would "increase sector-wide knowledge of building quality", the report says. "This can only lead to improvements in building quality and deliver benefits for all New Zealanders."

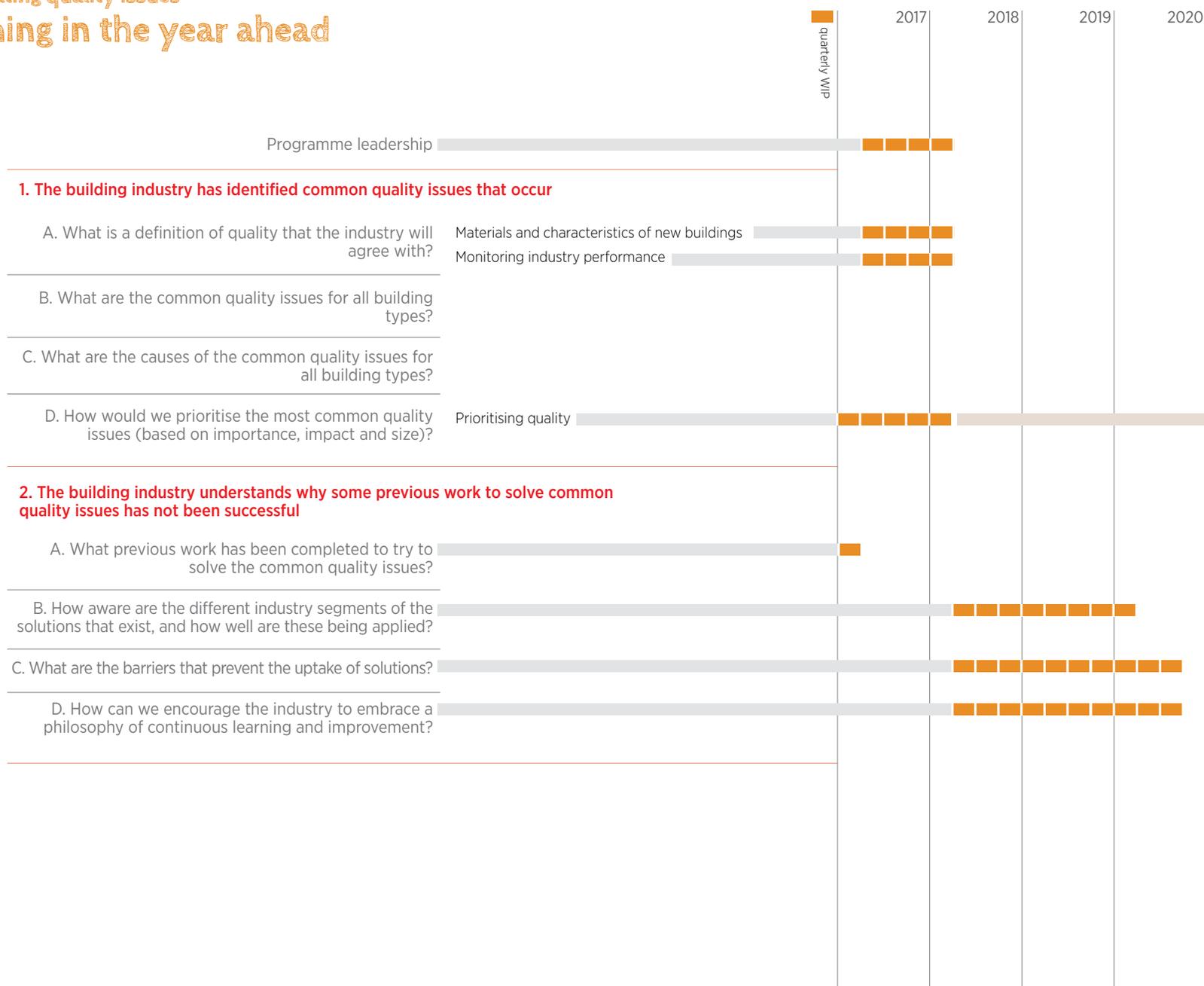
BRANZ is looking to trial the system in 2018/19.



The study concludes that a building pathology system is a cost-effective proposition



Eliminating quality issues Coming in the year ahead



Will identify quality issues that most affect owners and well as the building's long-term durability and usability. This will allow BRANZ to further study why common quality issues persist in the industry.

Eliminating quality issues
Coming in the year ahead

3. The building industry understands the need to change its practices

- A. What are some good examples of successful solutions to common quality issues that we can publicise and learn from?
- B. Who can we work with to change industry practices?
- C. How will we know that industry has actually changed practices and how do we measure this?
- D. What are all the options we can use to work with each segment of the industry to change their practices and what are the most effective?
- E. How can we get the industry to collectively buy in to the need to change their practices?

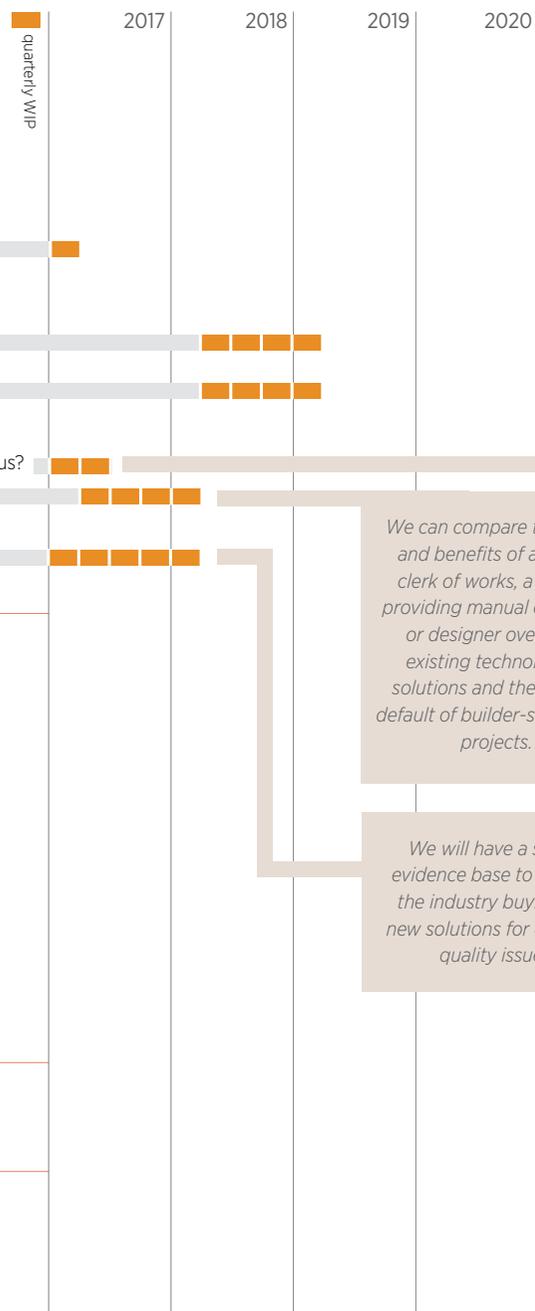
Evidencing quality issues - what can industry data tell us?
 Costs and benefits
 Adopting new ways

4. The building industry has determined the best way to reduce the incidence of common quality issues

- A. What is the existing knowledge that can be used to solve quality issues?
- B. Which of the most common quality issues can be solved with existing knowledge?
- C. Which of the most common quality issues require new solutions?
- D. Who needs to be involved in the solving of the most common quality issues?
- E. Which of the common quality issues are 'quick wins' that can be solved with little effort?

5. The building industry has eliminated common quality issues by using existing knowledge. The specific questions are to be scoped based on the results of achieving success criteria 1-4

6. The building industry has eliminated common quality issues by designing new solutions. The specific questions are to be scoped based on the results of achieving success criteria 1-4



We can join existing datasets for insights on building quality issues and identify simple available solutions for improving building performance.

We can compare the costs and benefits of a virtual clerk of works, a person providing manual oversight or designer oversight, existing technological solutions and the current default of builder-supervised projects.

We will have a strong evidence base to support the industry buying into new solutions for common quality issues.

Eliminating quality issues

New projects funded in 2017/18

Programme leadership

This investment supports the delivery of the programme as a whole. It provides time and resources for engagement with key stakeholders, and supports the operation of an advisory group. It also underpins the communication of key programme-level insights to the industry.

Levy investment \$53,000

Timeframe January 2017 – March 2018

Contact Matthew.Curtis@branz.co.nz

Adopting new ways

This project is designed to identify what the industry needs for practitioners to buy into new solutions and change their practices. The focus is on supporting improvement of quality across the supply chain. The research looks at the human factors behind the industry's willingness or otherwise to adopt new practices, even when the evidence is clear that change brings advantages.

It is a study of behaviours and attitudes – looking beyond the uptake of technical information. The research addresses the concern that new practices and solutions to quality issues will have no or little impact if the industry can't or won't adopt the solutions.

Levy investment \$80,000

Timeframe February 2017 – December 2017

Contact Lee.Bint@branz.co.nz

Costs and benefits for clerks of works

In previous research, a number of reasons for quality issues were identified. These include co-ordination problems and silo behaviours. Having a clerk of works (CoW) on site has historically solved this problem, but this approach has fallen in to disuse in recent years.

This project aims to look at the costs and benefits of the CoW model, including different CoW approaches. It will look at virtual solutions (such as the Artisan initiative being developed by BRANZ), a person providing CoW services on site and the current default of the builder supervising projects. This information will provide evidence to support improvements in site management and supervision.

Levy investment \$150,000

Timeframe April 2017 – March 2019

Contact Ian.Page@branz.co.nz

quality issues

Towards warmer, drier and healthier buildings

Why this is a priority

Research abounds, both internationally and in New Zealand, on the links between our built environment and health issues. Cold air, dampness and mould are linked to asthma, respiratory infections, rheumatic fever and even mental health issues. Pollutants in the air cause allergies and various allergy-related conditions.

In New Zealand, the physical condition of places in which we live, work, play and study can affect workers' productivity or the ability of children to learn. Thus, health issues are increasingly shaping building industry priorities.

It's not just our older houses that are to blame. We have seen evidence that new homes do not always provide a healthy indoor environment. There is a worrying trend of modern New Zealand buildings becoming more airtight. The resulting build-up of moisture and trapping of pollutants in the indoor air bring ever more health risks. And so we need to find new ventilation solutions for all our buildings.

The cost of bringing buildings up to a healthy standard places a major burden on the national and regional economies. Weathertightness issues ('leaky buildings') are estimated to have cost homeowners around \$23 billion so far to put right. In recent years, issues with substandard roofs, especially of school buildings, have

been identified. And this adds to the costs, both fiscal and societal.

New factors such as climate change and modern indoor-based lifestyles place more pressure on our buildings to perform. With the huge amount of construction needed as our population expands, this gives the industry an opportunity to make design improvements from the ground up.

The story so far

The first year of the Warmer, Drier and Healthier Buildings programme was about understanding the issues from all angles and gathering information to plug gaps in our knowledge.

To develop sustainable solutions, we first needed a good sense of existing and historic practice in New Zealand. We needed to know how other countries tackle the issues of warmer, drier, healthier buildings: what works or doesn't.

Roofing design and performance was a big focus of our research in 2016/17. Though it is central to all buildings, the problems are magnified in classrooms with their large concentrations of moisture-generating bodies. In schools, the problems tend to be bigger, more complex and more expensive to fix.



The next chapter

Research in 2017/18 will continue to seek an understanding of issues that prevent our current buildings from being warm, dry and healthy.

It will begin finding solutions to the most pressing problems in existing buildings that affect health. Focuses include weathertight cladding for mid-rise buildings, ventilation in large-span roofs, airtightness and energy-saving.

The programme will also investigate ways to communicate our learnings to the industry, as well as to the owners, suppliers and users of New Zealand buildings.

Making a difference

New Zealand will have warmer, drier, healthier buildings through a better understanding of the issues and exploring of solutions.

A comprehensive suite of information and a well-informed industry will help consumers to make the best building decisions for their health.

The industry will receive fewer complaints about excess indoor moisture resulting from building flaws.

Health statistics will show a reduced incidence of respiratory diseases from poor-quality indoor environments.

Critical success criteria

1. There is a strong understanding of the issues that prevent our current homes and buildings being warm, dry and healthy.
2. Solutions to developing warmer, drier and healthier homes and buildings in New Zealand have been successfully identified.
3. The industry understands the knowledge, ways of implementing the solutions and benefits provided.
4. Owners, suppliers and users of New Zealand buildings have the knowledge and understanding to make effective decisions for producing and maintaining warm, dry, healthy environments.



Programme leader Mark Jones
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Insights - Measuring moisture in the classroom

BRANZ scientists monitored indoor and outdoor climate at a Wellington primary school. They also measured levels of moisture released into the air by the presence of students at different times of day. The project was part of a multi-faceted investigation into how roof design can be improved to avoid moisture-related problems.

The chosen site was a three-storey concrete building. It was once divided into smaller classrooms, three to a storey. But with the change to innovative learning

environments, each level now operated as one large classroom capable of housing up to 60 students. The research took place over a six-month period, spanning both winter and summer months.

Temperature and relative humidity were recorded at 15-minute intervals at various locations on each floor. The study reveals great variation in the levels between winter and summer, and at different times of day.

The moisture readings show significant variance when the central heating switches on, when children leave the room for breaks, and on cold winter days when windows remain shut.

The resulting data set will help inform the future design of long-span roofs in schools, to produce healthier learning environments.

A complementary BRANZ study, 'Airflow through ceilings', provided data on how much indoor air in classrooms might be transported through the ceiling due to airflow.

warmer & drier



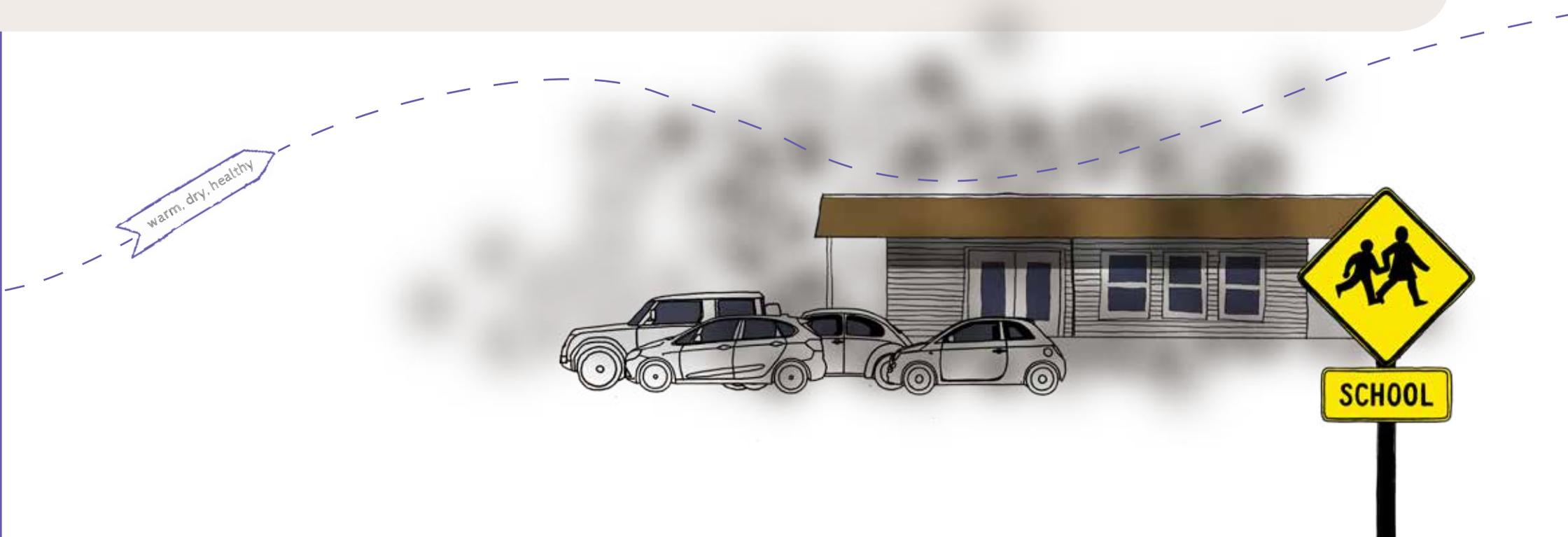
Insights - School air quality

A Levy-funded pollution study gathered valuable insights for informing ventilation improvements in future building design.

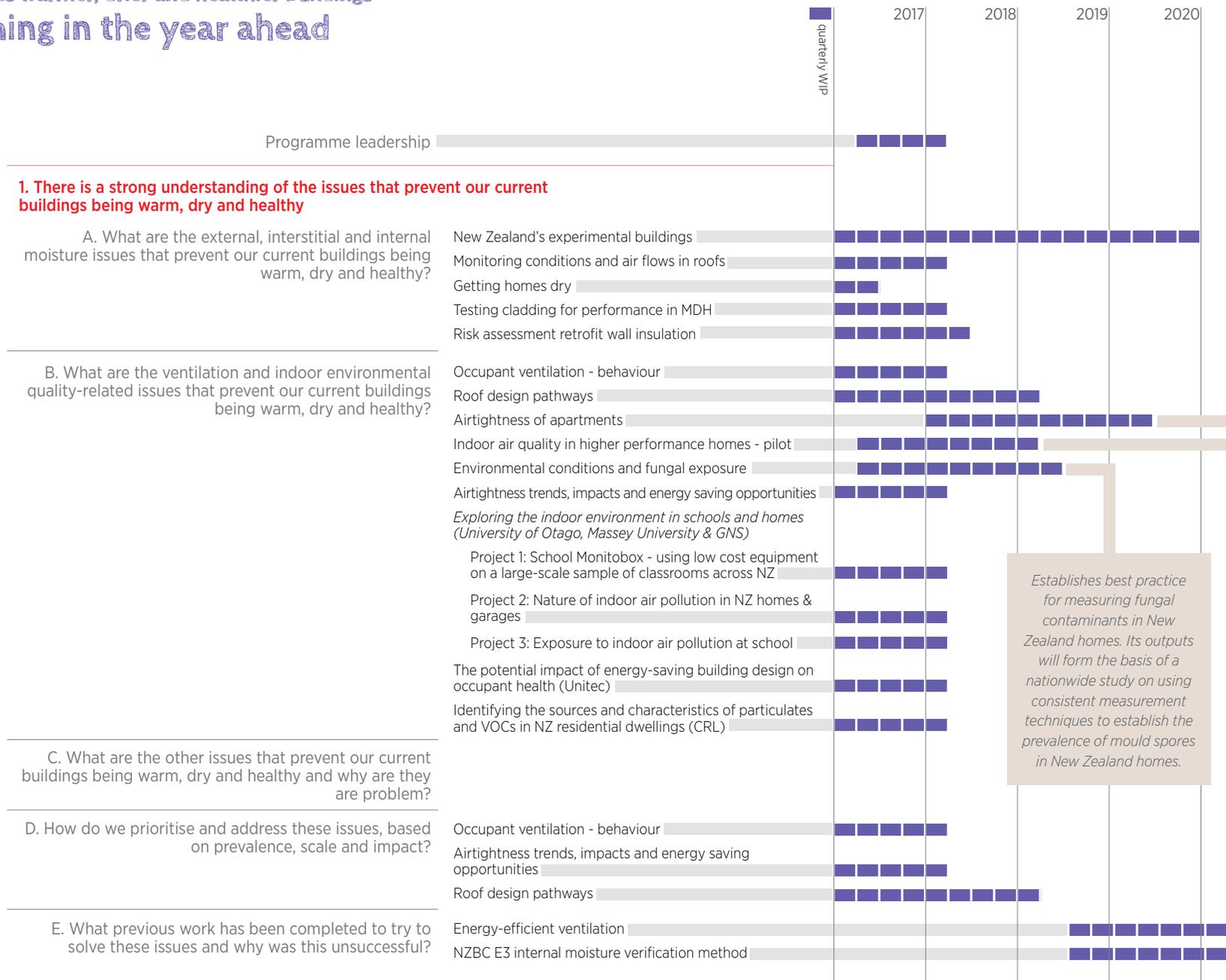
Researchers from the University of Otago, Massey University and GNS Science measured indoor and outdoor pollution at a Wellington primary school over a six-week period. The school operates out of prefabricated buildings that are poorly insulated and ventilated. It is also located at a busy intersection with high pollution levels from traffic fumes.

Results supported the case for an air quality system at schools such as this, to ensure the health of students and staff.

The researchers say the study addresses knowledge gaps about how outdoor air pollution interacts with the indoor environment in buildings near busy roads. Further exploration is needed on how to prevent outdoor pollutants from infiltrating classrooms.



Towards warmer, drier and healthier buildings Coming in the year ahead



Provides a better understanding of the dominant leakage paths in multi-unit residential buildings, so the industry can flag and address ventilation and moisture-control issues before they become too damaging.

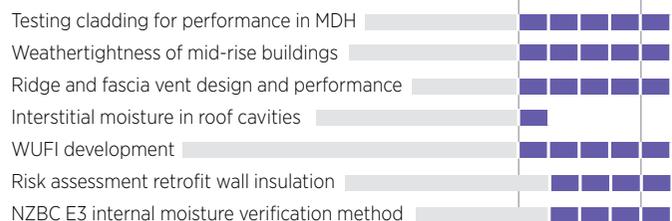
Establishes best practice for measuring fungal contaminants in New Zealand homes. Its outputs will form the basis of a nationwide study on using consistent measurement techniques to establish the prevalence of mould spores in New Zealand homes.

Provides insight into the actual indoor air quality of higher-performance homes and upskills BRANZ in pollutant monitoring. This pilot is a stepping stone to a wider, more representative study of higher-performance dwellings in New Zealand.

Towards warmer, drier and healthier buildings
Coming in the year ahead

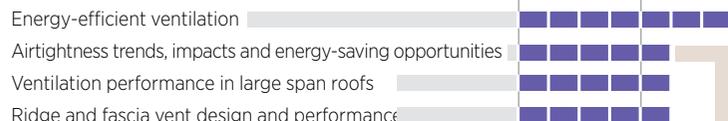
2. Solutions to developing warmer, drier and healthier buildings in New Zealand have been successfully identified

A. What are the accepted and effective solutions to addressing external, interstitial and internal moisture issues that enable our current buildings to be warm, dry and healthy?



Provides guidance for councils, installers and homeowners on a building's suitability for retrofitted wall insulation, to avoid moisture ingress. Also, advises on the best method to use.

B. What are the accepted and effective solutions to addressing ventilation and indoor environmental quality-related issues that enable our current buildings to be warm, dry and healthy?



Will establish methods of verifying internal moisture for clause E3 of the NZ Building Code. The aim is to produce a smoother, better targeted approach to these, and improved implementation pathways for BRANZ research.

C. What are the accepted and effective solutions to addressing other identified issues that enable our current buildings to be warm, dry and healthy?



D. What are the barriers that prevent the uptake of solutions and how can these barriers be addressed?



E. What is the potential impact of the proposed solutions? Are the solutions to the technical issues that have been identified practical and acceptable to end users?

Expands current data on airtightness for a new national database. This can then be used to develop ways of mapping, simulating and improving building performance. The project will also investigate the best way of preventing heat loss and improving energy efficiency.

F. How do these solutions support or contribute to broader design strategies to deliver warmer, drier, healthier homes and other buildings?

G. What are the benefits from having warmer, drier, healthier buildings?



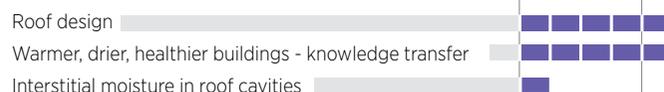
quarterly WIP | 2017 | 2018 | 2019 | 2020

Towards warmer, drier and healthier buildings

Coming in the year ahead

3. Industry understands the knowledge, ways of implementing solutions and benefits provided

A. What are the most effective ways of communicating the benefits to industry?



B. How can the solutions to the technical issues that have been identified be rolled out to industry to encourage their uptake?



C. How is the research incorporated into the regulatory framework, e.g. Acceptable Solutions and Standards, and how are these adopted by industry and consenting authorities?



D. How does the market provide for implementation of solutions?

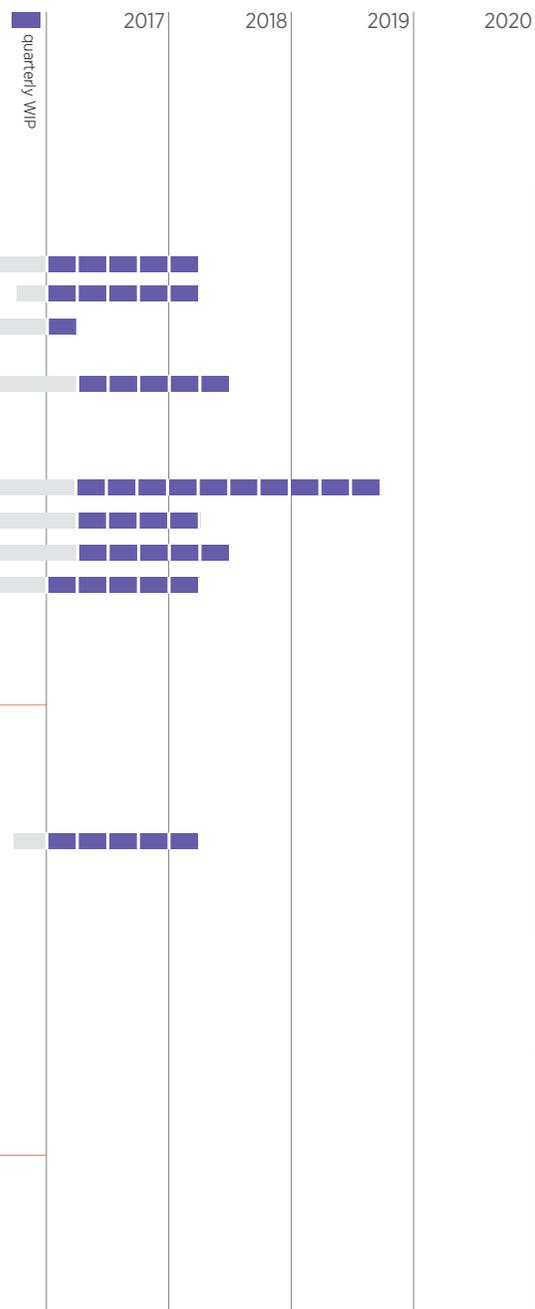
4. Owners, suppliers and users of New Zealand buildings have the knowledge and understanding to make effective decisions in producing and maintaining warm, dry, healthy environments

A. What are the most effective ways of communicating the benefits to owners, suppliers and users?



B. What knowledge/information do owners, suppliers and users need to make sound decisions when investing in, producing and maintaining warm, dry, healthy buildings?

C. How can the need for continual improvement to buildings be monitored and communicated?



Towards warmer, drier and healthier buildings

New projects funded in 2017/18

Programme leadership

This investment supports the delivery of the programme as a whole. It provides time and resources for engagement with key stakeholders and supports the operation of an advisory group. It also underpins communication of key programme-level insights to the industry.

Levy investment \$68,150

Timeframe December 2016 – March 2018

Contact Mark.Jones@branz.co.nz

Airtightness of apartments

This project will measure the airtightness of multi-unit residential buildings and compare these with the existing data on housing airtightness. We know our houses are being built more airtight, but what about apartments, which are subject to larger and more complex driving forces?

Levy investment \$720,000

Timeframe April 2017 – March 2020

Contact Greg.Overton@branz.co.nz

Basis for an internal moisture verification method

This project will review previous attempts to provide a verification method for clause E3 of the New Zealand Building Code. It will compare these with alternatives, such as computer simulations or prescriptive requirements. This will lay the platform for further work in the Warmer, Drier and Healthier Buildings research programme, which aims to establish a verification method for clause E3.

The project will also involve collaboration to ascertain an implementation pathway. It will review how verification methods and acceptable solutions have been developed in the past. The aim is to produce a smoother, more targeted approach to these.

Levy investment \$90,000

Timeframe April 2017 – March 2018

Contact Greg.Overton@branz.co.nz

Indoor air quality in higher-performance houses

The project aims to better understand the indoor air quality (IAQ) performance of whole-house, balanced, mechanical-ventilation systems in recently built, energy-efficient, airtight and occupied stand-alone New Zealand houses. The pilot will provide insight into the actual IAQ of 'higher-performance' homes and pollutant monitoring. It is a stepping stone to a wider, more representative study of higher-performance New Zealand dwellings.

Levy investment \$170,000

Timeframe August 2017 – March 2019

Contact Mark.Jones@branz.co.nz

warm, dry, healthy

Indoor environmental and fungal exposure in residential homes

This is a pilot study to establish best practice for measuring fungal contaminants in New Zealand homes. It will focus on the indoor environmental conditions in 60 homes. Specifically, it will measure the temperature, relative humidity, ventilation behaviour and airborne fungal spore counts and compare them with those gathered from the Housing Condition Survey/Occupant Ventilation Behaviour subset.

The outputs of this pilot are intended to form the basis for a nationwide study aimed at using consistent measurement techniques to establish the prevalence of mould spores in New Zealand homes.

Levy investment \$143,000

Timeframe December 2016 – March 2018

Contact Manfred.Plagman@branz.co.nz

Retrofitting wall insulation

The research assesses risks of moisture ingress into retrofitted wall insulation when the underlay is either absent or compromised by installation holes drilled through cladding. The project will provide guidance for councils, installers and homeowners on a building's suitability for retrofit and the best method to use.

Levy investment \$200,000

Timeframe December 2016 – March 2018

Contact Greg.Overton@branz.co.nz

Roof design pathway

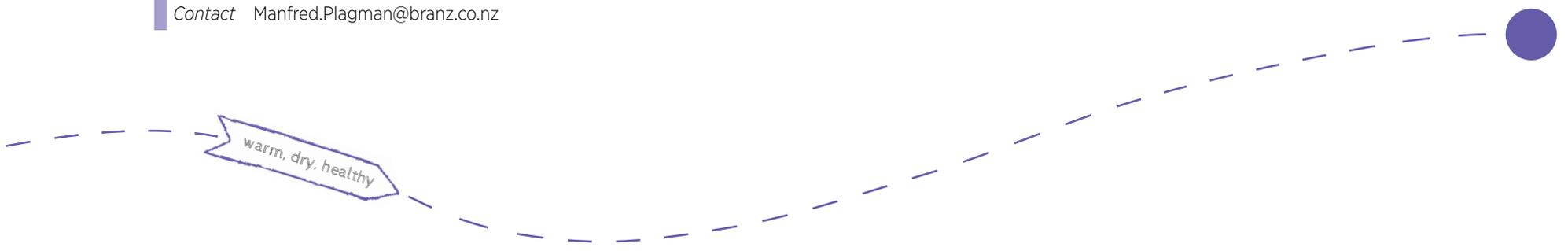
The project pulls together results from previous and current roof-related research to provide a single tool. This tool will support designers with improved options for roof design. It will also provide a clearer understanding of why some roofs fail, and provide strategies and guidelines for avoiding such failures in future.

Levy investment \$210,000

Timeframe April 2017 – March 2019

Contact Stephan.Rupp@branz.co.nz

warm, dry, healthy



Distinct stand-alone research

BRANZ also invests the Building Research Levy in distinct pieces of research into industry needs outside of the four priority programmes. This is part of BRANZ's commitment to maintaining a balance portfolio of research and maintaining investment in important research capability.

These stand-alone projects must also demonstrate how they address research priority themes from the Industry Research Strategy: Building a Better New Zealand.

Here are details of all new stand-alone research projects beginning in 2017/18.

A full list of all stand-alone projects under way in 2017/18, including those continuing from previous years, is presented in the Appendix.



stand-alone research

Materials performance

Development of a test method for plasterboard sheet lining screws

It is important that plasterboard linings are screwed in place securely enough that they can reliably operate as bracing elements.

The project is developing a new method to test this. Then, BRANZ will set up a screw listing scheme. This will provide builders with the necessary information so they can choose suitable screws for use with the various plasterboard linings. It will also assure regulators, such as building inspectors, that the installed system will perform as expected.

Levy investment \$20,000

Timeframe May 2017 – June 2017

Contact Graeme.Beattie@branz.co.nz

Better buildings

Application of chaos theory to seismic engineering

This is a scoping project to test the applicability of chaos theory to seismic engineering. The project will provide a better understanding of the dynamics of structures during earthquakes, identifying possible flaws in current seismic design methodologies. If successful, it will propose amendments to loading standards and/or new seismic design procedures as appropriate.

Levy investment \$90,000

Timeframe January 2017 – February 2018

Contact Chris.Litten@branz.co.nz

Flammable refrigerants fact sheets

New Zealand is phasing out ozone-depleting greenhouse gases such as fluorocarbon refrigerants. The refrigerants replacing them have the drawback of being flammable. Concerns have been raised about limited information in New Zealand on the safe use of hydrocarbon refrigerants. These are used extensively in some parts of the building industry, such as in food storage buildings.

This fact sheet will improve understanding of the potential hazards of using these refrigerants and provide information about how to mitigate these risks.

Levy investment \$19,000

Timeframe June 2017 – September 2017

Contact Cam Crawford, cam@chillex.co.nz

stand-alone research

Heat pump performance issues

A previous BRANZ study of 160 heat pumps around New Zealand has revealed that heat pumps are used quite differently from traditional heaters. Their energy use in actual operation is difficult to estimate.

This project follows up the earlier work and aims to provide much better information about how heat pumps are performing in New Zealand. This information is important, as the use of heat pumps as a primary source of heating in New Zealand homes and businesses continues to grow.

Levy investment \$80,000

Timeframe May 2017 – March 2018

Contact Andrew.Pollard@branz.co.nz

Preparing the foundation for risk-informed fire safety design

The current verification method for fire safety design is an important milestone in New Zealand. However, it has limitations, as highlighted recently by both the government and the building industry.

This project will take the next step towards risk-informed fire safety design. It will compile available knowledge and identify the gaps. The project's findings will be used for developing a comprehensive research programme aimed at improving how people and buildings are protected from fire.

Levy investment \$270,000

Timeframe October 2016 – March 2019

Contact Greg.Baker@branz.co.nz

Towards durable timber structures

There is increasing demand for timber use beyond traditional residential 'stick' construction and into more highly engineered timber solutions. Some of these innovative products and systems can find it challenging to meet or exceed the acceptable or alternative solution requirements of the New Zealand Building Code. This is strongly linked to a lack of durability information relevant to the New Zealand environment and limited accelerated weathering methodology to allow innovation.

This project will provide essential data for developing accelerated testing methodologies to assess timber structure durability. This has the potential to provide new acceptable solutions that satisfy the Code, bringing more choices in construction material.

Levy investment \$440,000

Timeframe November 2016 – March 2020

Contact Kathryn.Stokes@branz.co.nz

stand-alone research

Using COMSOL for building physics

This project focusses on how the software package COMSOL can be used for investigating building physics problems. Another software package, WUFI, is New Zealand's primary weapon for this type of problem. However, COMSOL has several advantages, particularly around airflows.

The experimental data from BRANZ's recent 'Vapour control in walls' project will be used as a test case. WUFI under-predicted the moisture level in the drained cavities of those test walls. If COMSOL can predict this more accurately, it should lead to clearer recommendations on whether venting cavities need topping.

COMSOL can also be used for a wide range of issues facing the industry, such as corrosion, structural mechanics, indoor air quality and acoustics. This project is exploring whether there are better ways to carry out fundamental building science. COMSOL could provide a new, improved building block to support work on delivering warmer, drier, healthier buildings.

Levy investment \$145,000

Timeframe April 2017 – March 2018

Contact Greg.Overton@branz.co.nz

Scholarships

Dan Court-Patience

Buckling restrained braces (BRB's) unique advantage to provide similar strength in compression and tension has seen the system become an attractive method for resisting seismic loads in steel structures. Despite the global popularity of BRBs there has been little testing of structures with BRBs with forces applied in two horizontal directions, as can occur during an earthquake event. This research will look at the performance of realistic BRB systems subject to 2-D horizontal shaking by focusing on ground storey frames where demands and consequence of failure are greatest.

Timeline To be completed by November 2017

Contact research@branz.co.nz

Beth Noble

The New Zealand Building Code outlines the importance of a built environment that is accessible to people of all abilities and function. However, there is often a large gap between the intentions of this and the built environment as it currently is. This project aims to investigate whether adverse effects of poor indoor environment are exacerbated in people on the autism spectrum, including which IEQ factors are the most significant. It is hypothesised that, due to known sensory sensitivities, people on the autism spectrum will be more sensitive than a control group to indoor environment quality in the built environment.

Timeline To be completed by March 2018

Contact research@branz.co.nz

Maintaining and improving the performance of existing buildings

Additional investment to support communication of the House Condition Survey findings

The House Condition Survey is a significant longitudinal survey of New Zealand homes. It is New Zealand's most comprehensive snapshot of the condition of housing stock. The survey, carried out every five years since 1994, has evolved to meet changing needs. For example, the most recent version included rental housing, reflecting the changing role of that tenure in our society.

The survey plays a key role in providing impartial evidence to inform industry practice and government policy. The investment allowed for additional research of the data and more activity to meet demand for access to the survey.

Levy investment \$60,000

Timeframe May 2017 – March 2018

Contact Mark.Jones@branz.co.nz

Scholarship

Cara Askew

This research proposes that the energy efficiency of non-residential buildings is not confined to the application of efficient or renewable technologies. The key is in how they are effectively controlled to meet the needs of the building occupants as efficiently as possible. Building Management Systems (BMS) provide this opportunity. However, the energy management capabilities of BMS are typically left un-optimised.

The research project aims to define the usability and utilisation of Building Management Systems in New Zealand's non-residential building stock, in order to identify limitations preventing the optimisation of building energy performance.

Timeline To be completed by February 2018

Contact research@branz.co.nz

Sustainability

Annual Loss Factor Tool – update

The Annual Loss Factor tool (ALF) is a key online thermal-analysis tool for code compliance and targeted improved thermal outcomes for houses. ALF is used daily by the design community. It provides evidence for thermal assessment and a verification method for determining the Building Performance Index (BPI). This can show compliance with New Zealand Building Code clause H1, energy efficiency. This is important where the designer is willing to go well beyond the (default) schedule method or even the calculation method for thermal requirements.

It also helps to educate homeowners/property-owners and enables users to quantify the benefits of investing beyond the minimum insulation standards.

The BRANZ helpline gathered a raft of requests to improve ALF's functionality and streamline the tool for industry use. This project delivers these improvements to this important resource.

Levy investment \$230,000

Timeframe May 2017 – March 2019

Contact Lisa.Clephane@branz.co.nz

Scholarships

Rochelle Ade

This work will compile a database that will allow the water and energy use of New Zealand homes to be benchmarked against each other as well as determining IEQ performance. This will in turn enable analysis of the performance of Homestar rated houses and compare it to the predicted performance in the Homestar Rating Tool.

By understanding what guidance, support and tools are needed it will look to help industry better understand and benefit from sustainability including benchmarking sector performance from a whole-of-life perspective. The research also hopes to establish benchmarks of IEQ performance that could be used as a threshold to determine if a dwelling has acceptable IEQ performance.

Timeline To be completed by February 2020

Contact research@branz.co.nz

Philip Penn

This research will encompass the BIM LCA tools developed by Brian Berg for residential housing. More specifically it will explore the consequences on accuracy of different levels of the BIM model detail and design when calculating the building LCI. The thesis will briefly consider issues in the development and use of LCI material coefficients, but will not explore that in detail.

Timeline To be completed by November 2017

Contact research@branz.co.nz

Vicky Southworth

Excess storm water causes problems across the globe and is likely to get worse with climate change and densification of our cities. A range of devices and materials that mimic natural processes are now available, collectively known as Water Sensitive Urban Design (WSUD). To be effective, WSUD need to be implemented widely. There are examples of WSUD in recent large scale developments around Christchurch, but what about existing housing stock and individual new developments? This work will put numbers to the benefits of including WSUD in small scale or individual developments and refurbishment projects, and then will investigate how we can increase the uptake of water sensitive options.

Timeline To be completed by June 2018

Contact research@branz.co.nz

Operating environment

Support for participation in a New Zealand building research conference

BRANZ plays a leading role in identifying and delivering research. Many other organisations, such as universities, CRIs, private research providers and industry organisations. Opportunity to share information on current and planned research projects. Support co-ordination and collaboration.

Levy investment \$65,000

Timeframe April 2017 – March 2018

Contact research@branz.co.nz

Support for input to the new tier-one housing quality statistic

Statistics New Zealand is developing a new statistic on the condition of New Zealand homes. This investment supports BRANZ experts' participation in this work. BRANZ has considerable expertise in housing quality data. This is an opportunity to support a new nationwide approach to collecting this important information.

Levy investment \$20,000

Timeframe March 2017 – March 2018

Contact research@branz.co.nz

Support for exploring a building-sector transformation initiative

BRANZ has initiated the development of a New Zealand Industry Transformations Agenda (ITA) to provide a practical approach for transforming our building and construction industry. The ITA is based on the World Economic forum's multi-year Future of Construction project (<https://www.weforum.org/projects/future-of-construction>), which began in 2015.

This investment supports BRANZ's work with a core group of industry leaders to refine and test the global ITA for the New Zealand context. The work includes conducting an industry-wide survey and holding workshops with industry members. The ITA will tackle the challenges and opportunities faced by the building and construction industry to make it more productive, more profitable and better at applying best practice.

Levy investment \$122,000

Timeframe March 2017 – March 2018

Contact research@branz.co.nz

Pre-work on revision of NZS 3604

NZS 3604 is one of the most commonly used standards in the building and construction industry. It supports the construction of light-timber-framed houses. A process has begun on reviewing the content of this standard. Since it was last reviewed, BRANZ has collected considerable data and information about aspects of the standard, for which updates or clarification are now required.

This investment supports preparatory work to draw this information together ahead of the review of NZS 3604.

Levy investment \$120,000

Timeframe July 2017 – January 2018

Contact Jack.Lyons@branz.co.nz

stand-alone research

Exploring the potential of open data

There is considerable interest in the opportunities presented by opening up and sharing data sources. Open data is a tremendous resource that is still largely untapped. Many individuals and organisations collect a broad range of data types to perform their tasks.

As a research organisation, BRANZ collects significant amounts of data. There are many areas where we believe opening up our data could be of value. This project supports BRANZ in exploring what is possible in opening up our data. In particular, it looks at how the House Condition Survey – a significant and very current data set – could act as a test case.

Levy investment \$50,000

Timeframe March 2017 – March 2018

Contact research@branz.co.nz

Preparing the foundation for risk-informed fire safety design

A previous BRANZ study of 160 heat pumps from around New Zealand has revealed that heat pumps are used quite differently from traditional heaters. Their energy use in actual operation is difficult to estimate. This project follows up this work and aims to provide much better information about how heat pumps are performing in New Zealand. This information is important, as the use of heat pumps as a primary source of heating in New Zealand homes and business continues to grow.

Levy investment \$80,000

Timeframe May 2017 – March 2018

Contact Andrew.Pollard@branz.co.nz

Building Better Cities and Communities

No new projects

Productivity

No new projects



stand-alone research

Appendix - All projects underway in 2017/2018

For further information on the programmes please contact the programme leaders.
All other enquires about other projects should be sent to research@branz.org.nz

Medium-density housing that meets the needs of New Zealanders

Lessons from international medium-density housing examples	\$50,000
The new medium-density housing market – demand side analysis	\$140,000
The new medium-density housing market – supply side analysis	\$150,000
Medium-density housing construction quality survey	\$200,000
Understanding medium-density housing	\$85,000
Getting medium-density housing through the hoops: the barriers and constraints involved in building and resource consents processes	\$85,000
Understanding the gaps in the knowledge of owners and residents around the maintenance requirements for medium-density housing	\$89,000
Medium-density housing Liveability	\$150,000
Medium-density housing Skills	\$150,000
Leveraging medium-density housing experts knowledge	\$150,000
Programme Leadership	\$124,000
Who has the ability and interest to deliver medium-density housing	\$150,000
Medium-density housing flooring	\$150,000
Testing claddings for performance in medium-rise buildings	\$360,000
Medium-density housing information resource	\$160,000
Medium-density housing fact sheets	\$120,000
Fire spread from lower roofs	\$428,000
Developing tools to measure and improve the quality and liveability of medium-density housing developments	\$98,000
Acoustical design of medium-density housing	\$116,000

Exceeding the minimum

Understanding life cycle design - the benefits of a new technique for evaluating building design life cycle impacts	\$176,000
Which Structure? Assisting engineers make more informed decisions about structural alternatives going beyond current Building Code	\$140,000
When is 'good enough' not good enough? Consumer attitudes towards minimum standards and upgrade options	\$90,000
The Choice to Exceed - the messages that industry gives to consumers about exceeding the minimum standard	\$145,000
The quantifiable evidence of building beyond Code	\$150,000
Which standards can be exceeded to provide benefits?	\$150,000
LCAQuick Residential. Adapting a new tool to demonstrate the benefit of going beyond minimum in residential building design	\$188,000
Building to rent	\$180,000
Measuring our sustainability progress	\$150,000
Programme leadership	\$53,000
Design decisions	\$105,000
Doing better - an assessment of New Zealand Research for currency and impact	\$94,000

Appendix - All projects underway in 2017/2018

Eliminating quality issues	
Prioritising quality	\$150,000
Adopting new ways	\$80,000
Costs and benefits of clerk of works models	\$150,000
Programme leadership	\$53,000
Evidencing quality issues - what can industry data tell us	\$54,000
Warmer, drier and healthier buildings	
Indoor air quality in higher performance homes	\$170,000
Airtightness trends, impacts, and energy saving opportunities	\$419,000
Monitoring conditions and air flows in roofs	\$73,000
New Zealand's experimental buildings	\$525,000
Roof design pathways	\$210,000
Ventilation performance in large span roofs	\$360,000
Ridge and fascia vent design and performance	\$187,000
Getting homes dry	\$75,000
Programme leadership	\$68,000
Airtightness of apartments	\$720,000
Indoor environmental & fungal exposure in residential homes	\$143,000
Basis for an internal moisture verification method	\$90,000
Retrofitting wall insulation - risk mitigation	\$200,000
Roof design	\$165,000
The potential impact of energy saving building design on occupant health	\$94,000
Identifying the sources and characteristics of particulates and VOCs in New Zealand residential dwellings	\$100,000
Exploring the indoor environment in schools and homes - School Monitobox	\$100,000
Exploring the indoor environment in schools and homes - the nature of indoor air pollution in New Zealand homes and garages	\$100,000
Exploring the indoor environment in schools and homes - exposure to indoor air pollution at school	\$100,000
Materials Performance	
Materials within geothermal environments	\$489,269
Building resilience	\$720,000
Materials performance testing methodologies	\$1,553,000
Structural adhesives	\$555,000
Positional material deterioration over the building envelope	\$538,000

Appendix - All projects underway in 2017/2018

A durability evaluation framework for innovative materials	\$652,000
Corrosion in the Bay of Plenty environment	\$236,000
Durability verification database	\$20,000
Weathering site	\$30,000
Development of a test method for plasterboard sheet lining screws	\$20,000
Effects of absolute humidity on plasterboard bracing	\$124,000
Ensuring affordable concrete supply post 2020	\$110,000
Simkin: Scholarship	\$75,000
Jones: Scholarship	\$75,000
Tariq: Scholarship	\$75,000
Better Buildings	
Whole house R-values	\$430,000
Energy efficient ventilation	\$440,000
Occupant behaviour - ventilation and temperature	\$475,000
Weathertightness	\$300,000
Interstitial moisture in roof cavities	\$330,000
WUFI development	\$470,000
Performance-based fire safety engineering - limiting fire spread by design	\$1,629,000
Heat pump performance issues	\$80,000
Warmer, Drier, Healthier Buildings - Knowledge transfer	\$73,000
Using COMSOL for building physics	\$145,000
Good Practice Guide - Non structural components	\$98,000
Good Practice Guide - Texture coated claddings	\$19,000
Flood It - reducing flood effects on New Zealand dwellings	\$380,000
Fire safe use of timber construction	\$837,000
Passive fire protection quality	\$398,000
Meth Houses: building material interactions and resilience	\$90,000
Design of hybrid timber structures for multi-storey and medium-density housing applications	\$300,000
Reducing earthquake damage to irregular light timber framed (LTF) buildings	\$385,000
Preparing the foundation for risk informed fire safety design	\$270,000
Towards durable timber structures	\$440,000
Application of chaos theory to seismic engineering	\$90,000
Specific design for light timber framed buildings	\$620,000

Appendix - All projects underway in 2017/2018

Quality preliminary investigation report	\$100,000
Design, installation & seismic restraint of interior partitions and walls	\$92,000
Flammable refrigerants fact sheets	\$19,000
Thompson: Scholarship	\$75,000
Taptiklis: Scholarship	\$75,000
VUW summer research scholarship	\$3,000
Marriot: Scholarship	\$20,000
Court-Patience: Scholarship	\$20,000
Noble: Scholarship	\$20,000
Maintaining and Improving the Performance of Existing Buildings	
House Condition Survey communication	\$60,000
Bedford: Scholarship	\$75,000
Askew: Scholarship	\$20,000
Sustainability	
Maintaining ALF 3.2	\$40,000
New Zealand best practice energy / thermal simulation	\$140,000
Residential water use Level	\$290,000
Annual loss factor tool - update	\$72,000
Materials and characteristics of new buildings	\$230,000
Measuring the value of sustainability and resilience features in housing	\$400,000
Ghose: Scholarship	\$450,000
Ade: Scholarship	\$75,000
Southworth: Scholarship	\$75,000
Penn: Scholarship	\$20,000
	\$10,000
Building Better Cities & Communities	
Revised legal frameworks for ownership of land with multiple dwellings	\$50,000
Mixed-use urban planning and development	\$56,000
Productivity	
Mapping the Roles of the Building & Construction Industry	\$156,000

Appendix - All projects underway in 2017/2018

Monitoring industry performance	\$180,000
New House Owners' Satisfaction Survey	\$250,000
Research on the Costs and Benefits of Residential Safety Systems Aimed at Reducing Falls	\$157,000
Leadership through future thinking - Project Provision (LR0493 continued)	\$312,000
People's Movements Across Firms and the Contribution of People's Productivity to Firms' Productivity in the Construction Sector	\$113,000
Miller: methods of Improving Productivity in Construction & Engineering: Information Flow	\$75,000
Arch-Eng-Build 2017	\$45,000
Operating Environment	
BRANZ Research Levy Forecasts 2017-2018	\$40,000
New Zealand Housing Review	\$459,000
Advisory Services	\$430,000
BUILD magazine to apprentices	\$22,000
BUILD magazine to all LBPs	\$883,000
BRANZ Find 2017-18	\$56,000
B Risk User support and development	\$220,000
Seminars 2017-18	\$435,000
Webinars 2017-18	\$90,000
Annual publications review	\$32,000
Guideline 2017-18	\$30,000
Builders Mate 2017-18	\$150,000
Bulletins 2017-18	\$150,000
Seismic design of screwed timber joints	\$200,000
Building Controls - input in to Standards and Code development	\$300,000
BRANZ Library and Information Management	\$261,000
Conference and seminar presentations on historic Levy projects	\$50,000
Artisan - Virtual Clerk of Works - management and hosting	\$360,000
Artisan - Virtual Clerk of Works - development and implementation	\$1,440,000
BRANZ support for the building industry transformation agenda	\$122,000
Funding for BRANZ input into a national building research event	\$65,000
Testing the potential of open data using the House Condition Survey	\$50,000
BRANZ input in to the development of a tier one housing quality statistic	\$20,000

Appendix - All projects underway in 2017/2018

Automation, industrialisation and new technologies	
BRANZ 3D and 4D library	\$200,000
BRANZ investment in to the National BIM initiative	\$750,000
Specific design of multi-storey light steel framed buildings	\$80,000
Zero Net energy schools	\$40,000
Patel:Scholarship	\$75,000
Haddock: Scholarship	\$20,000
Meeting the Housing Needs of All New Zealanders	
Henning-Hansen Scholarship	\$75,000