



# Towards a consistent approach for evaluating building performance for low-carbon houses

Various tools and approaches are currently available to evaluate carbon emissions and building performance across a range of variables. The available tools and inputs are not always consistent, and some are complex and difficult to use. BRANZ canvassed a range of industry stakeholders to find out the issues they face when evaluating building performance. A single, well-designed, low-cost New Zealand-based tool, underpinned by consistent data, would resolve many of the issues currently faced by building professionals.

Current priorities for the New Zealand construction sector include creating warmer, drier, healthier homes and measuring and reducing carbon emissions from building and construction. A number of tools and measures are currently available to inform building design and evaluation in these areas. However, there is no single, consistent, New Zealand-specific, online tool to help evaluate whether a design will meet these performance requirements.

The tools that are available have different methods, levels of complexity and varying needs for the data put into them, and some don't necessarily incorporate information relevant to New Zealand. They are often complex to understand and difficult to work with. This means some tools have a limited uptake.

The use of different siloed calculations and models within the building sector can lead to inconsistency in recommendations and inaccuracies in design.

A building is a total system, and changing one parameter in a tool affects other parameters. When thinking about these tools, improving them and ensuring their future use, it is essential to consider how to integrate a range of interrelated variables and data inputs such as thermal performance, energy efficiency, moisture risk and carbon emissions.

Ideally, the sector needs to move away from using multiple tools with varying scopes, methods, complexities, purposes and underlying datasets. A systems approach is needed to ensure that approaches to building performance are integrated, consistent and verifiable.

These tools should not just be used to prove compliance but should be used for designing beyond Building Code minimums.

To investigate the possibility of developing such a tool, BRANZ consulted a range of stakeholder groups in the construction sector to identify their requirements and scope how the sector could work towards creating a web-based, accessible, integrated solution that is straightforward to use and draws on and adapts existing tools. The aim was to co-design a collective roadmap for evaluating future building performance.

**Approach**

Industry stakeholders were canvassed through two separate channels. An online survey was sent out and completed by 84 industry professionals. Several workshops were then held with sector groups including architects and designers, compliance and consenting staff, building commissioners and staff from the government regulator, the Ministry of Business, Innovation and Employment (MBIE).

BRANZ asked these stakeholders to identify the issues they face when evaluating building performance. They were also asked for features they would value in a tool that could help them with this.

BRANZ focused the discussion particularly on tools for calculating carbon emissions. This decision was made due to MBIE’s plan to set future caps on carbon emissions from embodied carbon (material manufacture, transport, construction and end-of-life emissions) and the operational use of buildings.

**Findings**

**Online survey**

The 10-minute survey was mainly completed by design professionals. Of the 84 people who completed the whole survey:

- almost three-quarters currently use digital tools to support the design, performance and/or compliance of residential housing
- digital tools were mainly used for modelling thermal performance, ventilation, moisture risk and energy efficiency
- over half use the Design Navigator tool

- 39% considered themselves proficient in the tools they use, 38% beginners, 15% experienced and 7% expert users
- most people trained themselves to use digital tools.

When asked to imagine a digital tool that could assist in overcoming the main issues that they experience:

- almost half imagined a single web-based tool with multiple performance attributes
  - the most frequently identified ‘must haves’ included energy efficiency, followed by ventilation and moisture risk
  - 79% wanted an independent organisation like BRANZ, MBIE or a dedicated independent body to be responsible for developing, maintaining and supporting the use of the tool.
- The feedback received emphasised that the tool should be easy to use, meaning an accessible, user-friendly interface that allows simple data input and produces clearly understandable results. Many of the people responding pointed

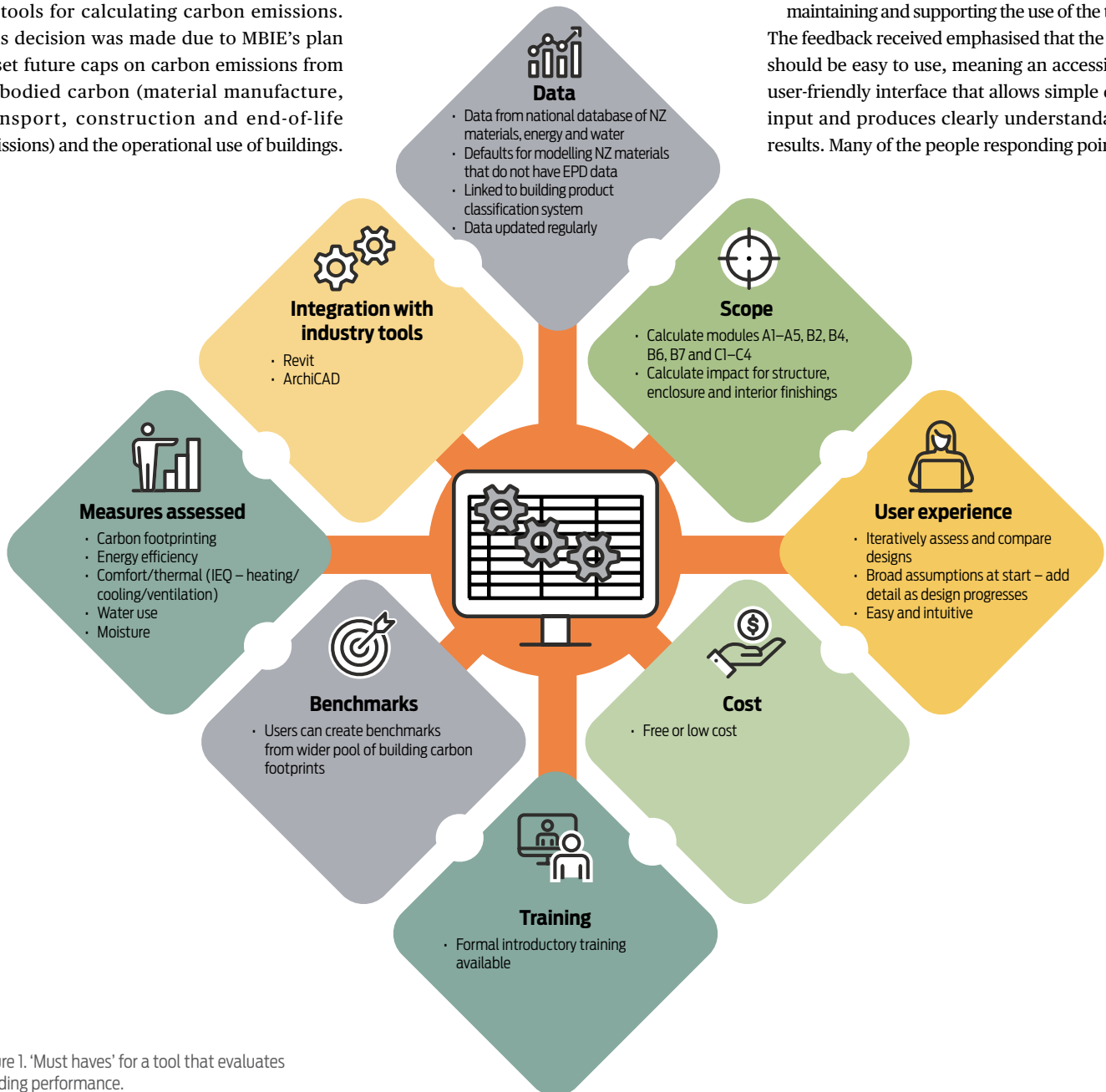


Figure 1. ‘Must haves’ for a tool that evaluates building performance.

out that data should be accurate, standardised, in consistent units and from a common source. The tool should accurately predict emissions and performance for a range of different contexts and builds. Affordability and the need for effective support and training were also pointed out.

### Stakeholder workshops

Several workshops were held with sector groups including:

- three online workshops with architects and building designers (14 people from the greater Auckland/Hamilton area, 16 from Christchurch and the lower South Island and 22 from Wellington and the Nelson region)
- one online workshop with compliance and consenting staff from the South Island (24 people from 11 building consent and territorial authorities)
- one online workshop with 11 building commissioners
- one in-person workshop with nine staff from MBIE.

Similar themes to the surveys were raised in the stakeholder workshops plus a number of other considerations.

### Scope

- The stakeholders had a clear understanding of the potential future compliance requirements

to design and build low-carbon buildings. They were supportive of this requirement. However, they were concerned that other aspects of building performance should not be compromised by a focus on carbon footprint compliance.

- The tool should be able to be used right through the preliminary and developed design, compliance and construction phases. It should be viable for multiple building typologies and integrate with existing industry tools.
- While the current focus is on new builds, future requirements will include evaluating alterations to existing stock and repurposed non-residential buildings.

### Use

- The ideal tool should be able to generate benchmarks based on a user's portfolio of completed buildings and a wider pool of other buildings. These can be used to set targets at the beginning of projects for warm, dry, healthy, low-carbon buildings.
- Designers need to be able to iteratively compare design options as the design develops. They need to be able to assess product substitution during construction.
- There was a preference for a tool that could analyse a design and provide any required

compliance information on different areas of performance.

### Data considerations

- The tool should be based on a consistent carbon dataset that is relevant to New Zealand and updated regularly.
- The tool should be updated regularly to include Building Code amendments and other initiatives and requirements across the industry.
- Manufacturers need to make reliable and current data available, including carbon footprints.
- Data inputs by users need to be quick and simple to enter. Users should be able to include more detail as the design and construction progresses. This is particularly important for small firms that don't usually produce a full schedule of quantities. It is also important to ensure life cycle analyses are completed early in the design process.

MBIE staff also indicated that they are considering a tool for buildings less than 300 m<sup>2</sup> and other tools for larger buildings. It is possible that a tool could be an Acceptable Solution, with the methodology being a Verification Method, and that there could be an accreditation system for other tools.

### Conclusions

- Stakeholders support the idea that the industry has to do something urgently to reduce operational and embodied carbon emissions in buildings and to improve overall performance.
- Voluntary action is not working across the industry. Regulation is essential in order to improve our buildings and meet New Zealand's 2050 zero-carbon goals.
- The stakeholder engagement suggested that a preferred option is to have a single tool that assesses multiple building performance metrics. The tool should be able to be used through the design, compliance and construction phases, be viable for multiple building typologies and integrate with existing industry tools.
- Although a single tool is a worthwhile goal, a more important factor is ensuring consistency. It is crucial to ensure consistent

design analysis and outputs across the many areas of building performance along with consistent compliance assessment.

- Many stakeholders felt it would be useful to audit the currently available tools to start reducing operational and embodied carbon emissions in buildings now, even if current evaluation and calculation tools are not perfect.
- 'Must haves' for the tool include measures (carbon emissions, energy efficiency, comfort, water use, moisture), integration with industry tools, accessibility, training, user experience, compliance, data, benchmarks and scope (Figure 1).
- The tool must ideally be freely available or affordable and easy to use. Training costs to become proficient need to be factored in. Ideally, calculating a carbon footprint of a specific building design should be a one-click process that can occur at any stage of the building's life cycle.

- Other aspects of building performance should not be compromised by a focus on carbon footprint compliance.
- There is a significant role for BRANZ to play in developing a national database given its current position with respect to available tools and data. A pilot project is under way looking at the issues and costs for transferring and maintaining data in the cloud. There would also be a challenge for manufacturers to make reliable, current product data available.

### More information

BRANZ Study Report SR473 *Roadmap for evaluating building performance for low-carbon houses*