Te Kāhui Whaihanga New Zealand Institute of Architects

Building System Performance
Ministry of Business, Innovation & Employment
Building for Climate Change Submission
PO Box 1473
Wellington 6140

11 October 2020

e: BfCC@mbie.govt.nz

TE KĀHUI WHAIHANGA SUBMISSION ON BUILDING FOR CLIMATE CHANGE: TRANSFORMING OPERATIONAL EFFICIENCY AND REDUCING WHOLE-OF-LIFE EMBODIED CARBON

Tēnā koutou

Thank you for the opportunity offered to Te Kāhui Whaihanga New Zealand Institute of Architects to make a submission on *Building for Climate Change: Transforming operational efficiency and reducing whole-of-life embodied carbon*.

The Institute has been in existence since 1905 and is the professional body representing more than 90 per cent of New Zealand's registered Architects and many recent graduates entering the profession. In total the Institute represents over 4,300 members. The Institute is active not only in advocating in the interests of our members, but also in promoting practices and providing education and promoting industry wide cooperation that will improve the quality and sustainability of New Zealand's built environment.

The Institute has, through its governance structure and membership, significant professional experience in the New Zealand construction industry. That experience includes a wide variety of projects across all construction types and scales. The Institute also has more than a century of experience assisting our members and their clients with projects at all stages, from project establishment and concept design through to contract administration and site observation.

The objects for which the Institute is established include the promotion of excellence in architecture, improvement of the technical knowledge and professional development of persons engaged in the practice of architecture, and bringing to the attention of central and local authorities any matters affecting architecture or architects.

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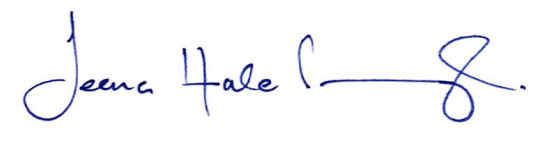
Accordingly, Te Kāhui Whaihanga supports Government initiatives to deliver a high-performing building sector, an efficient regulatory system and safe and durable buildings that perform well in terms of their operational efficiency and help reduce their impact on the environment by minimising their carbon footprint. We welcome the opportunity to comment on the Building for Climate Change programme and being an active participant in helping contribute to New Zealand's goal of net zero carbon emissions by 2050.

We do, however, wish to draw the Government's attention to several potential issues arising from the proposals to increase the operational efficiency of buildings, and to reduce the embodied carbon across the lifecycle of buildings, as outlined in the Institute's submission (attached).

Te Kāhui Whaihanga would welcome the opportunity to engage with officials and other industry professions on the issues raised in our submission. It will be important that any potential regulatory change is co-designed between industry and Government to ensure New Zealand's goals are met. This will ensure the expectations of any change are fit-for-purpose, pragmatic and deliver the intended benefits for the environment, industry and for those inhabiting the built environment. Put simply, we must collectively build better if we are to meet the climate challenges and international targets committed to. This will in turn return benefits to the health and wellbeing of communities and New Zealand's building stock and its performance.

Thank you for the opportunity to provide feedback on the Building for Climate Change programme. Should you have any questions about this submission, please contact Te Kāhui Whaihanga's Chief Executive Teena Hale Pennington on thalepennington@nzia.co.nz.

Ngā mihi



Teena Hale Pennington
Chief Executive

Attachment: Te Kāhui Whaihanga submission

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MINISTRY OF BUSINESS, INNOVATION & EMPLOYMENT
HIKINA WHAKATUTUKI

Submission Form

Building for Climate Change

1. Contact details (optional)

Name:	Teena Hale Pennington
Company/organisation	Te Kāhui Whaihanga New Zealand Institute of Architects
Email address:	thalepennington@nzia.co.nz

2. Are you making this submission on behalf of a business or organisation?

☐ No

☒ Yes (please tell us which Company/Organisation you are making this submission on behalf of)

Te Kāhui Whaihanga New Zealand Institute of Architects

3. Would you like to:

Remain anonymous in the published consultation summary report	☒ No	☐ Yes
Receive a copy of your own submission	☐ No	☒ Yes
Receive future updates on Building for Climate Change programme	☐ No	☒ Yes

4. Are you willing to be contacted in relation to your submission if MBIE has questions about your response?

☐ No ☒ Yes

5. The best way to describe your role is:

☐ Architect	☐ Building owner	☐ Geotechnical Engineer
☐ Building Consent Authority/Officer	☐ Electrician	☐ Structural Engineer
☐ Builder	☐ Engineer – other	☐ Plumber/Gasfitter/Drainlayer
☐ Building product/material supplier	☐ Fire Engineer	

☒ Other: Te Kāhui Whaihanga New Zealand Institute of Architects (NZIA) is a membership-based professional organisation that represents registered architects and promotes architecture in Aotearoa New Zealand.

To submit this form via email:
Once you have completed the form, you can email it to BfCC@mbie.govt.nz, with "Submission" in the subject line.

To submit a print copy of this form:
You can post or courier your submission to:

Via Courier:

Building System Performance
Ministry of Business, Innovation and Employment
Building for Climate Change Submission
15 Stout Street,
Wellington 6011

Via Post:

Building System Performance
Ministry of Business, Innovation and Employment
Building for Climate Change Submission
PO Box 1473
Wellington 6140

Overarching approach of the Building for Climate Change programme

6. Do you agree or disagree that the Building and Construction Sector needs to take action to reduce emissions?

☐ Strongly disagree ☐ Disagree ☐ Neither ☐ Agree ☒ Strongly agree

Please tell us why.

While policy makers have promised to stabilise and reduce emissions according to various international frameworks (United Nations Framework Convention on Climate Change), protocols (Kyoto Protocol) and agreements (Paris Agreement), New Zealand's greenhouse gas emissions profile has increased significantly since 1990. If New Zealand is to achieve its commitment to the Paris Agreement, which aims to limit the global temperature increases to 1.5˚C to 2˚C, New Zealand must reduce greenhouse gas emissions by 30 percent or 11 percent below 1990 levels.

To achieve this ambitious target, the building and construction sector must play its part in reducing emissions as the industry currently contributes 20 percent of New Zealand's overall emissions. The benign climate in the upper North Island, the popularity of wood as a building material, and the advantage of a largely low-emission electricity grid has mitigated the climatic impact of New Zealand's buildings thus far. However, researchers have calculated a typical New Zealand home emits five times more carbon dioxide than the levels required to stay inside 2˚C warming.

1. Operational Use

   Over the life of New Zealand home, the largest contributor to greenhouse gas emissions is energy use, with plug-loads contributing the most, following by water heating and space heating. The next largest contributor to emissions is the construction process, which includes the manufacturing of materials and their transportation.

   While energy consumption in the operation of buildings provides the greatest proportion of emissions, the New Zealand government has set a target for generating 90% of New Zealand's electricity from renewable sources by 2025. This means any reductions in energy consumption will not bring the change required to reduce carbon emissions as in other countries.

2. Building Code

   However, plug-in loads, water and space heating cannot be overlooked, because New Zealand's building code performs poorly when compared to other countries, and any improvements would still reduce emissions and provide tangible health benefits. For example, the temperatures in Canterbury, Otago and Southland during summer and winter are similar to those experienced in England between Southampton and Manchester. Despite similar temperatures, New Zealand's building code only requires an R-value to the roof of 3.3, compared to 7.7 in England, while the walls in New Zealand require an R-value of 2.0 compared to 5.6 in England. The requirements for airtightness, minimum internal temperatures, and ventilation are also very low. Reducing emissions through energy efficiency would benefit all New Zealanders by producing warmer, healthier homes, lowering household bills and resulting in significant beneficial health impacts such as a reduction in respiratory disease, which is estimated to cost the country some $6 billion per year.

The New Zealand Government can make meaningful changes to the building code that will add little to the build cost but would quickly reduce carbon levels. Making houses more thermally efficient and comfortable by harnessing the sun in winter and creating shade in summer would significantly improve the performance of the building code.

3. Materials and Construction Process

The effect of New Zealand's low-carbon power generation network and carbon reduction through small operational savings means a greater significance must be placed upon reducing our embodied carbon footprint during the manufacture and supply of the construction industry. Both short and long-term strategies will be required to reduce the impact of the manufacture and supply of steel, concrete, and aluminium. Substantial improvements in the commercial sector could result in the long-term reduction of carbon during the construction phase of some 50%. It is not only manufacturers and suppliers who need to implement changes to reduce carbon emissions, but also architects and clients who can consciously choose low-carbon footprint materials. The cost of embodied emissions is instant whereas the cost of operational emissions is accrued over the lifetime of the building.

While wider cultural changes are needed to reduce New Zealand's carbon footprint such as electric vehicles to move building materials, using better materials and more energy-efficient appliances, addressing the urban sprawl of New Zealand's cities is also key. As density increases, so does the use of materials with high embodied carbon but starting to plan higher density cities now will result in more sustainable outcomes in the long term.

7. What support do you think you or your business would need to deliver the changes proposed in the frameworks?

Data on the embodied carbon for building materials needs to be made available by the manufacturers and suppliers for all construction products, and this data needs to be collated into a single database that allows comparisons to be made equally and relatively.

Access to free tools that allow life-cycle assessments to be carried out and the environmental impacts of material selections to be assessed are important, so to education and training on how to use the tools properly is also vital.

We need a revised building code that reflects the diverse climatic conditions experienced in New Zealand (from subtropical in the upper North Island to the sub-Antarctic in the lower South Island) and significantly increases the levels of thermal performance, airtightness and ventilation, and introduces minimum levels of thermal comfort. This work should include the introduction of methods of measuring a building's performance; for example, blower door testing and the installation of indoor air monitors to monitor performance over the building's design life. A higher performance minimum building code hopefully will encourage clients and builders from merely meeting lowest levels to decrease costs and maximise profits.

The architecture profession would like to see the Government implementing real change that will help achieve the targets agreed to in Paris. To continue down the same path of agreeing to change, but deliberately failing to implement it would be a failure of leadership.

The legislation needs to be flexible enough to allow innovative solutions to be developed without undue cost or delays caused by bureaucracy. Government departments should also take the lead as clients to show by example that reduced a carbon footprint is achievable and these lessons should be shared with industry in a timely manner.

The construction industry is in a strong position to be able to both drive and implement the changes to the built environment, and it is important the profession is involved in the development of the tools to deliver the reduction in New Zealand's carbon footprint.

8. Are there any barriers that are currently preventing (or discouraging) you, or your business, taking action to reduce emissions?

☐ No ☒ Yes

Please identify the main challenges.

Embedded Carbon database:

In New Zealand, very little information is available on the life-cycle for construction products. If this basic information is not available, it will be very difficult to calculate the embodied carbon footprint of a building or make material selections based on a material's carbon footprint.

Tools for Assessment:

At present, very few professionals or construction industry participants have the experience, skills, or the tools to assess the embodied carbon footprint of buildings. The tools need to be simple to ensure all professionals, clients and contractors can make informed decisions that help achieve the Government's aims.

Building Code:

When compared to similar countries, The New Zealand Building Code is poor, and homes built to the code often perform poorly. A house that meets the building code is, in effect, the worst home you can legally build. Rather than just meeting the minimum, it is important people understand a home has a minimum lifespan of 50 years and a home that complies with the building code now is likely to be cold, mouldy and unhealthy , in 50 years' time. For an often-negligible price increase, a new home can significantly exceed the current low standards.

However, the cost of construction, particularly construction materials, has soared in New Zealand over the past 10 years, and is rising year on year. Any changes to the Building Code may further put pressure on building costs. The compliance process for buildings that are not 'standard' should be kept simple, in order to avoid stifling innovation.

Case study highlighting the challenges (text supplied courtesy of a Te Kāhui Whaihanga architect member):

Our business is engaged in a number of projects where we are looking at carbon, both operational and embodied, but the going is still hard. We have been using BRANZ's LCA quick for about 3 years and it is very useful but complicated. We have just commissioned Etool for an LCA on a large project but are finding carbon data on materials is hard; we currently have 50 EPDs but they are hard to get, vary in breadth and have issues with how to compare them.

So, we are pushing through the barriers, but I cannot see how other companies will do this. Others who are maybe not as interested and do not want to/cannot put the resources that we have into this learning will be slow to change. A key barrier can be broken down by making carbon information understandable, from a consistent source and easier to obtain.

9. Do you think the Building for Climate Change work programme should include the following building classifications?

	No	Yes
Housing	☐	☒
Communal Residential	☐	☒
Communal Non-Residential	☐	☒
Commercial	☐	☒
Industrial	☐	☒

If you have indicated that you believe one, or more, building classifications **should not** be included, please tell us why

All building classifications should be included in the proposed Building for Climate Change and any exclusions may be exploited to the detriment of New Zealand's carbon emission reduction goals, including all building work that does not require a building consent that is habitable (sleepouts, awnings and other similar structures etc). Even though a building may be small, it still contributes carbon emissions both during the supply and operation phases.

The goal of becoming carbon neutral can only be achieved if we all work together and move forward at the same rate. To allow some building typologies to fall outside of the climate change work programme will distort the market and value carbon reduction in specific areas and promote carbon waste in other areas.

Framework: Transforming Operational Efficiency

10. Do you agree or disagree that the Building for Climate Change work programme should include measures to improve the operational efficiency of buildings in New Zealand?

Strongly disagree	Disagree	Neither	Agree	Strongly agree
☐	☐	☐	☐	☒

Please tell us why.

It makes sense to focus on increasing the operational efficiency of buildings as this will reduce a building owner and/or a tenant's running costs and the savings over time will compensate for the cost in increasing the building's efficiency. The Building Code regulations need to be increased significantly (thermal performance, for example) to lift the minimum level of our built environment from the least efficient and lowest cost option.

The costs from this short-term thinking are passed to others in the form of higher operational costs, increased health costs and poor environmental outputs. Housing affordability is important but should not be the key consideration when determining how far and fast the Government raises the minimum bar.

Focussing on water efficiency is an important factor and this is highlighted by the recent droughts in Auckland and Northland. While parts of New Zealand have an abundance of water (West Coast), other parts of New Zealand often experience drought conditions (Canterbury and Hawke's Bay) and as the global temperatures start to rise, water is likely to become more scarce. To start to focus on reducing water consumption will increase the population's resilience to water shortages and result in droughts that have less of an impact on the local populations.

There is an argument that the document named 'Transforming Operational Efficiency' makes an error when it discusses operational efficiency while ignoring operational emissions. For example, an instantaneous gas hot water heater is likely to be more efficient in terms of the energy (watts) required to heat water, but the water heater is still emitting carbon. An electric hot water cylinder is likely to be less efficient due to the heat loss caused through the water being held in storage, but if the cylinder is powered by the grid, which is becoming increasingly low carbon, the operational emissions of the cylinder are likely to be less. A gas stove is considered to be more efficient than an electric stove, but a gas stove still emits carbon, and in order to reduce New Zealand's carbon footprint, the installation of appliances that burn fossil fuel must be disincentivised regardless of their operational efficiency.

From a climatic perspective, there is no difference between a villa built in the early 1900s being heated by an ultra-low emission wood burner and a new Passive House with its triple glazed windows and air-tight environment using mechanical ventilation (heat exchange unit) that requires little heating to ensure a comfortable internal environment. Emissions are the issue, not the efficiency. We note here that emissions from wood burners are not the same as emissions from fossil fuel combustion that World Health Organisation advice is based on. For example, in Nelson wood burner emissions were halved between 2001 and 2014, yet over the same period, hospital admissions for respiratory diseases increased by 20%. The HAPINZ study found a much stronger dose-response relationship between particulates in summer that were fossil combustion dominated than in winter that were wood particulate dominated.

There needs to be a clear distinction made between how operational emissions and operational efficiency is linked and a balance must be found between decreasing operational emissions and optimising embodied carbon. When increasing the thermal performance of a building there is a point where EROI significantly reduces and we need to understand what this point is in order to transform the operation efficiency/emissions of buildings. We must also move into an era of energy descent and be mindful of these limitations.

Managing affordability is also key to this process – we do not want new buildings that are too expensive for the average New Zealander, nor do we want to build buildings now that are too expensive to operate in a low carbon/low energy future.

11. The Framework proposes that operational efficiency requirements tighten in a series of steps to reduce emissions in the Building and Construction Sector, with the requirements for each step published at the outset and the final step being reached by 2035.

Do you support a gradual introduction of operational efficiency requirements, using a stepped approach?

☐ No ☒ Yes

12. Do you think the timeframe is appropriate?

☐ Yes ☐ No, it's too short ☒ No, it's too long

Please tell us your ideal timeframe if it's not by 2035.

No, it's too long. We agree that the measures should be stepped, but those steps should be more proactive at commencement.

The timeframes proposed must mirror the 2030 Sustainable Development Goals. At our current trajectory, the world will reach 1.5 degrees of warming by 2030 and for New Zealand to meet our 2030 requirements under the Paris Agreement, we need to be collectively reducing emissions by 8% year on year until 2030. We are simply running out of time.

The following case study highlights the progress that is being made by members (text supplied courtesy of a Te Kāhui Whaihanga architect member):

Our company is already doing this on many projects so from my experience I would argue it can be done quicker and has significant cashflow benefits and better health outcomes.

13. The Framework proposes that a number of building types will be exempt from operational emission reduction requirements.

Do you agree or disagree with the proposal to exclude the following from operational efficiency emission reduction requirements?

	No	Yes
Outbuildings	☒	☐
Ancillary buildings	☒	☐

Please tell us why.

Every building constructed now contributes to our emissions profile and, given the seriousness of the problem in trying to limit global warming, the Government must take every opportunity to minimise emissions and reduce the carbon footprint of the built environment.

The exemption of certain building types may result in manipulation of the Building Code to avoid the necessity for compliance with operational efficiency emissions reduction and potentially negate gains elsewhere. If the tools and data are readily available there is no reason not to apply across all building types.

Approach

14. The Framework proposes that operational efficiency requirements will only apply to new buildings initially with further work to look at requirements for existing buildings being undertaken at a later date.

Do you support this approach?

☒ No ☐ Yes

Please tell us why.

To achieve the goals set in the Paris Agreement, the industry must move towards carbon neutrality as quickly as possible and any future legislation must include alterations, renovations, and fitouts in both the residential and commercial sectors. The alteration, renovation and fitout market represent a large proportion of work in the construction sector. It also represents a significant opportunity to improve both operational and emissions efficiency, and to ensure these buildings are habitable in the future, particularly considering most buildings have a lifespan far in excess of 50 years (the New Zealand Building Code requires the life of the building to not be less than 50 years).

A large proportion of New Zealand's building stock, particularly residential buildings, perform poorly, are damp, display mould, and are cold in winter and overheat in summer. Existing buildings built prior to October 2020 will represent the majority of buildings constructed for many years to come and requiring changes to existing buildings on alterations and renovations will help to meet our carbon and climatic goals, and parallel social and health goals for older housing stock. As one Te Kāhui Whaihanga member said: '*There is no point in adding to the boat if you are not going to fix the leak first*'.

15. Do you support a limit on emissions from fossil fuel combustion to operate buildings (e.g. for space and water heating)?

☐ No ☒ Yes

Please tell us why.

New Zealand needs to phase out the use of fossil fuels and increase our usage of electricity, 90 percent of which will be generated from renewable sources by 2025. New Zealand has a significant advantage over other countries in the area of renewable power generation, which allows us to transition to renewable resources at a faster rate.

The argument that an increase in the efficiency of fossil fuel heating is acceptable is counterproductive to our goal of achieving a carbon-neutral future. Despite burner technology becoming cleaner, fossil-fuelled space-heating sources produce particulate matter that increases air pollution and exacerbates respiratory problems. These heat sources are polluting to the air, detrimental to public health and destructive to our landscape, as well as creating unacceptable levels of carbon emissions.

16. Do you think that new Thermal Performance requirements based on heating and cooling demand should be introduced to support increased operational efficiency of buildings?

☐ No ☒ Yes

Please tell us why.

A revision of the thermal performance requirements of the Building Code is long overdue and will ensure that all new buildings that are required to have a life span of not less than 50 years begin to perform more efficiently. For example, a building that has sufficient insulation to mirror the climate is airtight and requires little in the way of heating and cooling. As discussed previously, New Zealand's Building Code is particularly poor and is in desperate need of updating to reflect New Zealand's diverse climatic conditions and to ensure every building can be inhabited comfortably. It is simply not enough to update the Building Code without increasing the number of climatic zones in New Zealand which range from sub-tropical to sub Antarctic and requiring the thermal performance to mirror the zone.

Most buildings last longer than 50 years and to upgrade the existing building stock to help achieve a carbon neutral future may take 50-100 years. The efficiency and emissions generated by the existing stock will need to be addressed and forced upgrades may need to be legislated.

17. Detailed requirements for the efficiency of fixed services (such as heating and cooling systems, artificial lighting, hot water systems and appliances, ventilation systems etc) are not currently set out in the Building Code.

Do you think that Services Efficiency performance requirements should be introduced to support increased operational efficiency of buildings?

☐ No ☒ Yes

Please tell us why.

Increasing the Services Efficiency performance requirements will have long-term benefits as energy-conscious owners or tenants who are made fully aware of their energy use can operate buildings using small amounts of energy. Unfortunately, this type of behaviour is not widespread and to ensure we achieve a carbon neutral future, appropriate behaviours will need to be encouraged.

It is important to be cognisant of the burden that carbon-neutral changes will be on some building owners and tenants. However, this also needs to be weighed against the potential problems of living in an overheating environment. Research provided to the Eco Advisors conference by BRANZ this year showed that simply focussing on heating efficiency will not be enough to create low climate-impact buildings. The research found that plug loads and water heating dominated the loads once a building was constructed above the current minimum thermal performance requirements.

18. The framework proposes that there are requirements for the plug loads for large buildings*, but not small buildings. Do you support this approach?

(*Large and small buildings as defined in the framework scope section)

☒ No ☐ Yes

Please tell us why.

An allowance for the permitted plug loads of appliances should be part of the assessment and this will encourage other industries to either manufacture or supply appliances that have increased energy efficiency. In other parts of the world, energy-efficient appliances are common, but their limited development or availability in New Zealand may be attributed to a lack of demand, which in turn may be a result of our low energy-efficiency standards.

If the Government is serious about achieving a carbon-neutral future, the definition of a small building needs to be modified as New Zealanders are tending towards building large homes which is one of the most significant causes of rising emissions. Research suggests the average home in New Zealand is 166 square metres and this is expected to grow in the coming years to 198 square metres. Smaller buildings require fewer materials and lower operational costs, and BRANZ research suggests plug loads in residential buildings is one of the major contributors to use of operational energy. Introducing limits on plug loads for "smaller buildings" including all residential buildings will force owners and tenants to modify their behaviour which will likely result in lower energy use across the life span of the building.

19. The Framework proposes that new buildings will not be required to include onsite renewable energy generation or energy storage capacity. Do you agree or disagree with this proposal?

Strongly disagree	Disagree	Neither	Agree	Strongly agree
☐	☒	☐	☐	☐

Please tell us why.

Any carbon-neutral environment includes on-site renewables for all building typologies and this type of technology should be both encouraged and incentivised. On-site renewables reduce the demand on New Zealand's infrastructure, which allows a more efficient use of electricity and supports our transition from fossil fuels to electricity use.

For example, in the Orkney Islands in Scotland, excess wind-generated electricity using electrolysers generates hydrogen, which is a green energy source. The use of natural gas as both a water and space-heating fuel source could be phased out and replaced with hydrogen. In Orkney, hydrogen can also be used as a battery, where it is stored for use when the wind is light.

20. The Framework currently proposes to exclude the following elements from the Building for Climate Change work programme. Which do you think should be included or excluded?

	Should be included	Should be excluded
Electrical appliance efficiency	☒	☐
On-site collection and storage of water	☒	☐
On-site wastewater treatment	☒	☐

Please tell us why.

The first step to understanding plug-in loads is understanding energy efficiency. This will be achieved by creating more stringent codes and raising the awareness of energy efficiency and its benefits.

Collecting water on site is already happening on rural properties and is already being mandated in some urban areas. Using tanks as a water source increases the occupant's awareness of water usage, which in turn starts to influence behavioural change. As droughts become more frequent and longer in duration, a more resilient water supply will reduce the stress on a city's infrastructure. Required collection of rainwater for onsite usage would considerably ease demand for council-supplied treated water where rainwater would be sufficient e.g. in gardens or outdoor tap usage.

The inclusion of wastewater systems on all sites may be difficult to implement due to the current systems available and possible risks to health and safety. Many people may think this is a step to far, however, the rules need to be flexible to allow those who are interested to install wastewater recycling systems. Wellington City Council already provides 200L stand-alone water tanks with a simple connection to downpipes for emergency water, which are also widely used for gardens.

21. Buildings need to provide suitable indoor environmental quality (IEQ) for good occupant health and wellbeing outcomes. The Framework identifies the following critical IEQ parameters:

- Air temperature
- Relative or absolute humidity
- Ventilation rates
- Surface temperature
- Hygienic surface temperature (avoidance of mould)
- Daylight provision

If there are any additional elements that you think should be considered, please record them in the comment box below.

1. Volatile organic compound (VOC) levels
2. Carbon dioxide levels
3. General air quality
4. Acoustics (outdoor noise verses indoor environment)

22. The Framework proposes that the Thermal Performance energy use intensity and services energy use intensity are considered during the consent application process, and when a Code Compliance Certificate is applied for.

Do you think this would impact you or your business/organisation?

☐ No ☒ Yes

Please tell us why.

To be able to supply the EUI data at the time a building consent is lodged, the proposed building will need to be modelled to show evidence of its performance. This may challenge the consenting officers unless a consistent way of showing/demonstrating the proposed performance is established.

To show evidence of the consented performance being achieved, some form of measurement using on-site testing will be required that can be compared to the approved building consent drawings. On-site testing is likely to be easier for residential buildings than commercial buildings and the testing may require external consultants, which will add to the cost of compliance.

The parameters for measuring operational emissions, except for a building's thermal performance, may require adjustment from being measured per metre squared (m2) to per person accommodated. With the size of homes in New Zealand increasing, the legislation should be encouraging smaller houses; when measured by m2, it is more likely a smaller house may not comply, but if the floor area is increased, it may then comply. If measured per person accommodated, a small house may have the same number of fixtures and fittings as a larger house but be contained within a much smaller footprint per person, and therefore more compliant.

The cost of the additional compliance (modelling, consenting, and testing) will be outweighed by the benefits to the environment and to future generations by creating carbon-neutral buildings.

23. If there are any additional tools or support that you think you would need to implement this requirement, please tell us in the comment box below.

1. A simple online tool for calculating design EUI densities.
2. PHPP for building performance assessments
3. THERM for thermal bridge modelling

Information will need to be provided to show what type of testing will be carried out at the Code Compliance (blower door test, thermal analysis based on as-built drawings or another type of test). This type of testing will require a shift in thinking when it comes to building design and construction, and simple but accurate tools will be required to allow the right information outputs to be achieved. To help with the analysis during the design stages, standard tables developed by the Government (and an independent source) to show the types of services efficiencies and water use, for example, would be helpful as a baseline comparison. The key to the success of these tools and standard data sets would be ease of navigation and use, and the output of simple and efficient demonstrations of compliance.

Framework: Whole of Life Embodied Carbon Emissions Reduction

24. Do you agree or disagree that the Building for Climate Change work programme should include initiatives to reduce whole-of-life embodied carbon in New Zealand buildings?

Strongly disagree	Disagree	Neither	Agree	Strongly agree
☐	☐	☐	☐	☒

Please tell us why.

For the Government to achieve its committed goal of making New Zealand carbon neutral by 2050, the construction industry must first understand what embodied carbon is, how it is measured and how to go about reducing embodied carbon. To reduce the carbon content in each building, a clear roadmap setting out the steps that is required to achieve the stated goal will help the construction sector to embrace meaningful change.

Whole-of-life considerations are the most effective way to ensure that New Zealand's building stock performs strongly in one area.

To meet our emission reduction goals, a key objective of the framework is to increase building material efficiency and reduce construction waste.

25. What measures, if any, do you think should be put in place to increase building material efficiency? (Select all that apply)

☒ Update regulatory performance requirements to ensure they are appropriate

☒ Incentivise 'lean design'

☒ Remove barriers to the reuse of construction materials

☐ Other (please specify)

It is important that regulations are put in place to achieve New Zealand's goals of becoming carbon neutral so that the construction industry, which traditionally is very slow moving, adapts at the same rate as other industries. To ensure the rate of change moves at the required pace, change may need to be incentivised and inefficient methods of construction or behaviours penalised.

26. What measures, if any, do you think should be put in place to reduce construction waste?

Construction waste recycling schemes already exist (for example, Greenstar) and off-site manufacturing will contribute towards reducing construction waste.

To effect real change, levels of recycling may need to be mandated to decrease material usage, improve material separation, reduce landfill and increase carbon efficiency rates, and help incentivise the creation of a circular economy that opens up opportunities for downstream businesses that assist in the repurposing of construction waste.

27. Using low carbon construction materials and products is identified as another option to reduce whole-of-life embodied carbon emissions.

How could we encourage the use of low carbon construction materials?

A database of carbon information for all construction materials, components and products needs to be created that allows both the public and consultants to compare the carbon footprints of their selections and inform their final choices. All materials and components must be required to show what their embodied carbon is, in the same way food labels display nutritional values. Rather than developing bespoke systems slowly, Te Kāhui Whaihanga would encourage the Government to work collaboratively with existing construction information providers like, Construction Information Limited (CIL) who is jointly owned by Te Kāhui Whaihanga and Registered Master Builders to augment existing systems and frameworks for the benefit of industry. This work should be co-designed with industry and funded with the BRANZ levy.

Clearly declaring the embodied carbon of materials, components, and products is crucial to achieving a carbon-neutral environment and, while improving efficiency and reducing construction waste are important, these initiatives alone will not achieve carbon-negative buildings. To achieve this New Zealand needs to transition from high-embodied-carbon materials to carbon-low and even carbon-negative materials. Depending on the rates of change, the industry may need to be encouraged by the use of carbon pricing, and carbon and emission limits, including ecological compensation schemes for particular products.

The Framework proposes introducing reporting requirements for whole-of-life embodied carbon in buildings, followed by a cap on whole-of-life embodied carbon for new building projects.

28. Would you support a cap on whole-of-life embodied carbon for new building projects?

☒ Yes ☐ No

Please tell us why.

Creating targets and setting limits is a critical step in meeting our emissions target and a cap on whole-of-life embodied will help achieve this. It is important that any cap is calculated in a way that discourages the construction of large homes and incentivises smaller homes (numbers of people accommodated, for example). It could be said that if all new homes were built half the size, the emissions produced would almost be halved, therefore it is crucial that the construction of large homes is actively discouraged.

29. Do you think a data repository of embodied carbon from buildings should be established?

☒ Yes ☐ No

Please tell us why.

A single data repository of embodied carbon that is created and maintained in New Zealand needs to be established, as the data underpins the effective reduction of carbon emissions in the construction sector. It is key that the construction industry has access to data that reflects the New Zealand environment, is easily accessed, understood and continuously updated. The data needs to be held by either a government department (MBIE) or by a third party such as BRANZ or Construction Information Limited (CIL) to ensure the data is consistent and comparable. The method for calculating the data must be consistent and preferably calculated by a 'registered' calculation tool and method to avoid the quality of data being questioned. At present, carbon data is comprised of multiple assumptions.

Te Kāhui Whaihanga would encourage the Government to work collaboratively with existing construction information providers like, Construction Information Limited (CIL) who is jointly owned by Te Kāhui Whaihanga and Registered Master Builders to augment existing systems and frameworks for the benefit of industry. This work should be co-designed with industry and funded with the BRANZ levy.

30. If a data repository was established, do you think this information should be able to be accessed by the public?

☒ Yes ☐ No

Please tell us why.

The public need to have access to the data repository as the task to become carbon neutral by 2050 requires the input of all New Zealanders. At present, few people understand what carbon is, why we need to move to a carbon-neutral future, the carbon content of everyday products or how to use the data and information available. A publicly accessible database will help to educate future generations by introducing carbon analysis into schools which, in turn, will help trigger a generational change.

31. Which, if any, of the following factors would make it difficult for people to report the whole-of-life embodied carbon of new buildings, and why?

☒ Lack of an agreed methodology

☒ Inadequate data quality and availability

☒ Lack of appropriate tools or software

☒ Administrative burden on businesses

☐ Other (please specify)

At present in New Zealand, there is a general lack of knowledge on whole-of-life embodied carbon including what it is, how it can be reduced and how we achieve carbon-neutral buildings. The first step to effective reporting is to start educating the wider public and training those in the construction industry who are responsible for reporting embodied carbon.

Environmental Product Declarations (EPD) as a data source are very good, but at this stage, EPDs are not very common. Requiring building consents to mandate EPDs would ensure all projects are able to calculate their embodied carbon. While there are international methods for calculating embodied carbon, New Zealand as a nation needs to agree what stages of a LCA we are trying to measure. Is it from cradle to gate, cradle to practical completion, cradle to cradle or cradle to grave?

Because there are several tools that are available internationally to measure embodied carbon, New Zealand needs to choose the most appropriate tool and ensure the data is available locally. Alternatively, BRANZ could use its LCA quick system and enhance its ability to compare the outputs with international tools, using locally developed data. Ultimately, the tool choice needs to be as simple as possible and easy to use.

Reporting whole-of-life embodied carbon will place a greater burden on clients' budgets as the compliance costs will be transferred to the client from the consultants. But these additional costs will be offset by the savings made by clients as their buildings become more efficient. It is key that a start is made immediately as the transition will be long and significant steps must be taken as we transition to a carbon-neutral environment.

32. What support, if any, do you think will be needed to make reporting embodied carbon a standard part of the design and construction process for every new building project in New Zealand?

1. Quality data that is easily accessible
2. A tool for calculating embodied carbon that is universally accepted and used
3. A reporting process that is standard and universally accepted and used
4. A process for manufacturers and suppliers to get their products rated
5. Good educational material for the public, professions, and trades
6. Easy access to advice and associated services
7. Robust incentives for the construction sector to provide low carbon options.

The framework proposes that reporting of whole-of-life embodied carbon for buildings would be carried out as part of the building consent application process.

33. What impact do you think this proposal will have on the Building and Construction sector?

The impact of the proposals will be significant on the building and construction sector and there will be resistance to the proposals, in part due to the extra compliance costs, but mainly due to the lack of familiarity and understanding of what needs to be achieved. With the construction industry being a large contributor to New Zealand's emissions, the benefits of transitioning to a carbo- neutral future are significant, especially for future generations.

Most sectors in New Zealand will be required to make changes and the construction industry should not be excluded because change is deemed too hard to make.

34. What additional tools or support would be needed to implement this requirement?

1. Clarity around how the reduction in embodied carbon will be included in the building consent process and what systems will be implemented to ensure all participants are playing fairly and by the rules.

2. Training for building consent officers so they understand what they are looking for and can assess the application fairly and consistently.

35. Do you think that requirements for embodied carbon calculations should only include the initial building life cycle stages (product and construction stage)?

☒ No ☐ Yes

Please tell us why.

It is important to consider the full life cycle in order to gain a complete understanding and achieve an overall result. Through their research, BRANZ have indicated that in-life carbon content can be considerable and, as an industry, it is critical that strategies are not developed that lead to low carbon outputs during construction and high carbon outputs during operation.

If the implementation of whole-of-life carbon accounting will cause a delay to implementing better standards, it would be appropriate to introduce a preliminary standard that accounts for the production and construction stages (up to practical completion) to minimise carbon emissions as soon as possible. After this, whole-of-life carbon accounting can be introduced, but this needs to happen as soon as possible, as buildings have life spans which results in them being demolished and the materials are either reused or discarded in landfill.

36. The Framework proposes limiting the type of building components that would be included in an embodied carbon assessment, excluding components with lower emissions (such as internal fittings).

Do you agree with this proposal?

☒ No ☐ Yes

Please tell us why.

Every opportunity needs to be made to reduce carbon emissions and, while internal fittings may not be seen as major polluters, internal fittings are often high-tech products that have a large carbon intensity and are replaced at frequent intervals compared to the overall building fabric.

It is worth noting that the combined effect of a number of small components can result in a large volume of carbon emissions, so it is necessary to address internal fittings as soon as possible.

It has been discussed previously that any change is introduced in steps. The first step must be the carrying out of embodied carbon assessments, with the subsequent steps than focussing on the finer detail (internal fittings).

37. Do you think that reporting on, and ultimately capping, embodied carbon should apply to new building projects only, not refurbishment or demolition projects?

☒ No ☐ Yes

Please tell us why.

Refurbishment and, to a lesser degree, demolition, represents a large percentage of the work carried out by the construction industry. Reporting on and capping new-build projects will not be sufficient to achieve New Zealand's carbon-neutral goals, and refurbishment and demolition projects must be included.

38. The Framework proposes that a simplified embodied carbon calculation tool could be used for small buildings but more detailed calculations would need to be provided for large buildings*.

(* Large and small buildings as defined in the framework scope section)

Do you agree with this proposal?

☐ No ☒ Yes

Please tell us why.

Yes, with the caveat that the definition of small building is adjusted downwards, and the simplified carbon calculation tool is sufficiently robust that it provides accurate results. If this system was to be adopted, an audit process must be established that selects a small percentage of the buildings analysed by the simplified calculation tool to ensure it is still providing the necessary outcomes, thereby allowing the simplified tool to be continually improved. The tool must allow for construction methodologies that are less common (strawbale, for example) that have significant benefits to New Zealand's environmental footprint.

39. Any other comments on the proposed frameworks?

The proposed frameworks represent a very good start towards achieving New Zealand's international obligations under the Paris Agreement (limiting global temperature increases to 1.5˚C to 2˚C) and to achieve our aim of being carbon neutral by 2050.