New Zealand Green Building Council – submission on He Tūāpapa ki te Ora, Infrastructure for a Better Future: Aotearoa New Zealand Infrastructure Strategy Consultation Document

Thank you for the opportunity to submit on the Infrastructure Strategy for Aotearoa New Zealand.

The New Zealand Green Building Council are passionate advocates for better buildings, because we know that better buildings mean healthier, happier Kiwis. We run trusted, robust authentication schemes, such as Green Star and Homestar, that highlight the many buildings that have proven their healthy, sustainable and safe credentials.

We're a non-profit, that includes 520 companies and organisations amongst our members, including banks, energy companies, insurers, government departments, publicly listed property companies, project managers, manufacturers, construction companies, architects, developers, designers and tertiary education institutions. This includes many of the NZX50. These members have a combined market turnover of $20bn. We also work with local government members, representing over 60% of Aotearoa New Zealand's population

As our specialisation is in sustainable building design, construction, and operation, we have answered the consultation questions that relate to this.

The NZGBC was created by the construction industry to develop and administer independent sustainability rating tools for use in infrastructure planning, delivery, and operation. These are:

Green Star - assesses the important elements of a project's sustainability across key categories. Each category includes benchmark for a lower-carbon, healthy project. Green Star ratings are available for every commercial building type; from schools and hospitals, to office buildings, shopping centres, and industrial warehouses

Green Star Communities - This is of key importance to the future of infrastructure in New Zealand. Green Star Communities is a rating that benchmarks the sustainability of communities against international best practice on liveability, resilience to climate change, stakeholder engagement, and economic prosperity. Green Star Communities assesses the planning, design and construction of large-scale development projects including precincts, neighbourhoods and entire communities. It helps everyone from property developers through to policy makers to assess and promote the development of sustainable communities.

Homestar - a rating tool for assessing the health, efficiency, and sustainability of homes

HomeFit - straightforward way to check if a home is warm, safe and dry

NABERNZ - measures the energy performance of a building's core services – lifts, stairwell lighting, common toilets, air conditioning and ventilation etc.

Carbon Zero Building - to receive full carbon zero building certification, buildings will have to meet minimum carbon performance standards through either NABERSNZ or the greenhouse gas emission credits in Green Star Performance.

Central issues with this paper

Our major critiques of this document is that, with the exception of a few passing mentions, it largely overlooks the ability of sustainability rating tools to measure and improve the performance of infrastructure and the role of infrastructure in reducing energy waste.

Sustainability rating tools

This document rightly highlights environmental sustainability as a key issue in the future of infrastructure – to achieve our climate and other environmental goals, we need our infrastructure to produce fewer emissions and waste fewer resources. However, the document mostly overlooks the question of how we assess whether individual pieces of infrastructure or communities are being designed, built, and operated in accordance with meeting those targets.

If we don't measure it, we can't know how the size of the problem and how to go about reducing it. Sustainability rating tools, like those designed and administered by NZGBC on behalf of the construction sector, measure outcomes and give designers, builders, and operators the knowledge they need to make their infrastructure more sustainable.

We contend that assessment and certification must be key components in achieving more sustainable outcomes from infrastructure.

Energy efficiency

The term 'energy efficiency' appears just eight times in the paper and is not listed as part of the vision of action plan. The new infrastructure we create, and the upgrades we make to existing infrastructure, are major determinants of the amount of energy we consume.

New Zealand is aiming to simultaneously move to 100% renewable electricity generation while moving the enormous energy demands of transport and industrial process heat from fossil fuels to electricity. Yet, the opportunity to make this more achievable and more affordable by reducing energy waste in infrastructure – through investments which often have negative lifetime costs - is nearly totally ignored in this document. EECA recommends an energy efficiency first approach in its paper of that name https://www.eeca.govt.nz/our-work/research/research-papers-and-guides/energy-efficiency-first/ . This absolutely needs to be included in the infrastructure strategy.

Q1. What are your views on the proposed 2050 infrastructure vision for New Zealand?

We largely support the points in the vision section but are concerned that energy/resource efficiency is not explicitly stated, which is at odds with the Energy Efficiency First principle advocated by EECA, many in industry, and academics.

Energy efficiency is expected to deliver more than 40% of the reduction in energy-related greenhouse gas emissions over the next 20 years in the IEA's Sustainable Development Scenario, which shows how to put the world on track to achieve international climate and energy goals. And yet this is not happening in New Zealand.

Too many households must spend high proportions of their incomes heating cold, inefficient homes. If we are serious about tackling poverty and improving the lives of all Kiwis, we must ensure our future housing stock does not shackle households to high energy bills. According to health statistics, 30,000 are hospitalised from issues related to poor housing every year. Over 40% of our homes are damp or mouldy.

New Zealand has a clear and legislated goal of achieving a net zero carbon economy by 2050. If we are to achieve this, we must make drastic improvements to energy efficiency in our homes and reducing carbon emissions related to the housing sector.

The housing sector represents a huge opportunity for improving energy efficiency and reducing the nation's energy demand. If we significantly improve energy efficiency in homes, we will help to reduce peak demand, free up energy capacity for new technologies such as electric cars, and reduce the urgency for developing new energy generation.

Buildings are responsible for over 20% of New Zealand's carbon emissions (under a production perspective) and yet there are few drivers for generators to improve energy efficiency instead there is a consistent push for more renewables.

Analysis from Associate Professor Michael Jack & Professor Janet Stephenson (both University of Otago) & Dr Ben Anderson, University of Southampton *"The key observation missing from the CCC analysis (see Sec 3.8.3) is that space heating and in particular residential space heating is one of the dominant drivers for the seasonal variation in New Zealand's electricity demand"*

They go on to note that *"Overall, our modelling shows that applying currently-achievable best practice standards to new builds and retrofit of existing stock could reduce annual electricity demand to 1/3 (~6TWh) of business as usual by 2050 and the winter peak to 1/4 (~5TWh) of business as usual by 2050 (see https://www.otago.ac.nz/oerc/symposia/archives/otago759840.pdf). This reduction in winter peak represents a reduction in the current peak by ~1.5 TWh. This will substantially reduce the costs of the low carbon transition because excessive over-investment in supply side infrastructure will be avoided (c.f. "Principle 4: Avoid unnecessary cost"). In addition, this will have known co-benefits in terms of health and economic outcomes for lower socio-economic groups (Chapman et al., 2009) and would create substantial post-COVID employment opportunities."* These benefits from Chapman et al deliver a $5 benefit for every $1 invested.

The Ministry for the Environment estimate marginal abatement costs to be around $50 - $500 per tonne for decarbonising the electricity supply. Insulation measures and other steps to reduce energy use in homes are likely to have significantly better marginal abatement costs than this reinforcing the point that NZGBC consistently makes: that energy efficiency should be

prioritised. Concept Consulting (for EECA) also quantify the financial benefit of demand reduction on infrastructure.

The UK have an Energy Company Obligation which is overseen by the Office of Gas and Electricity Markets, a non-ministerial government department and an independent National Regulatory Authority. A recent Energy Company Obligation (ECO) programme, known as ECO2, ran from 2015 to 2017. This placed obligations on larger energy suppliers to deliver energy efficiency measures to domestic premises in Great Britain. There were three main obligations energy companies were required to meet.

- the Carbon Emissions Reduction Obligation
- the Carbon Saving Community Obligation
- and the Home Heating Cost Reduction Obligation.

Suppliers were required to achieve the following cost and carbon savings - 19.7 Mt CO2 under CERO, 6 Mt CO2 under CSCO and £6.46 billion under HHCRO.

There is also huge potential for Kiwi businesses. Research from BECA found *"if we retrofit 1,200 of New Zealand's largest commercial buildings (sized over 3,500m2) to net zero energy, the savings would be equal to the annual electricity generated by all wind turbines in New Zealand."*

We very much support the summary from Dave Erickson to look at an "infrastructure plan" that:

- Fund a massive retrofit project that would bring all non-conforming buildings up to this code regardless of ownership
- Part of this building code is to make these buildings flexible loads that can respond to a variety of stimuli, including price. This would in part be based on an independent engineering review of the distribution system characteristics in a particular area. It could also include an independent engineering evaluation of "optimal portfolios" of flexible demand, storage and renewable generation for each area.
- Require utilities to support the installation of these optimal portfolios, and hand over operation of them to an independent operator, which would operate them to minimize the reliance on the bulk system.

A national campaign to improve the energy efficiency of New Zealand homes and buildings will improve health, reduce costs for whanau, improve the competitiveness of kiwi businesses, drive down carbon and free energy up for the energy transition such as the move to EVs.

New Zealand faces a climate emergency. This calls on us to dramatically reduce carbon emissions and adapt to our changing climate. Developments of over 10 hectares should be mandated to benchmark the sustainability of their community with Green Star Communities.

Q4. For the 'Building a Better Future' Action Area and the Needs: • What do you agree with? • What do you disagree with? • Are there any gaps?

NZGBC supports these needs, particularly

F1.1 Adapt business case guidelines to ensure full consideration of mitigation and adaptation

- Require all infrastructure projects to directly assess climate change impacts (mitigation and adaptation).
- Ensure all infrastructure projects evidence they are compatible with a net-zero carbon emission future to prevent infrastructure with a long asset life locking-in a high-emissions future.
- Require all infrastructure projects to apply a consistent cost of carbon that is commensurate with New Zealand's international commitments in cost-benefit analysis and sensitivity analysis.

F1.7 Drive a culture of waste minimisation

Update procurement guidance to require the avoidance of waste creation as a design/procurement objective:

• Require the design of public-sector projects to evaluate the use of recycled products where feasible.

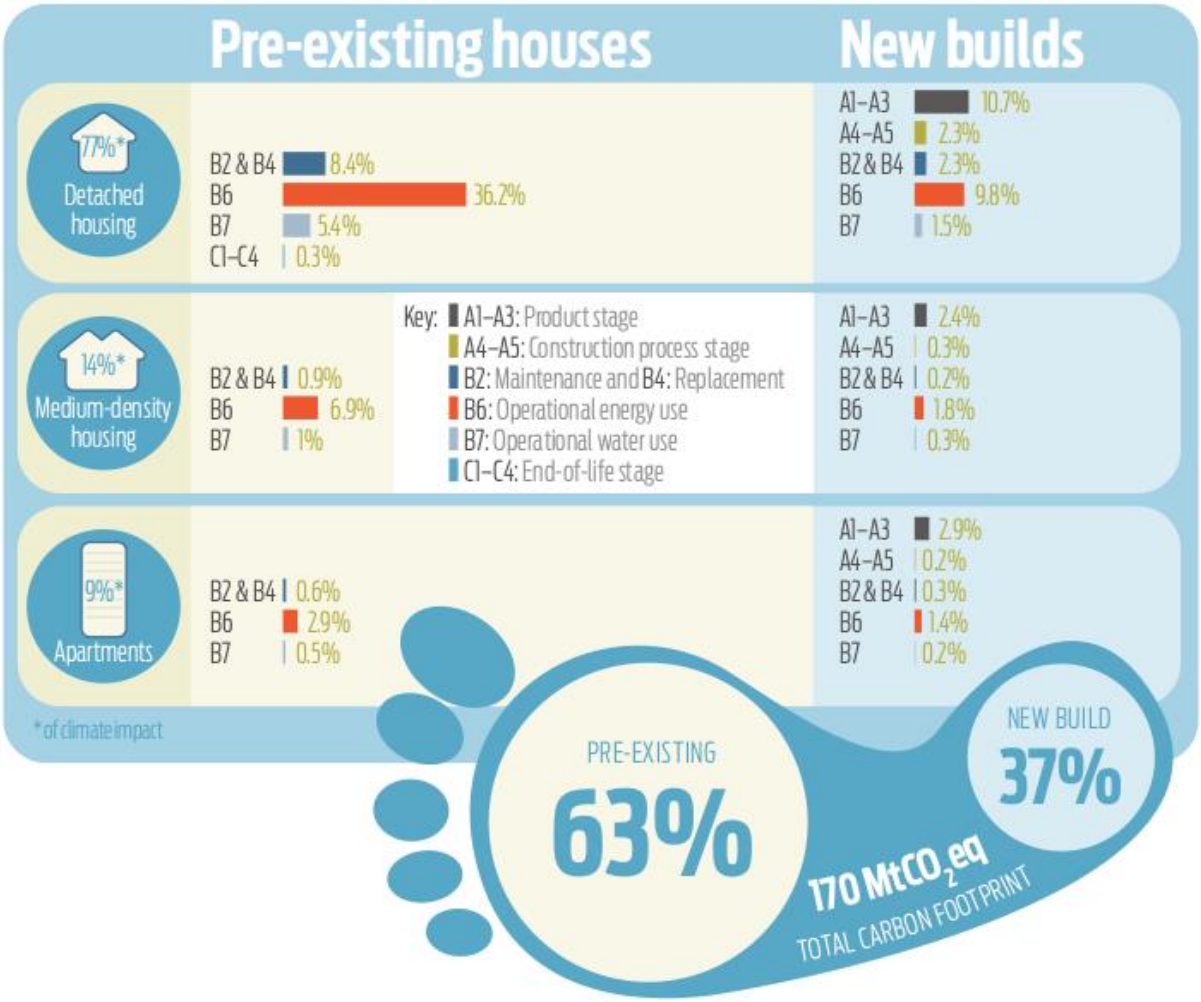
• Require that all projects of a certain size develop waste minimisation plans as tender deliverables that are considered as part of procurement evaluations.

However, we believe that F2 is too narrow, with its focus purely on creating electricity infrastructure, and not addressing the potential of energy efficiency. Reducing energy waste often has negative whole of life costs, while creating new energy infrastructure carries large costs – both generation and transmission. With the large new demand for electricity set to come from the electrification of transport and industrial process heat, the amount of new supply that will be needed is huge and will be very costly. Overlooking the opportunity to reduce waste instead, at negative cost, through efficiency, is a major deficiency of this analysis.

EECA recommends an energy efficiency first approach in its paper of that name https://www.eeca.govt.nz/our-work/research/research-papers-and-guides/energy-efficiency-first/ . This absolutely needs to be included in the infrastructure strategy.

For example, Residential electricity use, at 46PJ/12TWh a year, is on par with industrial sectors' total energy from coal and oil. The Building for Climate Change programme envisages eliminating fossil fuel energy in housing and a 75% reduction in operational electricity use for new builds over time (to the so-called near-zero energy buildings standard, which the EU is already requiring of new builds); a similar reduction for existing housing would eliminate fossil fuel energy in housing and free up 34PJ/9TWh of electricity a year – about a quarter of electricity supply.

Retrofit of efficiency improvements to existing infrastructure should be an important part of the strategy. Recent analysis by Professor Sarah McLaren et al (https://www.researchgate.net/publication/345456800_Application_of_Absolute_Sustainability_Assessment_to_New_Zealand_Residential_Dwellings) finds that New Zealand's buildings will emit 170Mt of CO2-e by 2050, of which 100Mt CO2-e will be due to operational energy use. 8 Mt CO2-e will come from operational energy use in existing buildings.



The marginal abatement 'cost' of some of R-value improvements is of the order of negative $500 - $2000 per tonne, meaning that New Zealand is saving money while reducing carbon emissions. This is in stark contrast to the estimated marginal abatement costs of decarbonising the electricity supply. The Ministry for the Environment estimated these costs to be around $50 - $500 per tonne.

Q5. How could we better encourage low-carbon transport journeys, such as public transport, walking, cycling, and the use of electric vehicles including electric bikes and micro-mobility devices?

Public transport, active transport, and micro-mobility thrive when there is a compact urban form, with dense residential and commercial buildings (as well as green space). Our extensive research and experience has taught us that we need to design compatibility with low-carbon transport into our buildings. For this reason, transport is one of the eight impact categories we use to assess Green Star.

Measures that can be taken range from locating near public transport nodes and reducing the number of car parks to providing storage for bikes and showers for commuting staff. The infrastructure is important, but so is the compatibility of the destinations, and the human experience – like the ability to have a shower after biking to work.

10 points are available under Green Star for encouraging and facilitating sustainable transport. These are awarded for such steps as:

- Ensuring access to public transport
- Reducing the number of carparking spaces
- Including dedicated low-emission vehicle/EV parking and charging
- Bike parking and end-of-trip facilities such as showers and changing rooms to encourage occupants and visitors into use active transport
- Providing walkable neighbourhoods, allowing residents to conveniently walk to amenities

New Zealand faces a climate emergency. This calls on us to dramatically reduce carbon emissions and adapt to our changing climate. Developments of over 10 hectares should be mandated to benchmark the sustainability of their community with Green Star Communities. This will drive liveable communities with more cycle ways and walkways.

Q6. How else can we use infrastructure to reduce waste to landfill?

Construction of infrastructure creates around half the waste sent to landfill in New Zealand. This is mostly due to poor practice, where construction teams make little or no attempt to recycle materials – even though much construction waste is readily recyclable (steel, concrete etc), often with lower energy inputs than creating new materials, or can be diverted from landfill for other uses (eg wood products).

Simply by changing these practices and introducing straightforward things like sorting waste rather than dumping it all together in skips, a reduction of 60-90% in the amount of waste sent to landfill can be achieved. The problem is how to incentivise these changes in practice. Ratings systems, like Homestar and Green Star, are an important tool to drive an increase in recycling. Green Star and Homestar ratings require the amount and type of waste to be recorded and recycling to be used whenever possible – achieving those 60%-90% reductions in waste.

Developments of over 10 hectares should be mandated to benchmark the sustainability of their community with Green Star Communities. This will drive developers to consider and reduce waste to landfill.

Q7. What infrastructure issues could be included in the scope of a national energy strategy?

The built environment has a tremendous impact on energy use – including through the energy used in construction, in operational energy use, and buildings' impact on transport demand.

It is easy to focus on the supply side of the energy equation but the evidence is clear that reducing energy waste is the cheaper, and often quicker option. Reducing energy waste often has a negative life-time cost, whereas new supply brings costs both in generation and transmission.

The need to focus on efficiency first, as recommended by EECA, is particularly acute as New Zealand moves to electrify transport and industrial process heat. These will create massive demand for electricity, which can be partially offset by reducing existing energy waste.

For example, Residential electricity use, at 46PJ/12TWh a year, is on par with industrial sectors' total energy from coal and oil. The Building for Climate Change programme envisages eliminating fossil fuel energy in housing and a 75% reduction in operational electricity use for new builds over time (to

the so-called near-zero energy buildings standard, which the EU is already requiring of new builds); a similar reduction for existing housing would eliminate fossil fuel energy in housing and free up 34PJ/9TWh of electricity a year – about a quarter of electricity supply.

Retrofit of efficiency improvements to existing infrastructure should be an important part of the strategy. The marginal abatement 'cost' of some of R-value improvements is of the order of negative $500 - $2000 per tonne, meaning that New Zealand is saving money while reducing carbon emissions. This is in stark contrast to the estimated marginal abatement costs of decarbonising the electricity supply. The Ministry for the Environment estimated these costs to be around $50 - $500 per tonne.

Q10. What steps could be taken to improve the collection and availability of data on existing infrastructure assets and improve data transparency in the infrastructure sector?

Lack of data is a major impediment to the better management of existing infrastructure. When the data is systematically collected and analysed, the sources of resource use and waste creation become apparent and options for reducing them can be created and implemented.

Tools like NABERSNZ should be mandatory for assessing large existing infrastructure. In Australia legislation was passed in 2010 making NABERS compulsory for large office buildings. As a result, over 80% of Australian office space is covered by assessments. This has saved businesses AU$1billion in operating costs and also avoided 7 million tonnes of carbon emissions.

We should not be afraid to copy successful examples from overseas. There is no reason why legislation requiring NABERSNZ, equivalent to the Australian legislation, could not be introduced within the next few years.

Q11. What are the most important regulatory or legislative barriers to technology adoption for infrastructure providers that need to be addressed?

In design and construction of infrastructure, legislative minimums are often treated as standards. Weak minimums mean weak outcomes. The current Building Code does not align with low carbon future. To achieve the country's goals, these standards need to be urgently lifted – on a shorter timeframe than is posited in the Building for Climate Change programme. The EU is already requiring new building to be built to a near-zero energy standard, while Building for Climate Change posits such a standard only by 2035.

The regulatory system needs to do more to incentivise high quality building. This can be achieved by making sustainability rating systems like Green Star, Homestar, and NABERSNZ mandatory and through tools such as energy performance certificates. Any regulatory tool that requires measurement of the environmental impacts of a piece of infrastructure AND enables high performance in that assessment to be used as a point of pride/selling point (and under-performance to be a source of shame/value decrease) is a powerful way to encourage developers and owners of assets to lift those assets' environmental performance.

The Treasury discount rate also needs to be reviewed with regards to long-lived infrastructure. A discount rate that is too high masks long-term operational costs (including externalities like emissions) and long-term benefits. This tends to favour reducing up-front construction costs, even if the result is worse operational outcomes.

Q12. How can we achieve greater adoption of building information modelling (BIM) by the building industry?

Building Information Modelling is an important tool to better understand the consequences of building design choices, enabling the selection of more sustainable options.

Previous studies have demonstrated that BIM offers potential to optimize the green building rating process as it aids different aspects of sustainable design. For instance, building orientation, building massing, daylight analysis, water harvesting, energy modeling, and materials selection. For instance, 13 credits of LEED can be directly evaluated through BIM software. In the New Zealand context, the author has done case study research as a part of PhD research to investigate the potential of integrating BIM for the Homestar assessment process using a BIM model of a residential building; the first 10 Homestar certified house in Christchurch.

The results reveal that 76 of the total 120 points available, can be achieved using BIM software, with 100% computable for Density and Resource Efficiency, 67% for Energy, 21% for Water, 17% for Waste, 33% for Management, 100% for Materials, and 67% for Site. This indicates that BIM-based green building assessment has significant potential to reduce the time, effort, and cost involved in the assessment process. More importantly, it enables professionals to analyse energy efficiency and environmental impacts of different design schemes and scenarios in the early design stage.

BIM-based green building assessment has not yet matured in New Zealand with only 6% of the local industry using BIM for sustainability evaluation in 2019 according to a BIM acceleration committee survey. In the UK, it is required on government projects. Here in New Zealand, use is still ad hoc. Government could require the use of BIM in government projects through the Government Procurement Rules or, if created, a centralised agency.

Q18. For the 'Enabling Competitive Cities and Regions' Action Area and the Needs: • What do you agree with? • What disagree with? • Are there any gaps?

Sustainability and reducing energy waste in both new and existing infrastructure should be included as needs in this section. It makes little sense to talk about sustainability at the national level or the individual project level, only to disregard it at the community level. Doing so increases the risk that environmental outcomes will be disregarded at this decision-making level, by councils and others.

Q24. For the 'Creating a Better System' Action Area and the Needs: • What do you agree with? • What do disagree with? • Are there any gaps?

Environmental and social sustainability should be listed as needs in creating a better system. They need to be thought of as integral to what the infrastructure system is aiming to achieve, not just one

of a set of goals that may be swapped out or put aside as needs be. We are in the middle of a climate and ecological crisis – addressing that must be at the heart of our infrastructure system.

Q25. Does New Zealand have the right institutional settings for the provision of infrastructure?

No. New Zealand is still lacking an integral sustainability commitment in its provision of infrastructure.

Infrastructure development is fragmented and ad hoc, with the focus being on immediate objectives of the project, rather than the holistic consequences of the project. There needs to be a climate change focus on all major infrastructure, and an energy efficiency first approach, as recommended by EECA.

As part of this, settings should make an assessment and reduction of externalities and resource use inherent to the planning, delivery, and operation of infrastructure. Use of sustainability rating tools should be mandatory for large projects, with government leading the way.

Q31. What options are there to better manage and utilise existing infrastructure assets?

Lack of data is a major impediment to the better management of existing infrastructure. When the data is systematically collected and analysed, the sources of resource use and waste creation become apparent and options for reducing them can be created and implemented. Tools like NABERSNZ should be mandatory for assessing large existing infrastructure.

In Australia, NABERS has been compulsory for large office buildings since 2010 and 82% of Australian office space is covered by assessments. This has saved businesses AU$1billion in operating costs and also avoided 7 million tonnes of carbon emissions.

Q32. Are there benefits in centralising central government asset management functions? If so, which areas and organisations should this apply to?

In our experience, government asset management is fragmented and inconsistent. We are agnostic as to whether the solution is a central asset management agency, but the status quo is unsatisfactory – delivering results that are worse than could be achieved for greater cost.

Q33. What could be done taken to improve the procurement and delivery of infrastructure projects?

With the world deep into the climate crisis and the Government recognising the need for urgent action, through the Zero Carbon Act, Climate Change Commission, and other measures, it beggars belief that New Zealand is still procuring and delivering infrastructure without sustainability as a core objective in every project. Today, we are still building projects that are inducing emissions, are car dependent, and are wasting energy and other resources – meaning we will have to expend further

resources in the near future to upgrade or replace them. Sustainability assessment tools should be mandatory for large projects to help avoid this.

Q34. Do you see merit in having a central government agency procure and deliver infrastructure projects? If so, which types of projects should it cover?

In our experience, government procurement is fragmented and inconsistent. We are agnostic as to whether the solution is a central procurement and delivery agency or strengthening of the current procurement rules, but the status quo is unsatisfactory – delivering results that are worse than could be achieved for greater cost.

Q35. What could be done to improve the productivity of the construction sector and reduce the cost of delivering infrastructure?

We would challenge the premise of this question – that reducing cost is inherently desirable. It would be better to frame the question in terms of improving value for money.

Cost reduction is not an end in itself and, if pursued as one, it can result in low quality infrastructure that fails (eg leaky homes), infrastructure that is not future proofed (eg Auckland Habour Bridge), and infrastructure that imposes large externalities, such as environmental costs (eg urban sprawl).

Instead, the question should be how we can achieve greater value for cost. This should take on a holistic definition of 'value', incorporating all externalities, economic, social, and environmental of infrastructure. This may mean taking on greater cost of delivering infrastructure but, ultimately, means a better product and improved productivity, in the sense of value created, because projects enhance, rather than burden, their communities.

An example of this is building a commercial building to the Green Star 6 standard. This will likely impose a, minor, additional cost on the project but the result will be a better environment for the people who use the building, less energy waste, lower emissions, reduced water use, less waste to landfill, and support for sustainable transport.

Q36. What components of the infrastructure system could have been improved to deliver effective stimulus spending during the Covid-19 pandemic?

The NZGBC put a large amount of work into this concept last year and produced a report on the topic, *A Green Recovery* (https://www.nzgbc.org.nz/Attachment?Action=Download&Attachment_id=3118).

This report recommended targeting infrastructure improvements that could be rapidly executed (to create jobs and stimulus) while improving health and reducing energy waste through improving the insulation and thermal performance of homes, by expanding the Warmer Kiwi Homes programme, expanding the voluntary targeted rates scheme, and introducing energy performance certificates.

In our view, the opportunity was missed to focus on small, rapidly executable investments, such as retrofit insulation, in favour of large, 'shovel ready' projects that would, in fact, take a long time to

get into delivery phase. Unfortunately, the opportunity to invest in sustainability was also not delivered through the shovel-ready projects.

I hope this has been of use. Do let me know if anything else would assist.

Nga mihi nui

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CEO, NZ Green Building Council