Building for Climate Change
Building Performance
Ministry of Business, Innovation & Employment
PO Box 1473
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Dear Building for Climate Change team,

EQC SUBMISSION TO MBIE'S BUILDING FOR CLIMATE CHANGE

Thank you for the opportunity to comment on the proposals contained in '*Building for Climate Change: Transforming operational efficiency and reducing whole-of-life embodied carbon*'.

What is EQC?

The Earthquake Commission is a New Zealand Crown Entity investing in natural disaster research, education and providing insurance to residential property owners.

EQC offers two types of cover:

- Building cover, whereby we can repair, replace, relocate, or otherwise compensate for damage to a residential building
- Land cover, whereby we can repair damage to land to enable it to continue to be suitable for residential purposes or pay out to cover the cost of relocation.

EQC covers more than just earthquakes. It also covers:

- residential property damage caused by a natural landslip, volcanic eruption, hydrothermal activity, tsunami, or natural disaster fire, and
- damage to land caused by a storm or flood.

The nature of EQC's role means that it has strong interest in climate change, as increased extremes in weather are likely to increase demand for EQC payouts. EQC also has a strong interest in the resilience of buildings for the same reason – it directly affects the demands on EQC following a natural disaster.

EQC is concerned about the impact of climate change on New Zealand and the EQC scheme

It is well documented and accepted that climate change will exacerbate existing hazards such as flooding, landslides and inundation of land due to rising sea levels, much of which is insured by the EQC scheme. Evidence suggests that with the increasing impact of climate change, insurance is likely to become increasingly less affordable in some locations and may not be available at all in higher risk areas. Reducing building sector emissions will mitigate the effects of climate change and in turn mitigate the impacts on the affordability and availability of insurance.

Research from Motu shows annual liabilities for the EQC to cover future weather extremes will likely increase between 1.6% and 18.1% as a result of climate change. This will necessitate at least an equivalent increase in premiums collected (and potentially more). The researchers note these figures could be underestimated.

Climate change, the expected increase in intensity and frequency of extreme weather-related events, is likely to translate into higher damages and thus an additional financial liability for the EQC. The percent change between projected and past damages, the climate change signal, rises from an increase of between 7% and 8% in 2020-40 to an increase of between 9% and 25% in 2080-2100, depending on the Green House Gas (GHG) concentration scenario. Overall, liabilities will increase more if future GHG emissions are higher.

Motu notes that the increase projected in EQC's liabilities can also inform private insurers and regulators, and policymakers who are assessing the future performance of both the public and private insurers covering weather-related risks in the face of climate change.

EQC is also concerned about the resilience of buildings to natural hazards

EQC's mission is to reduce the impact on people and property when natural disasters occur. This mission is supported by having better buildings that can hold up to protect lives and wellbeing when faced with natural disasters. Our resilience goal is to inform, enable and influence the choices and decisions that reduce vulnerability and the exposure of New Zealand's built environment to natural hazard events. In simple terms the result will be stronger homes, built on better land, served by resilient infrastructure, supported by affordable risk capital [1]. Four objectives support this goal:

- more resilient buildings and infrastructure reduces damage and impacts
- smarter land use avoids the worst risks
- sustained access to insurance markets funds effective recovery
- reducing New Zealand's vulnerability and exposure to natural hazard events.

The resilience of buildings in a natural disaster is directly related to the payout required from EQC and the subsequent impact this could have on premiums or other government (i.e. taxpayer) contributions to the EQC scheme.

EQC understands these two interests can involve trade offs

For reasons set out above, EQC generally supports efforts to reduce carbon emissions, including from the construction sector. **However, EQC does not want emissions reduction to come at the cost of resilience.**

[1] https://www.eqc.govt.nz/sites/public_files/documents/grants/EQC%20Resilience%20Strategy%202019.pdf

Increasing the carbon footprint at construction can increase resilience and decrease the total carbon impact

Small increases in the dimensions of building elements can provide significantly greater resilience and reduce the potential damage in a natural disaster. This can involve the building having a slightly greater carbon footprint at construction, which may come from using increased amounts of materials like steel and concrete. The proposed framework needs to get the right balance between these competing priorities.

For example, research in the United States indicates adding 10% to the steel content of a commercial building can add about 50% to the seismic load caring capacity of a building yet only adds 1% to the cost of the building[2]. This additional steel will increase the carbon footprint of the building but improve its resilience.

This increased resilience, through adding a small embodied carbon cost at the design and construction stage of a building, provides substantial reduction in potential life cycle embodied carbon costs in high hazard countries such as New Zealand by avoiding wide scale but periodic demolition and replacement impacts.

Case study from the Canterbury earthquake sequence

The Canterbury earthquake sequence provides a case study of the carbon impact from reconstructing after a natural disaster. In March 2011, the government indicated about 10,000 earthquake-damaged homes would need to be rebuilt[3]. These homes were replaced. In the seven years to September 2017, 36,431 new homes were consented in Canterbury. This was up more than 10,000 when compared with the seven years pre-earthquakes, when 25,913 homes were consented[4].

Further, 1,240 commercial buildings were demolished within the central city,[5] to be replaced by an estimated 900[6] new commercial buildings in the central business district.

We note additional buildings would have been demolished, e.g. university and hospital buildings, commercial and industrial buildings outside the central city, churches, etc. These buildings would generate additional carbon cost, as would demolished infrastructure such as roads and bridges.

A standalone house with a floor area of 200m^2 has embodied carbon of approximately 63 tonnes carbon dioxide equivalent over its 90-year life.[7] Technical advice indicates 55% of this carbon is embodied at construction, 5% at end of life (waste), and 40% through maintenance throughout the life of the building.

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[2] https://cdn.ymaws.com/www.nibs.org/resource/resmgr/mmc/mmc_workingpaper_porter.pdf
[3] https://www.beehive.govt.nz/release/around-10000-houses-will-need-be-rebuilt
[4] https://www.stats.govt.nz/assets/Reports/Canterbury-the-rebuild-by-the-numbers/Canterbury-the-rebuild-by-the-numbers.pdf
[5] http://www.stuff.co.nz/the-press/news/christchurch-earthquake-2011/66290638/1240-central-christchurch-buildings-demolished
[6] https://www.buildmagazine.org.nz/assets/PDF/Build126-34-Christchurch-Rebuild.pdf
[7] http://www.level.org.nz/material-use/embodied-energy/

A non-residential building with a floor area of 900m^2 has embodied carbon of approximately 450 tonnes carbon dioxide equivalent[8]. Larger buildings may embody up to five times this amount. 91% of this carbon is embodied at construction, 4% at end of life (waste) and 5% through maintenance throughout the life of the building.

The carbon cost of the Canterbury earthquakes includes:

- embodied carbon "forgone" as the lifetime of buildings was drastically reduced. For example, if a building was built in 2000 with a 90-year life span but demolished in 2010 after the first earthquake, 80 years of embodied carbon is effectively wasted. Or, to put it differently, 90 years of embodied carbon at the construction phase was effectively invested for only 10 years of benefits.
- The operational emissions involved in demolition, e.g. fuel burned in the operation of heavy machinery.
- The cost of rebuilding the new buildings.
- The carbon embodied in maintenance throughout the lifetime of the new buildings.

Based on these numbers, the rebuild of greater Christchurch may have generated well over 1 million tonnes of carbon dioxide equivalent, comprising:

- 630,000 tonnes carbon dioxide equivalent from the rebuild of 10,000 houses
- 405,000 tonnes carbon dioxide equivalent from the rebuild of 900 commercial buildings.
- More carbon dioxide equivalent for the other buildings and infrastructure not covered in the previous two dot points
- The other costs noted above.

We would support a scheme design that reduces carbon emissions as much as practicable without having a negative impact on resilience. But we need to be careful to ensure that efforts to minimise carbon emissions by restricting the footprint of a building does not have a negative impact on resilience and potentially lead to greater carbon emissions if buildings need to be demolished and rebuilt.

Specific comments on the objectives for a whole-of-life embodied carbon emissions reduction framework

Objective 1: New build efficiency

We support the inclusion of a "flexibility and resilience" objective in the objectives for new build efficiency. However, we suggest that the objective consider the usability of a building after a range of natural disasters. We also seek clarification on whether "resilience" in this context refers to resilience as we think of it at EQC or as the term has been used in the UK, i.e. resilience to increases in the price of carbon putting upward pressure on building operating costs.

[8] https://www.nzgbc.org.nz/KNOWLEDGEHUB/Attachment?Action=Download&Attachment_id=2437

Objective 2: Material efficiency

From EQC's perspective, the first two objectives for material efficiency – (i) appropriate performance requirements and (ii) the efficient use of materials by designers – are potentially in conflict with the flexibility and resilience objective above.

In our view:

- On the former, embedding multiple contingencies in the design of a building to ensure resilience is reasonable and in no way excessive. While it may add to the carbon footprint of a building at construction, it helps promote other government objectives, including resilience.
- On the latter, if additional material was used to add greater resilience to a building, we would consider that to be beneficial.

In relation to the point above, EQC requests more detail on "lean design", as we would not want "leanness" to be favoured to the detriment of resilience.

General comments on EQC's role in relation to climate change

As set out above, EQC has a direct interest in climate change given the likelihood that it will exacerbate or increase the frequency of natural disasters. This accords with the finding of the Report of the Public Inquiry into the Earthquake Commission: "There are broad and widely validated scientific data that indicate the frequency and severity of certain natural disasters is increasing and will continue to increase in the years to come, as the effects of climate change are felt."[9]

EQC has useful data on land stability and is working with other agencies to influence decisions on land use planning. EQC is similarly keen to be involved in discussions about climate change across government and can provide insights from its distinct niche.

Comments on timing and alignment with other work

We acknowledge work is underway to update the National Seismic Hazard Model, as well as preliminary work on any consequent changes required to building standards and performance expectations. These are obviously closely related to this framework and we trust these two workstreams will take account of each other, and/or will be integrated together at an appropriate time.

Furthermore, we recommend the timeframe for change is sequenced to align with any updates to the Building Code in regard to seismic loading/design (which we assume would be around 3-5 years away). This is because:

- many developed countries appear well advanced in their thinking and regulations around embodied carbon and that New Zealand can lever off this work
- the good work these countries have done in collecting and making data available
- the situation is urgent.

[9] https://eqcinquiry.govt.nz/assets/Inquiry-Reports/Report-of-the-Public-Inquiry-into-EQC.pdf

Comments from the University of Auckland

EQC encourages MBIE to engage with Professor Ken Elwood at the Department of Civil and Environmental Engineering at the University of Auckland (UoA) on this policy initiative. Professor Elwood and colleagues encourage a carbon cap that encompasses the entire life cycle of a building, rather than separate caps for operational and embodied emissions. They do not believe operational and embodied emissions are always easy to separate. For example, concrete shear walls may contribute to the thermal mass of the building which will reduce heating, ventilation and air conditioning and operational demands. This will not be captured if the caps are separate.

Further comments from Professor Elwood and his colleagues are attached as a separate document.

EQC would be happy to discuss any of the above submission. Please feel free to contact me at the address below.

With kind regards,

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