

Building for climate change

Transforming operational efficiency and reducing whole-of-life embodied carbon

Submission of the Society of Local Government Managers – October 2020



WHAT IS SOLGM?

The New Zealand Society of Local Government Managers (SOLGM) thanks the Ministry of Business, Innovation and Employment for the opportunity to submit on the Building for Climate Change: Transforming operational efficiency and reducing whole-of-life embodied carbon consultation.

SOLGM is a professional society of approximately 880 members made up of local government chief executives, senior managers, and council staff.¹ We are an apolitical organisation that can provide a wealth of knowledge about the local government sector and in particular knowledge of the technical, practical and managerial implications of legislation and policy. SOLGM is willing to further assist MBIE with any matters related to its submission as needed.

Our vision is:

To enhance professional local government management, leading staff and enabling communities to shape their future.

Our primary role is to help local authorities perform their roles and responsibilities as effectively and efficiently as possible. We have an interest in all aspects of the management of local authorities from the provision of advice to elected members, to the planning and delivery of services, and other important support activities such as election management and the collection of rates.

¹ As at 22 June 2020.

PART ONE: GENERAL COMMENTS

High carbon does damage to the environment, therefore we support the principle of carbon regulation for building design, in the same way we support other building safety design measures. We support the reduction of emissions from buildings. Achieving the goals in the proposal will take a whole of government approach.

We support a balance of having sufficient carbon information to achieve the purposes of carbon reduction, whilst maintaining the ability to regulate without undue expense for home-owners, builders and local authorities, because affordability is an important part of the considerations. We support implementing the greatest carbon reductions for the least expense. Costs of design, building and local authority regulation will be passed on to building owners, therefore we propose governmental support with national technology and guidance materials.

We ask that MBIE take this opportunity to support the proposals by establishing New Zealand standards, providing national carbon software and the development of artificial intelligence (AI) for sustainability¹ so that the sector is able to deliver and regulate carbon cost effectively and consistently.

We propose that at consenting stage, designers supply carbon information and demonstrate compliance. Local authorities would need to train building inspectors to include carbon metric assessment, however the responsibility to demonstrate compliance should remain with the building designer.

We propose that the missing piece in the consultation document is a mandatory requirement for every manufacturer or importer to disclose the embedded carbon value on a product by product basis i.e. x/m³. There could be a place for this in the *Building (MMC) Bill* in the proposed Part 4B Building Product Information Requirements. With that information, designers could design within a cap and councils could assess designers' compliance statements against the statutory requirements.

A further option which we recommend be given some consideration is that low carbon archetypes and best practice "Acceptable Solutions" be developed for the sector. Designs of pre-worked out carbon loads for both operational and embodied carbon would be efficient for the sector to design to and regulate against.

Whether legislating for archetypes or carbon data metrics we recommend the legislation be drafted broadly enough to allow for both.

We support the elimination of fossil fuel use in new buildings for heating, cooking and other operations by 2035, however, we consider this is a tight timeframe that will require a robust framework and guidance materials.

We support increasing the passive operational efficiency of buildings so they hold energy well and make better use of the sun's energy for heating. We support lowering carbon emissions by increasing efficiency in water use. Lastly, we support building technologies which use less embodied carbon, measured over the expected lifetime of a building.

We note that the Ministry for the Environment is proposing to reduce construction waste by increase tipping fees under the *Waste Minimisation Act* regulations. We support the changes. Further, we recommend synergistic changes to the *Building Act* to encourage reduction, reuse, recycling, and recovery of building products.

We support Local Government New Zealand's submission on this consultation which recommends there be further consideration of carbon emissions from building in the larger context of the New Zealand Emissions Trading Scheme.

Many local authorities have declared climate change emergencies and are in the process of reducing their carbon emissions to net zero emissions by 2050. They have in their sights the elimination of fossil fuels from heating public swimming pools and public buildings. Council controlled organisations are working on eliminating fossil fuel heating from council housing, and some councils have implemented sustainable purchasing policies. In this way, local authorities are reducing their own carbon emissions from buildings.

Lastly, we take this opportunity to support our communities to transition to 21st century living. Our submission supports our communities to shift to low emissions and low waste lifestyles.

PART TWO: SPECIFIC MATTERS

In this section we provide comments on specific questions as asked in the Consultation document. We have kept the question numbers the same as those in the response form.

We also submit on other climate change building issues at the end of the document on matters that may have been omitted from the Consultation. We also note that our comments in this section are subordinate to our general comments.

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?

We agree that the building and construction sector needs to take action to reduce emissions. Our view is that a voluntary approach from the sector would be unlikely to be consistent or successful because there is a view that to reduce emissions will be expensive.

Globally we need to transition to halve our greenhouse gas emissions. This goal requires building technology to transition from its current construction and operational practices, to new states which create fewer emissions.

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

Local authorities would be required to implement the regulation of operational and embodied carbon for all building consents, on-site inspections and code of compliance certificates.

Implementation of additional regulation as proposed in the frameworks would require designers to calculate compliance of operational and embodied carbon for all new buildings. Local authorities would need to train building inspectors to include carbon metric assessment, however the responsibility to demonstrate compliance should remain with the building designer.

We are cognisant that ascertaining the data for the amount of embodied carbon in a new building may be as much work as that of a quantity surveyor's job for each building design. Regulating this data would be substantial, and very expensive for territorial authorities to implement. The expenses of regulation would be passed onto the customer and increase the cost of building.

Therefore, we do not support regulation which would require quantity surveyors (or equivalent data analysts) to process consents at local authority level.

The inclusion of carbon data into the building consenting process is an opportunity for central government departments to enable making carbon calculations as easy as possible. We support the development of a New Zealand industry standard and ask that MBIE take this opportunity to develop software and AI for this purpose.

We note that the NZ Green Building Council has an existing rating scheme for both residential and commercial builds (HomeStar and GreenStar), and they are working on a zero carbon standard for buildings. Data on the embodied carbon of some building materials is available from the NZGBC which could be a starting point for an industry standard.

Whether legislating for archetypes or carbon data metrics we recommend the legislation be drafted broadly enough to allow for both.

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

The lack of existing carbon standards for any product is a real barrier to anyone meaningfully wanting to change course to low carbon designs. From a BCA perspective, there is no data to assess nor standard to assess against.

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

Our view is that the focus should be on all of the below categories because this is where the gains will occur. We recommend that the industrial classification be included for consistency and to stop designs being submitted for industrial use then conversion to commercial use thereby avoiding higher specifications.

	No	Yes
Housing	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Communal Residential	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Communal Non-Residential	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Commercial	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Industrial	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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? Why?**

We support operational efficiency of buildings being included in the work programme for new buildings. Significant efficiency gains can be achieved over our existing housing stock in the internal heating and cooling of buildings.

There is a real drive to put heating and insulating into buildings, but if poorly designed, can result in overheated houses which are expensive to cool during summer. Improved operational efficiency should incorporate energy costs at the different times of year, winter solstice, summer solstice, and the equinox. These measurements would ascertain the correct heating and cooling energy expenditure.

Increased efficiency for heating and cooling buildings would result in lower power bills and therefore, savings for owners. Furthermore, warmer and drier homes are known to result in improved health outcomes for vulnerable children as demonstrated in the Healthy Homes Initiative . Interventions included insulation, curtains, heating sources, minor repairs and support with private/community/social housing relocations, and other housing and health interventions. The results showed that many hospitalisations were prevented, and there were fewer GP visits and pharmaceutical dispensings.

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.

We support the use of reducing caps in a stepped approach for new buildings use of fossil fuels, electricity use and water use.

12. Do you think the timeframe of 2035 for achieving the final cap is appropriate?

Our view is that having the final cap in place by 2035 will be a tight timeframe and its success would rely on a good framework and guidance materials. We support more emphasis on fossil fuel reduction because reduction in this area will achieve the greatest gains.

13. The Framework proposes that a number of building types, outbuildings and ancillary buildings, will be exempt from operational emission reduction requirements. Do you agree?

We agree that, in general, outbuildings and ancillary buildings be exempt from operational emission reduction requirements. Sheds and garages do not have temperature demands required by human habitation placed upon them.

However, as noted in the consultation document, some ancillary buildings, such as indoor swimming pools will have substantial heating requirements and should be in the framework. Furthermore, some ancillary buildings become used as office or other work-from-home spaces. Therefore, buildings where office-type work or similar sedentary work such as studios or clinics will require heating and need to be brought into the framework.

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? Why?

Our view is that there is potential to include existing buildings under-going significant upgrade works and/or seismic upgrade. We suggest that the legislative wording be able to trigger "significant" upgrade work. This is a difficult definition as evidenced by the current fire and accessibility upgrade requirements.

The cost benefit needs to be practicable so that renovations are not unduly impinged, and unintended consequences are managed. There needs to be mitigation to stop buildings being shelled out and rebuilt without being caught by the carbon regulations.

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

We support a fossil fuel emission limit on building operations. Fossil fuels are not a renewable energy, therefore, where viable renewable sources are available, we should opt to reduce fossil fuel use and reduce CO₂ 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? Please tell us why?

Passive solar

We agree that passive solar principles are an extremely important factor for heating and cooling control in buildings. Once constructed, a building that is well designed to passively control and distribute heat from the sun will yield efficiencies and support a reduction in heating costs. Good passive solar design requires a solar collector.

Passive collector options can be used for both solar water heating and heating of rooms. Heating water through black plastic pipes on the rooftop is a low carbon technology, whereas an internal concrete slab to store the sun's energy requires higher embodied carbon. However, we support both technologies.

We support passive solar design and also support the incorporation of solar heating gains even where there is no collector to release the energy after the sun goes down. Rooms with north facing windows will be warmer when the sun is out than south facing rooms in the same house. Heating may be required on the south side but not the north side during the day which will have an effect on energy consumption. Data on how solar heating will work can be complicated to compile. Shading factors, such as hills, trees and other buildings are outside the scope of BRANZ passive house calculation tool and would need to be brought into the considerations and accounted for.

Airtight houses

We support the principles of airtight design which stops draughts, air leakage and keeps heat in. The PassivHaus system is an example of a systemised approach to airtight design. Such houses have an efficient use of energy because the house is effective at holding heated air constant due to the lack of air flow. Airtight houses can, however, suffer from internal moisture problems due to the lack of air flow. Not everybody knows they need to open their windows to let out moisture from cooking, showering and other activities. Sometimes there is considerable moisture in homes from drying washing inside during winter. This has been known to cause significant building damage in instances where the house has not been ventilated. We propose there should be cognisance of the moisture problem in any changes to the *Building Act*. Some solutions are trickle ventilation or ducted air/heat exchange systems.

Air exchange is also an important health consideration during COVID-19. The WHO recommendations are to ensure fresh air to prevent aerosol infections .

R-values

Thermal resistivity values (R-values) are successfully used now as a measure of heating and cooling performance of buildings in the building code. The higher the R-value the better the ability to slow down heat loss or heat gain from outside temperatures. We support the ongoing use of R-values as an ancillary tool to support the proposed measures of energy per square metre.

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? Please tell us why.

We support energy efficient performance of fixed service appliances. There is already an energy efficiency star rating for appliances and this system could be improved to meet New Zealand's carbon goals. We submit that regulation could be achieved via a combination of mandatory product certification by third parties, and mandatory efficiency performance.

We propose that third party certification would be required to manage the risks of self-certification or no independent testing of product performance.

Local authorities would need to add the checking of energy efficiency of fixed services to their regulatory functions. However, if there was a mandatory certification scheme in place, we do not envisage this would add a lot of additional regulation to building consent authorities.

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

Plug in load requirements will vary depending on the business or activity in the building and load limits would discriminate against certain businesses unfairly. Plug loads cannot be enforced easily after the consenting process is completed.

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? Please tell us why.

We recommend consideration that new buildings not be required to have solar cells for energy storage capacity. Designing this into buildings will add extra cost for homeowners to exchange one form of renewable energy with another source of renewable energy.

However, we support Government initiatives to consider a range of mechanisms to encourage distributed onsite features via voluntary mechanisms. Widespread use of solar collectors adds resilience to building performance which is becoming more important as extreme weather events increase.

Solar power when collected over many rooves lowers the demand on the power grid and our infrastructure. Excess power can also be sold back into the grid to support it, and although outside the scope of this consultation, the electricity regulator could support domestic solar collection.

Solar power can be stored in a building as hot water, or as battery power to light a 12v lighting system, for example. As previously discussed, solar hot water is a passive low carbon technology. Once batteries are part of the design, the embodied carbon load increases, however, the technology could be a tool in reducing overall emissions.

20. The Framework currently proposes to exclude the following elements from the Building for Climate Change work programme, (electrical appliance efficiency, onsite collection and storage of water, onsite wastewater treatment). Which do you think should be included or excluded? Please tell us why.

We support off-grid elements because they increase community resilience to extreme weather events and reduce carbon emissions, namely:

- Electrical appliance efficiency
- Onsite collection and storage of rainwater for use in laundry, toilet and garden

- Onsite use of rainwater for potable (drinking) purposes where there is practicable regulation
- Onsite disposal of grey water where practicable
- Onsite disposal of brown water where practicable

Electrical appliance efficiency

We support in principle electrical appliance efficiency. However, we also note that efficient appliances cost the consumer more for the initial purchase but save on power costs in the long term. Appliance efficiency is also dependent on user choice and behaviour.

Onsite storage of rainwater

We support the inclusion in the Framework of on-site water collection (rainwater, or other means in the future) for potable and other uses. This directly links to the goal of decreasing water use. It would also add resilience to buildings and decrease infrastructure costs. We support rainwater for laundry, toilet and garden use.

Only a small percentage of household water is used for potable purposes, so it's feasible that private residences collecting their own water need only treat the portion for drinking and cooking, e.g. in rural or off-supply households, treatment through a UV under-bench unit in the kitchen is common. However, ensuring appropriate quality for drinking, food preparation and oral hygiene is critical.

Onsite greywater disposal

We support the inclusion of grey water onsite collection, appropriate treatment and re-use onsite e.g. for watering of gardens. This would conserve water and decrease the wastewater demand on the infrastructure. Greywater can contain a number of contaminants and would need to be subject to specific conditions or resource consent in some areas.

We note that distributed onsite storage of water and onsite grey water disposal has the potential to significantly decrease infrastructure and carbon use. It will add extra building costs to consumers and decrease infrastructure costs.

Onsite brown water disposal

We propose that the legislation be drafted broadly enough to enable councils to make their own decisions about onsite brown water disposal.

Brown water disposal is regulated under *Resource Management Act* Regional Plans for environmental and health reasons. Each council needs to be able to consult with their communities about whether onsite brown water should be a permitted activity or not.

Environmental conditions vary across the country, e.g. brown water can have climate change impacts particularly in coastal and low-lying areas. Less densely populated regions may find it relatively easy to regulate brown water disposal and enable it by removing district planning restrictions. However, densely populated areas may find regulation more difficult preferring municipal or public wastewater systems.

Regulation of drinking water, greywater and brown water

Should onsite drinking water and/or grey water/brown water systems for individual buildings be included in the MBIE work programme, we suggest that consideration be given to how these systems are (or will be) regulated to minimise environmental health impacts. Note that local authorities may not have the resources to regulate multitudes of properties, and recouping costs of inspection could be problematic especially in financially vulnerable communities. Where

there are national gains to be made, we propose that the government assist local authorities with financial consideration to enable regulation.

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. Please let us know if there are any additional elements you think should be considered.

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

We do not recommend any other IEQ parameters.

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 your organisations?

We recommend consideration that there be carbon compliance statements provided to local authorities at the consenting stage. For the code of compliance stage, we recommend there be a further compliance statement provided to the local authority via the construction team engaging the right expert to provide it for them. The compliance will need to account for minor onsite variations and amendments to the consent.

Local authorities would need additional time to assess and process carbon consenting information, however, if the regulatory process is as above, this should not be significant.

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.

A consistent methodology and standard will be needed for designers and regulators. Local authorities will need designers to have the ability to provide compliance certainty when they put in their consent applications and also at the code of compliance stage.

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?

We recommend that there be consideration of the inclusion of whole-of-life embodied carbon in the proposals. Building and product fabrication uses significant amounts of energy and emissions can be reduced when being judicious with design, materials and methods of construction.

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 (reduce our need for imported materials)

We recommend consideration that lean design be excluded because building to more than the minimum standards provides a buffer to the variable building quality that gets delivered.

Finally, we suggest that we reduce our need for imported materials, for example, treating our own timber instead of sending it offshore for treatment and then buying it back.

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

A lot of construction waste occurs due to the design requiring different sized panels to factory made panels or board sizes. Therefore, there is a lot of trimming to size on site. Building designs are often constrained by the site shape and terrain which dictates a bespoke design.

However, more awareness by designers of construction waste would improve design efficiencies to keep trimming to a minimum. Manufacturers could also assist by improving their processes to keep up with demands for changes to their products. Greater use of prefabricated modules may also limit wastage.

A further measure would be for central government to incorporate the latest developments in supply chain waste innovation into the building industry to reduce construction waste.

We note that the Ministry for the Environment is proposing to reduce construction waste by increase tipping fees under the *Waste Minimisation Act* regulations. We support the changes and recommend synergistic changes to the *Building Act* to encourage reduction, reuse, recycling, and recovery of building products.

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?

Low carbon construction materials, e.g. biobased or recycled/reused products could be identified by a rating system that is certified by an independent regulator, and data included in mandatory product information material. This would be a cost-effective way to provide information to the sector and for regulators to assess compliance.

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?

We recommend consideration of a cap on whole of life embodied carbon for new building projects. We note that more work needs to be done to ascertain where the embodied carbon loads are high before we know how they will be able to be reduced without compromising strength and resilience.

Transport carbon is included in the proposals and we know that population and economic growth is projected for many provincial and rural areas in next decades. We submit that carbon caps do not hinder these communities by virtue of their distance from metropolitan areas.

Improved software and AI solutions would assist designers to work to a cap. This could be an area of development for MBIE to assist with to produce a NZ standard and software solution to provide consistency across the country.

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

We recommend consideration for mandatory product information to be made available for designers to incorporate into the design. The data could arguably be captured at the consenting lodgment stage and reported to Stats NZ just like other housing materials data is collated and transferred.

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

A data repository would only be of use to the public if the data informed best practice that others could emulate. There would have to be some consideration about the narration for buildings with high embodied carbon so as to avoid unintended consequences, such as demolition because they become unpopular to buy or lease.

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).

We recommend consideration that a consistent methodology be developed for designers to implement at the design stage and experts to give assurance at code of compliance stage.

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?

Most people in the industry will need to undergo training on carbon data calculation. Local authorities would need central government support to set up consenting, and on-site compliance regimes for the new requirement.

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 extra requirements would be added to the design stage of the building. It also would add an additional review process to all the BCA consenting and compliance processes.

We recommend there be consideration given to a requirement that there be carbon certification at the code of compliance stage. This is for the purposes of managing the risk that there be a carbon appropriate design consented and then strategic product substitutions on site to lower cost, with higher carbon replacements used that undermine the efficacy of the carbon rating.

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

Local authorities would need to train their building consent officers on the new regulatory processes.

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

We support having the whole of life factored into carbon calculations are made to ensure decisions work over the life of a building and not just the product and construction stage. The longer a building lasts, the better its carbon performance becomes over time, e.g. technologies which preserve the use of a building in an earthquake, as opposed to having to demolish it, is a sustainable way to build.

We submit that only including the initial building life cycle stages pose a risk that buildings with good seismic technologies would not rate as highly as they ought.

There have been some excellent seismic designs in recent years which decrease the repair and demolition burden post-earthquake. Some are New Zealand inventions which are now used overseas, such as, replaceable shear links and post-tensioned laminated veneer lumber. We support a whole of life approach which would provide incentives to design for the long term rather than design for demolition post-earthquake.

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?

The proposal is a pragmatic approach to regulation and we agree with the proposal for ease of compliance, particularly in the initial reforms.

However, carbon product information for internal fittings could be required and voluntary specification of low carbon products be encouraged which would help achieve the goal to zero carbon 2050. Once software and AI solutions are more developed, the inclusion of internal fittings could be reviewed for fit in the regime.

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

We support that new buildings and refurbishments be regulated for embodied carbon. This would be achievable under our preferred regulatory scheme of low carbon archetypes and best practice acceptable solutions.

Refurbishments, if excluded would result in unintended consequences of high embodied carbon methods being used, simply because it would not be regulated. This in turn would defeat the objective of lowering the overall embodied carbon.

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. Do you agree with this proposal?

We support smaller buildings having simplified methods which enable design, construction and consent with fewer compliance costs. Larger buildings will routinely have materials schedules produced by a quantity surveyor which could be used to add carbon data to. Therefore, the small and large building division seems to be a practicable division.

39. Any other comments on the proposed frameworks?

- (a) The missing piece in the consultation document is a mandatory requirement for every manufacturer or importer to disclose the embedded carbon value on a product by product basis i.e. x/m^3 . There could be a place for this in the *Building (MMC) Bill* in the proposed Part 4B Building Product Information Requirements. With that information, designers could design within a cap and councils could assess designers' compliance statements against the statutory requirements.
- (b) Some construction activities do not appear to be included in the embodied carbon consultation, e.g. hydrovac, welding, piling, installation of scaffolding and hoarding. We ask that there be clarification about carbon inclusion for onsite construction systems and methods.
- (c) We note that clarification is needed about how waste and recycling in the construction process is to be assessed and verified.
- (d) Wood-fired heating is not included in the proposals and some thought needs to be given to its place in regard to operational carbon.
- (e) We ask that the definitions of small and large buildings be altered for large metropolitan areas because buildings of four storeys are common in the social housing space. There would be a benefit to include them in the "small" category in these areas to reduce compliance costs for low cost housing.
 - iii Large and small buildings as defined in the framework scope section
 - Small buildings are less than three storeys and 300m² gross external floor area
 - Large buildings are greater than three storeys or 300m² gross external floor area
- (f) Transport carbon is included in the proposals and we know that population and economic growth is projected for many provincial and rural areas in next decades. We recommend that carbon caps do not hinder these communities by virtue of their distance from metropolitan areas.
- (g) Climate change considerations should also include designing for greater disruption in the weather patterns. Predicted is:
 - higher wind loads
 - greater range of temperatures – lower cold temperatures and hotter hot temperatures

- (h) As the polar caps melt and we have less ice to deflect UV light back to space, we recommend consideration of “white rooves” as a simple and cheap measure to deflect UV light and offset some planet warming. Some places have put this in place, e.g., Los Angeles for commercial buildings.

- i For example, IES Intelligent Communities Lifecycle – digital twin technologies <https://www.iesve.com/icl>
- ii Healthy Homes Initiative Outcomes Evaluation Service: Initial Analysis of Health Outcomes (Interim Report) <https://www.health.govt.nz/system/files/documents/publications/healthy-homes-initiative-outcomes-evaluation-interim-report-18sept2019.pdf>
- iii World Health Organisation Q&A: Ventilation and air conditioning in public spaces and buildings and COVID-19 <https://www.who.int/news-room/q-a-detail/q-a-ventilation-and-air-conditioning-in-public-spaces-and-buildings-and-covid-19>



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