The Carbon of New Zealand stand-alone houses: benchmarking and opportunities

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Paris Agreement and Zero Carbon Act

Paris Agreement (Article 2a)

(a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change;

Zero Carbon Act

- Sets greenhouse gas emission reduction target:
  - Net emissions of all greenhouse gases (except biogenic methane) to zero by 2050
  - Reduce biogenic methane emissions to 24 – 47% below 2017 levels by 2050, including to 10% below 2017 levels by 2030.
- Establishes a system of 5 year emissions budgets for NZ, which will track downwards towards 2050.
- Establishes an independent Climate Change Commission (CCC) for expert advice and monitoring.

Research questions:

- What does an emissions budget for a typically sized new stand-alone house look like for NZ?
- How does this compare to what is being designed and built now?

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Carbon budget (198 m^2 stand alone house)

<u>2°C warming</u>

- 1,110 Gtonnes CO_2eq

<u>1.5°C warming</u>

- 786 Gtonnes CO_2eq

- Global population vs NZ population to 2050
- Existing floor area / new floor area
- Rate of demolitions
- Carbon footprint of current houses

- 55 tonnes CO_2eq
- 39 tonnes CO_2eq

By 2050, close to zero (any emissions should be offset by additional activities to absorb carbon e.g. planting more trees, managing soil carbon, carbon capture & storage)

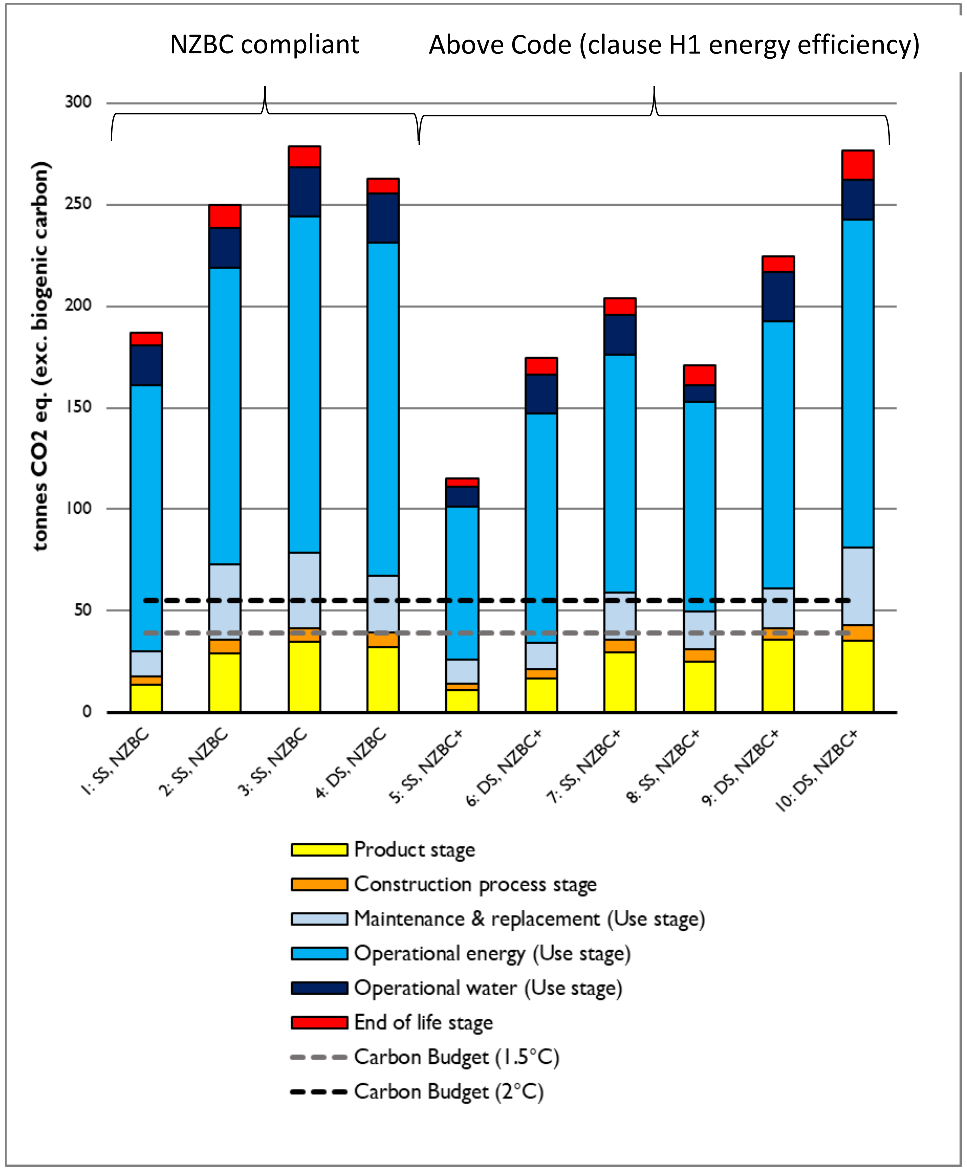
- Massey University / BRANZ – led research
- Tested methodology at IEA Annex 72 special workshop.
- Presented at SBE19 – received "best paper" award from 185 papers

More research needed to:

- Test assumptions
- Refine input data

Budgets not static!

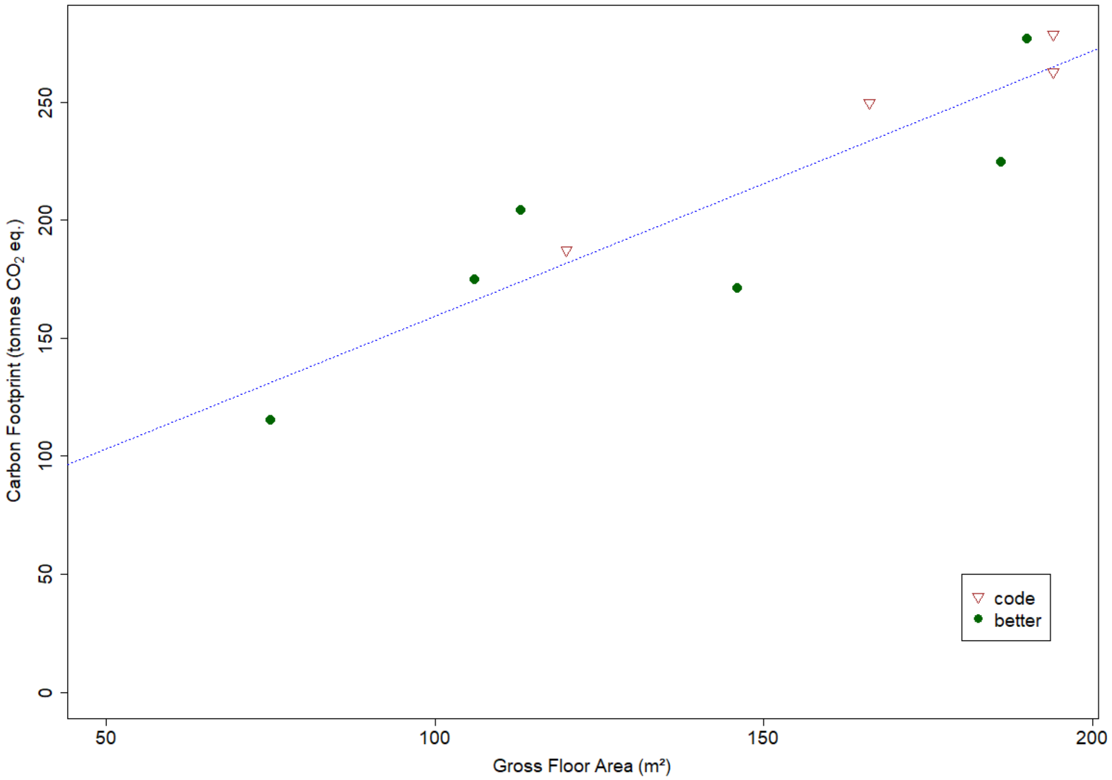
How do new houses compare?



- Modelled emissions over 90 year service life
- Some materials missing e.g. electrical, plumbing, kitchen and bathroom units
- Current materials manufacturing technology. This should progressively decarbonise over time
- Some increase in renewables supplying grid electricity – will be updating next year for ICCC and MBIE scenarios
- Energy – simulated to maintain a temperature of 18°C – 25°C. Includes heating + cooling, hot water, lighting, plug-in appliances.

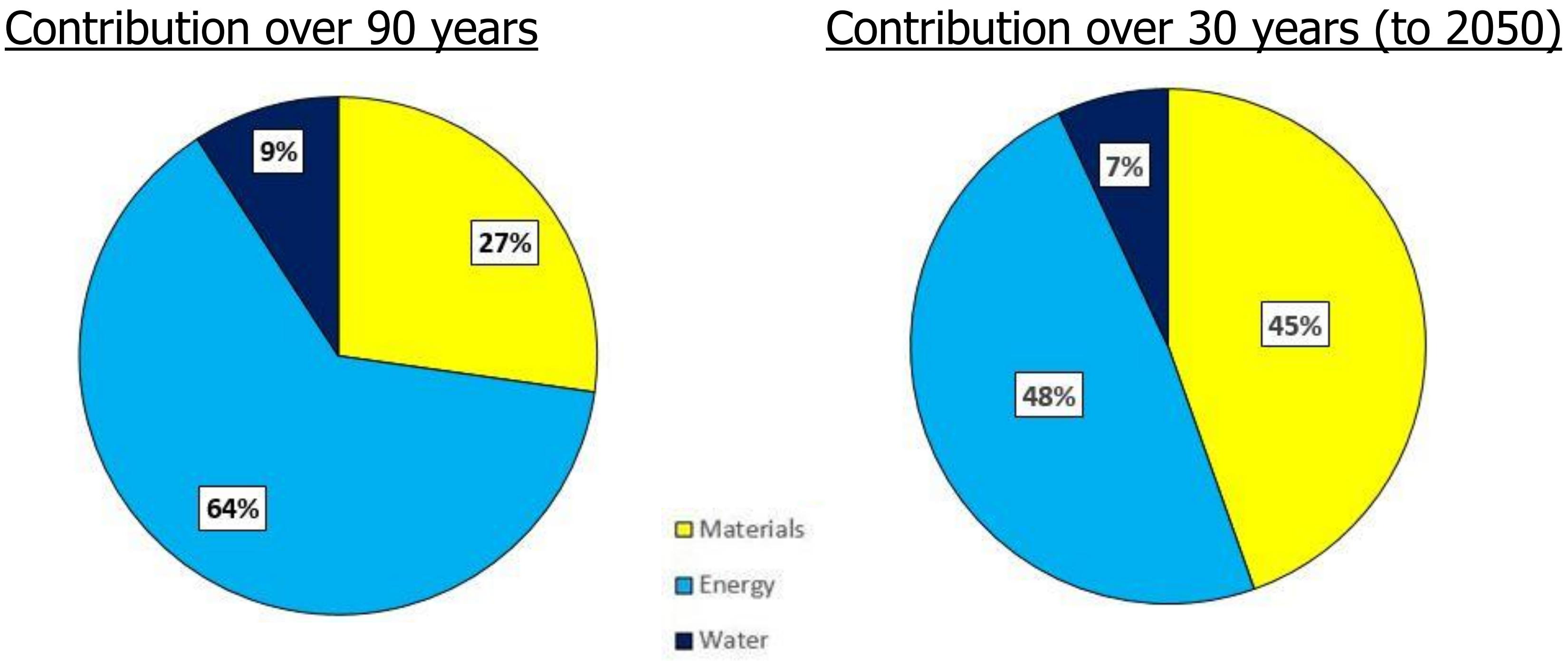
- High performance houses are not necessarily low carbon houses.
- They have lower heating energy demand. However, dominant energy demand appears to be plug-in appliances and hot water.

House size



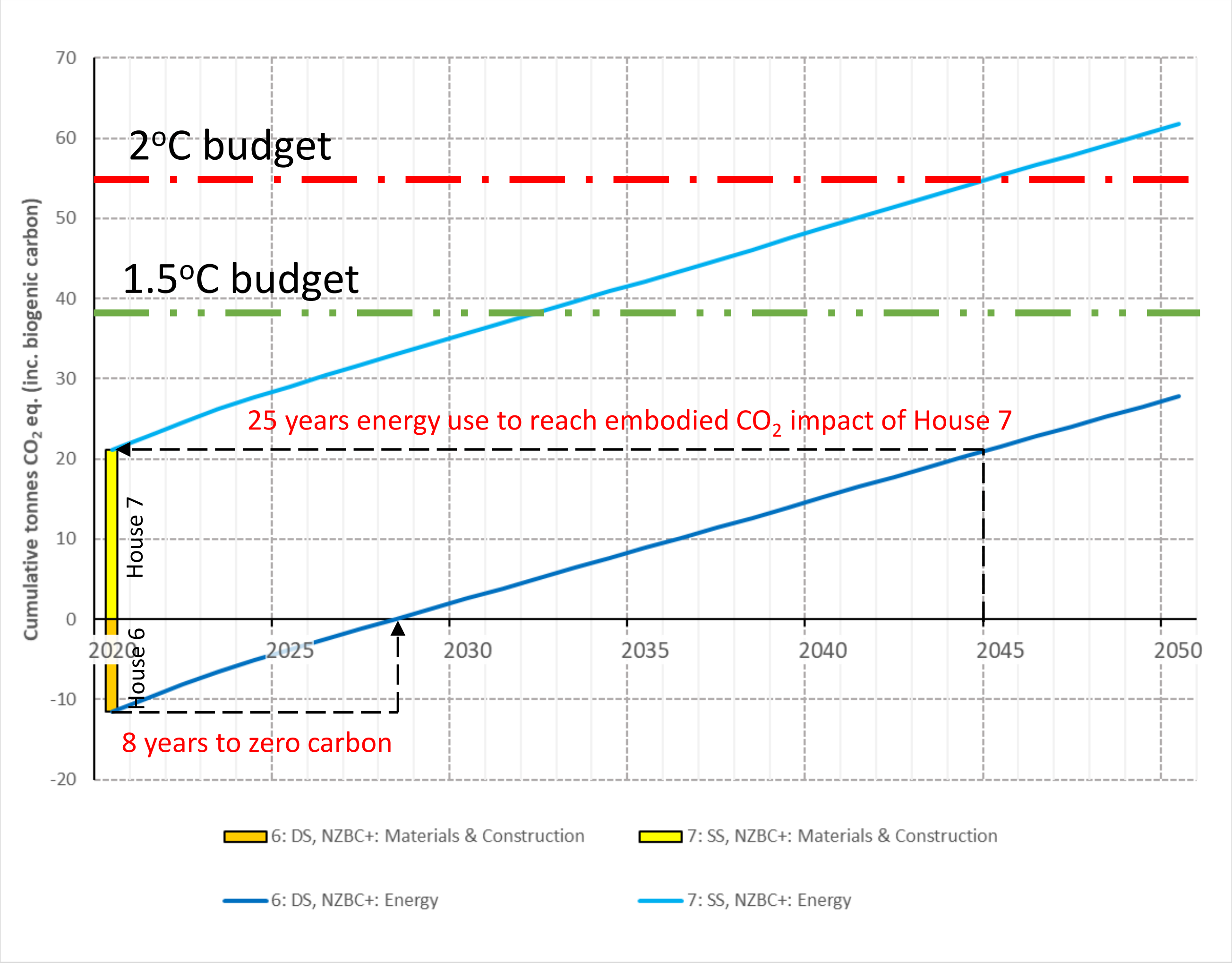
- Larger houses have larger carbon footprints
- This is also true of high performance houses
- Large houses with few occupants not desirable from a carbon perspective
- Build more smaller houses.

Materials/design is important for new houses



- Should not ignore "embodied carbon" that arises from house design and choice of materials.
- Significant proportion of materials-related greenhouse gases are emitted before a house is occupied.
- Opportunity to use more bio-based materials that have sequestered atmospheric carbon dioxide e.g. timber, engineered wood. Must come from sustainable forestry practices!

Carbon storage potential



- Both houses have 4 occupants
- Energy use includes plug-in appliances
- Includes carbon dioxide sequestration by growing trees that are processed into timber and engineered woods = sustainable forestry practices (e.g. FSC, PEFC)
- Using more bio-based materials (from sustainable sources) and good, efficient house designs, means our new houses could provide carbon storage NOW.
- Water consumption/efficiency, water source, reuse/recycling also needs to be considered.
- This can help to buy time, as our economy shifts towards net zero carbon by 2050.

What can industry do?

Design carbon out of our buildings.

How?

What BRANZ tools are available?

BRANZ CO2NSTRUCT DATABASE

BRANZ LCAQuick

www.branz.co.nz/co2nstruct

www.branz.co.nz/lcaquick

- BRANZ is developing a tool to illustrate the comparison of residential, wall, floor and roof constructions from a materials and embodied carbon perspective.
- It will be based on the BRANZ House Insulation Guide, and is due in April 2020.

The call to action

The BRANZ **Transition to Zero Carbon** research programme

1) Seeks to create cost effective **low carbon solutions** for new and existing dwellings; 2) Seeks to **implement these solutions** within industry.

BRANZ Research Investment funding prospectus devoted to climate change

- Available late February
- Building momentum and responding to the urgency
- Expressions of interest sought around how we can work together to grow capability

Thank you

Continue the conversation at:

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