CHAPTER 12:

Building and construction

Building and construction

Lead

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Contribution to our long-term vision

By 2050, Aotearoa New Zealand's building-related emissions are near zero and buildings provide healthy places to work and live for present and future generations.

Contribution to Aotearoa New Zealand's greenhouse gas emissions (AR5) in the first emmissions budget period[1]

Projected emissions without the initiatives in this plan	32.5 Mt CO_2-e
Projected average annual emissions without the initiatives in this plan	8.1 Mt CO_2-e
Estimated emissions reduction from the initiatives in this plan	0.9 to 1.7 Mt CO_2-e

1 Unlike other sectors, these figures reflect a 'consumption' approach that includes emissions accounted for in other sectors but for which building and construction is responsible (eg, emissions from energy used in buildings, emissions from the manufacture of building materials). Counting only emissions directly produced from buildings (predominantly fossil fuels used for space heating and cooling), building and construction produced 1.59 Mt CO_2-e in 2018. This represents 3.6 per cent of total domestic emissions for that year (excluding biogenic methane).

Building and construction

Why building and construction is important

In 2018, nearly 9.4 per cent of domestic emissions were building-related. These emissions are largely accounted for in the energy and industry, transport and waste sectors. For example, they include:

- emissions from the energy and other resources used when operating a building
- the carbon emitted in Aotearoa by the manufacture, transport, use and disposal of the materials and products in a building across its life – including construction, maintenance and deconstruction.

As we reduce our emissions and build Aotearoa New Zealand's circular economy and bioeconomy, we can expect healthier homes, less reliance on global supply chains for construction materials and more sustainable living.

Key actions

- Reduce the embodied carbon of construction materials by supporting innovation and regulating to promote the use of low-emissions building design and materials.
- Accelerate the shift to low-emissions buildings by promoting good examples, providing incentives and supporting the use of low-emissions practices.
- Improve building energy efficiency by amending the Building Code and measuring energy performance to ensure buildings are designed, and retrofitted, to use less energy for heating and cooling.
- Shift energy use from fossil fuels by developing a gas transition plan and understanding the impacts of transition for households and communities.
- Establish foundations for future emissions reduction by improving emissions data for buildings and materials, building relationships with Māori, and progressing behaviour change and workforce transition programmes.

Buildings are central to New Zealanders' lives and the economy

Buildings are where New Zealanders spend most of their time living, working and playing. They impact on most wellbeing indicators at an individual, community and national level – they are our houses, our hospitals, residential and aged care facilities, our shops and offices, our warehouses and industrial buildings. Buildings are key to our everyday lives.

The building and construction sector is Aotearoa New Zealand's fourth largest employer. It contributed NZ$20.5 billion (around 6.7 per cent) to Aotearoa New Zealand's gross domestic product in the year ended March 2019.[2]

Buildings are long lived – setting emissions patterns for the future – and drive emissions in other sectors

The building and construction sector was responsible for 7.4 Mt CO_2-e of emissions in 2018. This represents 9.4 per cent of domestic greenhouse gas (GHG) emissions, or over 15 per cent of emissions if biogenic methane is excluded (see figure 12.1).[3]

In addition, the building and construction sector was responsible for 2.9 Mt CO_2-e of emissions that occurred outside Aotearoa, largely from the production of imported construction materials and products. These are not included in domestic emissions budgets for Aotearoa but are a significant proportion of the sector's total emissions.

2 Stats NZ – Series, GDP(P), Chain volume, Seasonally adjusted, ANZSIC06 industry groups (Qrtly-Mar/Jun/Sep/Dec). See National accounts (industry production and investment): Year ended March 2019. Retrieved from https://www.stats.govt.nz/information-releases/national-accounts-industry-production-and-investment-year-ended-march-2019 (accessed 22 April 2022).

3 Figures in AR4 terms, based on the New Zealand's Greenhouse Gas Inventory 1990-2018 published in 2020 as opposed to the most recent inventory published 2022.

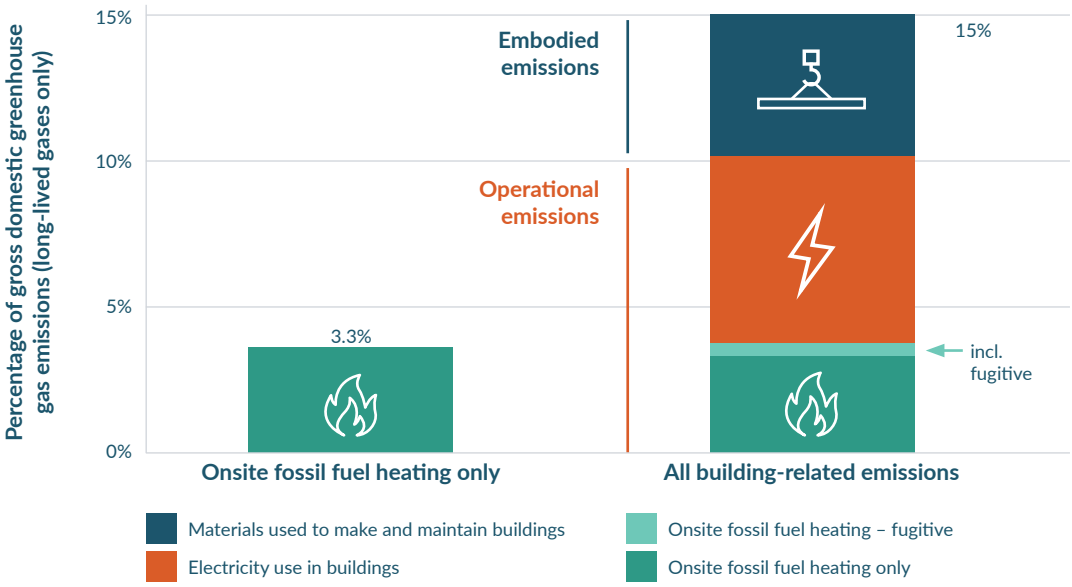
Emissions directly from buildings, such as fossil fuels used for space and water heating, are only one part of the emissions for which buildings are responsible. They also drive emissions that are accounted for in the energy, industry, waste and transport sectors.

To enable us to account for and reduce all of the emissions that buildings generate, this chapter uses a "consumption" approach (as recommended by He Pou a Rangi – Climate Change Commission) which incorporates all the emissions in Aotearoa related to buildings, regardless of the sector that produces them (see figure 12.1). This differs from the 'production' approach of other sector-specific chapters, which specifically incorporate emissions produced within that sector.

The consumption approach includes the impact of two types of building-related emissions.

- **Operational carbon emissions** – from the energy and other resources used for operating the building.
- **Embodied carbon emissions** – from the manufacture and use of the materials and products in buildings across their lifespan, from construction to deconstruction. These include emissions from the production, transportation and disposal of building materials.

Figure 12.1. Building- and construction-related emissions as a proportion of Aotearoa New Zealand's gross greenhouse gas emissions (excluding biogenic methane) in 2018[4]



Buildings and houses are long lived, and the amount of energy used to heat, cool, light and maintain them is affected by their original design and construction. Designing, building, using and deconstructing our buildings more efficiently will provide more opportunities to reduce emissions across many sectors.

4 Figures in AR4 terms, based on the New Zealand's Greenhouse Gas Inventory 1990-2018 published in 2020 as opposed to the most recent inventory published 2022.

Actions we are taking to reduce building and construction emissions

Initiatives are underway across government and industry to reduce emissions from building and construction, and to meet the sector's complex challenges – like workforce and skills shortages, material supply constraints, pipeline uncertainties, productivity constraints, and health and safety concerns.

More needs to be done to ensure this sector can meet the scale of the challenge. Everyone has a role to play – central and local government, business and industry, the finance and insurance sectors, and households and communities. The Construction Sector Accord provides a platform for much of this collaboration.

Together, government and industry must identify opportunities that reduce emissions, create cost savings and support affordability. For instance, changes to building designs or footprints can be cost neutral but significantly reduce emissions. Some opportunities have long-term cost savings, for instance, from reduced energy bills, but can have higher upfront costs.

To provide an equitable transition, the Government will work to understand potential costs and mitigate their negative impacts for groups, including workers, renters, seniors, disabled people and lower socio-economic groups.

Reducing building and construction emissions

The steps we are taking to reduce emissions have two objectives:

- reduce the embodied carbon of buildings
- reduce operational emissions.

Objective 1: Reduce embodied carbon of buildings

We can reduce the emissions created during the extraction, manufacture, operation and disposal of resources used in buildings through the actions below.

Focus area 1: Reduce embodied carbon of construction materials

Actions in this focus area put in place requirements and support for people to measure or reduce their buildings' embodied carbon.

Action 12.1.1: Progress regulatory change to reduce embodied emissions of new buildings

The Government consulted on a Whole-of-Life Embodied Carbon Reduction Framework in 2020. The framework would require reporting and measurement of whole-of-life embodied carbon emissions – from manufacturing building materials to disposing of them at the end of a building's life. The framework would cap new buildings' whole-of-life embodied carbon and reduce the cap over time.

Key initiatives

- Consult in late 2022 on introducing whole-of-life embodied carbon requirements to the Building Code.
- Establish a sector advisory group to help develop proposals for reporting and measurement of whole-of-life embodied carbon emissions and expand the sector's understanding of embodied carbon.
- Explore barriers in existing regulation to the sector considering whole-of-life embodied carbon.

Opportunities for building and construction innovation

The Government is looking to use a climate innovation platform to enable the rapid development and adoption of innovative low-emissions building materials and approaches. This will involve policy and regulatory changes, international cooperation and supply agreements, and developing capability. These tools have the potential to lift competitiveness and increase access to innovation and affordability.

The Government supports innovative use of timber in buildings where this can reduce embodied carbon. The Wood Processing and Manufacturing Industry Transformation Plan and the newly established Timber Design Centre are two examples of work to develop a competitive and resilient timber industry (see chapter 14: Forestry).

To provide an equitable transition, the Government will look to support small businesses, Māori-owned businesses or emerging companies which may not have the same capacity as larger enterprises to access innovation opportunities or funding.

The Government will also explore providing independent specialist advice to households and supporting product information about low-emissions building products, which could also support households to take meaningful action.

Action 12.1.2: Spark and foster innovation across the sector

Key initiatives

- Establish an Embodied Emissions Climate Innovation Platform (see climate innovation platforms in chapter 8: Research, science, innovation and technology).
- Explore providing industry grants to increase the number of Environmental Product Declarations[5] for building materials and products.
- Establish independent household advice, such as expanding the Eco Design Advisor service, and explore grants to support households to reduce their carbon impact.
- Support development of the Forestry and Wood Processing Industry Transformation Plan (see action 14.4.1 in chapter 14: Forestry).

5 Environmental Product Declarations assess the greenhouse gas emissions from a product over the course of its lifecycle, in accordance with international standards.

Opportunities with the waste and transport sectors

Up to half of all waste in Aotearoa is made up of construction and demolition waste, with 20 per cent of this waste going to municipal landfill and 80 per cent to non-municipal landfills or cleanfills.[6] Adopting circular principles, where waste is minimised at the design, construction and deconstruction phases, will reduce emissions from landfills.

A more circular economy, where existing materials are reused and recycled, will lower costs and reduce emissions associated with extracting resources and manufacturing new materials (see chapter 15: Waste and chapter 9: Circular economy and bioeconomy).

The transport of building and construction materials, products and workers generates emissions. Improving coordination and project management across the construction supply chain will help reduce transport costs and emissions.

Action 12.1.3: Realise cross-sector opportunities to reduce whole-of-life embodied emissions

Key initiatives with the waste sector

- Explore requiring waste minimisation or recovery plans for building consent.
- Continue the Kāinga Ora – Homes and Communities waste minimisation programme and share lessons learned.
- Investigate barriers to reusing, repurposing and recycling building materials.
- Explore circular economy initiatives for the sector as part of broader work in this area.

Key initiatives with the transport sector

- Contribute to the national freight and supply chain strategy (see chapter 10: Transport).
- Support the use of project management and prefabrication to reduce road transport.

6 BRANZ. Reducing building material waste. Web page. Retrieved from https://www.branz.co.nz/sustainable-building/reducing-building-waste/#:~:text=Construction%20and%20demolition%20waste%20is,materials%2C%20damaged%20materials%20and%20rework (accessed 22 April 2022).

Focus area 2: Accelerate the shift to low-emissions buildings

Reducing building-related emissions requires lower-emissions alternatives to be the norm for both the sector, and for households and building owners. These must be competitive to produce and affordable. Households and building owners, government and the sector must make informed, deliberate decisions about embodied carbon and operational efficiency when considering the design and use of buildings.

Action 12.2.1: Shift expectations and grow the market for low-emissions buildings

We must adopt and mainstream new manufacturing and construction processes, technologies, building designs, materials and products to reduce building-related emissions and increase affordability and competitiveness.

Key initiatives

- Identify real and perceived financial barriers to low-emissions buildings and explore options to reduce barriers, such as financial incentives, green bonds or green loans.
- Recognise and showcase low-emissions buildings to highlight practices the sector can adopt.
- With the Construction Sector Accord, explore providing business change support and grants to help construction businesses move to a low-emissions business model.

Action 12.2.2: Use the Government's purchasing power to drive market change

The Government owns, manages or procures a large number of buildings, including public and defence housing, schools, hospitals and office buildings. The Government can use its purchasing power to drive the market towards low-emissions alternatives.

Key initiatives

- Support the implementation of Rule 20 of the Government Procurement Rules and the Procurement Guide to Reducing Carbon Emissions in Building and Construction.
- Continue to convene a group for government agencies – the Climate Change Infrastructure and Property Group – to share advice about delivering building and construction climate change initiatives.

Objective 2: Reduce operational emissions

Operational emissions can be reduced by improving building design so that maintaining a comfortable indoor environment uses less energy and by using energy from low-emissions sources. This can also reduce energy costs across a building's lifetime.

Focus area 3: Improve building energy efficiency

Half of all Aotearoa New Zealand's electricity is used in buildings, mostly for heating and cooling spaces and water heating. Building electricity use often occurs in peaks – many homes will use heating at the same time, such as on cold evenings. Peak electricity is more likely to be generated by burning coal or gas. Many buildings in Aotearoa are also hard to heat and not dry or healthy, which can contribute to poor health outcomes for building users.

The Government has already made significant investments to lift buildings' energy efficiency, improve their quality and drive down energy costs. For example, more than 85,000 insulation and heating retrofits have been completed under the Warmer Kiwi Homes programme since July 2018. However, more needs to be done for both new and existing buildings to meet the scale of the emissions reduction challenge.

Opportunities to improve energy efficiency in new and existing buildings

Further reducing operational emissions requires more substantial changes to the Building Code. In 2020, the Government consulted on the Transforming Operational Efficiency framework. It proposes to cap buildings' use of energy and water and defines quality measures for indoor environments. Implementing any proposals will require care to avoid unintended consequences.

This work also presents an opportunity to provide more broadly for an equitable transition. Complementary actions will be explored such as improving building accessibility and seismic resilience, supporting workforce development, and enabling medium- and higher-density housing options that support more liveable urban environments.

The building regulatory system largely focuses on the performance of new buildings. However, we also need to address existing buildings. This means reducing emissions by improving their performance and energy efficiency.

Supporting existing buildings to become low emissions is an important part of an equitable transition. People living in existing buildings, including vulnerable populations, are less likely to benefit from regulation that ensures new buildings are warmer, drier and healthier.

Actions currently in place – such as the Energy Efficiency and Conservation Authority's Warmer Kiwi Homes programme, the continued rollout of the Healthy Homes Standards, and Kāinga Ora's work to improve the operational efficiency of its building stock – will address some of these impacts (see the case study below).

Action 12.3.1: Amend the Building Code to improve new buildings' operational efficiency

Key initiatives

- Implement amendments to Building Code Clause H1 (energy efficiency) compliance pathways.
- Consult in late 2022 on proposed Building Code changes to introduce new requirements for operational efficiency.

Action 12.3.2: Encourage and enable emissions reduction from existing buildings

Key initiatives

- Introduce mandatory energy performance certificates for buildings. Initially, they could apply to government, commercial and large residential buildings and potentially expand to other residential buildings in future.
- Explore how incentives, support or regulatory requirements could reduce existing buildings' emissions, while making buildings warmer and drier.
- Explore options to expand the Warmer Kiwi Homes programme, such as eligibility criteria, to better achieve equitable outcomes.

CASE STUDY

KĀINGA ORA – HOMES AND COMMUNITIES: NGĀ KĀINGA ANAMATA

Ngā Kāinga Anamata (homes of the future) is part of Kāinga Ora's carbon-neutral programme. The proposed public housing development aims to meet the aspirations for mitigating carbon under the Building for Climate Change programme.

The project in the Auckland suburb of Glendowie plans to deliver 30 new homes in five, three-level apartment buildings. Each building will use common structural systems and materials, and achieve significantly reduced carbon and energy outputs compared to typical 2020 construction.

The project team conducted whole-building lifecycle carbon assessments throughout the design process. The result is a lifecycle carbon reduction of approximately 74 per cent less than typical 2020 apartment construction. This includes timber's biogenic carbon sequestration, or a 58 per cent carbon reduction without.

If agreed for delivery, Ngā Kāinga Anamata will share lessons and insights to prove low lifecycle carbon construction is possible now. It will accelerate decarbonisation in new residential construction. Monitoring and evaluation during building and occupancy will establish the overall cost and benefits of low-carbon housing. The project will report this to the industry to help drive change towards a decarbonised, climate-resilient built environment.

Ngā Kāinga Anamata was showcased as one of only 17 global initiatives in the COP26 Build Better Now pavilion – part of the 2021 United Nations Climate Change Conference.

Focus area 4: Shift energy use from fossil fuels

About 4 per cent of Aotearoa New Zealand's domestic emissions in 2018 were from fossil fuels used in buildings for space and water heating, cooling and cooking.

Transitioning buildings from fossil fuels to low-emissions renewable energy will reduce these emissions. It will also improve the health and wellbeing of building users. To be equitable, the transition must take care to mitigate unequal impacts for building users, households, communities and industry.

For example, fossil fuels are currently the only viable energy option in some rural and off-grid communities, homes and marae. Measures that affect the affordability or supply of fossil gas or coal may disadvantage these people unless the transition is supported.

Other actions to reduce emissions from fossil fuel use in buildings

Fossil fuel use in buildings will be reduced through actions already covered in the emissions reduction plan, including:

- managing the phase-out of fossil fuels, including fossil gas (focus area 3 of chapter 11: Energy and industry).
- introducing measures to improve the energy efficiency of new and existing buildings (focus area 3 of this chapter).

Focus area 5: Establish foundations for future emissions reduction

Continuing to reduce building related emissions will require looking ahead and establishing relationships, training systems, data and regulatory systems to support change and make the most of low-emissions opportunities.

Action 12.5.1: Work with Māori to identify new opportunities and support an equitable transition

The Government and the building and construction sector must be well positioned to understand and respond to the diverse needs and aspirations of Māori. Partnership in the building and construction sector needs to be improved to support Māori aspirations and progress key opportunities across the sector.

Hapū, iwi and whānau Māori are significant land and property holders, business owners and participants in Aotearoa New Zealand's construction sector. Empowering Māori and maximising opportunities will contribute to better outcomes, both for Māori and emissions reduction.

Key initiatives

- Access established networks and improve cross-agency coordination when engaging with Māori on building and housing and climate change matters. Coordinated engagement allows more holistic consideration and more efficient use of Māori resources.
- Support Māori to identify and share examples of Māori innovation and leadership in the climate change and building and construction space.
- Establish systems to enable representation of Māori views within the building and construction sector, such as a mātauranga Māori reference group.
- Use resources such as iwi, hapū and local government climate response plans to better understand existing work.

Action: 12.5.2: Develop a strong data and evidence base

High-quality, user-friendly data and evidence is needed to introduce regulation change for operational emissions and embodied emissions reduction. Data and evidence also supports monitoring and evaluation and allows the sector and households to make informed decisions about the emissions impacts of their building choices.

Key initiatives

- Establish an embodied emissions advisory group of government and non-government building emissions experts.
- Develop a national database for building and construction emissions data. It will be underpinned by a data assessment methodology, emissions calculation tools, a data repository, and appropriate guidance and education.
- Support research into reducing building-related emissions by key non-government organisations, such as BRANZ and universities.

Action 12.5.3: Change behaviours of households and the sector

New Zealanders could benefit significantly from low-emissions buildings, materials and practices that are not yet mainstream. Shifting attitudes and behaviours could result in emissions reductions becoming a core consideration when procuring or undertaking building work. This will support business competitiveness and raise the real (and perceived) affordability of low-emissions approaches.

Supporting people to become more aware of low-emissions building and construction opportunities will underpin much of the work in the building and construction sector in the first emissions budget period and complement initiatives across government.

Key initiative

- Develop and implement a programme to raise awareness, reduce barriers, and encourage action to reduce the climate impact of the building and construction sector. This will support action by households, building owners, producers (sector and supply chains) and building-consent authorities.

Action 12.5.4: Support workforce transition to ensure the sector can build for climate change

Reducing emissions in the building and construction sector will create new economic and job opportunities across the sector – including for people and skills that the sector has not traditionally employed.

To take advantage of these opportunities, it is important that the workforce has the right skills, capabilities and capacity. As well as supporting an equitable transition, the actions preparing –and upskilling – the workforce could also help address existing shortages.

The Government will partner with the Construction Sector Accord's people development and environment workstreams, Māori and Pacific businesses and workers, and across regions, industries and professions, to realise opportunities and an equitable transition.

Key initiatives

- Coordinate and facilitate building and construction workforce planning and sector education across government.
- Explore support or training for workers who may need to meet new requirements, such as gasfitters, designers, and building-consent authority staff.
- Explore direct supports such as targeted funding, behaviour change and site-based opportunities to grow skills and attract people to the workforce.

Action 12.5.5: Establish an enabling legislative framework

The Government will future-proof the Building Act 2004 to ensure it is clear about the Government's priorities for climate change. This will lay the foundation for future legislative and regulatory action that might be required to progress emissions reduction and adaptation work.

Key initiatives

- Explore potential legislative barriers that may prevent or disincentivise the sector from engaging in emissions reduction or adaptation work.
- Progress changes to the Building Act to incorporate climate change goals more clearly.

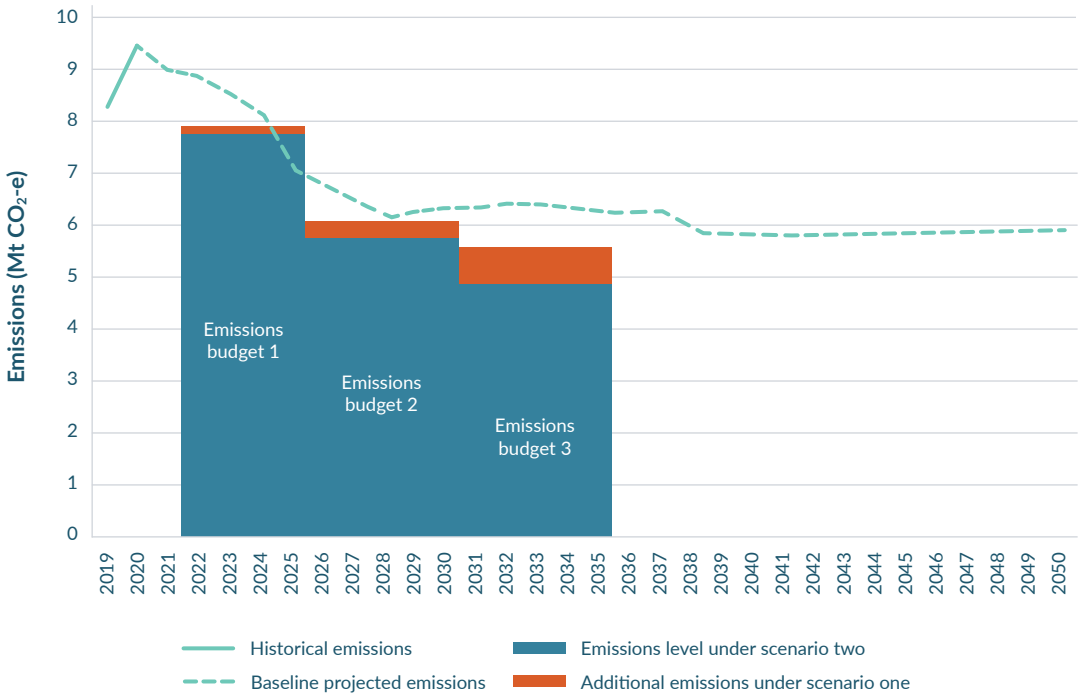
What this means for the emissions budgets

Building-related emissions are expected to reduce by 0.9 Mt CO_2-e to 1.7 Mt CO_2-e in the first emissions budget period, mainly through the potential impact of non-regulatory initiatives such as a behaviour change programme and providing technical infrastructure such as data and tools.

Regulatory actions that could come into force from 2025 are expected to have a more significant impact on emissions reductions in the second and third emissions budget periods. The specific reductions will depend on the strength and speed of the regulatory settings, which the Government will decide at the appropriate time. As an illustration, building-related emissions reductions of between 1.5 Mt CO_2-e and 3.4 Mt CO_2-e could be realised in the second emissions budget period, and between 3.9 Mt CO_2-e and 7.5 Mt CO_2-e in the third emissions budget period.

The Government has modelled two scenarios to show the sector's potential emissions reductions from the actions above. The scenarios show the impact that different timelines and initiatives could have on emissions from the building and construction sector.

Figure 12.2. Illustration of potential building and construction emissions reduction scenarios against baseline (operational and embodied emissions)



- Scenario one illustrates the impact of both embodied carbon and operational efficiency regulatory settings coming online more slowly and with emissions caps set at lower levels.
- Scenario two illustrates the impact of embodied carbon and operational efficiency regulatory settings coming online more quickly and with emissions caps set at higher levels.

The modelled emissions reductions mostly occur in the energy and industry sectors, with some reductions in the waste and transport sectors.

We need to work together to reduce emissions from the building and construction sector

The Government is putting in place the systems and settings to facilitate a low-emissions building and construction sector, but we all need to work together to meet our 2050 targets.

In their role as building-consent authorities, local government co-regulate the building system. They will have a role to play in implementing proposed Building Code requirements to report and measure whole-of-life embodied carbon and operational emissions. Local government will also have a role in reducing construction and demolition waste.

All parts of the building and construction sector have a role in reducing emissions. For instance, designers, engineers and architects can develop and offer lower-emissions building designs, builders can reduce construction waste onsite, and industry training organisations can build the climate change skills and capability needed for the workforce.

The financial and insurance sectors also have levers that may enable or incentivise households and businesses to opt for low-emissions houses and other buildings. For example, mortgage lenders and brokers can offer "green loans" (loans with more favourable terms for more climate-resilient buildings) or adapt lending criteria for efficient, low-emissions buildings with small footprints.

Helping the building and construction sector adapt to the effects of climate change

The 2020 National Climate Change Risk Assessment for New Zealand identified "risks to buildings due to extreme weather events, drought, increased fire weather and sea-level rise" as one of its 10 most significant climate change risks, based on urgency.[7]

The forthcoming national adaptation plan (to be released by August 2022) will outline regulatory and non-regulatory actions to address risks. These actions will be jointly developed by the Ministry of Business, Innovation and Employment and Te Tūāpapa Kura Kāinga (Ministry of Housing and Urban Development) to ensure they consider the linkages between the building regulatory system, housing and Māori priorities.

The Government will ensure system settings mitigate the risk of trade-offs between emissions reduction and building adaptation or resilience. In addition, the national adaptation plan will outline appropriate policies and support to ensure Māori can achieve both adaptation and emissions reduction goals. Work with Māori outlined in action 12.5.1 will support the development of further actions.

7 For an assessment and more details of this risk, see Ministry for the Environment. 2020. National Climate Change Risk Assessment for Aotearoa New Zealand: Main report – Arotakenga Tūraru mō te Huringa Āhuarangi o Āotearoa: Pūrongo whakatōpū, at pp 82–87. Retrieved from https://environment.govt.nz/assets/Publications/Files/national-climate-change-risk-assessment-main-report.pdf (accessed 21 April 2022).

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