# CATI

## Waka Kotahi Climate Assessment of Transport Investment (CATI)

Environment & Sustainability

18 May 2023

A resource outlining CATI [v.2]

link to CATI resources webpage

# Context and strategic relevance

In 2022, the Government released the country's first Emissions Reduction Plan (ERP). This sets out emission reduction targets for the next three emission budget periods until 2035 (commenced 1 January 2022) as well as a range of policies and actions for specific sectors, including transport, to collectively achieve these targets.

The ERP calls for a 41 percent reduction in emissions from the transport sector by 2035 (from 2019 levels). To achieve these reductions three broad areas are identified for reducing transport carbon emissions:
- reduce reliance on cars and support people to walk, cycle and use public transport
- rapidly adopt low-emissions vehicles
- begin work to decarbonise heavy transport and freight.

The ERP is supported by the Decarbonising Transport Action Plan (DTAP), released by Te Manatū Waka Ministry of Transport in December 2022. Waka Kotahi has an essential role in meeting the ambitious transport emission reductions called for in the ERP and facilitated by DTAP.

## Investment decisions

Programme investment decisions are widely recognised to play a critical role in transport emission reductions. For example, both the Paris Agreement 2015 and He Pou a Rangi Climate Commission cite their heft. The Waka Kotahi Investment Decision Making Framework (IDMF) Review, implemented in August 2020, resulted in investment settings that include a mandatory requirement to consider greenhouse gas (GHG) emissions as part of economic assessments and options evaluation.

The strategic relevance of the Climate Assessment of Transport Investment (CATI) model is underlined in Toitū te Taiao: Our sustainability action plan. Under Workstream 5: Invest for Sustainable Outcomes, as part of the IDMF review Waka Kotahi undertakes to enable investment for land transport GHG emission reductions through:

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- embedding long-term emission reduction objectives and emission-based thinking into planning, investment, and accountability instruments (includes consideration of planning and investment bottom lines)
- designing and implementing a methodology to support emission profiling and monitoring of national and regional land transport programmes, and significant infrastructure with an intergenerational life.

## CATI in brief

CATI our climate assessment of transport investment model, is a flexible, simple, nationally consistent methodology to inform programme-level investment decision-making at multiple stages of programme development. To date, there has been no simple method that can be applied quickly, even at the very early stages of development, to understand how investment programmes might positively or negatively impact land transport emissions.

CATI can be applied to all components of a given land transport investment programme to understand whether actions taken have the potential to reduce or increase emissions. It is applicable to Regional Land Transport Programmes (RLTPs), the Waka Kotahi Investment Programme, the National Land Transport Programme (NLTP), as well as to other large programmes such as the Auckland Transport Alignment Project and the Climate Emergency Response Fund (CERF).

CATI assigns a rating for potential impact to reduce or increase emissions for each activity class and for the work categories within activity classes; the model also includes a set of influencing factors based on evidence that give an indication of the potential scale of impact.

The research and evidence underpinning the CATI methodology came originally from the comprehensive international literature review identified Inter-American Development Bank guidance as a suitably robust and authoritative evidence base to understand the emissions reduction potential of different transport-investments. The methodology was initially deployed in Latin America and has subsequently been used in Europe, Asia, and North America. Supplemented by the International Transport Forum (ITF) Transport Climate Action Directory an online database of transport CO2 reduction measures.

CATI can also be used to help inform and optimise Vehicle Kilometre Travelled (VKT) Reduction Programmes, required under the ERP. It enables decision-makers to explore and challenge how much investment within a programme is going towards initiatives that are likely to increase or reduce current emissions. At the RLTP and NLTP level, CATI can be used to develop and optimise major programmes and to assess whether on balance they align with the Government's transport emission reduction targets.

## Planning and use of the CATI tool
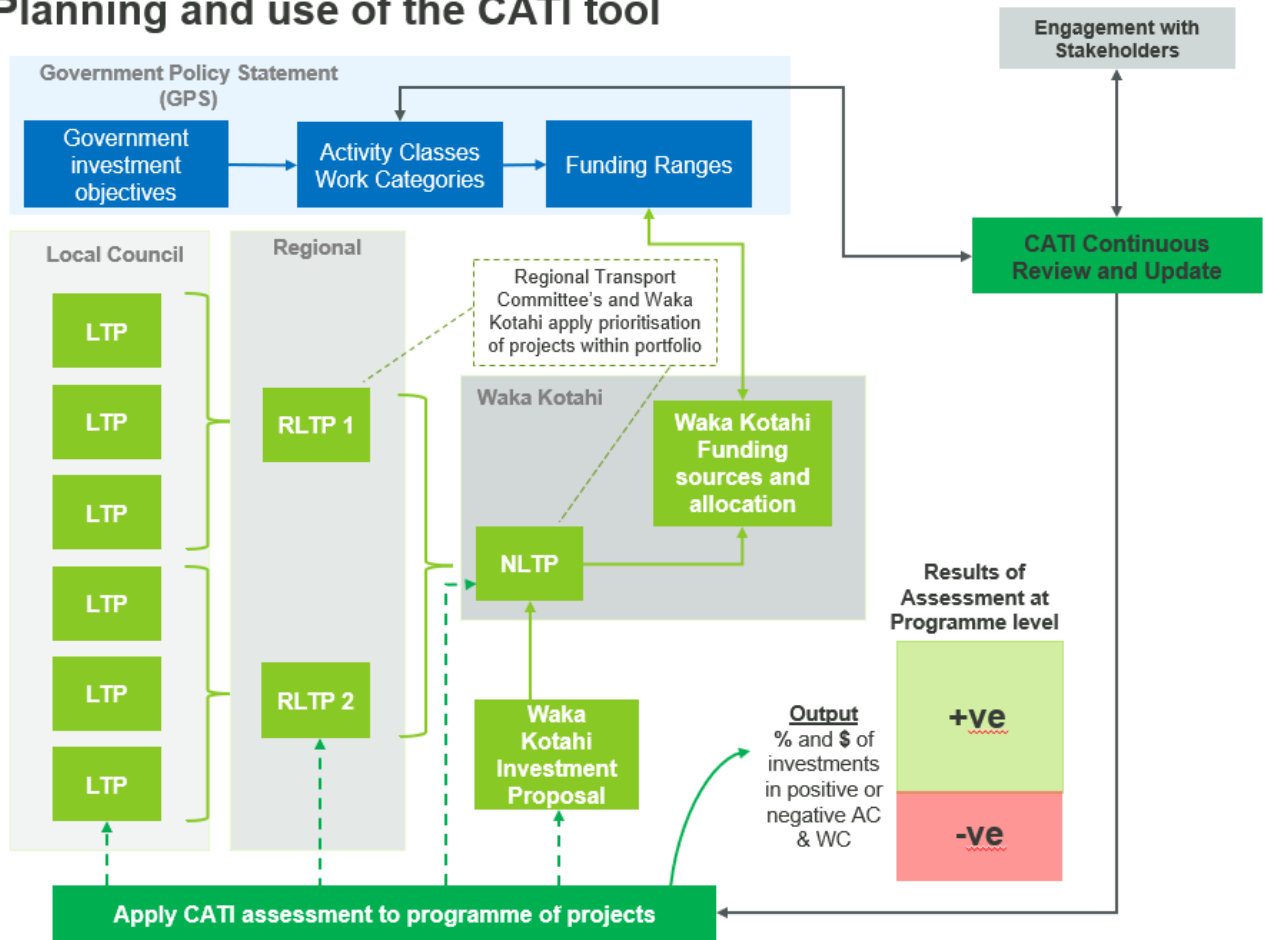


## Qualitative, not quantitative

CATI enables a qualitative assessment of potential carbon impacts, but does not provide a quantitative assessment of actual impacts. It shows where the balance of investment is focused across the negative-positive climate categories. Its outputs should not be confused with the monetary value of emissions benefits or costs that could arise from each category of investment or from individual projects.

CATI describes how investment, grouped by six categories, could affect emissions. The interventions are separated by urban and non-urban programmes. It is worth noting that a zero investment has potential to increase GHG emissions given projected transport use. Whereas category plus three has the highest estimated potential GHG emissions reduction. Category minus three has the potential to increase emissions (which often covers investments in road-safety improvements, thus CATI is a guide to shaping programmes and not a clear-cut decision-making tool).

There are three climate-positive categories (+1, +2, +3) are associated with different strengths of potential for reducing emissions – these categories cover investments aimed at non-motorised local initiatives or soft-initiatives which support Public Transport (PT), through to those associated with substantial PT packages (such as rail/MRT) which, if implemented successfully could have a significant impact on emissions.

# A very simplistic example is illustrated below

## Activity Class and CATI Ratings

For advancement towards carbon goals – aim for at least 2/3 of all investment in the positive category.

| Category | Activities [Activity class/work category/TIO information] | Rating |
|---|---|---|
| Potential for emissions reductions | Passenger Services – Rail – New Infrastructure | 3: H-VH reductions potential |
| | Public Transport Facilities and Operations Renewal | 2: M-MH reductions potential |
| | Public Transport Facilities Operations and Maintenance | 1: L-LM reductions potential |
| Potential for emissions to increase | State Highway Maintenance and Operations | -1: L-LM emissions potential |
| | State Highway Improvements for Resilience and Safety | -2: M-MH emissions potential |
| | State Highway - New Infrastructure and Improvements | -3: H-VH emissions potential |

# A more detailed view into the model below

| | Climate Negative (-ve) | | | Climate Positive (+ve) | | |
|---|---|---|---|---|---|---|
| | -3 | -2 | -1 | 1 | 2 | 3 |
| **Urban** | WC 323 - New roads | WC 321 - New traffic management facilities | WC 111 - Sealed pavement maintenance; WC 212 - Sealed road resurfacing; WC 214 - Sealed road pavement rehabilitation; WC 151 - Network and asset management; WC 322 - Replacement of bridges and other structures; WC 341 - Low cost / low risk improvements; WC 324 - Road improvements; WC 421: Activities influencing users of the transport system; WC 421: Activities influencing users of the transport system; WC 421 - New activities influencing users of the transport system e.g. T3 or T2 lanes | WC 421 - New activities influencing users of the transport system; WC 421 - Travel demand management and behaviour change; WC 451 - Walking facilities; WC 125 - Footpath maintenance; WC 225 - Footpath renewal; WC 524 - Public transport information supply, operations and maintenance; WC 531 - Public transport infrastructure and major renewals; WC 532 - Low cost / low risk public transport improvements; WC 534 - Public transport facilities & infrastructure - renewals; WC 561 - Passenger facilities and infrastructure improvements - bus; WC 562 - Passenger facilities and infrastructure improvements - ferry | Walking & Cycling: Urban Cycleway Programme; WC 451 - Walking facilities; WC 421 - New activities influencing users of the transport system; WC 452 - Cycling facilities; WC 124 - Cycle path maintenance; WC 224 - Cycle path renewal; WC 511: Passenger services - bus; WC 512 - Passenger services - ferry; WC 514 - Public transport facilities operations and maintenance; WC 524 - Public transport information supply, operations and maintenance; WC 540 - Rapid Transit Infrastructure | WC 421 - New activities influencing users of the transport system; WC 452 - Cycling facilities; WC 515 - Passenger services - rail; WC 545 - Transitional Rail Infrastructure; WC 563 - Passenger facilities and infrastructure improvements - rail |
| **Non-urban** | WC 323 - New roads | WC 111 - Sealed pavement maintenance; WC 212 - Sealed road resurfacing; WC 214 - Sealed road pavement rehabilitation; WC 151 - Network and asset management; WC 321 - New traffic management facilities; WC 322 - Replacement of bridges and other structures; WC 341 - Low cost / low risk improvements; WC 324 - Road improvements; WC 421: Activities influencing users of the transport system; WC 421 - Travel demand management and behaviour change | | Walking & Cycling: Urban Cycleway Programme; WC 451 - Walking facilities; WC 181 - Rail network and asset management; WC 421 - New activities influencing users of the transport system e.g. T3 or T2 lanes; WC 421 - Travel demand management and behaviour change; WC 442 - Sea freight operations; WC 125 - Footpath maintenance; WC 225 - Footpath renewal; WC 452 - Cycling facilities; WC 124 - Cycle path maintenance; WC 224 - Cycle path renewal; WC 524 - Public transport information supply, operations and maintenance; WC 531 - Public transport infrastructure and major renewals; WC 532 - Low cost / low risk public transport improvements; WC 534 - Public transport facilities & infrastructure - renewals; WC 561 - Passenger facilities and infrastructure improvements - bus; WC 562 - Passenger facilities and infrastructure improvements - ferry | WC 421 - New activities influencing users of the transport system; WC 511: Passenger services - bus; WC 512 - Passenger services - ferry; WC 514 - Public transport facilities operations and maintenance; WC 515 - Passenger services - rail; WC 524 - Public transport information supply, operations and maintenance; WC 540 - Rapid Transit Infrastructure; WC 545 - Transitional Rail Infrastructure; WC 563 - Passenger facilities and infrastructure improvements - rail | WC 452 - Cycling facilities |

Below is a view of the final assessment summary output of CATI

## Inputs and outputs

- Inputs required
  - Estimated investment $$
  - Type of project/work category
  - Urban vs. non-urban
- Outputs
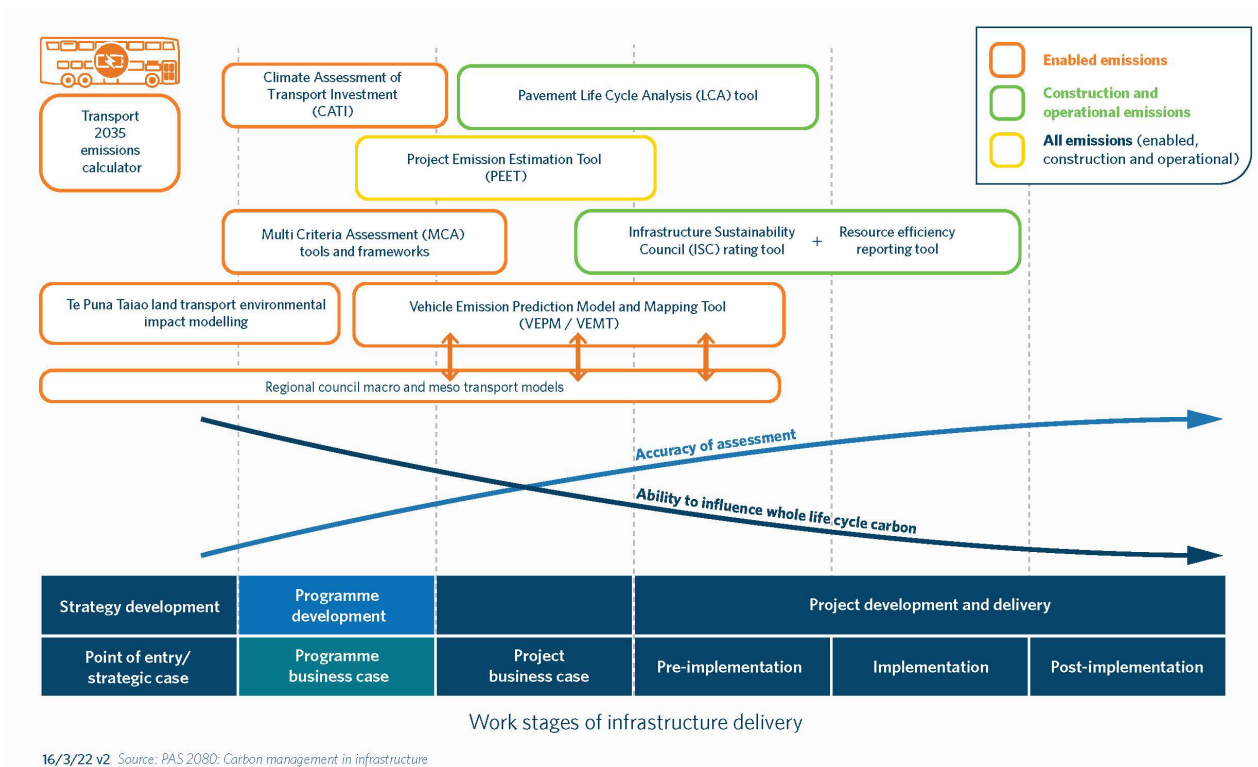  - Proportion of total investments/project sitting under each rating level



NLTP Funding Split - Current and Potential Future
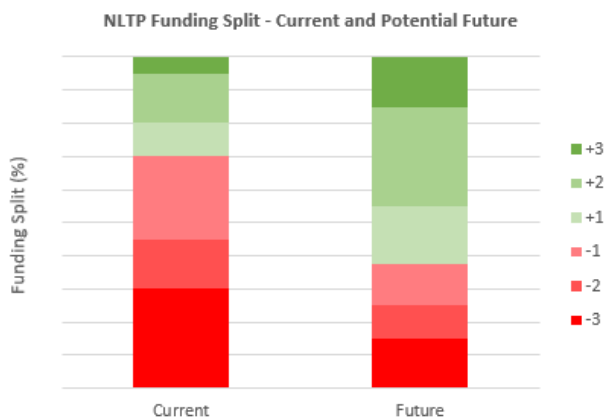
## Part of an integrated suite of resources

Waka Kotahi continues to develop tools and resources to contribute towards our transport emission reduction goals. CATI is a methodology that sits alongside and can be used in conjunction with other assessments and tools to ensure land transport investment decisions align with the Government's emission reduction targets.

Using CATI requires resource: actual assessments are often outsourced but still require in-house management and strategic review. It is best used to help develop, optimise and assess investment programmes early in the decision-making process. To date, CATI has been applied to other uses eg, providing the investment profile of the NLTP 2021-24, and its potential uses continues to evolve.

The full suite of resources is set out in the diagram below. It includes T2035, Project Emission Estimation Tool (PEET), Te Puna Taiao land transport environmental impact modelling initiative, and Vehicle Emission Prediction Model and Mapping Tool (VEPM/VEMT).

**Legend:**
- Enabled emissions (orange)
- Construction and operational emissions (green)
- All emissions (enabled, construction and operational) (yellow)

Tools shown:
- Transport 2035 emissions calculator
- Climate Assessment of Transport Investment (CATI)
- Pavement Life Cycle Analysis (LCA) tool
- Project Emission Estimation Tool (PEET)
- Multi Criteria Assessment (MCA) tools and frameworks
- Infrastructure Sustainability Council (ISC) rating tool + Resource efficiency reporting tool
- Te Puna Taiao land transport environmental impact modelling
- Vehicle Emission Prediction Model and Mapping Tool (VEPM / VEMT)
- Regional council macro and meso transport models

Accuracy of assessment

Ability to influence whole life cycle carbon

| Strategy development | Programme development | Project development and delivery | | | |
|---|---|---|---|---|---|
| Point of entry/ strategic case | Programme business case | Project business case | Pre-implementation | Implementation | Post-implementation |

Work stages of infrastructure delivery

16/3/22 v2 *Source: PAS 2080: Carbon management in infrastructure*

# Why CATI?

- The Government has set into law a target for net zero GHG by 2050 (other than for biogenic methane).
- The land transport system in Aotearoa New Zealand generates approximately 20 per cent of our GHG emissions annually.
- The Government's Emissions Reduction Plan calls for a 41 percent reduction in transport sector emissions (from 2019 levels) by 2035.
- Land transport investment decisions play a critical role in transport emissions reduction.
- Waka Kotahi's investment decision-making settings require it to consider GHG emissions as part of economic assessments and options evaluation.
- The Climate Assessment of Transport Investment (CATI) model is a simple, nationally consistent methodology that provides insights into how investment programmes might positively or negatively impact land transport emissions.
- CATI sits alongside and should be used in conjunction with other resources to influence desirable land transport investment decisions.
- Together, these methodologies and tools will help us transition to a low-emissions climate-resilient transport system for the benefit of all New Zealanders.
- Using CATI requires resource: actual assessments are often outsourced but still require in-house management and strategic review.

# Frequently Asked Questions

**Who are the intended users of CATI?**
Investment managers, planners, and other programme investment decision-makers on RLTP, NLTP and other investment programmes.

**What research or evidence underpins the methodology?**
Comprehensive international literature review identified Inter-American Development Bank guidance as a suitably robust and authoritative evidence-base to describe the emissions reduction potential of different transport-investments. The methodology was initially deployed in Latin America but has subsequently been used in Europe, Asia, and North America.

**How does it take account of local variables?**
Initial methodology development applied a generic rating to assess emission reduction potential of a number of 2015 RLTPs. Influencing factors were subsequently applied to weight up or down the potential for emission reduction based on the local context. These include:
- Population-density
- Geographical emission context
- Scheduling/timing
- Whether the investment is new, an upgrade or a replacement

**How does CATI describe investment profiles?**
CATI has been refined and developed since the original version used in 2022. CATI now describes how investment, grouped by six categories, could affect emissions. The interventions are separated by urban and non-urban programmes. It is worth noting that a zero investment has potential to increase GHG emissions given projected transport use. Whereas category plus three has the highest estimated potential GHG emissions reduction. Category minus three has the potential to increase emissions (which often covers investments in road-safety improvements, thus CATI is a guide to shaping programmes and not a clear-cut decision-making tool).

There are three climate-positive categories (+1, +2, +3) are associated with different strengths of potential for reducing emissions – these categories cover investments aimed at non-motorised local initiatives or soft-initiatives which support Public Transport (PT), through to those associated with substantial PT packages (such as rail/MRT) which, if implemented successfully could have a significant impact on emissions.

**Does CATI quantify the carbon reduction impacts of investment decisions?**
CATI is a qualitative methodology which can be used for comparative evaluation of land transport investment options and decision-making. It does not quantify actual reductions in carbon emissions.

**Has CATI been tested with external stakeholders?**
In its early development stage CATI was applied to the funding associated with the years 2015-21 in three Regional Land Transport Programmes (RLTPs), the Auckland Transport Alignment Project 2020 (ATAP), and Let's Get Welly Moving (LGWM) programme options.

**What additional improvements are envisaged for CATI?**

Expanded use of the tool was envisaged in 2021 by applying it to more RLTPs and to the 2018 and 2021 NLTPs. The aim was to enhance the tool via engagement with stakeholders and adjusting further for the New Zealand context (for example, LGWM and ATAP made small adjustments to the categories and influencing factors to take account of their local urban environments). Several improvements to the tool have been identified through use cases to date.

**When will these adjustments be available?**
Progress on improving CATI is expected to be made over the next few months – by July 2023 – supported by consultants Aurecon.

**What other resources and tools are there to assist in options evaluation for GHG reduction?**
Several methodologies, tools and resources are being or have been developed by Waka Kotahi to assist in making decisions about GHG emission reductions. These include:

- **T2035** is web-based tool designed primarily for council land-use planners, transport planners, designers, and operators. It can help them consider the impact different transport choices could make in reducing greenhouse gas (GHG) emissions caused by vehicles and transport in their region. It is not intended to develop feasibility studies or evaluate business cases.
- **Project emissions estimation tool (PEET)** is a high-level emissions assessment tool for all transport project emissions: construction, operation, and maintenance, and enabled (or avoided). Using a hierarchy of data, including carbon footprint database information, dimensions of the transport infrastructure being created, and quantities of materials required, a high-level estimate of emissions can be provided at the early stages of a project.
- **Vehicle emissions prediction model (VEPM)** has been developed by Waka Kotahi and Auckland Council to predict emissions from vehicles in the New Zealand fleet under typical road, traffic and operating conditions. The model provides estimates that are suitable for air quality assessments and regional emissions inventories.
- **Vehicle emissions mapping tool (VEMT)** Waka Kotahi has developed a vehicle emissions mapping tool that automates calculation of both harmful air pollutants and greenhouse gas emissions. The tool can be applied to all public roads throughout New Zealand.
- **Te Puna Taiao** is a sustainable land transport system modelling initiative to help us assess the likely impact that different combinations of operational policies, programmes and projects will have on the environment. Some of the interventions we are modelling are:
  - Mode-shift and urban form (eg PT and active mode infrastructure investment, integrated ticketing)
  - Travel planning (eg promoting use of the EV charging network)
  - Policy and regulatory settings (eg clean car programme, spatial planning).

**What else is Waka Kotahi doing to progress emissions reduction?**

**Construction**
(embodied emissions)

Construction materials

Transport of materials

On-site fuel and electricity use

**Maintenance & operations**

Maintenance materials

Maintenance fuel use

Electricity use
(eg lighting and tunnel ventilation)

**Vehicle use**
(enabled emissions)

Emissions from vehicles using infrastructure

**Avoided** emissions from increased active travel or public transport

At Waka Kotahi, we have been focussed on emission reduction for some time as part of our climate change response. We are working with partners to shape urban form; investment in PT, walking and cycling, reshaping streets, tackling unsafe speeds, administering clean car discount and clean car standard, supporting government work on EV charging infrastructure, transitioning to lower emission infrastructure construction, maintenance and operation through requirements under the CNGP; reducing corporate emissions.

Some specific examples include:
- helping shape towns and cities so that people don't need to travel far from home (Arataki)
- providing good transport choices so people walk, cycle, or use public transport more frequently when they do travel (Innovating Streets for People and Reshaping Streets)
- encouraging a safe and clean vehicle fleet (clean car discount)
- using lower carbon materials in construction and maintenance activities to reduce the carbon footprint of major infrastructure; and,
- reducing our own corporate emissions (transitioning the Waka Kotahi vehicle fleet to low emission alternatives).

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