

SUMMARY REPORT

Hīkina te Kohupara – Kia mauri ora ai te iwi

Transport Emissions: Pathways to Net Zero by 2050

GREEN PAPER



NOT GOVERNMENT POLICY

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Introduction

On 2 December 2020, Government declared a climate change emergency, and committed Aotearoa New Zealand to taking urgent action on reducing emissions.

As part of this commitment, we will need to achieve net zero emissions by 2050, as mandated under the Climate Change Response Act 2002 (the CCRA).

Transport is responsible for 47 percent of our total domestic carbon dioxide (CO₂) emissions, and 21 percent of total greenhouse gas (GHG) emissions.¹ Transport emissions need to fall significantly, and quickly, to achieve our emissions reductions commitments and targets.

What can we do to reduce transport emissions?

Hīkina te Kohupara – Kia mauri ora ai te iwi: Transport Emissions – Pathways to Net Zero by 2050 (hereafter Hīkina te Kohupara) identifies opportunities to shift our transport system towards a pathway to zero emissions. Though decarbonisation will come with challenges, this transition could make Aotearoa a healthier, safer, more vibrant, resilient, and prosperous place to live and work.

In the short-term, Hīkina te Kohupara will contribute to the Government's Emissions Reduction Plan (ERP), which sets out the Government's response to the Climate Change Commission's advice over five-yearly emissions budget periods. The ERP must be completed by December 2021.

Hīkina te Kohupara will also be used to develop a 10-15 year action plan setting out how to continue reducing transport emissions in Aotearoa.

Who needs to be involved?

The pathway to a zero-carbon transport system will require substantial and sustained action from Government, civil society, iwi, businesses, and consumers over the next three decades.

Central government has a particularly important role to play given its influence in the transport system as a planner, funder, partner, enforcer, and regulator. Collaboration between central and local government will also prove critical given local government's vital role in planning and funding transport, and urban development at a regional and local level.

The need for co-operation also extends to sectors outside the transport sector given their impact on transport emissions, both direct and indirect. These interdependencies include those agencies and businesses across the planning system, and sectors such as housing and urban development, health and social development, energy, and taxation.

While roles and responsibilities vary, collective action is crucial to our ability to reach eliminate emissions. Actions taken within the next five years will significantly shape our future pathway, and will determine how close we get to, or stray from, meeting our zero-carbon target.

What lies ahead?

Hīkina te Kohupara is one step on our path to a zero-carbon transport system. We do not underestimate the challenges ahead, but we recognise the need to change. The pathways proposed envision a better transport system that will allow a cleaner, healthier, safer, more inclusive and resilient transport system, enabling people and businesses to flourish

¹ These figures are based off the 2018 New Zealand Greenhouse Gas Inventory (NZ GHG inventory). Future work on Hīkina te Kohupara following public consultation will begin to use 2019 NZ GHG inventory numbers.

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Executive Summary

Hīkina te Kohupara models four potential pathways to achieve a zero-carbon transport system by 2050. These pathways are not limited to, or by, existing Government policies or commitments. Rather, these pathways illustrate the scale of the changes required. They demonstrate that reaching zero carbon can be achieved if complementary policies are implemented across the transport system.

Three themes govern Hīkina te Kohupara’s four proposed pathways. These themes are based on the ‘Avoid, Shift, Improve’ framework, and focus on changing the way we travel, improving passenger vehicles, and supporting a more efficient freight system.

Hīkina te Kohupara proposes a whole-of-system approach towards transport system decarbonisation. This systems approach fits with aspects of a te ao Māori worldview, which inherently and intrinsically acknowledges the interconnectedness and interrelationship of all living and non-living things.

Fairness, equity and inclusivity are also central to Hīkina te Kohupara. This recognises that while everyone will experience changes from the transition to a zero-emissions transport system, the impacts of this shift will be uneven. Achieving a Just Transition will necessitate careful consideration of the impacts of policies and changes on different communities, regions and industries.

This work has also been guided by the Transport Outcomes Framework (see Figure 1), which has helped to identify opportunities to reduce emissions that will help to ensure our transport system is also inclusive, safe, resilient, and supports economic activity.

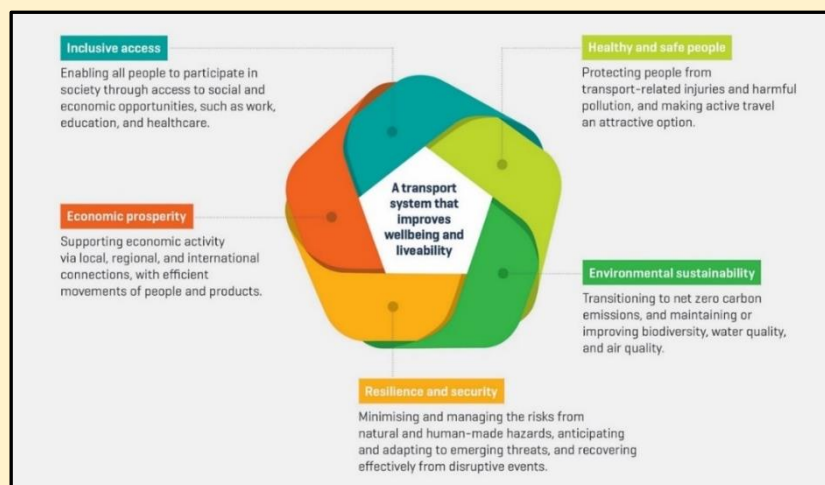


Figure 1:
Transport
Outcomes
Framework

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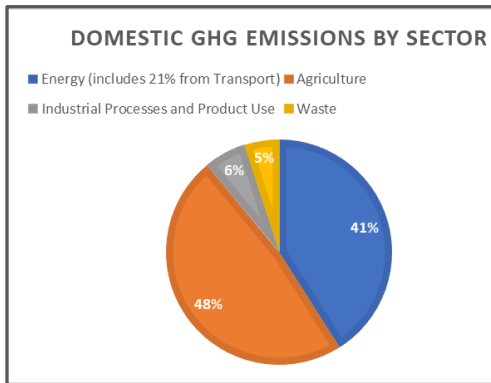
Guide to reading this document

This summary report provides a high-level overview, including an examination of:

- **Key transport statistics**, such as transport’s total contribution to domestic GHG and CO₂ emissions and the breakdown of transport emissions from different modes;
- **Opportunities to reduce transport emissions under the three themes** governing Hīkina te Kohupara, as informed by the ‘Avoid, Shift, Improve’ framework, including:
 - **Theme 1:** Changing the way we travel
 - **Theme 2:** Improving our passenger vehicles
 - **Theme 3:** Supporting a more efficient freight system
- **The four potential pathways to a zero-carbon transport system by 2050**, and the underpinning modelling assumptions used;
- **The importance of supporting a Just Transition**, including recognition of distributional impacts from transport emission reduction policies and initiatives; and
- **What lies ahead**, including Hīkina te Kohupara’s role in the development of the Government’s ERP and a 10-15 year action plan for transport emissions.

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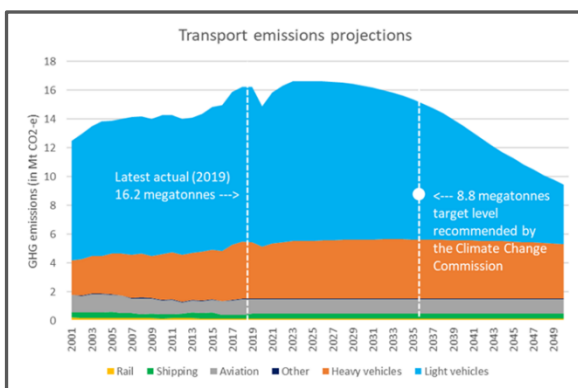
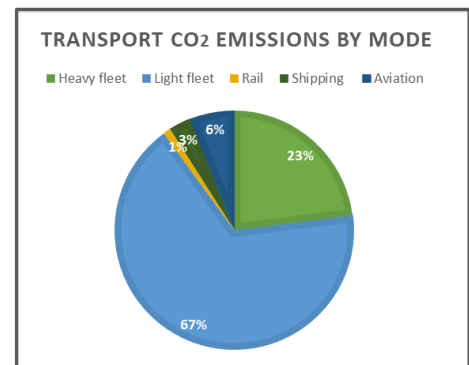
Key Statistics



47 percent of Aotearoa’s **CO₂ emissions** come from **transport**, and **21** percent of gross domestic **GHG emissions** (as part of the energy sector).

67 percent of our **CO₂ transport emissions** come from **travel by light vehicle** – cars, vans and utes.

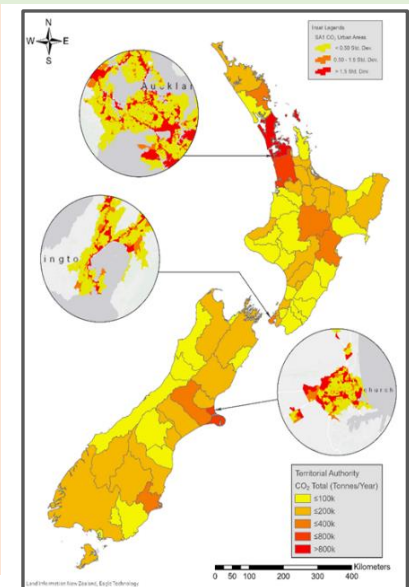
Light vehicle CO₂ emissions are **7 percent higher** now than in the **previous 10 years**.



Unless we do more, road transport emissions **will keep rising** until around **2024**.

Our **larger cities generate more emissions than rural towns** based on population and the number of vehicles.

However, **per capita transport emissions** are **lower in cities**.



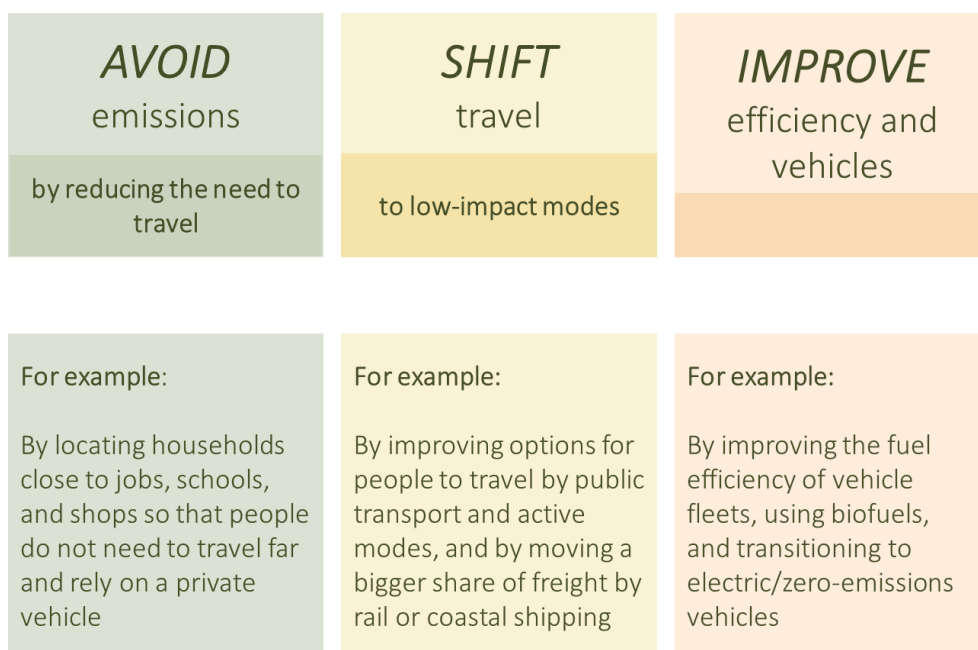
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Themes overview

Transport emissions are generated from a combination of four factors:

1. **transport activity** – the number of trips and kilometres travelled;
2. **mode share** – the percentage share of different modes;
3. **energy intensity** – the quantity of energy/fuel used per kilometre; and
4. **carbon intensity** – the emissions from the quantity of energy/fuel per kilometre.

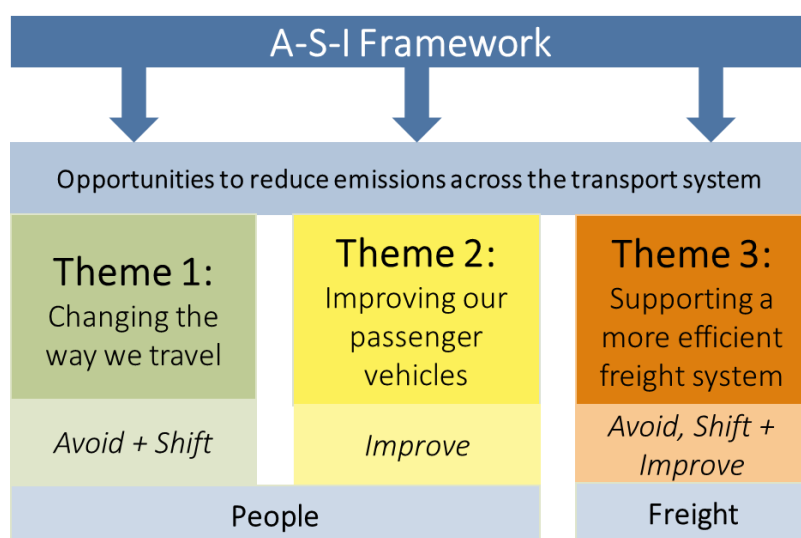
Hikina te Kohupara uses the **Avoid-Shift-Improve (A-S-I)** framework to address these four emissions factors, while acknowledging that transport emissions are also driven by other factors, including land use planning and economic policy. A-S-I is a strategic framework comprised of the following three pillars:



Opportunities to reduce emissions identified using the A-S-I framework are subsequently grouped into three themes, with Theme 1 and 2 focussing on people and Theme 3 on freight (see Figure 2).

Interdependencies and overlaps are found between each of these three themes.

Figure 2: A-S-I and Hikina te Kohupara’s Three Themes



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Theme 1: Changing the way we travel

Changing the way we travel requires examining and addressing our available modes of transport, as well as our surrounding environments. Theme 1 therefore covers:

- Ways in which we shape our towns and cities to avoid the need for lots of travel by private motorised vehicles, while making places highly accessible and liveable;
- Ways to reduce trip distances and encourage the use of sustainable transport modes;
- How we can support mode shift through the promotion of better transport options, such as public transport, walking, cycling, and shared mobility; and
- The role of demand management (e.g. pricing) levers to influence transport choices.

Shaping our cities and towns to improve the overall efficiency of the transport system

Shaping our cities and towns is key to improving the overall efficiency of the transport system. We need to integrate land-use, urban development and transport planning to reduce emissions, especially over the medium to long term.

To deliver mode shift for emissions reductions, comprehensive cycling/scooter networks are needed in urban areas, along with more dedicated/priority bus lanes, and better urban environments for walking. Street changes to support public transport and active travel could potentially be made swiftly and cost-effectively, as it is possible to reallocate space on existing streets to deliver mode shift without building major new infrastructure.

Quality compact mixed-development urban form

From an emissions reduction perspective, shifting urban development towards quality, compact mixed-development urban form is critical. Just as urban form influences the *distance* people need to travel to access jobs, schools, shops, and other important destinations, it affects *how* people travel by influencing the range and quality of transport options available. Quality compact mixed-use urban development can reduce trip distances and car dependence, and encourage the uptake of walking, cycling, and public transport.

Achieving quality compact, mixed-development urban form can be progressed through several avenues, although multiple players are required to deliver these actions owing to the interdependencies between land-use, transport and urban development:

- **More strongly integrating land use and transport planning and investments in Government policy and capability**, such as through the proposed Strategic Planning Act as part of the Government's resource management reforms, and improving capabilities for spatial planning within central and local government.
- **Requiring transport GHG emissions impact assessments for proposed urban developments.**
- **Making transport investments conditional** on having clear links to land use and urban development plans that support quality compact, mixed-use urban development.

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Placemaking and inclusive street design

Placemaking and inclusive street design can also play a key role in shaping our cities by encouraging travel by walking, cycling, and public transport.

Placemaking is the process of turning spaces into vibrant public places that are good for people's wellbeing, and makes urban areas attractive places to live, work and visit. This can also help to make places more appealing for walking, biking, scooting and for accessing public transport.

The following are some actions we could take to promote the above:

- **Develop design guidance and expectations for quality high-density environments**, including streets, public spaces, buildings and green space.
- **Make changes to policy and funding settings to maximise opportunities to 'build back better'** (improving streets for people walking, cycling, and using public transport) when doing street renewals.
- **Invest in the placemaking and urban design capability and capacity** of transport agencies and transport functions within local government.
- **Review standards and guidance for street design** and develop a nationally applicable consistent set of standards for Aotearoa.

Providing better travel options to support mode shift and improve trip efficiency

We can influence how people travel by providing better travel options that are energy efficient and generate low or no emissions. This includes providing quality public transport services (both intra-regional and inter-regional), safe and accessible walking and cycling networks in urban areas, and shared mobility options, such as car sharing.

Improving public transport

Attractive, safe, and reliable public transport systems (including shuttles, buses, rail and light rail) can provide a foundation for the use of more sustainable modes in cities. Not only is public transport critical for supporting higher density urban environments, public transport improvements provide several co-benefits, including improved health and safety in communities and enhanced access.

Improvements to public transport can be achieved through actions such as:

- **Further investment in public transport infrastructure** to increase the capacity, frequency, quality and reliability of services.
- **Accelerating the delivery of dedicated/priority bus lanes**, particularly by reallocating existing street space.
- **Increased incentives to use existing public transport**, such as fare reductions or service improvements.
- **Targeted investment in improving public transport operations**, providing additional public transport services, and/or improving passenger amenities, such as better shelters/terminals, and better connections with walking and cycling.

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Increasing travel by walking, cycling, and use of other active modes

Walking, cycling and other active modes can also reduce transport emissions by substituting for motor vehicle trips and supporting public transport. There is major untapped potential in urban areas for travelling more by foot, bike, or scooter.

There are numerous opportunities to make cities and towns safer and more attractive for travel by active modes:

- **Delivering quality compact, mixed-use urban development**, which reduces trip distances and makes walking and cycling more feasible.
- **Investing more in high quality infrastructure for connected walking, cycling, and scootering networks** with safe separation of high/low speed modes.
- **Prioritising the reallocation of street space** to accelerate the delivery of active travel networks.
- **Setting targets for councils to deliver complete active travel networks** by a specific date, linked with funding conditions.

Improving shared mobility

Shared mobility refers to sharing vehicles and rides, including car sharing, micromobility sharing (bike and scooter sharing), carpooling/ride sharing and shared on-demand shuttles.

The benefits of shared mobility differ depending on the type of shared mobility and its location. In general, shared mobility options are most likely to affect emissions in larger urban environments where they can grow to a scale that attracts a significant number of users.

The following actions that can improve shared mobility:

- **Providing dedicated on/off street parking for shared mobility** in convenient, highly visible locations and encouraging shared mobility parks to be incorporated in new and existing facilities.
- **Providing car share companies with grants, loans or other incentives or subsidies.**
- **Developing procurement guidelines and expectations for the All of Government vehicle fleet**, such as permitting the fleet to be used by other groups and people at night and on weekends.
- **Regulating for data access/data sharing** between public and private transport providers.

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Transport demand management

Transport demand management is the application of strategies, policies and interventions to influence how and when people and products travel. This includes initiatives that optimise networks and redistribute trips to other modes, time, routes or by removing trips from the network.

Transport demand management can encourage people to shift from private motorised vehicles to using public transport, or to walk and cycle. It can also support quality compact, mixed-use urban environments by reducing congestion and managing demand for parking. These choices affect transport emissions.

Transport pricing – which refers to charges imposed on people/businesses for using the transport system – can help to capture the social and environmental costs of travelling by private motorised vehicles and can deliver meaningful behavioural changes.

Transport pricing can also help to address rebound effects that come from investing in public transport, walking and cycling, such as induced car travel from reducing congestion.

Carbon charges also have a role in encouraging mode shift and reducing car dependency but are blunt revenue instruments; there would need to be equity considerations between different levels of charges applied to different vehicles using the same road and the different fuels used.

Potential transport demand management levers include:

- **Congestion pricing** (charging road users for use of a road/network during set times) and **distance pricing** (charging road users an amount linked to how much they drive)
- **Low-emissions zones** can reduce harmful pollutants from vehicles in specified zones by implementing a charge for specific vehicles to enter the designated zone.
- **Parking management to control the supply of parking spaces**, and who, when, and how long vehicles may park at a particular location.
- **Further carbon charges**, such as increases in fuel excise duty (a tax on fuel) to reduce emissions.

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Theme 2: Improving our Passenger Vehicles

While the opportunities explored in Theme 1 will help to avoid emissions and make it easier for people to shift to low-emissions modes, improving the energy efficiency and carbon intensity of our passenger vehicle fleet is also critical, particularly in the short- and medium-term.

Passenger vehicles include light vehicles (cars, vans, and utes), public transport (buses, trains, and ferries) and planes (while acknowledging that aviation is also part of the freight system).

Two thirds of transport emissions come from the light vehicle fleet. Shifting our reliance on CO₂-emitting internal combustion engine (ICE) passenger vehicles towards low-emissions fuels and vehicle options is therefore an important part of reaching a zero-carbon transport system.

Theme 2 considers opportunities to improve our passenger vehicle fleet, including ways to increase the availability of, and access to, low-emission vehicles, and ensure that vehicles entering the fleet are increasingly low-emission. A future phase out of ICE vehicles and widespread removal of all high-emitting vehicles from the existing fleet is also examined.

Increasing availability and access to low-emissions vehicles

While there are currently over 22,000 electric vehicles (EVs) in Aotearoa, EVs represent just one percent of the existing vehicle fleet. To put this into perspective, there are currently more than 4 million light vehicles in Aotearoa.

Supply measures

Increasing the share of EVs and other low-emissions vehicles in our existing passenger vehicle fleet will require significant and accelerated action across Government and civil society. Well-timed and strategic regulatory intervention can increase the supply and demand of EVs and other low-emissions vehicle options. However, given our dependence on the global market for our supply of cleaner vehicles, careful monitoring of global supply trends for EVs and other emerging vehicle types is also needed.

There are several key actions that can help increase the supply of cleaner vehicles. These include:

- **Introducing and implementing a fuel efficiency standard**, which would restrict the types of vehicles that can be imported, resulting in an overall improvement of fuel efficiency and emissions reductions. The Government is currently progressing this through the Clean Car Standard, which will lower the CO₂ emissions of imported vehicles to 105 grams of CO₂/km by 2025.
- **Exploring a maximum CO₂ limit**, which would complement a progressively more stringent 'average' target for vehicles and fleets of vehicles over time.
- **An ICE vehicle importation phase out**, which would prevent further additions of imported fossil fuel vehicles to the existing vehicle fleet.

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Demand measures

Increased supply-side measures will not be enough. Demand-side measures are also needed to make it easier for people and businesses to buy low-emission vehicles. Some common barriers include high upfront purchase costs, range anxiety (fear that an EV will run out of charge and be stranded), and the availability and cost of relevant infrastructure (such as EV charging stations).

The following are some demand-side measures to encourage greater uptake and usage of EVs and other low-emissions vehicles:

- **An incentive scheme** to support achieving price parity between conventional ICE vehicles and zero- or low-emissions alternatives.
- **Investment into supporting infrastructure** for low-emission vehicles and low-carbon fuel options. This includes EV chargers and charging networks, and fuelling infrastructure for low-emissions fuels, such as green hydrogen and sustainable biofuels.
- **Government procurement of low-emission vehicles** to ensure all Government fleet vehicles are electric, or another low-emission vehicle or fuel type.

Decarbonising the existing light vehicle fleet

We will also need to explore and introduce measures to decrease emissions from our current light vehicle fleet. Measures to increase uptake of zero – and low – emitting vehicles will take time, and existing vehicles will continue being driven for many years to come.

Potential measures to decarbonise our existing passenger vehicle fleet include:

- **Using sustainable biofuels** to transition from fossil fuels. The Government is currently progressing work on a biofuels mandate, which will increase the demand for and supply of sustainable, low-emissions transport biofuels.
- **Removing fossil-fuelled vehicles from the fleet over time**, including through a potential rolling age ban for used vehicles and/or a vehicle scrappage scheme. Such policies would need to be designed and implemented alongside other policies, such as road safety measures, to ensure a whole-of-system approach.

Ensuring public transport and passenger aviation sectors are low emission

Although the majority of passenger vehicle emissions come from light vehicles, emissions from public transport and aviation will also need to be addressed if we are to decarbonise transport.

Public Transport

Within public transport, decarbonising our **public bus fleet** is key. Without significant interventions in place, emissions from buses are expected to continue increasing, particularly if public transport uptake increases significantly (as explored in Theme 1).

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There are several possible interventions to support the uptake of lower-emitting buses, such as:

- **Supporting local government to invest in clean buses and related infrastructure**, such as through funding for the buses themselves or the supporting infrastructure. This work is underway through the Government’s public bus decarbonisation work programme, which will support regional councils to achieve their decarbonisation targets through a \$50 million fund over four years. This will help to overcome cost-related uptake barriers, such as upfront purchase costs for electric buses and the accompanying infrastructure needed for depot charging.
- **Reducing ongoing operational costs of electric buses** by continuing the current road user charge (RUC) exemption and/or amending the Public Transport Operating Model (PTOM) to remove or reduce system barriers to decarbonisation. For example, amending procurement and ownership arrangements for zero-emissions buses.

Rail also forms a key part of the public transport system, particularly in two of our largest cities, Wellington and Auckland. Electrification of the passenger rail network will therefore support public transport decarbonisation.

Passenger Aviation

Efforts must also be made to make passenger aviation (for both domestic and international flights), less polluting.

While only 6 percent of domestic emissions, reducing emissions from air travel will be challenging. Due to our geography and widely dispersed population centres, air travel is an important mode for inter-city and inter-regional travel.

Domestic aviation emissions can be reduced through a variety of interventions, although some technologies that could substantially reduce emissions are still in the early phases of development.

Potential opportunities to reduce passenger plane emissions include:

- **Using sustainable aviation fuel (SAF)**, which is a type of advanced biofuel² to replace up to 50 percent of the conventional jet fuel used to power a plane. The Government is currently progressing work on a sustainable biofuels mandate for transport fuels that could increase use of SAF for domestic aviation trips.
- **Supporting electric aircraft and technology development and use**, particularly for smaller aircraft operating short-haul domestic flights.
- **Improving airports and operations** to reduce emissions. For example, implementing better air traffic flow management and improving navigation to reduce fuel burn.
- **Promoting low-emissions alternatives to aviation-based inter-regional travel**, such as electric ferries.

Hīkina te Kohupara focusses specifically on identifying opportunities to reduce domestic aviation emissions, although it acknowledges that reducing emissions from international

² *Advanced biofuels* are fuels that can be manufactured from various types of non-food biomass and can be blended with their fossil fuel equivalents at high levels, sometimes up to 100 percent.

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aviation is critical to support global climate change mitigation efforts. International aviation is responsible for approximately 1.3 percent of global CO₂ emissions, and the Paris Agreement is silent on its inclusion.

The Government is currently participating in the Carbon Offsetting Reduction Scheme for International Aviation (CORSIA), a global market-based measure for reducing and offsetting carbon emissions in the international aviation sector. Efforts that we make towards alternative fuels, such as SAF, that can be used for aviation activities will contribute to the global goal of reducing international aviation emissions.

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Theme 3: Supporting a more efficient freight system

Our domestic freight system plays a vital role in the economy, allowing producers to get their goods to consumers and other businesses within Aotearoa and the rest of the world. Heavy vehicles, the majority of which are large trucks, emit nearly 25 percent of our transport emissions. Supporting and achieving a more efficient freight system is a critical part of getting to net zero, particularly as freight's role is forecast to expand over time.

Theme 3 examines how we can improve the efficiency of our overall supply chain, shift freight to low-emissions modes, and improve the fuel efficiency and carbon intensity of freight modes and fuel.

Improving supply chain efficiency

Freight supply chains are complex systems, consisting of the networks of infrastructure, services, information, and operators through which freight is transported from businesses to other businesses and consumers. Reducing freight emissions therefore requires taking a system approach that looks for opportunities to improve efficiency and value across the whole of the supply chain.

There are multiple relationships and interdependencies between different parts of the freight system. Changes to one or more pieces of the supply chain will likely have flow-over effects to other aspects. Additionally, there are challenges around our physical geography and population distribution. Built-in imbalances between centres of consumption (primarily the Upper North Island region) and where exports are generated (primarily rural regions further south) pose challenges for freight load optimisation.

Opportunities to reduce emissions by improving the efficiency of our overall freight system exist nonetheless. Many of these options are currently being considered through the Ministry of Transport's (the Ministry) work on a National Supply Chain Strategy, which will provide strategic direction and set out priorities amongst various supply chain objectives, including emissions reductions.

Optimising freight routes, equipment and vehicles is a key area where we can improve overall supply chain efficiency and reduce freight emissions. The following are some examples of such measures, although further work and sector consultation is required to gain a comprehensive understanding of their feasibility within Aotearoa's freight system:

- **Examining the spatial organisation efficiency of supply chain nodes**, such as the location of ports and freight hubs. This is currently underway through the work on a National Supply Chain Strategy.
- **Efficiency improvements to first- and last-mile delivery centres**, such as through urban consolidation centres and at drop-off/pick-up consolidation points.
- **Payload optimisation**, which refers to improving the carrying capacity of vehicles. Improving the load factor for freight is one of the most efficient ways to improve energy efficiency and lower carbon emissions.
- **Support for further use of Intelligent Transport Systems (ITS) in freight systems.** ITS uses technologies like wireless communication, cloud computing, and big data analytics to provide transport users better quality, real time, and automated data

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collection. ITS could enhance freight management systems by improving load factor, finding optimal delivery routes, and improving delivery times.

Information sharing and collaboration can also help to reduce freight emissions. This includes efforts to:

- **Achieve higher volumes and quality of available data**, which could assist in freight sector efficiency evaluations. This could help to inform the design of fit-for-purpose interventions, determine their effectiveness, price externalities and make efficient infrastructure investment decisions.
- **Encourage data sharing and cross-business collaboration** through voluntary collaboration between businesses across the supply chain that aim to build sustainability into their operations. This may generate opportunities to optimise routes and modal share, share loads, and leverage back-loading opportunities.

Shifting freight to low-emissions modes

Shifting freight movements from road to more efficient and less carbon intensive transport modes will reduce emissions. However, road freight is often the cheapest option where short distances, low cargo volumes, and geographic constraints around effective rail and coastal shipping infrastructure occur.

Rail and coastal shipping are both viable low-emissions freight modes but have been chronically underfunded and prioritised less than road freight. Key actions to enable modal-choice through supporting their use include:

- **Long-term (ten-year) investment in existing and new rail infrastructure** to maintain, improve, and expand service levels.
- **Supporting the development of inter-modal hubs** to facilitate employment opportunities, modal choice and improve supply chain efficiency. Intermodal freight terminals are nodes in the logistic chain which enable the efficient transfer of goods between different modes of transport.

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Decarbonising freight vehicles

Aotearoa uses a combination of planes, trucks, trains, and boats to move freight. All of these modes contribute to our domestic emissions and will require decarbonising.

Road freight

Though our freight system encompasses multiple modes, decarbonising our road freight provides the best opportunity to reduce freight emissions. Heavy vehicles, the majority of which are large trucks, produce almost 25 percent of our transport emissions.

There are multiple opportunities to reduce road freight emissions, many of which are highlighted in the Ministry's [2020 Green Freight Strategic Working Paper](#). These include:

- **Electrification**, particularly as the majority of our electricity is generated from renewable sources (and this proportion will keep growing in the future). However, the current upfront cost of battery electric vehicles (BEVs) is a significant barrier to their uptake. Electrification is currently best suited to medium trucks undertaking short urban freight delivery tasks, and heavy trucks with return-to-base operations or niche delivery services.
- **Use of low-carbon fuels**, such as green hydrogen and sustainable biofuels. Green hydrogen is produced using renewable electricity and can be used as a fuel source for Fuel Cell Electric Vehicles (FCEVs). FCEVs appear best suited to long-haul freight tasks. Biofuels can be used in most existing ICE vehicle engines, which allows for their use across the freight sector.
- **Providing the necessary support infrastructure** to enable the transition to BEVs, FCEVs and use of biofuels. This may also include supporting market investment through clear investment signalling from the Government.

Shipping

Encouraging cleaner, more efficient ships and ports is also needed. Our international obligations will help to promote this shift, such as through:

- **Acceding to Annex VI of MARPOL** (International Convention for the Prevention of Pollution from Ships). Annex VI specifically control emissions to air from ships and will be applied to our domestic shipping emissions.
- **Improving the energy efficiency of ships and port operations**, as well as associated activities. For example, improving ship-port interfaces (reducing waiting times for ships entering ports) and purchasing energy efficient vessels, such as electric/hybrid vessels.

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Rail freight

Although rail contributes a relatively small amount to Aotearoa’s transport emissions, there are opportunities to reduce rail emissions. These include:

- **Electrifying our rail network.** This will require significant capital investment³. For the high initial costs of electrification to be justified, modal shift of freight from road to rail would need to be intensified to yield higher levels of rail traffic, and therefore greater gains from lower operational costs. Battery-powered trains that could travel on non-electrified routes could also be explored.
- **Using sustainable biofuels.** In addition to decarbonising our road freight vehicles, biofuels could offer immediate options to reduce rail emissions as they have lower lifecycle emissions relative to their fossil fuel alternatives.

Air freight

Reducing emissions from planes involved in freight will also be important, particularly for trade and social connections. Several of the opportunities to decarbonise passenger aviation outlined in Theme 2 apply. However, there are even greater challenges to shifting aviation to lower-emissions modes in the context of freight. Substituting alternative modes to shift high value/perishable products is not generally feasible because of the need to meet tight timeframes and/or travel to places that are only readily accessible by aviation.

Broader opportunities to reduce system-wide freight emissions, which apply to all modes, include:

- **Improvements to the design of existing infrastructure and vehicles.** This includes adaptations to improve transmission efficiency and to reduce aerodynamic drag, vehicle weight and rolling resistance.
- **Decarbonising fuels.** This may require supporting policies, such as the implementation of a carbon intensity standard for all transport fuels. Incentives and/or investment in infrastructure for alternative fuels and/or electrification may also be needed.

³ KiwiRail has estimated that it would cost \$2.5 million to electrify one kilometre of single track.

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Four Potential Pathways

What could it take to meet a zero-carbon target for transport by 2050?

Hīkina te Kohupara outlines four pathways to a zero-carbon transport system by 2050. Each pathway outlines how a combination of initiatives (Figure 3) could reduce transport GHG emissions to meet this target. These initiatives are drawn from across the three themes covered in the previous sections, and thus align with a whole-of-system transition approach.

FIGURE 3: Pathway initiatives by theme

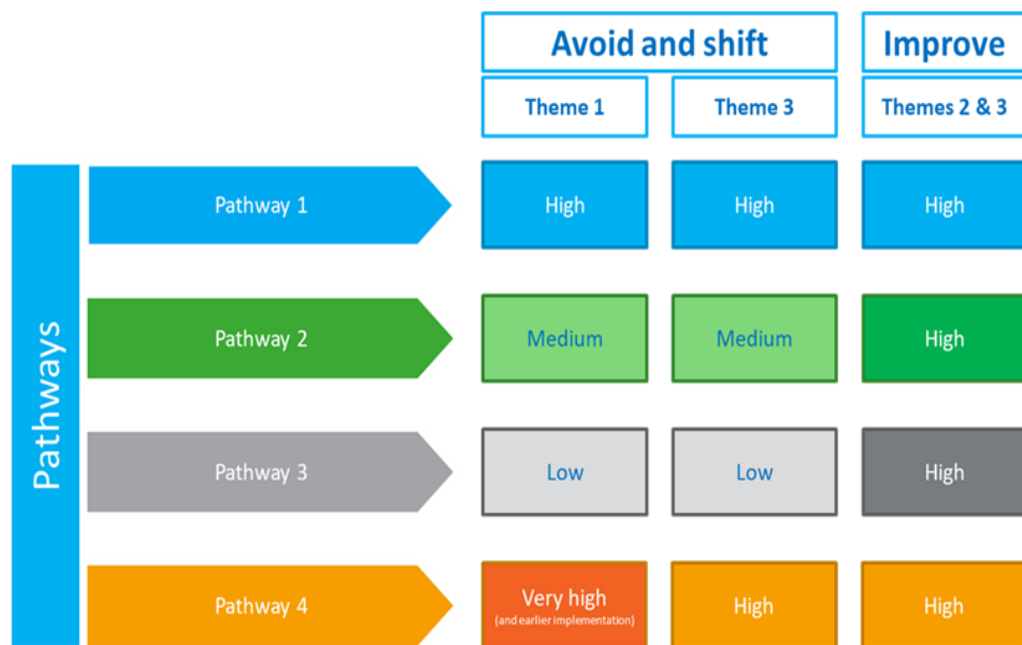
Each pathway includes the following initiatives	
Theme 1 Changing the way we travel	Land-use changes; improvements to walking, cycling, and public transport networks; and demand management levers (including parking, congestion, and distance-based pricing).
Theme 2 Improving our passenger vehicles	Phasing out imports of ICE light vehicles by 2035; restricting the use of all ICE light vehicles in 2050; adoption of biofuels in light vehicles and buses; and electrifying the PT bus fleet by 2035.
Theme 3 Supporting a more efficient freight system	Energy saving and logistic improvements (such as freight routes optimisation, freight consolidation, and improved last mile efficiency); mode-shift from road freight to rail and to coastal shipping; adoption of biofuels for road freight and accelerating uptake of electric medium trucks.

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The role of the A-S-I framework in Hikina te Kohupara’s four pathways

Though all four pathways prioritise electrification of the vehicle fleet, each differs in the relative weight allocated to ‘avoid’ (avoiding emissions by reducing the need to travel), ‘shift’ (shifting travel to low-impact modes), and ‘improve’ (improving efficiency and vehicles) initiatives (see Figure 4).

FIGURE 4: Relative weight given to avoid, shift and improve interventions in each pathway



Pathway 1

Pathway 1 assumes ‘avoid’ and ‘shift’ initiatives (Theme 1) play a significant role in reducing transport GHG emissions. This pathway requires **reducing nearly 30 percent of light vehicle kilometres travelled by 2050** through reducing trip distances and encouraging mode shift to public transport, walking and cycling. It also requires **higher mode-shift from road to rail and coastal shipping**.

Pathway 2

Pathway 2 assumes ‘improve’ initiatives (Theme 2) play a more significant role in reducing emissions than that modelled in Pathway 1. This pathway requires a **larger number of EVs with greater use of biofuels in the short- to medium-terms**. It also allocates **greater weight on ‘improve’ initiatives for freight**.

Pathway 3

Pathway 3 assumes ‘improve’ initiatives (Theme 2) play a more significant role in reducing emissions than all other pathways (1, 2, 4). In this pathway, **increasing the share of EVs in New Zealand’s transport system compensates for the limited avoid and shift changes**. There is also **greater emphasis on ‘improve’ initiatives in freight**.

Pathway 4

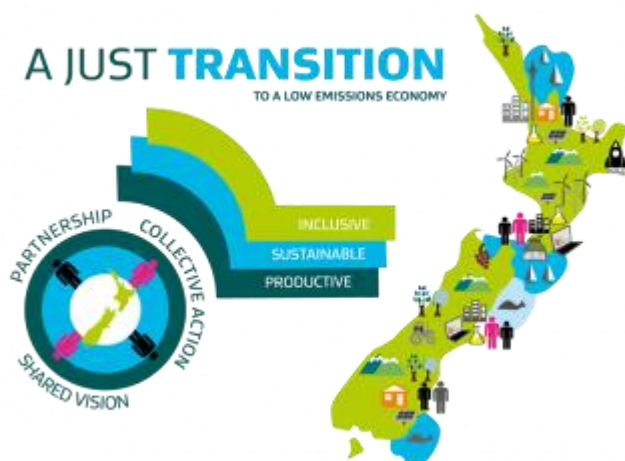
Pathway 4 was developed following the release of the Climate Change Commission’s (the Commission’s) 2021 draft advice. It seeks a 47 percent reduction (relative to 2018) in transport emissions by 2035, as recommended by the Commission.

Pathway 4 allocates the greatest weight to ‘avoid’ and ‘shift’ initiatives (Theme 1) compared to the other three pathways. It assumes ‘avoid’ and ‘shift’ interventions occur at greater rates, thus bringing forward these emissions impacts, and assumes both the success of clean car policies and their influence as material in accelerating EV uptake. This pathway **requires reducing nearly 40 percent of the light vehicle kilometres travelled by 2035, and over 55 percent by 2050**. In the long term, the greater weight allocated to ‘avoid’ and ‘shift’ initiatives reduces the number of vehicles needing to be electrified.

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Supporting a Just Transition

Government has committed to taking a ‘**Just Transition**’ approach to becoming carbon free – this means making the transition fair, equitable and inclusive. Giving effect to this means Government will need to carefully plan with iwi, communities, regions, and sectors to manage the impacts and maximise the opportunities of the changes brought about by the transition to a low-emissions economy and transport system.



Government will need to work with industries and workforces that find it difficult to transition quickly

As transport in Aotearoa is decarbonised, impacts will fall differently on the various industries and workforces in the transport sector. Mitigating, or supporting adaptation, to these impacts may require Government to assist some businesses in adopting new technologies to encourage an earlier

transition, and support education and upskilling. Government signalling can also support industry to prepare and plan in advance.

At the same time, there is significant potential for economic opportunity and job creation as we shift towards a low-emission transport system. This includes through the uptake of new transport technologies, infrastructure and service improvements to public transport and active modes, and increased domestic production and use of renewable electricity and biofuels.

Government also needs to consider wider distributional impacts to society

Every New Zealander will be impacted by the transition to a zero-carbon transport system given transport’s fundamental role in facilitating access to people, goods and services. There will be several benefits, including gains from better transport options, better health, and lower and more stable transport costs over time. However, while many people will benefit, existing inequities in our transport system mean these benefits will not be evenly spread.

To make a Just Transition, Government needs to mitigate the impacts of interventions that could increase transport disadvantages (lack of transport choice, which limits options to participate in everyday activities) and/or transport poverty (paying more than is affordable for mobility). Beyond this, Government can also make interventions that improve transport equity.

While there are many opportunities to reduce transport disadvantage by providing people with better travel options, and to avoid increasing transport poverty by mitigating the impacts of some interventions, it is also important to look beyond the transport system to make a Just Transition. Transport levers alone will not be able to mitigate all the inequities in the transport system. Initiatives in other areas, such as urban housing, education and regional development, will all play a critical role in supporting a just transition to a zero-carbon transport system.

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Where to Next?

Hīkina te Kohupara forms the first, critical step towards fully understanding how transport GHG emissions can be rapidly and effectively reduced. It will be used to facilitate discussions with Ministers, Iwi/Māori, stakeholders and our wider communities on potential policies that we will carry forward in 2021 through to the first all-of-government ERP under the Climate Change Response Act 2002.

In addition to informing the policies for the ERP, Hīkina te Kohupara will be the foundation document from which a 10-15 year action plan will be developed. This will be used to inform future ERPs and future investment and resource needs.

Feedback on Hīkina te Kohupara will help shape the advice the Ministry puts forward to Ministers for the first ERP, and for the 10-15 year action plan.

