Ministry of Transport
TE MANATŪ WAKA

Vehicle Purchase Feebate Scheme
Preliminary Social Impact Assessment

July 2019

Preface

This report documents a preliminary social impact assessment on the introduction of a vehicle purchase Feebate Scheme (also known as *Clean Car Discount* scheme) on the importation of light vehicles. Vehicle buyers who purchase emissions-intensive vehicles pay a fee in recognition of the increased environmental and economic costs they impose on the wider society. These fees are then used to reward vehicle buyers who opt to buy vehicles with zero or very low carbon emissions. This is one of the policy options that aims to reduce greenhouse gas emissions in road transport and to contribute towards New Zealand's efforts to transition towards a net zero carbon economy.

Contacts

Head Office:
Ministry of Transport
3 Queens Wharf
Wellington 6140
+64 4 439 9000

Wellington postal address:
Ministry of Transport
PO Box 3175
Wellington 6011

Auckland Policy Office:
Level 6, Tower Centre
45 Queen St
Auckland

Auckland postal address:
Ministry of Transport
PO Box 106 238
Auckland

Tel +64 4 439 9000
Fax +64 4 439 9001
Email info@transport.govt.nz

Acknowledgement

This preliminary SIA has been prepared by the Domain Strategy, Economics and Evaluation team at the Ministry of Transport.

The Domain Strategy, Economics and Evaluation team operates within the Regulatory and Data Group of the Ministry of Transport. The team supports the Ministry's policy teams by providing the evidence base at each stage of the policy development.

The team is responsible for:

- Developing the Transport Evidence Base and the Transport Knowledge Hub which connects people from across the wider transport sector and promotes the sharing of transport data, evidence, knowledge, research, information, capabilities, and ideas.
- Providing economic input on business cases, funding requests, competition issues and specific projects such as value capture, natural disasters, and the social impacts on environment and health.
- Providing the evaluation function for the Ministry, including designing evaluation frameworks, developing performance metrics and indicators, and designing, conducting and procuring evaluations.

Important qualifications and information

Due to the lack of information, time and resources, this preliminary social impact assessment does not include the following items:

- ***Detailed projections of light vehicle imports to be purchased by household over the 6 years to 2025 by household and vehicle characteristics*** – Instead, this SIA utilises the light vehicle registration projections from the Vehicle Fleet Emission Model and the light vehicle imports purchasing patterns (by households) for the three years to June 2018 from administrative data to provide an indication of the likely size of the population (of selected household characteristics) to be affected.

- ***A detailed analysis of the light vehicle imports purchasing patterns by specific geographic location such as region and/or local area*** – However, work is being scoped to investigate the kind of breakdowns that might be possible using the administrative data from Statistics New Zealand's Integrated Data Infrastructure.

- ***Estimates of the combined effect of implementing other emission related interventions such as the Vehicle Fuel Emissions Standard (VFES also known as Clean Car Standard) or the Euro 6 standard*** – However, further analysis has been scoped to estimate the interaction effects of different vehicle related policies on vehicle registration, scrappages and the level of travel. Such an analysis would help to improve estimates of environmental and other outcomes.

- ***Any flow-on impacts onto the domestic used light vehicles market*** – However, work is being scoped to investigate how such impacts should be considered when revising the CBA and SIA.

Unless otherwise indicated, this SIA refers mainly to the purchase of light vehicles that are new to the fleet (either new or used imports) and not to the purchase of used light vehicles that are already in the fleet.

Similarly, the discussion of the potential impacts of the policy on households refers mainly to households that might purchase a light vehicle new to the fleet (i.e. exclude businesses and government) over the six years to 2025. To get a sense of the relative size of the population to be affected, some household estimates are expressed as a percentage of total number of households in New Zealand.

An earlier draft of this SIA has been peer reviewed by the Department of Population Health, University of Otago and Infometrics.

Disclaimer

Table of Contents

List of Tables

List of Figures

GLOSSARY OF TERMS AND ABBREVIATIONS

CBA	Cost-benefit analysis
CO_2	Carbon dioxide
EV	Electric vehicle
g CO_2/km	Grams of CO_2 emitted per kilometre travelled
GHG	Greenhouse gas
GVM	Gross vehicle mass
HEV	High-emissions vehicle
HLFS	Household Labour Force Survey
HTS	Household Travel Survey
ICEV	Internal combustion engine vehicle
IDI	Integrated Data Infrastructure
LEV	Low-emissions vehicle (EVs, hybrids and low-emissions ICEVs)
MPV	Multi-purpose vehicle (people mover)
MVR	Motor Vehicle Register
SIA	Social impact assessment
SUV	Sports utility vehicle
TRAPs	Transport-related air pollutants, including nitrates, sulphates and particulate matter
VFES	Vehicle Fuel Efficiency Standard

1. Executive Summary

1.1 Introduction

This preliminary Social Impact Assessment (SIA) aims to highlight the potential scale and distribution of impacts on households from the implementation of a Feebate Scheme in 2020-2025, for all light vehicles entering the New Zealand fleet. This report should be read in conjunction with the cost-benefit analysis (CBA), which assesses the aggregate impacts of this scheme.

1.2 Policy description

The Feebate Scheme[1] is based on the notion that price is one of the key factors influencing the uptake of EVs, hybrid vehicles, and low-emissions ICEVs (all of which we refer to in this report as low-emissions vehicles or **LEVs**). A Feebate Scheme would effectively reduce the prices of LEVs and increase the price of high-emissions vehicles (or **HEVs**), through granting a rebate for the former and levying a fee on the latter. Over the lifetime of the policy, the levels of the rebates will decline and the eligible emissions bands will become progressively narrower. The fee levels will remain the same but over time will be levied on vehicles in lower emissions bands.

The policy is intended to accelerate the reduction in the overall greenhouse gas (GHG) emissions of the New Zealand light vehicle fleet. This policy is expected to reduce CO_2 emissions by 1 million - 2.3 million tonnes over the period 2020-2041[2].

This SIA has analysed the potential distributive impacts of the proposed feebate schedules[3] provided in Appendix 1 for the period 2020-2025. The schedules in Appendix 1 illustrate the progression of the fees and rebates beyond 2025 to provide the reader with an idea of how these might look like if the feebate scheme is applied for a longer time period.

1.3 Approach

Overall approach

Although vehicle price is a key factor in influencing the uptake of LEVs, the specific needs of households and their use of vehicles also have a strong influence on vehicle choice. Therefore, buyer reactions to the Feebate Scheme are uncertain. To understand the distribution of the impacts of the Feebate Scheme, there are two main questions:

1. How will the Feebate Scheme affect the price or availability of new or used imported light vehicles in the 2020 to 2025 period?
2. What would be the likely impacts on different categories of the affected households, based on their behavioural responses to the changes in the prices of imported vehicles[4], which would influence their vehicle purchasing choices in 2020-2025?

[1] The Feebate Scheme is also referred to as the *Clean Car Discount* in the Cabinet Paper and Consultation Document.
[2] Further details are found in the 'Vehicle Purchase Feebate Scheme' Preliminary Cost Benefit Analysis.
[3] The feebate schedules modelled in the CBA are different to those in Appendix 1 as the proposed schedules were not available at that time. The feebate schedules are subject to change.
[4] Unless otherwise indicated, all analyses that look at breakdowns by household type only include light vehicle imports purchased by individuals. Over the three years to June 2018, 26% of all light vehicle imports (or 41% new and 10% used) were purchased by companies, and government or its agencies.

The first question is relatively easy to address, as the prices of imported light vehicles should change by approximately the amount of the assessed rebate or fee, depending on the emission levels of the vehicles. However, the answer to the second question, around the behavioural responses of vehicle buyers and importers to the Feebate Scheme, is uncertain.

In addition, there could be minor changes in the prices of light vehicles already in the fleet if the demand for such vehicles changes. This SIA has not investigated this flow-on impact as it depends on information not readily available (such as the comparability and availability of vehicles already in the fleet compared with those of imported vehicles, including condition, mileage, and specification).

To understand how behavioural responses affect vehicle purchasers, this SIA uses two scenarios around the central estimates of potential impacts to illustrate the range of possible outcomes. Based on vehicle purchase patterns over the three years to June 2018 and vehicle registration predictions, households that are expected to buy imported light vehicles during the 6 years to 2025 make up of 42 percent of all New Zealand households.

Identifying groups of households that might be vulnerable

There are different measures to identify households that are potentially vulnerable to changes in transport-related policies (see Appendix 2 for further details). They include:

- **Income-based measures** – these are based on median, equivalised, disposable household income. Equivalised disposable income is a standard income measure of inequality and hardship[5]. It includes income from all sources such as social benefits, superannuation and salary from paid employment. Low-income households[6] make up around 24 percent of all New Zealand households. Those that might be expected to purchase a light vehicle import during the 6 years to 2025, make up around 9 percent (or 1.5 percent per year) of all households. The weakness with this definition is that it does not consider wealth and consumption and low income does not necessarily equate to hardship. For example, some of these households may have other assets, particularly in the 65 years and above category, which could make it easier to finance a vehicle.
- **Deprivation and hardship measures** – there are different hardship measures, including the NZ Deprivation Index (NZDEP 2013) and DEP-17 scores developed by the Ministry of Social Development (MSD).

  Analysis based on NZDEP 2013 found an annual average of 1.4 percent of households in the most deprived areas (bottom 20 percent of all households) purchased at least one imported light vehicle during the period 2015-2018. This is very close to the estimate of 1.5 percent annual average discussed above using an income-based measure. Those that might be

[5] For example, see OECD, "What are equivalence scales?" http://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf.
[6] This SIA defines low-income households as those with an annual, equivalised, disposable income of less than 60 percent of the median household income (of $40,900 in 2017/18). The disposable income is "equivalised" to allow comparison across various household sizes and compositions. In 2017/18, 60 percent of the median household income was $24,540 per "equivalent adult". The household disposable income refers to the level of total household gross income, after tax is deducted.

expected to purchase a light vehicle import during the 6 years to 2025 under this measure would make up of around 8.4 percent of all households.

Analysis based on MSD's DEP-17 measure found that there are 7 percent of households in material hardship[7] . Those that might be expected to purchase a light vehicle import during the 6 years to 2025 make up around 2.6 percent of all households. This means on average households that might purchase a light vehicle import each year (during 2020-2025) and are in material hardship make up around 0.44 percent of all New Zealand households per year.

As these measures have different bases, different pictures can emerge as to what proportion of households in NZ might be affected by the policy i.e. 9 percent (income-based measure), 8.4 percent (based on NZDEP 2013) or 2.6 percent (based on DEP-17 i.e. the MSD's material hardship measure).

While the MSD's measure (DEP-17) is arguably the best measure of hardship, the SIA uses household equivalised income as an indicator of vulnerability because:

i. Income can act as a proxy for measuring the affordability of, or the ability to pay for, an increase in cost burden. In this case, there could be an increase in the prices of certain imported vehicles.

ii. DEP-17 measures have small sample sizes and therefore households cannot be disaggregated by emission band and other details to identify the impacts on households in detail. This means that we cannot disaggregate the DEP-17 measures into rural versus urban households, and other groupings such as single parent households with children. This makes it difficult to show the relative sizes of, and how, different groups of households might be affected by the policy.

1.4 Key assumptions

The key assumptions used in this SIA include the following:

- There is no other policy affecting the future vehicle prices and choices;
- There is no economic shock (e.g. appreciation/depreciation of the exchange rate) or supply restriction that affects vehicle prices;
- Vehicle technologies continue to develop at the current rate;
- Price elasticities of demand for vehicles are the same as those used in the preliminary Cost-Benefit Analysis on the Feebate Scheme;
- EV charging infrastructure will grow to support the estimated increase in uptake of EVs;
- The relative share of vehicles to be purchased by household type (broad income groups and locations) are similar to those observed in 2015-2018.

[7] This refers to households with a DEP-17 score of 6 or more, i.e. households with missing 6 or more basics non-income items from a list of 17.

1.5 Key findings and conclusions

The Feebate Scheme can achieve a net benefit to the nation but households that cannot alter their vehicle purchasing choices will likely be required to pay a fee.

- Vehicle price premiums have been seen as one of the barriers to the adoption of LEVs. The Feebate Scheme aims to lessen this price effect by providing a financial incentive (rebate) to assist buyers of imported light vehicles to switch to LEVs. The scheme also sends a price signal to deter the purchase of HEVs.
- According to the CBA, the Feebate Scheme could deliver, on average, fuel savings benefits of between $2,800 and $8,900 to the owner over the economic life of each imported LEV purchased under the scheme. Therefore, buyers switching to imported LEVs would benefit from ongoing fuel savings and any rebates that could, partly or wholly, offset the estimated vehicle cost premium.
- Aside from vehicle prices, other factors such as seating capacity and cargo space can be important for some households. However, there are strategies (such as purchasing from the domestic used car market or travel mode switch) that vehicle buyers could adopt, where available, to mitigate any price effects.
- Households that continue to purchase HEVs during 2020-2025 will be subject to a fee varying between $700 and $2,750 per vehicle.

There are different measures of vulnerability, such as income and material hardship. The share of vulnerable households that might be affected is expected to be small (between 0.44 percent to 1.5 percent per year, depending on the measure used).

- Low-income households account for 24 percent of households, but own only 18 percent of registered vehicles, and 16 percent of vehicles that entered the fleet in the three years to June 2018 (Table 12 in Appendix 3). Therefore, the share of the direct impacts of the Feebate scheme on low-income households would be smaller than the impacts on the remainder of households.
- On average, around 1.5 percent of all households that might purchase a light vehicle import each year (during 2020-2025) are low-income households.
- Some research argues that some of the households classified as low-income may not be considered in material hardship[8]. For example, some low-income households with members aged 65 and over may have other assets and therefore may have other options to lessen the impacts of the policy.
- Currently around 7 percent of all households are in material hardship. Analysis found that, on average, 0.44 percent of all households that might purchase a light vehicle import each year (during 2020-2025) are in material hardship.

[8] Perry, B (2017), "The material wellbeing of New Zealand Households: Overview and key findings", Ministry of Social Development, Wellington.

Low-income households that might purchase a light vehicle import would be affected in a similar fashion to better-off households because of similar patterns of vehicle choices by emission band.

- Measures of material hardship are based on a small sample size and cannot be broken down by vehicle emission in order to estimate the affected households. Therefore, this SIA used equivalised disposable income as a proxy for ability to pay and to estimate the proportion of households to pay a fee or to receive a rebate. It must be noted that the results provided in this report are an indication of affordability based on equivalised disposable income and do not consider the impact of wealth and consumption.
- In addition, there are uncertainties around how vehicle purchasers would respond to the Feebate Scheme. The overall price changes corresponding to the feebate schedule were modelled to estimate the possible behavioural changes to determine the size of the groups that would receive a rebate or pay a fee.
- Analysis suggests low-income households that might purchase a light vehicle import would be affected in a similar fashion to better-off households, as the patterns of vehicle choices by emission band for all income groups are similar. That said, for a given price increase, the impact on low-income households would represent a much higher share of their income. However, households that are able to switch vehicle purchasing choices would benefit from the rebate to lessen any price impacts.
- According to the central estimates[9], around 36 percent of imported (new and used) light vehicles purchased by low-income households in 2021 would be subject to a fee. This increases to 50 percent in 2025. These estimates include behavioural responses to the fees and rebates. The estimated average fees range from $1,300 (used) to $2,500 (new)[10] in 2021. These averages fall to $1,100 (used) and to $1,900 (new) by 2025, as buyers of HEVs buy progressively lower-emissions HEVs, subject to lower fees.
- Around 45 percent of low-income households that might buy an imported LEV in 2021 would receive a rebate. This reduces to 34 percent in 2025. The estimated average rebates range from $1,200 (used) to $3,200 (new) in 2021, rising to $1,300 (used) and to $5,700 (new) by 2025. These changes again indicate increasing uptake of LEVs and occur despite the fall in rebates according to the schedules.

In absolute terms, the number of rural households that are likely to be affected is small, but a larger share of rural households would be subject to a fee, as they tend to buy high-emission vehicles.

- Based on vehicle purchase patterns over the three years to June 2018 and vehicle registration predictions, around 42 percent[11] of all households might be expected to buy imported light vehicles over the six years to 2025. This figure is made up of 5 percent (or less than 1 percent per

[9] The *central estimates* were based on the projections modelled for the CBA, and reflect changes in the composition of vehicle imports in response to the vehicle price changes caused by the rebates and fees.
[10] Hereafter, "used" refers to used light vehicle imports and "new" refers to new light vehicle imports.
[11] The remaining 58 percent of all New Zealand households that might not purchase a light vehicle new to the fleet in the 6 years to 2025 might not be directly impacted by the Feebate Scheme. However, they would benefit indirectly from improved safety and a reduction in GHG and other emissions. As these wider impacts have not been estimated in the CBA, they have been excluded from this SIA.

year) of rural households and 37 percent (or just over 6 percent per year) of urban households, both expressed as a percentage of all households in New Zealand.

- Although the share of rural households as a percentage of all New Zealand households (11.5 percent) and as a percentage of the owners of light vehicle imports (12 percent) are broadly similar, they are likely to be more affected by the Feebate Scheme than urban households (irrespective of income) because they tend to buy a higher share of HEVs.
- In the early years of the Feebate scheme, the fee and rebates schedule is designed to ensure that a variety of new utes and new and used vans, SUVs, and people-movers are exempted from paying a fee and some newer models of vans and SUVs will receive a rebate. Over time more low emitting, large vehicles are expected to enter the market.
- In the first few years of this policy, it is possible that people who want to buy a new or used imported ute may have limited choices of vehicles that do not incur a fee. However, in 2019 there are already several models of new double cab utes that would not incur a fee. By 2022 there would likely be more. In the coming years, new hybrid, plug-in hybrid, and battery electric ute models are expected to be introduced into the market.
- According to the central estimates, around 52 percent of vehicles (new and used) purchased by rural households in 2021 would be subject to a fee. This increases to 68 percent in 2025. These estimates include allowance for potential behavioural responses due to the presence of fees and rebates. The estimated average fees range from $1,300 (used) to $2,500 (new) in 2021 and from $1,100 (used) to $2,200 (new) in 2025.
- On the other hand, around 31 percent of rural households that buy an imported LEV in 2021 would receive a rebate. This reduces to 20 percent in 2025. The estimated average rebates range from $1,400 (used) to $2,500 (new) in 2021 and from $2,000 (used) to $5,400 (new) in 2025.

The Feebate Scheme is likely to have short-term impacts on vehicle purchasing decisions until the prices of LEVs reach parity with HEVs, and there are strategies that vehicle purchasers could adopt in the short-term to lessen any negative effects

- In the short term, for households that are not able to finance a low-emission vehicle or downsize to a smaller vehicle, they could purchase a replacement vehicle ahead of the policy change, keep their existing vehicles for longer, or purchase from the domestic fleet. They could also switch to other modes, such as public transport or ride share.
- In the long term, the market will adjust to minimise any price or choice impacts, particularly as the price of hybrid vehicles and EVs reaches parity with that of ICEVs. Some commentators are of the view that purchase price parity between electric and conventional vehicles will occur in the mid-2020s in the major markets[12]. However, officials forecast that price parity in terms of total cost of ownership may not occur until around 2030[13] and price parity in terms of upfront costs would be later still.

[12] Deloitte, 2019. *New market. New entrants. New challenges. Battery Electric Vehicles*. Accessed from: https://www.deloitte.com/uk/en/pages/manufacturing/articles/battery-electric-vehicles.html.

[13] Vehicle fleet modelling (including the Vehicle Fleet Emissions Model and the EV Prediction model) suggests the prices of EVs or petrol hybrid vehicles could reach price parity with other conventional ICEVs between 2030 and 2035.

2. Background

This preliminary Social Impact Assessment (SIA) aims to highlight the potential scale and distribution of impacts on households from the implementation of a Feebate Scheme on all light vehicles[14] entering the New Zealand fleet in 2020-2025. At this stage, it is a distributional assessment, mainly of the direct monetary impacts rather than a comprehensive SIA, which was not possible within the timeframe. This report should be read in conjunction with the cost benefit analysis (CBA), which assessed the aggregate social costs and benefits from implementing this scheme, but was based on different schedules of rebates and fees.

The Feebate Scheme (also known as *Clean Car Discount*) is one of the policy options of the Low Carbon Emissions Package that aims to reduce GHG emissions from road transport. Another policy within this Package is the Vehicle Fleet Emissions Standard (VFES) (also know as *Clean Car Standard*). A discussion of the economic and social impacts of this policy is provided in the respective preliminary cost benefit analysis and social impact assessment reports. Further work is being planned to estimate the combined impact of the two measures on the emissions of the light vehicle fleet.

2.1 Policy rationale and description

The Feebate Scheme is anticipated to improve society's wellbeing owing to its potential impacts on the natural, physical and human capitals (as classified in the Treasury's Living Standards Framework) through influencing the uptake of low-emission vehicles and the flow-on positive impacts on the environment (greenhouse and harmful atmospheric emissions).

Several countries have introduced or investigated a Feebate Scheme as part of their efforts to reduce GHG emissions and to contribute towards meeting the reduction target required under the Paris Agreement on Climate Change. A key difference in the proposed Feebate Scheme for New Zealand is that it would apply to used vehicle imports as well as new imported light vehicles. Implementing a Feebate Scheme in New Zealand is intended to encourage the purchase of EVs, hybrid vehicles, and low-emissions ICEVs (together, **low-emissions vehicles** or **LEVs**) and discourage the purchase of high-emissions vehicles (or **HEVs**). This behavioural change would accelerate the reduction in the GHG emissions of the light vehicle fleet.

The estimated distributional impacts of the Feebate Scheme are based on the proposed fees and rebates shown in the schedules in Appendix 1. The schedules stipulate that between 2020 and 2025, the rebate on new imported LEVs can range from $200 to $8,000 for each imported new light vehicle priced under $80,000. Over the lifetime of the policy, the level of rebates will decline in line with the projected declining trend in LEV prices. The rebates on low-emissions ICEVs will gradually be removed, whilst the applicable emissions bands that are subject to a fee will successively include more vehicles with lower levels of emissions.

Accelerating the uptake of LEVs in the fleet would reduce the fuel used by light vehicles and this would result in substantial cost savings to vehicle owners, as well as reducing GHG emissions and concentrations of transport-related air pollutants (TRAPs).

[14] Light vehicles include both new and used imports that have a gross vehicle mass of 3.5 tonnes or less.

2.2 Costs and Benefits of the Feebate Scheme

The preliminary CBA carried out by the Ministry estimated that the Feebate Scheme would have a benefit to cost ratio between 1.4 and 4.2 (central estimate of 2.6) and a net present value of between $111 million and $821 million (central estimate of $413 million). The fuel savings were estimated to range from $2,800 to $8,900 (central estimate of $5,200) on each imported light LEV purchased under the scheme. The average emissions level of light vehicles imported was estimated to decrease to 132 gCO_2/km by 2025 as a result of the Feebate Scheme.

In addition, the policy is expected to deliver wider societal benefits relating to lower harmful emissions, improved vehicle safety, and reduced congestion if some vehicle owners switch to public transport or active modes. The CBA did not estimate the size of these benefits and, therefore, they are not the focus of this SIA.

2.3 Social Impact Assessment Framework

The CBA does not include the transfer of money from one sector of the economy to another. Thus, the social impact from using funds collected from the fees levied on HEVs to pay the rebates on LEVs was not assessed. However, this could have a substantial impact since those households who (can afford to) buy an imported LEV will benefit from the rebate as well as in substantial fuel savings, whereas those who (can only afford to) buy HEVs will be liable to pay fees under the scheme.

The Ministry's draft SIA Framework recommends that transport policies should address transport inequities that are observed in the existing distribution of transport resources (of which access to vehicles and vehicle affordability are key components), opportunities (e.g. access to employment), risks (e.g. health and safety), or outcomes (e.g. observed travel patterns, and well-being).

The Feebate Scheme could impact on the distribution of transport resources. Transport resources include car ownership (and the ability to afford car ownership); an individual's proximity to public transport and the destinations it serves; an individual's physical capabilities to engage in active modes of transport; and aspects of an individual's location e.g. the exposure level of TRAPs and the extent of severance from a community because of a motorway. An individual's level of transport resources helps determine their capability or means to access employment, education, healthcare, and recreation.

An initial assessment (see Table 1) of the social and distributional impacts of the Feebate Scheme suggests households that need to buy vehicles during the period 2020-2025 may experience both direct and indirect impacts. The direct impacts would be the result of the changes in vehicle prices, whereas the indirect impacts refer to any flow-on impacts on prices of vehicles already in the fleet, and any indirect (and potentially longer-term) impacts on health and safety.

The uncertainty around how car purchasers would respond to price changes makes it difficult to draw clear conclusions on the size of the impacts of the Feebate Scheme, and how those impacts would be distributed amongst various households. Therefore, a scenario approach is adopted, analysing different degrees of responsiveness or adaptability to the policy.

The next section summarises the scenario analysis and the results. Section 4 discusses the limitations of the analysis and summarises the key findings. The appendices provide a range of supporting data and additional analysis by different household groups.

Table 1: Initial social impact assessment of the Feebate Scheme

Step	Description	Analysis
Step 1	**Outline policy options**	The policy option under consideration is a Feebate Scheme, aimed at reducing the CO_2 emissions of the light vehicle fleet. The policy stipulates either a fee added to the purchase price or a rebate deducted from the price of an imported light vehicle, depending on whether its CO_2 emissions are above or below a certain threshold. The emissions band in which neither a fee nor a rebate applies is the exempted or "zero band", which applies to progressively lower emissions vehicles between 2020 and 2025.
Step 2	**Identify who is affected**	The policy will directly affect, to a greater or lesser degree, all buyers of imported light vehicles. HEVs will attract fees and LEVs will receive rebates. Vehicle purchasers can be expected to respond in several different ways to these price signals, by either buying the same vehicle as they would have without the policy, or by buying a different vehicle (generally, towards LEVs and away from HEVs), or by postponing the purchase of a vehicle for the duration of the Scheme.
Step 3	**Identify potential positive and negative direct impacts, considering any mitigation measures to be adopted by those affected**	**Positive Direct Impacts:** • Reduction in purchase price (increase in transport resources) for buyers of imported LEVs. • Reduction in lifetime fuel costs (increase in transport resources) for buyers of imported LEVs. • Reduction in GHG emissions. • Reduction in exposure to and harm from TRAPs (a decrease in exposure to transport risks). Not measured in this SIA. **Negative Direct Impacts:** • Increase in purchase price (decrease in transport resources) for buyers of imported HEVs. • Increase in purchase price (decrease in transport resources) for buyers of substitute HEVs already in the fleet (their price might rise by some proportion of the fee they would attract if they were new to the fleet). The timing of the impact and extent of changes will depend on behaviours of manufacturers, importers and buyers. **Mitigation measures that vehicle owners may consider to lessen any negative impacts:** • Downsize to a smaller or different (and cheaper) vehicle type • Purchase a used vehicle from the domestic fleet • Hold on to their existing vehicle for longer • Switch to alternative modes of transport • Purchase a vehicle replacement ahead of the Feebate scheme
Step 4	**Consider pathways to impact**	• In 2020-2025, the prices of imported HEVs would increase by the fee attracted. • In 2020-2025, the prices of LEVs would decrease by the rebate provided. • Emissions of GHG and other TRAP will decrease, benefiting all New Zealanders, even those who do not buy an imported light vehicle in 2020-25. • Vulnerable groups may have reduced opportunities (mainly the access that car ownership provides), and some will face lower or higher risks to safety and health, depending on the alternative chosen (e.g. keeping existing vehicles or switching to public transport or active modes).
Step 5	**Outline potential distributed impacts**	• Only households that are able to pay the extra cost for a LEV will benefit directly from the fuel savings as a result of this policy. • Vulnerable groups are more likely to pay a fee and buy an imported HEV or one already in the fleet, whose prices might also rise slightly. • There are, however, some positive wider social impacts, such as health and safety, and affordability considerations for households that switch to public transport, active modes, or ride-sharing, rather than buy an imported HEV that attracts a fee. These occur in the longer term and therefore need to be balanced with the short term negative impacts. • Reductions in TRAPs that would tend to benefit the health of low-income households more as they are likely to be exposed to higher levels of these pollutants. • Reductions in GHGs that would tend to benefit low-income households more (in the long term) as they are more exposed to climate change consequences.
Step 6	**Decision to proceed with detailed assessment**	• Since negative social impacts are expected to be associated with the Feebate Scheme, a more detailed analysis might be warranted to assess in more detail the impact on vulnerable groups – for example engaging with impacted groups and importers. • Further analysis of the impacts on vehicle owners who do not switch to LEVs would be useful when more information on behavioural changes becomes available.

3. Estimating the social impact of the Feebate Scheme

3.1 Factors contributing to vulnerability

The impact of the Feebate Scheme on households depends on a number of factors, mainly relating to their current circumstances and on the design and timing of the scheme itself. The main factors are summarised in the following three categories:

(i) Level of exposure

The draft SIA framework recommends that one considers how existing levels of transport resources imply certain levels of exposure to transport risks and opportunities (such as the ability to afford car ownership). Households that do not purchase a vehicle during the Feebate Scheme's implementation period (2020-2025) are largely unaffected by the policy. Households buying an imported light vehicle in 2020-2025 (estimated at 775,500 households) would be exposed to the Feebate Scheme in one of three ways: they would either be entitled to a rebate, be obliged to pay a fee, or be exempted from either one.

(ii) Ability to adapt

The ability to adapt to the Feebate Scheme is dependent on access to other assets (e.g. e-bikes, mobility scooters), the level of income and access to other transport alternatives (e.g. public transport, shared mobility, etc.), including the choice of LEVs made available by importers and which are affordable substitutes to popular models.

- The level of income affects whether a household buys a more expensive LEV, keeps their existing vehicle, or switches transport mode. Low-income households (including those with specific household characteristics such as elderly or single-parent households) may be more vulnerable to any cost increases. Analysis suggests **168,400** low-income households (about 9 percent of all households) are expected to be impacted by the scheme during the six-year to 2025, compared with **607,100** higher-income households (or 33 percent of all households). These numbers include households that purchase new and used imported LEVs and HEVs.
- The ability to switch to or access alternative transport modes depends on household and demographic characteristics, household location, and physical capability. For example, rural households, especially those without access to alternative transport modes, would have a lower ability to adapt. Rural households are estimated to account for **94,000 (or 5 percent)** of all households that are likely to be affected by the Feebate Scheme during the six-year to 2025.

(iii) Level of rebates and fees

The levels of rebates and fees stipulated under the Feebate Scheme will send price signals that will influence the decisions of potential buyers of imported light vehicles in 2020-2025. The level of rebates and fees is extremely important to maximise the behavioural response of buyers whilst (ideally) ensuring the scheme is cost-neutral (i.e. self-funded).

3.2 Identifying households that could be vulnerable

There are different measures to identify households that are potentially vulnerable to changes in transport-related policies (see Appendix 2 for further details). These include:

- **Income-based measures** – these are based on median, equivalised, disposable household income. Equivalised disposable income is a standard income measure of inequality and hardship[15]. It includes income from all sources such as social benefits, superannuation and salary from paid employment. Low-income households[16] make up of around 24 percent of all New Zealand households. Those might be expected to purchase a light vehicle import during the 6 years to 2025 make up of around 9 percent (or 1.5 percent per year) of all households.
- **Deprivation and hardship measures** – there are different deprivation or hardship measures, including NZ Deprivation Index (NZDEP 2013) and DEP-17 scores developed by Ministry of Social Development (MSD).

  Analysis based on NZDEP 2013 found an annual average of 1.4 percent of households in the most deprived areas (bottom 20 percent) purchased at least one imported light vehicle during the period 2015-2018. This equates to around 8.4 percent of all households over the 6-year to 2025. This is very close to the estimate of 1.5 percent per year discussed above using an income-based measure.

  Analysis based on MSD's DEP-17 measure found that there are 7 percent of households in material hardship.[17] Those households that might be expected to purchase a light vehicle import during the 6 years to 2025 make up of around 2.6 percent of all households. This means on average households that might purchase a light vehicle import each year (during 2020-2025) and are in material hardship make up around 0.44 percent of all households per year.

Table 2 compares households as a percent of the total number of all households that might be affected by the policy using different measures of vulnerability. It shows that around 8.4 to 9 percent of all households (using either income-based or NZDEP2013 measures) will be impacted over the 6 years. However, when looking exclusively at households that are in material hardship (DEP-17), it is 2.6 percent. This is not surprising given this group of households are considered the most deprived group of the population.

[15] For example, see OECD, "What are equivalence scales?" http://www.oecd.org/els/soc/OECD-Note-EquivalenceScales.pdf.
[16] This SIA defines low-income households as those with an annual, equivalised, disposable income of less than 60 percent of the median household income (of $40,900 in 2017/18). The disposable income is "equivalised" to allow comparison across various household sizes and compositions. In 2017/18, 60 percent of the median household income was $24,540 per "equivalent adult". The household disposable income refers to the level of total household gross income, after tax is deducted.
[17] This refers to households with a DEP-17 score of 6 or more, i.e. households with missing 6 or more basics non-income items from a list of 17.

Table 2. Comparison of share of households that might be expected to purchase a light vehicle imports by vulnerability measure

	Ref	Low-income households	NZDEP 2013 (bottom quintile)	Households in material hardship (based on DEP-17)
Shares of all NZ households	A	24%	20%	7%
Shares of all NZ households might be expected to purchase a light vehicle imports during the 6 years to 2025	B	9% (or 1.5% per year)	8.4% (or 1.4% per year)	2.6% (or 0.44% per year)
Relative share of households might be expected to purchase a vehicle during the 6 years to 2025	B/A	37% (or 6% per year)	42% (or 7% per year)	37% (or 6% per year)

In the next six years when the Feebate Scheme is implemented, it is unclear whether or not these potentially vulnerable groups of households (i.e. households with low income or classified as being in material hardship):

- would want or need to purchase an imported light vehicle,
- would (or could) amend their vehicle choices in light of the proposed policy, and
- could afford such a vehicle.

While the MSD's DEP-17 measure is arguably the best measure of hardship, the SIA uses household equivalised income as an indicator of vulnerability because:

i. Income can act as a proxy for measuring the affordability of, or the ability to pay for, an increase in cost burden. In this case, there could be an increase in the prices of certain imported vehicles.

ii. DEP-17 measures have small sample sizes and therefore households cannot be disaggregated by emission band and other details to identify the impacts on households in detail. This means that we cannot disaggregate the DEP17-based measure into rural versus urban households, and other groupings such as single parent households with children. This makes it difficult to show the relative sizes of, and how, different groups of households might be affected by the policy.

3.3 Income-based measurement of vulnerability

To estimate what type of households might be exposed to the scheme requires understanding what type of vehicles different household types currently own and purchase. For this, the linked administrative data (of household income, vehicle ownership, and emissions) is explored below based on the Treasury's IDI analysis.

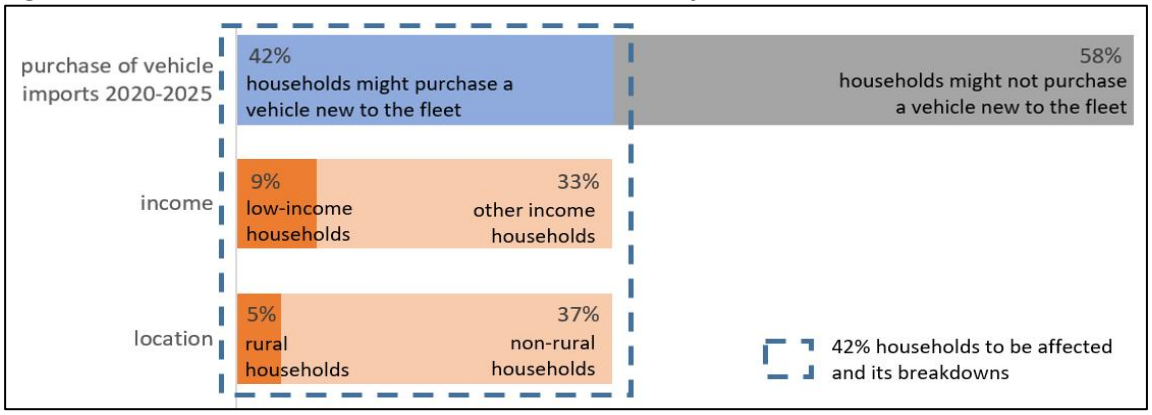
The detailed tables in Appendix 3 provide descriptions of household profiles and vehicle ownership while the tables in Appendix 4 provide the estimated share of imported light vehicles that will be impacted by the Feebate Scheme in 2021 and 2025. A breakdown of households by broad income group and location as a percentage of all New Zealand households is provided in Appendix 5 while Table 27 and Table 28 in Appendix 6 lists the 20 most popular light vehicle imports that were purchased by low-income households in 2015-2018.

Figure 1 shows that the low-income[18] households expected to purchase new to the fleet vehicles over the 6-year period when the Feebate Scheme is implemented (2020-2025) make up around 9 percent (or 1.5 percent per year) of all New Zealand households. On the other hand, households with other incomes purchasing light vehicles new to the fleet make up 33 percent of all New Zealand households (or 5.5 percent per year).

The 9 percent figure includes households with members aged 65 years or older. Some of these households might have a higher net worth[19] from asset accumulation but having a low-income reduces the household's ability to pay the fees on HEV under the Feebate Scheme.

Figure 1 below also shows that rural households purchasing new to the fleet vehicles during the same 6-year period make up 5 percent of all New Zealand households, or averaged just under 1 percent per year.

Figure 1. Estimated share of households to be affected by the Feebate Scheme



Of the rural households buying a vehicle new to the fleet, slightly more than half are more likely to pay a fee than receive a discount. This is because a greater proportion of their vehicle purchases are of

[18] The term "income" used in this analysis includes income received from all sources (such as benefits, rental or investment income and paid employment).

[19] Stats NZ defines net worth as the household's financial and non-financial assets net of liabilities.

high-emissions vehicles. However, there is the opportunity for these households to change their buying habits and avoid this fee.

Table 3 shows the estimated distribution of vehicles registered in the period July 2015 to June 2018 by selected emissions band and equivalised household income quintile. While the estimated distribution of average emissions for different income quintiles is broadly similar, the average emissions of imported vehicles registered to low-income households are slightly lower than those for high-income households (172 gCO_2/km vs. 180 gCO_2/km for new imports and 177 gCO_2/km vs. 181g CO_2/km for used imports). The average emissions for all income quintiles are greater than 170 gCO_2/km. Under the Feebate Scheme, fees would be incurred for all light vehicles with average emissions of 181 gCO_2/km or higher if imported in 2021, or 141 gCO_2/km or higher if imported in 2025.

Table 3. Distribution of imported vehicles registered to households during July 2015 to June 2018, by emissions band and income quintile[1]

Equivalised household income per annum by income quintile	Average emission CO_2/km	Emission band								%
		lower than 105g CO_2/km		106g CO_2/km – 130g CO_2/km		131g CO_2/km – 200g CO_2/km		over 200g CO_2/km		
		Share of total of all income groups for new imports (share within income quintile in *blue italic*)								
1 – lowest income	172.1	0.2%	*1%*	1.3%	*10%*	9.1%	*67%*	3.0%	*22%*	13.6%
2	172.4	0.1%	*1%*	1.3%	*11%*	8.1%	*64%*	3.2%	*25%*	12.8%
3	177.6	0.2%	*1%*	1.4%	*9%*	9.9%	*62%*	4.6%	*28%*	16.1%
4	177.4	0.2%	*1%*	1.7%	*8%*	13.5%	*64%*	5.7%	*27%*	21.1%
5 – highest income	179.9	0.3%	*1%*	2.9%	*8%*	22.7%	*62%*	10.6%	*29%*	36.6%
All income groups	**177.0**	**1.0%**	***1%***	**8.7%**	***9%***	**63.3%**	***63%***	**27.0%**	***27%***	**100%**
		Share of total of all income groups for used imports (share within income quintile in *blue italic*)								
1 – lowest income	177.4	0.6%	*4%*	1.6%	*12%*	7.1%	*53%*	4.0%	*30%*	13.3%
2	178.8	0.7%	*3%*	2.3%	*12%*	10.4%	*53%*	6.3%	*32%*	19.7%
3	179.5	0.7%	*3%*	2.8%	*11%*	13.1%	*53%*	7.9%	*32%*	24.5%
4	178.8	0.7%	*3%*	2.4%	*10%*	13.3%	*55%*	7.6%	*31%*	24.0%
5 – highest income	181.1	0.7%	*4%*	1.8%	*10%*	9.7%	*52%*	6.3%	*34%*	18.6%
All income groups	**179.2**	**3.5%**	***3%***	**10.9%**	***11%***	**53.6%**	***54%***	**32.1%**	***32%***	**100%**

[1] excludes vehicles that do not have a record of fuel consumption.
Source: Ministry estimates based on IDI data

As discussed earlier, the impact and magnitude of the Feebate Scheme will depend on the household's level of exposure, ability to adapt, and the fee or rebate rate. The impact of the fees (and rebates) as a proportion of household income will be higher for low-income households.

The segments of the population with disabilities[20] could also be vulnerable to cost increases associated with the Feebate Scheme if they need to purchase vehicles during the implementation period of the Feebate Scheme (2020-2025), because they might be physically constrained in terms of their ability to switch to alternative modes of transport. Furthermore, those requiring the use of wheelchairs might also be affected by the Feebate Scheme. They face higher costs when buying or switching vehicles, as the vehicle often needs to be modified. In addition to the higher upfront cost, this could make low-

[20] Currently, there is not enough information available to ascertain the current vehicle choices of people with disabilities.

emissions vehicles unaffordable for those with disabilities. The EU implemented an exemption for special-purpose vehicles built to accommodate wheelchair access.

Due to the small sample size used in the Household Labour Force Survey, the share of light vehicle imports purchased by individuals with a disability cannot be determined. However, the impacts on low-income individuals with a disability are included in the scenario analysis as part of the wider group of low-income households.

Table 4 sets out the characteristics of selected low-income household types. It shows that low-income single parent households with dependent child(ren) only and low-income households with members aged 65 or over have the lowest car ownership rate (37 and 41 percent respectively). For households that do own a car and need to purchase a light vehicle imports in the 6 years to 2025, any cost increase due to the Feebate Scheme would represent a higher share of their income than it would for middle and high-income households.

Table 4. Characteristics of selected low-income household types

Households earning less than $25,450 in 2017/18 by household profiles (note 2)	**Mean household equivalised income by household size (median in brackets)**	**Mean household disposable income (not equivalised by household size) (median in brackets)**	**Estimated number and share of household group (% of all households)**	**Estimated number of households that do not own a vehicle, as of August 2018 (% within household type)**	**Estimated number of households that purchased at least one vehicle from July 2015 to June 2018 (% within household type purchased new imports)**
All low-income households	$17,402 ($19,624)	$26,424 ($23,108)	444,700 (24.2%)	137,200 (30.8%)	84,200 (38%)
Low-income households with two or more persons	$17,215 ($19,200)	$31,454 ($33,470)	285,000 (15.5%)	71,000 (24.9%)	67,900 (36%)
Low-income, single-parent households with dependent child(ren) only	$17,900 ($19,212)	$29,833 ($30,358)	47,400 (2.6%)	17,700 (37.3%)	5,600 (13%)
Low-income households with Māori or Pasifika members (note 2)	$17,574 ($19,270)	$32,571 ($30,603)	109,900 (6.0%)	39,500 (28.8%)	18,000 (18%)
Low-income households with members aged 65 or over (note 2)	$19,658 ($20,533)	$24,857 ($21,542)	188,000 (10.2%)	56,400 (41.1%)	30,700 (63%)

Notes:

1. Low-income households are classified as those with an annual equivalised disposable income, which is less than 60% of the median household income ($40,900 in 2017/18).
2. The two household profiles are not additive (i.e. not mutually exclusive) to other low income household profiles because each household profile can have multiple household characteristics (such as single-parent Māori).
3. The total number of households as of June 2018 was around 1.83 million.
4. The analysis uses Household Labour Force Survey linked to data (analysis conducted in March 2019) on taxable income and benefits and motor vehicle registrations. The analysis makes use of Treasury's estimates of annual disposable household income for survey respondents.
5. Source: Ministry estimates based on IDI data

Other household types that could be vulnerable may include single mothers with dependent children and large households in remote areas. However, due to the lack of information, this SIA cannot determine the size of the impacts, if any, on these household types. Again, the impacts on such households with low incomes are included in the scenario analysis as part of the wider group of low-income households.

3.4 Behavioural responses

Buyers' responsiveness to the price signals of the Feebate Scheme and the change in the choice of vehicle makes and models offered by importers would largely determine whether the buyer will opt to buy a vehicle that is eligible for a rebate, or which incurs a fee, or one that is exempted. The potential responses of buyers and importers to the Feebate Scheme are summarised below.

Buyers' responses:

- Buy a LEV that is substitutable with the desired HEV and benefit from the rebate
- Downsize to a smaller LEV and benefit from the rebate
- Buy a HEV that is already in the fleet to avoid paying a fee
- Keep an existing vehicle for longer to avoid paying a fee
- Buy a vehicle that is exempted from paying a fee or from receiving a rebate
- Buy a HEV and pay the corresponding fee.

Importers' responses:

- Introduce new LEV models and discontinue some HEV models
- Source LEV alternatives to popular HEV models
- Heavily promote and market LEVs over HEVs (potentially offering discounted price or finance options)
- Import more LEVs in anticipation of the greater demand
- Import fewer HEVs in anticipation of the reduced demand.

In the short term, there are several factors affecting how importers and buyers might respond to the scheme:

- The relative price differences between LEVs and HEVs
- The availability of different varieties of affordable LEVs
- Any battery range anxiety and concerns with battery life and charging infrastructure
- Incomplete information between consumer preferences and suppliers' willingness to seek out alternative varieties of LEVs.

The following section discusses the impacts on medium and high-income households, and on businesses and government. This is followed by a scenario analysis of the likely impacts of the Feebate Scheme using different behavioural response assumptions to reflect the uncertainties around these influencing factors.

3.5 Impact on Medium and High-Income Households

The Feebate Scheme will impact a larger number of medium and high-income households than low-income households because they are more numerous and buy more vehicles than low-income households. Targeting medium and high-income households with advertising campaigns and information around the net benefits of switching to LEVs could help encourage them to switch to LEVs. More generally, information could be disseminated to all households on the benefits of switching to LEVs, the alternatives such as public transport and active modes, or partially switching (instead of buying a second car).

Higher income earners are typically early adopters of new technologies and tend to buy a larger share of new vehicles. The financial incentives offered by the rebates on LEVs is expected to encourage even more of these households to buy such LEVs and accelerate the uptake of EVs, in particular.

3.6 Impact on Companies & Government Entities

The impact of the Feebate Scheme on imports of light vehicles by companies and government has not been considered in this SIA, as these segments are unlikely to involve vulnerable groups. The likely impacts on these purchasers are also uncertain, for example, the following potential influences could act in opposite directions:

- There are advantages to encouraging businesses to adopt zero or low-emissions vehicles because they tend to have a higher turnover rate. Therefore, to the extent the rebate component of the Feebate Scheme encourages corporate and government purchases of LEVs, this should speed up the replacement of the vehicle fleet with LEVs, as these vehicles will quickly be re-sold into the used fleet.
- Businesses will be better able to afford the example fees associated with HEVs, and if they are not presented with viable LEV alternatives to common models such as the Toyota Hiace or Hilux, then they could be more willing to pay the fees rather than change their behaviour.

3.7 Scenario analysis

The share of households that are expected to buy a LEV or HEV during the implementation of the Feebate Scheme was based on estimates obtained from linked administrative datasets[21] (including the Motor Vehicle Registration and the Household Labour Force Survey) and the Ministry's Vehicle Fleet Emission Model.

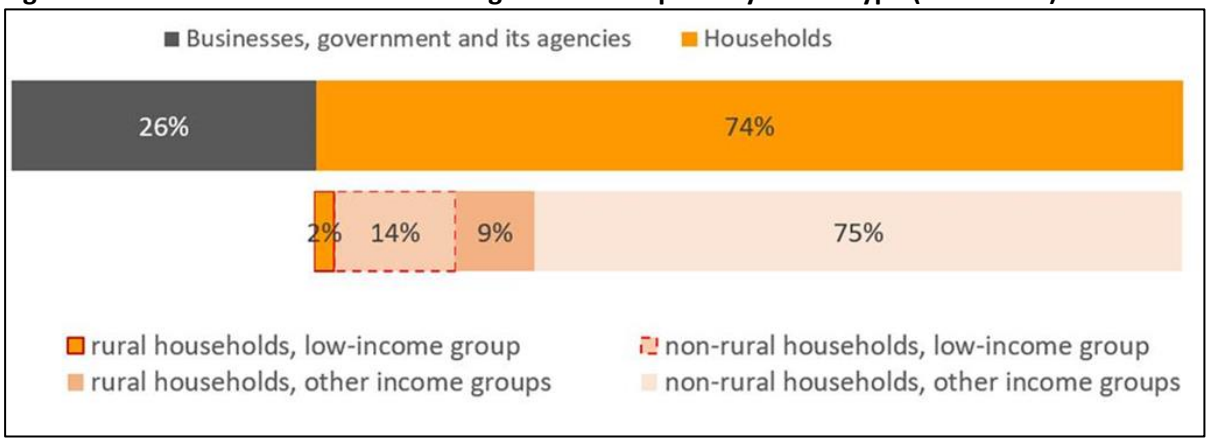
The two scenarios developed to account for the uncertainty around the buying behaviour of consumers are a range of +/- 30 percent around the central estimates of the proportion of vehicles that would be subject to a fee. These are labelled the *'flexible'* and *'rigid'* scenarios. The flexible scenario assumes households are more responsive to the Feebate Scheme and therefore 30 percent less likely to buy a HEV (than under the central scenario). The difference is then attributed to the other two categories equally. On the other hand, the rigid scenario assumes households are 30 percent more likely (than under the central scenario) to continue buying HEVs even though these vehicles are subject to a fee. Appendix 4 provides detailed tables showing the share of households facing a fee or receiving a rebate for different household types.

[21] The estimates were obtained from New Zealand Treasury using data for the three years to June 2018 available at Statistics New Zealand's IDI.

3.7.1 Results of the central estimates

Figure 2 shows the shares of light vehicle imports by owner type, household location, and income. It indicates that 74 percent of light vehicles imported in the period 2015-2018 were purchased by households (as opposed to businesses and government). For vehicles purchased by households, around 89 percent were purchased by urban (non-rural) households, with 16 percent by low-income[22] households. Of the 11 percent of vehicles purchased by rural households, only 2 percent were purchased by rural low-income households.

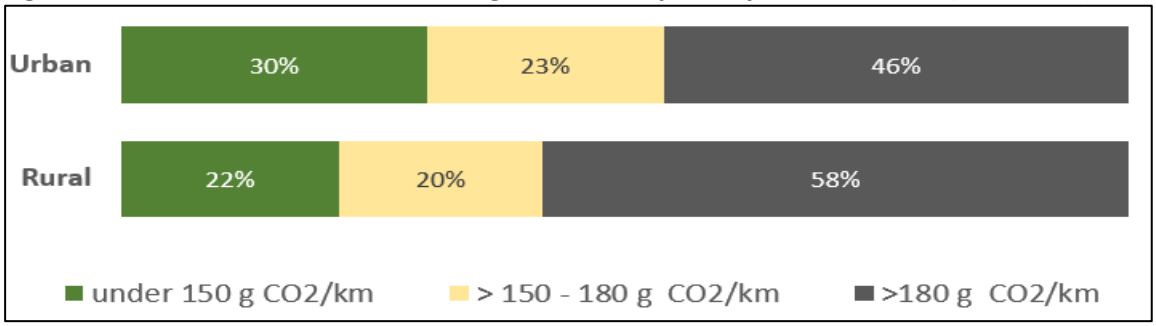
Figure 2. Distribution of new and used light vehicle imports by owner type (2015-2018)



Source: Ministry estimates based on IDI data

Rural households could be more affected by the Feebate Scheme than urban households, because a greater proportion of their vehicle purchases are of high emissions vehicles. Figure 3 shows that over 2015-2018, 58 percent of the new and used light vehicles bought by rural households had emissions higher than the average vehicle (i.e. over 180g CO_2/km). This compares with 46 percent for urban households. If this purchasing pattern continues, a larger share of rural households would incur fees than urban households. This could be considered unfair on rural households. However, urban households would still be the group affected most, given they purchased nearly 90 percent of the light vehicle imports bought by individuals.

Figure 3. Distribution of new and used light vehicle imports by emission band (2015-2018)



Source: Ministry estimates based on IDI data

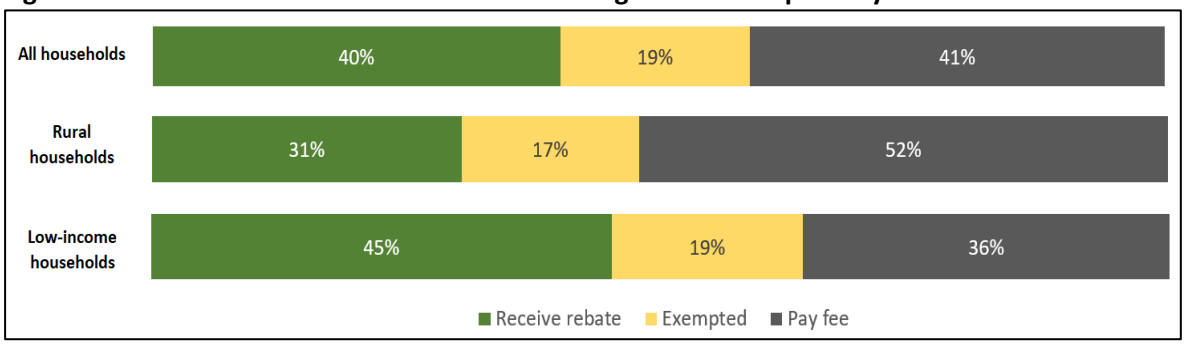
With the Feebate Scheme, 59 percent of all new or used light vehicle imports to be purchased by households would either qualify for a rebate or be exempted from a fee in 2021 (Figure 4). The

[22] A low-income household is defined as one that has an equivalised household income that is 60% of the median or lower. In 2017/18, the median equivalised household income was $40,900.

estimated shares of imported vehicles for rural households is 48 percent and 64 percent for low-income households. These estimates include allowance for potential changes in vehicle purchasing patterns in response to the proposed level of fees and rebates.

At the aggregated level, the estimated proportion of imported vehicles that are subject to a fee in 2021 is similar to that qualifying for a rebate. At the disaggregated level, however, there would be a higher share of imported vehicles to be purchased by rural households paying a fee than receiving a rebate and a lower share of vehicles to be purchased by low-income households paying a fee than receiving a rebate.

Figure 4. Estimated distribution of new and used light vehicle imports by feebate status in 2021

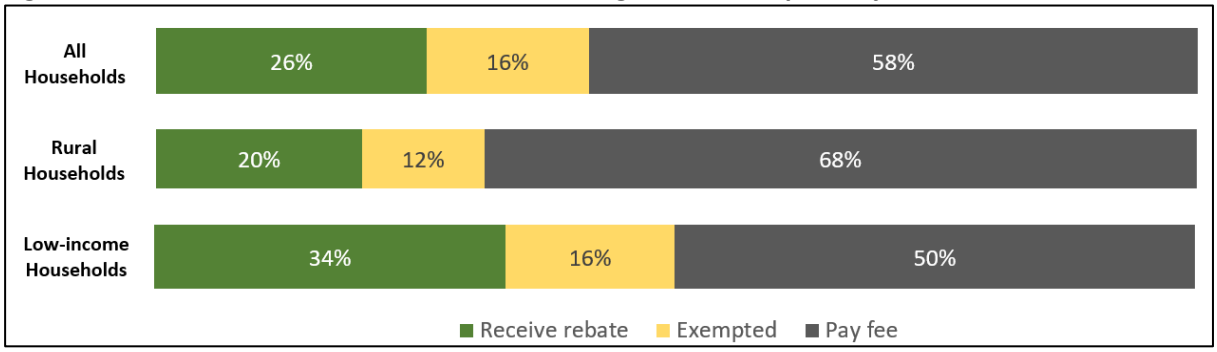


Source: Ministry estimates based on IDI data

The proposed feebate schedule envisages narrowing the number of emission bands in which vehicles are eligible for rebates over time, and the level of the rebates falls over time. In contrast, the application of fees widens over time to encompass vehicles in lower emissions bands, although the maximum fee levels do not increase. This is expected to increase the share of imported vehicles to be purchased by households (especially for rural households, from 52 percent in 2021 to 68 percent in 2025) that would be required to pay a fee, because there are still many households that would not change their vehicle choice away from HEVs. These increases are largely driven by the widening of the application of fees and the falling levels of rebates, and are estimated to occur despite allowing for some behavioural responses towards LEVs, due to the presence of fees and rebates where applicable.

Although the share of imported vehicles purchased by low-income households facing a fee is slightly lower than other households, any cost increase would consume a greater proportion of the income of low-income households.

Figure 5. Estimated distribution of new and used light vehicle imports by feebate status in 2025



Source: Ministry estimates based on IDI data

During the period 2020-2025, households that are unable to finance LEVs or downsize, could instead keep their existing vehicles longer, or purchase a vehicle already in the fleet. They could also switch to other travel modes, such as public transport or ride share.

In the longer term, as the supply and variety of LEVs increase and as the prices of EVs and petrol hybrids attain parity with ICEVs, it will be easier for vehicle purchasers to opt for LEVs without the need for an ongoing Feebate Scheme.

The rebate or fee that an imported vehicle will be qualified to receive or required to pay will vary over time and, therefore, the corresponding impact on the household will also change. Table 5 provides the estimated average fee or rebate per vehicle, weighted by volume, across the applicable emissions bands and the feebate schedules (see Appendix 1) for new and used light imported vehicles, that are expected to be purchased by different household types in 2021 and 2025. The fees could represent a high share of a low-income household's annual income, considering that a low-income household's equivalised income is a maximum of $24,540 (per equivalised adult per year). The impact of the fees also depends on households' ability to spread the upfront vehicle cost by securing finance.

There are many factors affecting the calculated average fee/rebate and the share of vehicle imports in the fee/rebate categories:

- Cut-off points for when a fee or rebate applies
- The level of fees or rebates
- Distribution of vehicles by emissions band and how these change over the feebate implementation period.

If the schedules were to be amended annually to ensure the scheme is self-funded, the distribution of vehicles by emission band and hence the average fee/rebate would change. This analysis has not looked into whether the scheme will be cost neutral and has simply taken the schedules as given.

Table 5 shows two key observations:

- Despite an estimated increase (from 2021 to 2025) in the share of vehicles subject to a fee over time, the estimated average fee per vehicle reduces for all household types. This reflects a shift in vehicle choices towards lower emission vehicles, although the shift might not reach the zero band.
- At the same time, despite a reduction (from 2021 to 2025) in the level of rebates and the number of emission bands that are eligible for a rebate, the average rebate per vehicle increases over time. Again, this reflects the anticipated increase in uptake of LEVs over time, incentivised by the rebates on offer.

Table 5. Weighted average fee or rebate per vehicle purchased in 2021 and 2025

	New Vehicle 2021	New Vehicle 2025		Used Vehicle 2021	Used Vehicle 2025
All households receiving rebates	$2,700	$5,700		$1,300	$1,600
All households exempted	$0	$0		$0	$0
All households paying fees	$2,500	$2,100		$1,300	$1,100
Rural households receiving rebates	$2,500	$5,400		$1,400	$2,000
Rural households exempted	$0	$0		$0	$0
Rural households paying fees	$2,500	$2,200		$1,300	$1,100
Low-income households receiving rebates	$3,200	$5,700		$1,200	$1,300
Low-income households exempted	$0	$0		$0	$0
Low-income households paying fees	$2,500	$1,900		$1,300	$1,100

Source: Ministry estimates based on IDI data

3.7.2 Results of the scenario analysis

Table 6 provides more detailed estimates of the range of possible impacts obtained from the scenario analysis, which reinforces the key findings discussed earlier, namely:

- Low-income households would be affected in a similar fashion to better-off households, as the patterns of vehicle choices by emissions bands for all income groups are similar;
- Rural households tend to be affected more by the Feebate Scheme (with a higher share of vehicles subject to a fee) than urban households because they tend to buy a higher share of HEVs.

Table 6. Estimated impacts of the Feebate Scheme by household type

Household type	Share of vehicles to be purchased in 2021 (within each household type)					
	New Light Vehicle Imports			Used Light Vehicle Imports		
	Receive rebate	Exempted	Pay fee	Receive rebate	Exempted	Pay fee
All household types	20%-37%	16%-29%	34%-63%	44%-55%	10%-20%	25%-46%
Low-income households	30%-46%	18%-24%	28%-52%	47%-58%	10%-19%	23%-43%
Rural households	11%-20%	15%-33%	47%-74%	35%-48%	11%-23%	29%-54%
Household type	**Share of vehicles to be purchased in 2025 (within each household type)**					
	New Light Vehicle Imports			**Used Light Vehicle Imports**		
	Receive rebate	**Exempted**	**Pay fee**	**Receive rebate**	**Exempted**	**Pay fee**
All household types	21%-27%	8%-28%	45%-70%	19%-33%	10%-28%	38%-71%
Low-income households	38%-48%	6%-21%	30%-56%	18%-33%	11%-29%	38%-71%
Rural households	7%-12%	5%-32%	56%-88%	17%-30%	5%-28%	42%-79%

Source: Ministry estimates based on IDI data

The estimated share of households that are expected to buy a new-to-the-fleet vehicle, and how they are likely to be impacted by the Feebate Scheme in 2021 and 2025, are summarised in Table 7. It subdivides these households into low-income households and rural households. The low and high estimates reflect the uncertainty in the buying behaviour of households after the Feebate Scheme is implemented (see Section 3.6 for further detail).

Table 7. Share of light vehicles new to the fleet that would be subject to fees in 2021 and 2025

	Share of all households	% of all households to be expected to buy a new to the fleet vehicle		% of households expected to buy a new to the fleet vehicle, on average per year, and who are expected to:		
		over the six year period (2020-2025)	average per year	receive a rebate	exempted	pay a fee
Low-income households	24%	9.2%	1.5%	2021= 0.7% [0.6%- 0.8%]	2021= 0.3% [0.2%- 0.3%]	2021= 0.6% [0.4%- 0.7%]
				2025= 0.5% [0.4%- 0.5%]	2025= 0.2% [0.1%- 0.4%]	2025= 0.8% [0.5%- 1.0%]
Rural households	11%	4.8%	0.8%	2021= 0.2% [0.2%- 0.3%]	2021= 0.1% [0.1%- 0.2%]	2021= 0.4.% [0.3%- 0.5%]
				2025= 0.2% [0.1%- 0.2%]	2025= 0.1% [0.0%- 0.2%]	2025= 0.6% [0.4%- 0.7%]
Share of households affected		42.3%	7.0%	2021= 2.8% [2.4%- 3.4%]	2021= 1.3% [0.9%- 1.7%]	2021= 2.9% [2.0%- 3.8%]
				2025= 1.8% [1.4%- 2.2%]	2025= 1.1% [0.7%- 2.0%]	2025= 4.1% [2.9%- 5.0%]
Share of households unaffected		57.7%	n/a	n/a	n/a	n/a

Note: Shares may not add up to be equal to the share of households expected to buy a new to the fleet vehicle due to rounding. Source: Ministry calculations based on IDI data

3.8 Wider social benefits of the Feebate Scheme

The wider social impacts such as health, safety and environmental impacts of the Feebate Scheme have been excluded from this SIA because these could not be quantified due to data constraints. It is also unclear whether these impacts will be distributed unevenly amongst segments of the population.

Nevertheless, it is anticipated that the Feebate Scheme would yield health benefits, from reduced emissions of TRAPs, and safety benefits from mode switches towards public transport and active modes. Further research is needed to determine the likely social impacts of the Feebate Scheme on health and safety, as well as on access for households with different income levels and in different locations.

In respect of other TRAPs (e.g. nitrates, sulphates and particulate matter), it is not clear how much, on balance, these would decline and how the reduction would be distributed. The Feebate Scheme might induce some households to retain their existing vehicles, which could emit more TRAPs than their replacements in the absence of the scheme. Nevertheless, on balance, the Feebate Scheme is anticipated to reduce emissions of TRAPs[23] and there could be social benefits to individuals and households, particularly in low-income areas, as they tend to be more exposed to these pollutants[24].

The safety benefits of switching to LEVs are also uncertain. To the extent these vehicles are newer than the vehicles they replace, they should be safer, in which case there will be safety benefits related to a decline in crash-related injuries and fatalities. These benefits would not be restricted to the drivers of

[23] The extent to which transport related air pollution would reduce will depend on how vehicle buyers respond to the policy (eg whether to switch to diesel vehicles or to hold on to existing vehicles for longer).

[24] See Pearce, J. and Kingham, S (2008), "Environmental inequalities in New Zealand: A national study of air pollution and environmental justice", Geoforum, Vol 9, Issue 2, March 2008, Pp. 980-993.
'https://www.sciencedirect.com/science/article/pii/S0016718507001613?via%3Dihub

the LEVs and their passengers. On the other hand, low-income households could decide not to buy a vehicle because of the Feebate Scheme, in which case they could be exposed to the relatively lower level of safety offered by their existing vehicles, compared with the vehicle they might have purchased but for the fees.

There could be health and safety benefits for individuals who decide to switch travel modes rather than buy a light vehicle under the Feebate Scheme. However, the magnitude of these benefits is uncertain and it is not clear how they would be distributed. Whilst mode switching might be more prevalent amongst low-income households, this will depend on their access to suitable public transport alternatives, and whether they are close enough to their destinations to use active modes.

4. Limitations, summary and conclusions

4.1 Limitations

The SIA and the CBA are both subject to limitations owing to lack of information and data, particularly around the likely responses of vehicle importers and buyers to the Feebate Scheme. Further research, particularly on data and modelling requirements, will form part of the Ministry's work in terms of the Domain Plan and Research Strategy.

The results obtained from the Integrated Data Infrastructure (IDI) analysis are not official statistics. The IDI related analysis is subject to estimation errors that might be inherent in the various datasets (e.g. Household Economic Survey). Therefore, it is intended to provide an indicative picture of the characteristics of households that purchased new or used imported light vehicles over the three years to June 2018. The analysis should be repeated when Census 2018 data becomes available during 2019/20.

Three additional limitations are:

- **The analysis ignores the share of buyers who would respond to the Feebate Scheme by switching modes or buying a vehicle already in the fleet.** The preliminary CBA did not estimate the impacts of these behavioural responses and nor does this SIA. Instead, it was assumed that there would be no change in the numbers of light vehicles imported. It would be necessary to refine the CBA and SIA to estimate the likely impact of these possible responses. However, more research would be required to estimate the impacts more accurately, such as by surveying how importers and vehicle buyers might behave under a Feebate Scheme.
- **The SIA also ignores the impact of the Feebate Scheme on business and government buyers of imported light vehicles.** As noted, it is uncertain what the net impact would be, and an SIA should focus on groups of people/households rather than corporate or government entities.
- **This SIA ignores the life-cycle impacts of EVs.** Emissions involved in producing EVs are ignored, the raw materials used to produce EV batteries are scarce, and recycling, repurposing, and disposing of EV batteries is problematic at present. As the number of EVs increases over time, these problems could well be resolved, but there is a risk that if they persist, they could contribute to negative impacts on the environment, partly offsetting the expected environmental benefits of the Feebate Scheme.

- **This SIA does not assess the distribution of the environmental benefits, mostly related to TRAPs, on the most disadvantaged communities.** Research suggests that these are more prone to live in areas that have a higher exposure to TRAPs[25]. The Feebate Scheme is expected to reduce TRAPs and it may be inferred that the most disadvantaged communities will disproportionately benefit from this reduction. However, further research is require to determine the environmental benefits of the feebate scheme on these communities.
- **Engagement with potentially affected communities was not possible in the timeframe.** This could perhaps be planned for the period before implementation or during implementation.

4.2 Discussion

This SIA has been constrained by the quantity and quality of data currently available. In particular, there is no reliable information to help estimate buyer and importer behaviour. Further research to understand the impact of feebates on the domestic and international new and used car markets in New Zealand is required, as well as the price sensitivity of different household groups, and the trade-offs buyers are likely to make between price and vehicle features. Such research will be useful not only for developing vehicle emissions policies, but also for informing vehicle safety and harmful emissions reduction-related policies.

To speed up the transition process to LEVs, measures to incentivise businesses (e.g. vehicle rental companies) to replace their fleets with LEVs could be beneficial, as these vehicles are on-sold to private buyers after only a few years, and because as rental cars they can serve to demonstrate the features and benefits of EVs to customers who might then consider buying them.

Mitigation measures could help low-income households adapt to the changes brought about by the Feebate Scheme. Examples of measures to consider include exemptions for buyers with certain disabilities, facilitating access to finance to buy LEVs, improving access to public transport for low-income households (e.g. the Green Transport Card scheme) and households in remote locations, providing information about affordable alternatives to HEVs, and providing financial incentives to car owners to scrap their older HEVs and purchase LEV replacements.

4.3 Monitoring and evaluation

The results obtained from this analysis are sensitive to the following data and assumptions:

- Any impact on the upfront ownership cost of low-emissions vehicles, particularly hybrids and EVs
- Any changes in the overall volume and mixes of light vehicles to be imported
- Any changes in the age and vehicle features (e.g. power source, engine size, vehicle mass, safety and harmful emissions) of light vehicle imports
- Any changes in the scrappage rates of vehicles
- Any changes in the amount of travel by light vehicles

[25] See Pearce, J. and Kingham, S (2008), "Environmental inequalities in New Zealand: A national study of air pollution and environmental justice", Geoforum, Vol 9, Issue 2, March 2008, Pp. 980-993.

If the Feebate scheme were to be implemented in New Zealand, it would be useful to build in a reporting or monitoring mechanism to collect the above and other related information for monitoring and evaluation purposes.

4.4 Summary and conclusion

Vehicle price premium has been seen as one of the barriers to the adoption of LEVs. The Feebate Scheme aims to lessen this price effect by providing a financial incentive (rebate) to assist light vehicle import purchasers to switch to LEVs. The scheme also sends a pricing signal to deter the purchase of HEVs. The Feebate Scheme can achieve a net benefit to the nation. However, it will affect households that do not amend their vehicle purchasing choices.

According to the preliminary CBA, the Feebate Scheme could deliver, on average, fuel savings benefits of between $2,800 and $8,900 (central estimate of $5,200) to the owner over the economic life of each imported light LEV purchased under the scheme. Therefore, light vehicle import purchasers switching to a LEV could not only benefit from on-going fuel savings but also from any rebates that could be used for offsetting any vehicle cost premium.

Based on vehicle registration predictions and vehicle purchase patterns observed in the three years to June 2018, households that are expected to purchase an imported light vehicle ***in the six years to 2025*** would make up around 42 percent of all New Zealand households.

- A relatively small share of all households are low-income households (9 percent in the six years to 2025 or 1.5 percent per year) and rural households (5 percent in the six years to 2025 or less than 1 percent per year).
- An even smaller share of all households can be categorised as in material hardship (2.6 percent in the six years to 2025 or 0.44 percent per year).

There are uncertainties around how vehicle purchasers would respond to the Feebate Scheme. A scenario analysis has been completed to estimate the possible behavioural changes to determine the size of the groups that would receive a rebate or pay a fee.

Analysis suggests low-income households would be affected in a similar fashion to better-off households, as the patterns of vehicle choices by emissions bands for all income groups are similar. That said, for a given price increase, the impact on low-income households would represent a higher share of their income. On the other hand, rural households (irrespective of income) tend to be affected by the Feebate Scheme more than the urban households because they tend to buy a higher share of HEVs. There is not enough information to disaggregate households in material hardship by emission band on vehicles owned. Therefore, this analysis cannot determine the impact of the policy on households in material hardship.

In the short term, for households that are not able to finance a low-emission vehicle or downsize to a smaller vehicle, they could purchase a replacement vehicle ahead of the policy change, keep their existing vehicles longer, or purchase a vehicle already in the fleet. They could also switch to other travel modes, such as public transport or ride share.

We would expect some low-income households to respond to the scheme in these ways. Households that opt to retain their existing vehicle or to replace their existing vehicle with a used HEV already in the fleet, will incur higher ongoing maintenance and fuel costs and could be relatively more exposed to the risks of lower vehicle safety and reliability. The severity of these impacts would depend on factors such as the availability of alternative transport modes, whether households have the resources to use those modes (e.g. physical ability to walk to work), and whether they have an existing vehicle to retain. On the other hand, households that are willing and able to switch to public transport and/or active modes, or to ride-sharing, would save on vehicle purchase and operating costs and potentially also gain health and safety benefits.

The balance between the costs and benefits of these options is not clear-cut. Some households might have poor access to public transport (particularly in rural or other remote areas) while, for those with better access, the Feebate Scheme could help persuade them to switch to public transport, or partly switch, by not buying a second vehicle. The same applies to active modes: some households might not be located where they can reach their destinations by active modes but, for those that are, the policy might cause a switch to walking or cycling.

In the long term, the market will adjust to minimise any price or choice impacts, particularly as the price of hybrid vehicles and EVs reaches parity with ICEVs. At that time, there may be no continuing need for a Feebate Scheme. These longer-term market developments would benefit all used-vehicle buyers, including low-income households, through a wider choice of LEVs and lower fuel costs.

Appendix 1: Proposed Feebate Schedules

Table 8. Feebate Scheme: examples of rebates and fees (2021-2028): new imported light vehicles

	NEW VEHICLES: CO_2 Emissions Band (gCO_2/km)															
	Hyundai Kona VW eGolf LDV EV80 van	Toyota Prius Prime (PHEV) Kia Niro (PHEV) Mitsubishi Outlander (PHEV)	Mini Countryman (PHEV) BMW 225xe (PHEV)	Toyota Prius (hybrid)	Toyota Camry (hybrid) Lexus CT200h (hybrid) Audi A1 (P)	Suzuki Swift (P) Lexus IS300 (hybrid)	VW Golf (1.4 P) Kia Rio (P) Nissan X-trail (D)	Suzuki Vitara (D) Ford Fiesta (1.5P) BMW 3 Series (P)	Toyota Corolla Ford Focus Suzuki Jimny Mazda CX-3	Mazda 6 Nissan Qashqai Audi Q7 (D)	Kia CERATO Mazda CX-5 Audi Q5 (P) Outlander (D) Outlander (P)	Mitsubishi ASX Ford Endura Honda Odyssey	Kia Sportage (P) Hyundai Tucson (P)	Mitsubishi Triton 4x4(4WD) Toyota RAV4 4x4	Toyota Hilux 4x4 Mazda CX-9 (AWD)	Ford Ranger 4x4 Holden Colorado 4x4 BMW 8 Series V8
Emissions	0 to 4	5 to 49	50 to 69	70 to 89	90 to 105	106 to 120	121 to 130	131 to 140	141 to 150	151 to 160	161 to 170	171 to 180	181 to 190	191 to 200	200 to 225	226 to 250
YEARS	Rebates									Zero			Fees			
2020/21	$8,000	$6,800	$5,800	$4,800	$3,800	$2,800	$1,800	$800	$600	$0	$0	$0	$2,000	$2,250	$2,500	$2,750
	Rebates								Zero			Fees				
2022	$7,200	$6,200	$5,200	$4,200	$3,200	$2,200	$1,200	$200	$0	$0	$0	$1,750	$2,000	$2,250	$2,500	$2,750
	Rebates							Zero			Fees					
2023	$6,500	$5,600	$4,700	$3,800	$2,900	$2,000	$1,100	$0	$0	$0	$1,500	$1,750	$2,000	$2,250	$2,500	$2,750
	Rebates						Zero			Fees						
2024	$6,300	$5,200	$4,100	$3,000	$1,900	$800	$0	$0	$0	$1,250	$1,500	$1,750	$2,000	$2,250	$2,500	$2,750
	Rebates					Zero			Fees							
2025	$6,000	$4,700	$3,400	$2,100	$800	$0	$0	$0	$1,000	$1,250	$1,500	$1,750	$2,000	$2,250	$2,500	$2,750
	Rebates				Zero			Fees								
2026	$5,600	$4,100	$2,600	$1,100	$0	$0	$0	$750	$1,000	$1,250	$1,500	$1,750	$2,000	$2,250	$2,500	$2,750
	Rebates				Zero			Fees								
2027	$4,500	$3,300	$2,100	$900	$0	$0	$0	$750	$1,000	$1,250	$1,500	$1,750	$2,000	$2,250	$2,500	$2,750
	Rebates			Zero			Fees									
2028	$4,200	$2,500	$800	$0	$0	$0	$500	$750	$1,000	$1,250	$1,500	$1,750	$2,000	$2,250	$2,500	$2,750

Note: This SIA has analysed the potential distributive impacts of the feebate schedule for the period 2020-2025. The above illustrates the progression of the fees and rebates beyond 2025.

Table 9. Feebate Scheme: examples of rebates and fees (2021-2028): used imported light vehicles

USED VEHICLES: CO_2 Emissions Band (gCO_2/km)																	
	Nissan Leaf Mitsubishi MiEV	Holden Volt (PHEV) Mitsubishi Outlander (PHEV) Toyota Prius (PHEV)	2016 BMW 740e (PHEV) 2016 Mercedes C350 (PHEV)	Porsche Cayenne (PHEV) Porsche Panamera (PHEV) Toyota Yaris/Vitz	Toyota Prius (hybrid) Honda Insight (hybrid) Fiat 500 (P) 2016 Renault Megane (D)	Toyota Camry (hybrid) Ford Fiesta (P) Hyundai i30 (D)	Lexus GS300 (hybrid) BMW 318(D) Skoda Fabia (P)	Citroen C3 (1.4P) BMW 116 (P) BMW 3 (hybrid)	Ford Focus (D) Holden Cruze (D) Lexus RX450 (hybrid)	Mitsubishi Outlander (D) Honda Jazz (1.5P)	Holden Cruze (P) Ford Modeo (D) Nissan Pulsar (P)	Corolla (P) Skoda Superb (P) Mazda CX-5 AWD (P) Mitsubishi Outlander (P)	Camry (P) Nissan Tiida (P) Mazda 3 (P) Ford Kuga (P)	Ford Focus (P) Kia Sportage (D) Nissan X-trail (D) Nissan Dualis (P)	Ford Falcon 6 Holden Commodore SV6 Honda Odyssey	Ford Territory (D) Holden Colorado (D)	Holden Commodore V8 Range Rover Toyota LandCruiser
Emissions	**0 to 4**	**5 to 49**	**50 to 69**	**70 to 89**	**90 to 105**	**106 to 120**	**121 to 130**	**131 to 140**	**141 to 150**	**151 to 160**	**161 to 170**	**171 to 180**	**181 to 190**	**191 to 200**	**200 to 225**	**226 to 250**	**over 251**
YEARS	**Rebates**									**Zero**			**Fees**				
2020/21	**$2,600**	**$2,300**	**$2,000**	**$1,700**	**$1,400**	**$1,100**	**$800**	**$500**	**$200**	**$0**	**$0**	**$0**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates								**Zero**			**Fees**					
2022	**$2,400**	**$2,100**	**$1,800**	**$1,500**	**$1,200**	**$900**	**$600**	**$300**	**$0**	**$0**	**$0**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates							**Zero**			**Fees**						
2023	**$2,200**	**$1,900**	**$1,600**	**$1,300**	**$1,000**	**$700**	**$400**	**$0**	**$0**	**$0**	**$900**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates						**Zero**			**Fees**							
2024	**$2,200**	**$1,900**	**$1,600**	**$1,300**	**$1,000**	**$700**	**$0**	**$0**	**$0**	**$800**	**$900**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates					**Zero**			**Fees**								
2025	**$2,100**	**$1,700**	**$1,300**	**$900**	**$500**	**$0**	**$0**	**$0**	**$700**	**$800**	**$900**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates				**Zero**			**Fees**									
2026	**$2,100**	**$1,700**	**$1,300**	**$900**	**$0**	**$0**	**$0**	**$600**	**$700**	**$800**	**$900**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates				**Zero**			**Fees**									
2027	**$2,100**	**$1,600**	**$1,100**	**$600**	**$0**	**$0**	**$0**	**$600**	**$700**	**$800**	**$900**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**
	Rebates			**Zero**			**Fees**										
2028	**$2,100**	**$1,600**	**$1,100**	**$0**	**$0**	**$0**	**$500**	**$600**	**$700**	**$800**	**$900**	**$1,000**	**$1,100**	**$1,200**	**$1,300**	**$1,400**	**$1,500**

Note: This SIA has analysed the potential distributive impacts of the feebate schedule for the period 2020-2025. The above illustrates the progression of the fees and rebates beyond 2025.

Appendix 2: Different measures of household vulnerability

There are different measures to identify households that are potentially vulnerable to negative impacts from transport-related policies. They include:

- **Income-based measures** – these are based on median, equivalised, disposable household income[26]. While income-based measures provide a good indication of ability to pay, they do not account for wealth and consumption. Because income measures are typically household-based, they are useful for understanding the relative income position at the household level.
- **Deprivation and hardship measures** – there are different level of hardship measures, ranging from deprivation, material hardship to severe material hardship. Examples of such measures include the NZ Deprivation Index 2013, developed by the University of Otago; the NZ Index of Multiple Deprivation (IMD), developed by The University of Auckland; the Material Wellbeing Index (WMI) and DEP-17 scores developed by the Ministry of Social Development; and the Material and Social Deprivation Index, by Eurostat (EU-13). The IMD measure is area-based and therefore does not provide information at the household or individual level, whereas the DEP-17 measure relies on a small sample size and cannot be broken down by emission band on vehicles owned.

As these measures have different bases, different pictures can emerge depending on which measure is used. This appendix explains these measures briefly and outlines some similarities and differences between them, from the perspectives of analysing the impacts of the VFES or the Feebate schemes.

Income-based measure

The VFES and Feebate SIAs define low-income households as those earning less than 60 percent of the median, equivalised, disposable household income, before deducting housing costs ($40,900 in 2017/18). The disposable income is "equivalised" to allow comparison across various household sizes and compositions. Disposable income refers to the level of total household gross income, after tax is deducted. Equivalised, disposable income includes income from all sources such as social benefits, investment income and salary from paid employment, etc.

This SIA uses household equivalised income as an indicator of vulnerability because it indicates the affordability of, or the ability to pay for, an increase in cost burden. In this case, there could be an increase in the prices of certain imported vehicles.

The New Zealand Index of Multiple Deprivation (IMD)

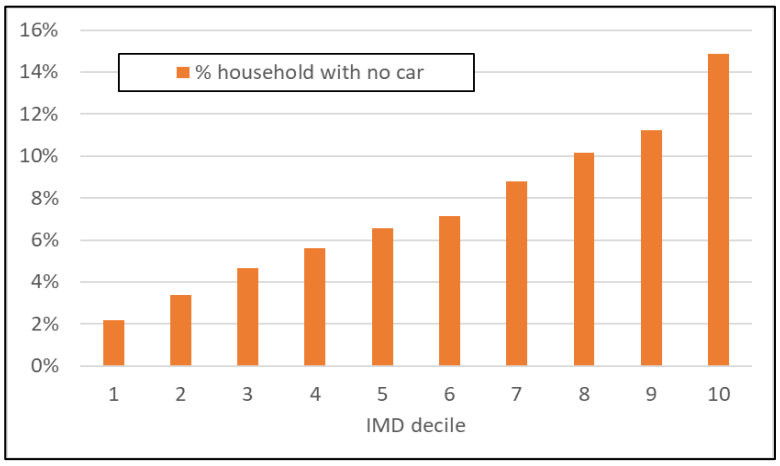
The New Zealand Index of Multiple Deprivation (IMD) measures deprivation at the neighbourhood level in custom-designed data zones that have an average population of 712. Data zones are aggregations of census meshblocks. The meshblock is the smallest geographic unit for which statistical data is collected and processed by Statistics New Zealand. A meshblock is a defined geographic area, varying in size from part of a city block to large areas of rural land. The IMD uses routinely collected data from government

[26] Statistics New Zealand uses six different measures based on different cut-off rates (50% or 60%) and treatment of housing costs

departments, census data and methods comparable to current international deprivation indices, to measure different forms of disadvantage. It comprises 28 indicators grouped into seven domains of deprivation: Employment, Income, Crime, Housing, Health, Education and Access to services. Figure 6 below shows the percentage of households that do not own a light vehicle by IMD decile. This clearly indicates the relationship between car ownership and the level of deprivation. Even in the most deprived areas, however, at least 85 percent of households do own a light vehicle. In the next six years, it is unclear whether or not these households:

- would want or need to purchase an imported light vehicle,
- would (or could) amend their vehicle choices in light of the proposed policy, and
- could afford such a vehicle.

Figure 6: Percentage of households that do not own a light vehicle, by IMD decile



Source: IMD and Census 2013 data

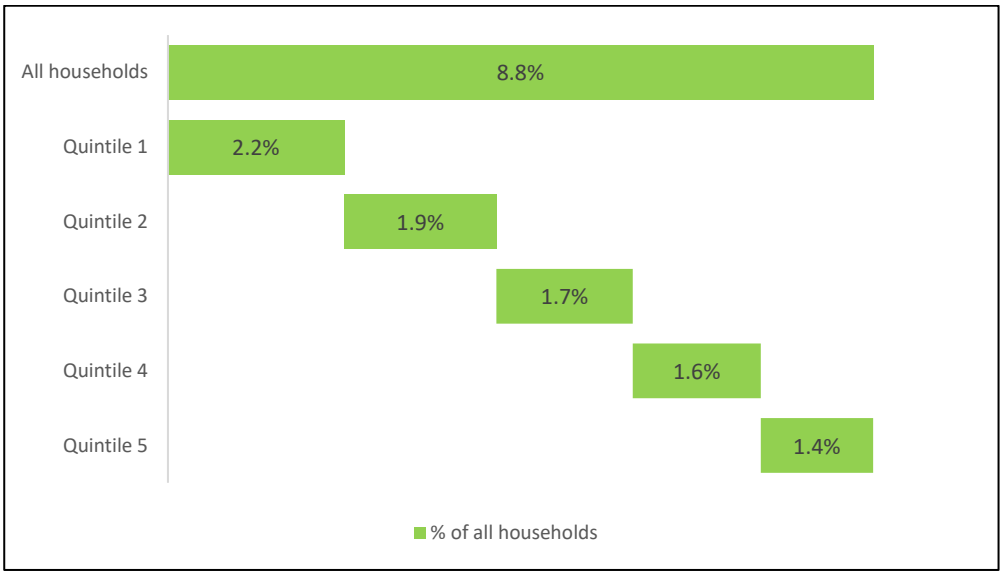
The New Zealand Deprivation Index (NZDep)

The New Zealand Deprivation Index (NZDep) combines census data (2013) relating to income, home ownership, employment, qualifications, family structure, housing, access to transport and communications. The index provides a deprivation score for each meshblock in New Zealand. Meshblocks are the smallest geographical areas defined by Statistics New Zealand, with a population of around 60–110 people each. The deprivation index groups the deprivation scores of meshblocks into deciles, with the highest scores representing the most deprived areas. The deprivation index estimates the relative socioeconomic deprivation of an area and does not account for the different levels of deprivation of each individual (or household) within a meshblock. The indicators used to generate the index may also change over time, depending on their relation to deprivation.

The NZ Transport Agency completed a high-level analysis of the relationship between motor vehicle imports (both new and used) and the socioeconomic profile of New Zealand households. Households were segmented into quintiles based on NZDep 2013 and this data was merged with the information in the Motor Vehicle Register. The analysis found that an annual average of 1.4 percent of households in the most deprived areas (quintile 5) purchased at least one imported light vehicle during the period 2015-2018 (see Figure 7). This figure is very similar to the one identified using the income-based measure (of 1.5 percent, see Section 3.2).

Figure 7: Percentage of households (based on NZDep2013) that purchased an imported light vehicle – annual average (2015-2018 calendar years) by income quintile

(Quintile 1: least deprived – Quintile 5: most deprived)



Source: NZ Transport Agency

Measures of material hardship

The three types of material hardship measures[27] are outlined below:

- *Material wellbeing index (MWI)* - The MWI is made up of 24 items that give direct information on the day-to-day actual living conditions that households experience. These items include food, clothes, accommodation, electricity, transport, keeping warm, maintaining household appliances in working order, and so on, and also about the freedoms households have to purchase and consume non-essentials that are commonly aspired to. Statistics New Zealand and Ministry of Social Development believe this index gives the same results at the DEP-17.
- *DEP-17* – According to Statistics New Zealand, the DEP-17 index focuses on the low living standards end of the spectrum. Statistics New Zealand and Ministry of Social Development believe the index gives the same results as the MWI when looking at the bottom quintile (20 percent), but the DEP-17 scoring may seem more intuitive (e.g. a score of 6+/17 simply means "missing 6 or more basics from the list of 17").
- *Material and Social Deprivation Index by Eurostat EU-13* - this 13-item index is used in Europe and we use it to monitor how New Zealand ranks internationally – it ranks households in much the same order as DEP-17 does. However, currently the Household Economic Survey questions are not the same as EU-13, so they are not directly comparable internationally.

[27] Perry, B (2017), "The material wellbeing of NZ households: Overview and key findings", Ministry of Social Development, Wellington.

An analysis of households that purchased a new or used imported vehicle between 2015 and 2018 using DEP-17[28] indicates that just under 7 percent of all households are in a state of material hardship. Table 10 below compares the proportion of households that purchased imported light vehicles in 2015-2018 by household status (based on income or material hardship measures). It shows that higher shares of households with higher incomes, and of those that are not in material hardship, purchased light vehicle imports. However, it also indicates that around 20 percent of households in material hardship purchased vehicles in the three years to June 2018. However, the extent to which these households want or need to purchase an imported light vehicle in the next six years, whether they would or could amend their vehicle choices and whether they could afford such vehicles is unclear.

Due to the relatively small sample size used for the DEP-17, which consists of 12,500 households over a 3-year period, estimates based on material hardships are subject to higher estimation errors.

Table 10: Light vehicle imports purchase by household characteristics (July 2015 – June 2018)

July 2015 – June 2018 - light vehicle imports purchased, by household characteristics • Material hardship – DEP-17 6 or above • Low income - Less than 60% median disposable HH income	% bought new or used imports	% did not buy (note)	Share of all NZ households	
			Based on DEP-17	Based on income-measure
Households in material hardship	**20%**	**80%**	**7%**	**n/a**
Households not in material hardship	**31%**	**69%**	**93%**	**n/a**
All households based on material hardship measure	**30%**	**70%**	**100%**	**100%**
Estimates based on income-based measure				
Low-income households	**19%**	**81%**	**-**	**-**
All households based on income measure	**28%**	**72%**	**-**	**-**

Note: The above do not sum to the same totals as the income-based analysis due to the smaller sample size used in the HES and DEP-17 work.

Table 11 shows the proportion of households purchased a light vehicle import in the three years to June 2018 by main household income source. It shows that a lower share of households (between 13 and 20 percent) with benefits as the main income source purchased a light vehicle imports compared to other households. For example, between 27 (low-income) and 32 percent (other income) of households with earnings as the main income purchased a light vehicle imports in the three years to June 2018. Low-income households with NZ Superannuation as the main income source account for just 8.6 percent of all NZ Households. There are another 7.9 percent that belong to other income groups (i.e. there are 16.4 percent of all NZ households receiving NZ Superannuation as the main income source).

[28] Integrated Data Infrastructure and MVR, Treasury, June 2019

Table 11: Light vehicle imports purchased, by main income source (July 2015 – June 2018)

July 2015 – June 2018 June years - light vehicle imports purchase HH income and main income source	% bought new or used imports	% did not buy (note)	Share of all NZ households
Low income - NZ superannuation	16%	84%	8.6%
Low income - benefits	13%	87%	5.2%
Low income - earnings	27%	73%	7.9%
Low income - other/none	18%	82%	2.6%
Not low income - NZ superannuation	20%	80%	7.9%
Not low income - benefits	16%	84%	2.0%
Not low income - earnings	32%	68%	64.4%
Not low income - other/none	27%	73%	1.5%
Total – this table	**28%**	**72%**	**100%**
Previous estimates based on income-based measure only			
Low income households	**19%**	**81%**	-
All households	**28%**	**72%**	-

Note: The above might not sum to the same totals due to disaggregation of information.

Appendix 3: Analysis of integrated data on Motor Vehicle Registrations (MVR), Household Labour Force Survey (HLFS) and Household Economic Survey (HES)

Unless otherwise indicated, the data and estimates included in this Appendix are sourced from an analysis of Statistics New Zealand's IDI-linked data carried out by New Zealand Treasury.

Table 12. Description and characteristics of household profiles and vehicle ownership

Household profiles	**Estimated total number of households**		**Estimated number of low-income households (see note below)**		**Estimated number of low-income households that do not own a vehicle**		**Estimated number of vehicles currently registered to low-income households**		**Estimated number of low-income households that purchased at least one vehicle during July 2015 to June 2018**		**Estimated number of vehicles purchased by low-income households during July 2015 to June 2018**	
One-person household	382,100	21%	159,700	36%	66,200	48%	145,000	22%	16,400	19%	18,900	18%
Couple only	490,600	27%	93,200	21%	15,500	11%	168,900	26%	23,200	28%	29,500	28%
Couples with 1 or 2 dependent children only	292,600	16%	34,000	8%	7,000	5%	67,900	11%	10,900	13%	14,800	14%
Couples with 3+ dependent children only	82,500	4%	20,700	5%	3,600	3%	48,600	8%	7,000	8%	8,500	8%
All other couples with children	157,700	9%	17,500	4%	3,100	2%	47,000	7%	5,200	6%	7,200	7%
One parent with dependent child(ren) only	92,200	5%	47,400	11%	17,700	13%	53,900	8%	5,600	7%	6,700	6%
All other one-parent with child(ren)	74,900	4%	18,200	4%	5,400	4%	28,400	4%	3,300	4%	4,100	4%
All other households	261,600	14%	54,000	12%	18,700	14%	86,100	13%	12,700	15%	17,100	16%
Total	**1,834,200**	**100%**	**444,700**	**100%**	**137,200**	100%	**645,700**	**100%**	**84,200**	**100%**	**106,700**	**100%**
Share of total number of households	**100%**		**24.2%**		**7.5%**		**-**		**4.6%**		**-**	
Share of low-income households	**-**		**-**		**30.9%**		**-**		**18.9%**		**-**	
Share of total number of registered vehicles	**-**		**-**		**-**		**18.2%**		**-**		**16.1%**	
Further breakdowns of low-income households	**Estimated total number of households**		**Estimated number of low-income households (see note below)**		**Estimated number of low-income households that do not own a vehicle**		**Estimated number of vehicles currently registered to low-income households**		**Estimated number of low-income households that purchased at least one vehicle during July 2015 to June 2018**		**Estimated number of vehicles purchased by low-income households during July 2015 to 2018**	
Total households	**1,834,200**	**100%**	**444,700**	**100%**	**137,200**	**100%**	**645,700**	**100%**	**84,200**	**100%**	**106,700**	**100%**
Households with Māori or Pasifika members	412,000	23%	109,900	25%	39,500	29%	168,100	26%	18,000	21%	21,900	21%
Households without Māori or Pasifika members	1,422,200	77%	334,800	75%	97,500	71%	477,600	74%	66,200	79%	84,800	79%
Households with members aged 65 or over	492,100	27%	188,000	42%	56,400	41%	237,200	37%	30,700	36%	37,400	35%
Households without members aged 65 or over	1,342,100	73%	256,700	58%	80,600	59%	408,500	63%	53,500	64%	69,300	65%

Note: Low-income households are classified as those with an annual equivalised disposable income which is less than $24,540 (or less than 60% of the median household income of $40,900 in 2017/18).

The shares of new or used imports for rural households compared to the remaining households based on data for the three years to June 2018 are shown in the tables below.

Table 13. Estimated share of new and used imported light vehicles (July 2015 – June 2018) – rural households

July 2015 – June 2018	New imports	Used imports
Rural households	17%	8%
The remaining households	83%	92%
Sub-total	**100%**	**100%**

Table 14. Estimated share of total imported light vehicles (July 2015 – June 2018) – rural households

July 2015 – June 2018	New imports	Used imports	New + used
Rural households	6%	5%	12%
The remaining households	31%	57%	88%
Sub-total	**37%**	**63%**	**100%**

The shares of new or used imports for low-income households compared to the remaining population based on data for the three years to June 2018 are shown in the tables below.

Table 15. Estimated share of imported light vehicles (July 2015 – June 2018) – low income households

July 2015 – June 2018	New imports	Used imports
Low-income households	16.4%	16.1%
The remaining households	83.6%	83.9%
Sub-total	**100%**	**100%**

Table 16. Estimated share of total imported light vehicles (July 2015 – June 2018) – low income households

July 2015 – June 2018	New imports	Used imports	New + used
Low income households	6%	10%	**16%**
The remaining households	31%	52%	**84%**
Sub-total	**37%**	**63%**	**100%**

The shares of new or used imports by low-income household segments based on data for the three years to June 2018 are shown in the tables below.

Table 17. Estimated share of imported light vehicles registered to low income household segments (July 2015–June 2018)

Low-income household segments	%new	% used	total
1. One-person household	48%	52%	100%
2. Couple only	64%	36%	100%
3. Couples with 1 or 2 dependent children only	28%	72%	100%
4. Couples with 3+ dependent children only	18%	82%	100%
5. All other couples with children	29%	71%	100%
6. One parent with dependent child(ren) only	13%	87%	100%
7. All other one parent with child(ren)	24%	76%	100%
8. All other households	17%	83%	100%
Total	**38%**	**62%**	**100%**

Table 18. Estimated share of total imported light vehicles registered to low-income household segments (July 2015 – June 2018)

Low-income household segments	%new	% used	total
1. One-person household	8%	9%	18%
2. Couple only	18%	10%	28%
3. Couples with 1 or 2 dependent children only	4%	10%	14%
4. Couples with 3+ dependent children only	1%	7%	8%
5. All other couples with children	2%	5%	7%
6. One parent with dependent child(ren) only	1%	5%	6%
7. All other one parent with child(ren)	1%	3%	4%
8. All other households	3%	13%	16%
Total	**38%**	**62%**	**100%**

Table 19. Estimated shares of imported light vehicles registered to low-income households with and without Māori or Pasifika members (July 2015 – June 2018)

Low income households with and without Māori or Pasifika members	%new	%used	Total
Households with one or more Māori or Pasifika members	18%	82%	100%
Other low-income households	43%	57%	100%
Total	**38%**	**62%**	**100%**

Table 20. Estimated shares of total imported light vehicles registered to low-income households with and without Māori or Pasifika members (July 2015 – June 2018)

Low income households with and without Māori or Pasifika members	% new	% used	Total
Households with one or more Māori or Pasifika members	4%	17%	21%
Other low-income households	34%	45%	79%
Total	**38%**	**62%**	**100%**

Table 21. Estimated shares of imported light vehicles registered to low-income households with and without members aged 65 and over (July 2015 – June 2018)

Low income households with and without members aged 65 and over	% new	% used	Total
Households with members aged 65 and over	63%	36%	100%
Other low-income households	24%	76%	100%
Total	**38%**	**62%**	**100%**

Table 22. Estimated shares of total imported light vehicles registered to low-income households with and without members aged 65 and over (July 2015 – June 2018)

Low income households with and without members aged 65 and over	% new	% used	Total
Households with members aged 65 and over	22%	13%	35%
Other low-income households	16%	49%	65%
Total	**38%**	**62%**	**100%**

Appendix 4: Share of Light Vehicle Imports and Household Category

Unless otherwise indicated, the data and estimates included in this Appendix, exclude light vehicle imports purchased by companies and government entities. The *'flexible'* scenario assumes that 30 percent more households receive a rebate on the purchase of a LEV relative to the central estimate, while the *'rigid'* scenario assumes 30 percent more households incur a fee on the purchase of a HEV relative to the central estimate.

The data used to compile these tables was sourced from modelling carried out by the Ministry and linked with data provided by Treasury through Statistics New Zealand's IDI (Integrated Data Infrastructure).

Table 23. Feebate Scheme impacts on new imports in 2021 by household income & location

Estimated share of New Vehicle imports in 2021 by Household Category, Feebate Eligibility & Sensitivity Scenario															
	That are expected to:														
That are Purchased by:	Receive a Rebate				Be Exempted				Pay a Fee				Total Vehicles		
	Flexible	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*
All household types	37%	28%	20%		29%	24%	16%		34%	49%	63%		100%	100%	100%
Low income households	46%	36%	30%		26%	24%	18%		28%	40%	52%		100%	100%	100%
Other households	35%	26%	18%		29%	24%	16%		35%	50%	66%		100%	100%	100%
Total	**37%**	**28%**	**20%**		**29%**	**24%**	**16%**		**34%**	**49%**	**63%**		**100%**	**100%**	**100%**
Urban households	40%	**30%**	24%		28%	**25%**	18%		31%	**45%**	58%		100%	100%	100%
Rural households	20%	**15%**	11%		33%	**18%**	15%		47%	**67%**	74%		100%	100%	100%
Total	**37%**	**28%**	**21%**		**29%**	**24%**	**17%**		**34%**	**49%**	**61%**		**100%**	**100%**	**100%**

Table 24. Feebate Scheme impacts on new imports in 2025 by household income and location

Estimated share of New Vehicle imports in 2025 by Household Category, Feebate Eligibility & Sensitivity Scenario															
	That are expected to:														
That are Purchased by:	Receive a Rebate				Be Exempted				Pay a Fee				Total Vehicles		
	Flexible	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*
All household types	27%	25%	21%		28%	11%	8%		45%	64%	70%		100%	100%	100%
Low income households	48%	44%	38%		21%	12%	6%		30%	43%	56%		100%	100%	100%
Other households	23%	21%	17%		29%	11%	8%		48%	68%	75%		100%	100%	100%
Total	**27%**	**25%**	**21%**		**28%**	**11%**	**8%**		**45%**	**64%**	**72%**		**100%**	**100%**	**100%**
Urban households	30%	**27%**	18%		27%	**12%**	3%		42%	**61%**	79%		100%	100%	100%
Rural households	12%	**11%**	7%		32%	**9%**	5%		56%	**80%**	88%		100%	100%	100%
Total	**27%**	**25%**	**16%**		**28%**	**11%**	**3%**		**45%**	**64%**	**80%**		**100%**	**100%**	**100%**

Table 25. Feebate Scheme impacts on used imports in 2021 by household income & location

Estimated share of Used Vehicle imports in 2021 by Household Category, Feebate Eligibility & Sensitivity Scenario															
	That are expected to:														
That are Purchased by:	Receive a Rebate				Be Exempted				Pay a Fee				Total Vehicles		
	Flexible	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*
All household types	55%	49%	44%		20%	15%	10%		25%	36%	46%		100%	100%	100%
Low income households	58%	52%	47%		19%	15%	10%		23%	33%	43%		100%	100%	100%
Other households	54%	48%	43%		20%	15%	10%		25%	36%	47%		100%	100%	100%
Total	**55%**	**49%**	**44%**		**20%**	**15%**	**10%**		**25%**	**36%**	**46%**		**100%**	**100%**	**100%**
Urban households	55%	**50%**	44%		20%	**15%**	10%		25%	**35%**	46%		100%	100%	100%
Rural households	48%	**41%**	35%		23%	**17%**	11%		29%	**42%**	54%		100%	100%	100%
Total	**55%**	**49%**	**44%**		**20%**	**15%**	**10%**		**25%**	**36%**	**46%**		**100%**	**100%**	**100%**

Table 26. Feebate Scheme impacts on used imports in 2025 by household income & location

Estimated share of Used Vehicle imports in 2025 by Household Category, Feebate Eligibility & Sensitivity Scenario															
	That are expected to:														
That are Purchased by:	Receive a Rebate				Be Exempted				Pay a Fee				Total Vehicles		
	Flexible	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*		*Flexible*	*Central*	*Rigid*
All household types	33%	27%	19%		28%	18%	10%		38%	55%	71%		100%	100%	100%
Low income households	33%	26%	18%		29%	19%	11%		38%	55%	71%		100%	100%	100%
Other households	33%	27%	19%		28%	18%	10%		38%	55%	71%		100%	100%	100%
Total	**33%**	**27%**	**19%**		**28%**	**18%**	**10%**		**38%**	**55%**	**71%**		**100%**	**100%**	**100%**
Urban households	34%	**27%**	19%		28%	**19%**	11%		38%	**54%**	71%		100%	100%	100%
Rural households	30%	**26%**	17%		28%	**14%**	5%		42%	**60%**	79%		100%	100%	100%
Total	**33%**	**27%**	**19%**		**28%**	**18%**	**10%**		**38%**	**55%**	**71%**		**100%**	**100%**	**100%**

Appendix 5: Breakdown of the estimated number of households in New Zealand and households that might purchase light vehicle imports in 2020-2025

Breakdown of the estimated total number of households in New Zealand

total number of low-income households	=	A	=	444,700
total number of other income households	=	B	=	1,389,500
total number of all NZ households	=	A + B	=	1,834,200
total number of low-income rural households	=	C1	=	51,600
total number of low-income urban households	=	D1	=	393,100
total number of other income rural households	=	C2	=	158,400
total number of other income urban households	=	D2	=	1,231,100
total number of all NZ households	=	C + D	=	1,834,200
Low income households as a % of total NZ households	=	A / (A + B)	=	24%
Other income households as a % of total NZ households	=	B / (A + B)	=	76%
				= 100%
Low-income, Rural households as a % of total NZ households	=	C1 / (C + D)	=	3%
ow-income, Urban households as a % of total NZ households	=	D1 / (C + D)	=	21%
ther income, Rural households as a % of total NZ households	=	C2 / (C + D)	=	9%
her income, Urban households as a % of total NZ households	=	D2 / (C + D)	=	67%
				= 100%

Breakdown of the estimated number of households that might purchase light vehicle imports in 2020-2025

Low income households might purchase a light vehicle imports 2020-2025	=	E	=	168,600
Other income households might purchase a light vehicle imports 2020-2025	=	F	=	606,900
Total households might purchase a light vehicle imports 2020-2025	=	E + F	=	775,500
Total number households that might purchase a light vehicle imports during 2020-2025 as a % of total NZ households	=	(E + F) / (A + B)	=	42%
Total number households that might NOT purchase a light vehicle imports during 2020-2025 as a % of total NZ households	=	(A + B - E - F) / (A + B)	=	58%
				= 100%
Low income households that might purchase a light vehicle imports during 2020-2025 as a % of total NZ households	=	E / (A + B)	=	9%
Other income households that might purchase a light vehicle imports during 2020-2025 as a % of total NZ households	=	F / (A + B)	=	33%
				= 42%

Source Treasury's IDI analysis and CBA model

Appendix 6: Top 20 most popular vehicles for low-income households

Table 27. Top 20 most popular new light vehicles imported from July 2015 to June 2018 for low-income households

Make	Model	Count	Vehicle Type	Tare Weight (kg) > X to <= Y	Indicative CO_2 g/km	Indicative low price	Indicative high price
TOYOTA	COROLLA	1480	Sedan/Wagon	1000-1400	131-155	$28,990	$39,490
HONDA	HR-V	1360	SUV	1200-1400	155-162	$29,990	$39,990
HONDA	JAZZ	1350	small ICEV	1000-1200	119-124	$21,990	$26,790
SUZUKI	SWIFT	1180	small ICEV	up to 1,000	112-145	$21,990	$29,900
FORD	RANGER	1110	Ute	1400-1800	198-229	$30,000	$60,000
KIA	SPORTAGE	1080	SUV	1400-1800	141-200	$30,000	$60,000
TOYOTA	HILUX	930	Ute	1600-2200	161-191	$30,000	$60,000
TOYOTA	YARIS	800	small ICEV	1000-1200	122-151	$20,000	$30,000
MITSUBISHI	TRITON	800	Ute	1800-2000	161-181	$40,000	$60,000
VOLKSWAGEN	TIGUAN	790	SUV	1400-1800	122-181	$40,000	$80,000
MAZDA	CX-5	770	SUV	1400-1600	151-181	$40,000	$70,000
MITSUBISHI	MIRAGE	710	Small ICEV	up to 1000	112-122	$10,000	$20,000
TOYOTA	RAV4	710	SUV	1600-1800	198	$32,990	$52,990
NISSAN	QASHQAI	630	small ICEV	1200-1400	159-178	$36,270	$44,990
SUZUKI	VITARA	630	small SUV	1000-1200	123-145	$27,990	$33,990
MAZDA	CX-3	590	small SUV	1200-1400	130-161	$30,000	$50,000
HYUNDAI	TUCSON	580	small SUV	1400 - 1600	185	$23,200	$32,950
MAZDA	MAZDA3	570	small ICEV	1200-1400	134	$28,990	$32,795
KIA	CERATO	560	small ICEV	1200-1400	158-167	$31,990	$41,990
HOLDEN	CAPTIVA	550	small SUV	1600-1800	178-235	$40,990	$56,990

Data sources:

1. Treasury's IDI analysis completed in March 2019.
2. New cars price information was downloaded from http://www.nzautocar.co.nz/prices-a-e.html on 15 March 2019.

Table 28. Top 20 most popular used light vehicles imported from July 2015 to June 2018 for low-income households

Make	Model	Count	Vehicle Type	Tare Weight (kg) > X to <= Y	Indicative CO_2 g/km	Indicative low price	Indicative high price
NISSAN	TIIDA	3180	small ICEV	1200 - 1400	125 - 185	$6,000	$10,000
SUZUKI	SWIFT	3010	small ICEV	up to 1000	120 - 190	$6,000	$11,000
HONDA	FIT	2320	small ICEV	1000-1200	129 - 166	$5,000	$7,000
TOYOTA	WISH	2220	MPV	1400 -1600	159	$7,000	$14,000
MAZDA	DEMIO	2180	Hatchback ICE	1000 - 1200	120 – 145	$9,000	$13,000
TOYOTA	VITZ	1900	small ICEV	1000-1200	117 – 164	$5,000	$14,000
TOYOTA	PRIUS	1580	hybrid	1,200-1,400	80	$9,000	$15,000
MAZDA	MPV	1380	MPV	1800 - 2000	240	$10,000	$22,000
MAZDA	AXELA	1310	ICEV	1200 - 1400	130 - 200	$8,000	$12,000
TOYOTA	HIACE	1300	light van	1600 - 1800	234 - 292	$15,000	$29,000
TOYOTA	ESTIMA	1260	MPV PEHV	1600 - 1800	116	$9,000	$25,000
HONDA	ODYSSEY	1180	MPV	1800 -2000	178 - 218	$6,000	$14,000
NISSAN	NOTE	1140	ICEV	1000 - 1200	119 - 159	$5,000	$10,000
TOYOTA	MARKX	1060	MPV	1400 - 1600	187	$10,000	$15,000
SUBARU	LEGACY	1040	wagon	1400 - 1600	198	$7,000	$17,000
MITSUBISHI	OUTLANDER	1030	MPV	1600 - 1800	215 - 240	$9,000	$19,000
MAZDA	PREMACY	1000	MPV	1200 - 1400	234 - 370	$5,000	$11,000
NISSAN	DUALIS	970	SUV	1400-1600	194.635	$8,000	$15,000
HONDA	STREAM	950	large ICEV	1400-1600	157	$5,000	$14,000
TOYOTA	COROLLA	940	Sedan/Wagon	1000-1400	131.7-155.2	$6,000	$13,000

Data sources:

1. The list of most popular vehicle makes and models is sourced from Treasury's IDI analysis completed in March 2019.
2. Emissions and used cars prices shown in this table are indicative only. They were obtained from Trade-Me based on vehicles manufactured between 2009 and 2010 (searched performed on 29 March 2019) and do not represent the actual emission level or price paid for the vehicles purchased during 2015-2018.

References

[1] Covec, “Improving the Fuel Economy of New Zealand's Light Fleet,” 2017.

[2] Eftec, “Demand for Cars and their Attributes,” Department for Transport, UK, 2008.

[3] Carbon Pulse, “carbon-pulse.com,” Carbon Pulse, 2018. [Online]. Available: https://carbon-pulse.com/category/eu-ets/.

[4] Comm Trade, “Commtrade.co.nz,” Comm Trade, 2018. [Online]. Available: https://www.commtrade.co.nz/.

[5] United States Environment Protection Agency, “Technical Update of the Social Cost of Carbon for Regulatory Impact Analysis,” Under Executive Order 12866, May 2013, Revised August 2016.

[6] New Zealand Transport Agency, “Motor Vehicle Register,” Wellington, 2017.

[7] Ministry of Transport, “Quarterly vehicle fleet statistics,” 2017. [Online].

[8] Ministry of Transport, “New Zealand Transport Outlook: Future State,” Wellington, 2017.

[9] Ministry of Transport, “Household Travel Survey,” New Zealand, 2015.

[10] Huce C and Lucinda C, *The Market Impact and the Cost of Environmental Policy: Evidence from the Swedish Green Car Rebate,* Munich: MPRA Paper No 48905, 2013.

[11] Beresteanu A and LI S, “Gasoline Prices, Government Support, and the Demand for Hybrid Vehicles in the US,” *Internetional Economic Review,* pp. 161-182, 52(1).

[12] Gallagher KS and Muehlegger E, “Giving green to get green? Incentives and consumer adoption of hybrid vehicle technology,” *Journal of Environmental Economics and Management,* 2010.

[13] Ministry of the Environment, “New Zealand’s Seventh National Communication,” Wellington, December 2017.

[14] New Zealand Transport Agency, “Economic Evaluation Manual,” Wellington, 2016.

[15] Ministry of Business, Innovation & Employment, “New Zealand’s Energy Outlook 2011,” Wellington, 2012.

[16] Ministry of Transport, “Used Electric Vehicle Registrations 2015, 2016,” 2018.

[17] Ministry for the Environment, “New Zealand’s 2030 climate change target,” December 2016.

[18] Ministry for the Environment, “New Zealand's climate change programme,” April 2018.

[19] Ministry of Transport, “New Zealand Transport Outlook: Future State,” Wellington, 2017.

[20] Ministry for the Environment, “New Zealand’s Seventh National Communication,” Wellington, December 2017.

[21] New Zealand Transport Agency, “Economic Evaluation Manual,” Wellington, 2016.

[22] New Zealand Productivity Commission, “Low Emissions Economy (Draft Report),” Available from www.productivity.govt.nz/inquiry-content/low-emissions-draft-report, April 2018.

[23] Senatla. M., Merven. B., Hughes. A., Cohen. B., “Marginal Abatement Cost Curves: Mitigation Decision Support Tools,” MAPS Paper, Cape Town, 2013.

[24] Teagasc, “A Marginal Abatement Cost Curve for Irish Agriculture,” Teagasc, Carlow, 2012.

[25] R.Price., S. Thornton., S.Nelson., “The Social Cost of Carbon and the Shadow Price of Carbon: What They Are, and How to Use Them in Economic Appraisal in the UK,” Department for Environment, Food and Rural Affairs, London, 2007.

[26] Ministry of the Environment, “About New Zealand’s emissions reduction targets,” 06 June 2018. [Online]. Available: http://www.mfe.govt.nz/climate-change/what-government-doing/new-zealands-emissions-reduction-targets/about-our-emissions.

[27] Ministry for the Environment, “National Inventory Submissions,” 2018.

[28] Ministry for Business, Innovation & Employment, “Energy greenhouse gas emissions,” December 2016. [Online]. Available: http://www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/statistics/greenhouse-gas-emissions.

[29] Parliamentary Commissioner for the Environment, “Climate change and agriculture: Understanding the biological greenhouse gases,” https://www.pce.parliament.nz/media/1678/climate-change-and-agriculture-web.pdf, October 2016.