# ROAD USER CHARGE: APPLYING LESSONS LEARNED IN NEW ZEALAND TO THE UNITED STATES

*Prepared for:*

Project Panel on Administration of
Highway and Transportation Agencies

*Prepared by:*

Susan J. Binder
Cambridge Systematics, Inc.
3 Bethesda Metro Center, Suite 1200
Bethesda, Maryland 20814

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# Executive Summary

Within the United States, a key challenge to the yields of long-accepted revenue systems generated from volume-based excise taxes for transportation funding is the growth of more fuel-efficient vehicle fleets and the expanded use of alternative fuel sources. Such user fees on gasoline and diesel have long been the standard. While they have performed well historically, they are becoming an increasingly less sustainable source of road funding revenue because most states and the federal government have not adequately adjusted the fee to account for increasing fuel efficiencies of vehicles and the erosive effects of inflation. An alternative user-based system that charges by distance has been identified and advocated by some as a solution because it would be fairer to travelers regardless of vehicle fuel types. The Fixing America's Surface Transportation (FAST) Act authorized research with pilot studies of alternative approaches in various locations across the U.S. As of now, these federal pilots and other independently sponsored ones, are at different stages of maturity. A study tour of senior U.S. transportation executives from state DOTs traveled to New Zealand in October 2018 to learn first-hand how New Zealand has organized its road funding scheme to help evaluate if elements of its program may be applicable within the U.S. With 40 years of experience designing, implementing, administering, and updating their road usage charge (RUC) policies, New Zealand was an ideal partner. This report describes the findings and conclusions drawn from that study tour.

While this type of system is known by various names within the U.S., including VMT-fees and mileage-based user fees, this paper will generally refer to all such initiatives as a RUC to allow for ease of reading and better comparison with the New Zealand program.

Although the New Zealand and U.S. transportation and governance systems are very different, the New Zealand RUC experience can shed light on a variety of user charge systems now under study in the U.S. The RUC system was first established there in 1978 as to efficiently capture the cost of road damage imposed by heavy-duty vehicles. It has evolved over time to the point where 19 percent of the New Zealand vehicle fleet, both heavy-duty and light-duty (operating on diesel) are currently subject to RUC. It should be noted that for vehicles operating on gasoline (petrol), New Zealand still charges a fuel excise tax, similar to the U.S.

Through its many iterations, the New Zealand RUC system has settled on a simplified system that combines pre-purchased distance-based licenses (in blocks of 1000 km, or 621 mi) with rate of the fee calculated based on variations for vehicle class and weight. All diesel vehicles and any vehicle over 3.5 metric tons or 3,500 kg gross vehicle weight are subject to the RUC. Light-duty diesel vehicles (under 3.5 metric tons GVW) are subject to $68 NZD per 1000 km, while larger vehicles over 3.5 metric tons have a higher unit cost. New Zealand has adopted methods over time in an effort to allow payment to be made electronically to make it easier for users and administers to collect the fees and comply with RUC requirements. Commercial motor vehicles are taking advantage of Electronic RUC (eRUC) services, in combination with fleet management tools.

Throughout discussions with relevant New Zealand counterparts, the Study tour delegates heard various perspectives on RUC policy, administration costs, eRUC implementation/adoption, and equity and fairness in the system. From the range of both broad and detailed information discussed during these meetings, seven major cross-cutting findings were identified by the delegation.

- First, the overall user fee structure in New Zealand relies on both RUC charges (for diesel and heavy vehicles) and fuel taxes (for light duty gasoline fueled vehicles) to help fund their investment and maintenance programs. In managing such a duel system, consideration is given to their parity and government expenditure levels. Between all the forms of tax collection, rates are set to recover all

transport expenditure (e.g. new road investments, additional capacity on existing roadways, and improvements in levels of service.

- Second, the focus of the RUC system has changed to some degree over time. Initially designed to cover all diesel vehicles, exemptions were introduced to exclude vehicles used primarily off-road. Based on user-pay principles that recognize the impacts of heavy-duty vehicles, the marginal strengthening cost required by heavy vehicles is passed on to the heavy vehicle fleet. With an increasing number of light-duty vehicles now required to comply with RUC, including the general public, New Zealand officials recognize that the system should further evolve to accommodate those payers. Thus, changes are likely to be made to ensure compliance, transparency, and fairness across all vehicle fleets and taxpayers.

- Third, the process by which rate charges are set under the New Zealand RUC system is based internally on a Cost Allocation Model (CAM) that is generally accepted by the industry. The RUC is meant to cover planned road maintenance expenditures, rather than independently generate revenue.

- Fourth, costs to administer the RUC system are consistently higher than fuel duties but information about the actual costs are not available. According to the Ministry of Transport, while the cost to administer current fuel excise duty within the country is relatively small, rough estimates are that RUC is about twice as expensive.

- Fifth, compliance under the New Zealand's RUC system is largely based on the honor system, with some external enforcement mechanisms. Noncompliance and evasion challenges do exist in the system. However, no definitive estimates are available.

- Sixth, although the RUC system has evolved over 40 years, large parts of it particularly as it applies to passenger vehicles, are still using original technology, including paper licenses displayed in the windshield. Although new technology, such as eRUC systems have been introduced and successfully adopted by at least half of commercial vehicles, the financial burden to the individual passenger car user has not decreased enough to see large-scale adoption in the light-duty sector at this point.

- Seventh, RUC charges are collected in New Zealand at the national level, either directly by the Government agency or indirectly through third parties (e.g., eRUC providers).

Further conclusions:

1. Although it is unclear at this time whether a RUC might be established at a national or state-by-state basis, policy makers should consider the New Zealand Ministry of Transport's focus on heavy, commercial vehicles. If adopted, there are advantages of taking into account individual travel markets in designing a system architecture. For example, it is plausible to employ a variety of approaches whether during pilot phases or in full implementation to treat trucks differently than passenger cars and to recognize the differences among truck operations.

2. Privacy concerns can be alleviated to a great degree by focusing on commercial fleets and offering low tech options as well.

3. Technology itself is not a barrier to RUC design and execution, particularly for truck fleets which constitute the vast majority of the payers. New Zealand has demonstrated that the understandings that have been gained with the existing eRUC systems can be built upon such that barriers to adoption for light duty vehicles can be overcome, in line with the determination of goals and tolerances.

4. Administering a RUC system at the scale of the U.S. may be a "good news—bad news" story. If interoperable and/or standardized mechanisms are adopted, the economies of scale involved should bring the costs down significantly while the extensive involvement with millions of drivers will mean that the public policy benefits and messaging would likely need to be demonstrated. The appropriate institutional framework for implementing mileage based charges is unclear. Depending on whether it is implemented at a state, national, regional or multistate level, different oversight agencies and institutions would be needed.

5. The New Zealand experience demonstrates how a clear national policy direction is critical to public acceptance, including that the revenue mechanism is fair across the range of users. Focus on road damage cost recovery alone simplifies the calculation and transparency. However, the potential policy direction which may apply these mechanisms to deal with impacts beyond roadway damage (such as congestion) would add complexity in terms of both fairness and consensus.

6. No reliable cost estimates from New Zealand are available that could give an indication of the challenges related to implementation costs in the U.S. With a significantly different scale in the U.S., this would likely be problematic, particularly since compliance is considered by New Zealand authorities to be relatively innocuous at the national level at this time.

7. The opportunity to get the policy signals straight and consistent between user fees and network investments is a unique one. As articulated by Ministry of Transport, expansion of the RUC, administered through efficient eRUC systems, has the potential to create a "win-win" for transportation and other policies.

CHAPTER 1

# Introduction

This section will give a brief introduction to the study tour and provide sufficient context regarding the U.S. and New Zealand to help the reader understand the applicability and potential for a RUC system in the United States. A 52-page background briefing was developed to help the travelers prepare for the experience, describing the RUC system as implemented in New Zealand and information about the context of its implementation. That document has not been replicated here in its entirety. This report focuses on the findings and conclusions drawn from the study tour. Multiple slide decks from presentations during the trip have been archived and are available upon request.

## Overview and Purpose of Study Tour

New Zealand has had a fully functioning road usage charge (RUC) program since 1978. Many of the challenges found by government road agencies are common to both countries including:

- Maintaining a quality road network with limited available funding.
- Recognition that different vehicles have different impacts on the roadway network.
- A well-functioning transport network is critical to economic vitality, the backbone of which is the roadway network.
- With improvements in fuel economy, shortfalls in the available funding are expected to continue to grow.

The New Zealand experience in designing, implementing, administering, and updating policies provides an opportunity to assess a revenue mechanism that is not currently part of the U.S. national user fee system and in operation on a limited basis in the U.S.

This study tour program was established and funded under the National Academies of the Science—Transportation Research Board within their National Cooperative Highway Research Project (NCHRP) 20-24 (Administration of Highway and Transportation Agencies) Series.

The study tour was conducted across four days in both Auckland and Wellington, New Zealand. Meetings in Auckland primarily focused on the RUC system from an industry perspective, while meetings in the capital city of Wellington were primarily government focused. As a result of meetings with the New Zealand Ministry of Transport (MoT), New Zealand Transport Agency (NZTA), New Zealand Police and commercial stakeholders, the U.S. participants gathered insight on the RUC system, its development, and the challenges still faced under the system. A more detailed description of the Study tour itinerary and its participants can be found in Appendix A at the end of this report.

## United States Context and Interests

As early as 1919 in Oregon and in 1932 nationally, federal and state governments have levied excise taxes on motor fuels on a per-gallon basis. Beginning in 1956, federal fuel taxes were dedicated to the Federal Highway Trust Fund to fund Interstate construction. With some increases in rates and dedicated taxes over time as well as a broadened set of purposes, this revenue source has performed well over the long term. However, a number of conditions now jeopardize its long-term solvency of the system is in jeopardy. Inflation in construction costs, improvements in vehicle fuel economy and emergence of

alternative-fuel vehicles (including hybrids and electric vehicles) have combined to undermine the continued viability and sustainability of transportation funding mechanisms based predominantly by on fuel taxes. A variety of other taxes and fees are used at both levels to fund transportation as well. Many of the same dynamics have been at work at the state and local levels.

Over the last decade, debates on how to fund infrastructure investment have continued with no shortage of options and opinions. From the long list of alternatives defined by two study commissions organized under the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) Act of 2005, awareness has increased as to the *potential* for a mileage-based road user fee or RUC-like system to be the long-term replacement for fuel excise taxes. In concept, under a RUC system, the revenue stream would be indifferent to changes in fuel economy or fuel type sold, stabilizing revenue and restoring greater fairness to those facing the tax burden. A per-mile-fee, when properly designed, could potentially also address other aspects such as equity, traffic congestion, roadway maintenance costs, or excessive emissions. These are policy goals and applications that various interests have recognized although there is no consensus as to their political viability. As such, the focus has been to date on the basic RUC aspects dealing with direct road use. The potential exists for using a more sophisticated collection mechanism than volume-based fuel taxes that attracts policy interests however concerns continue for privacy and administrative cost. Should in-vehicle technology be adopted to meter mileage, this could be integrated with a variety of value-added services for drivers such as usage-based insurance, real-time vehicle monitoring, and other driving-related apps, as well as provide useful data for governments in more efficient transportation modeling and planning.

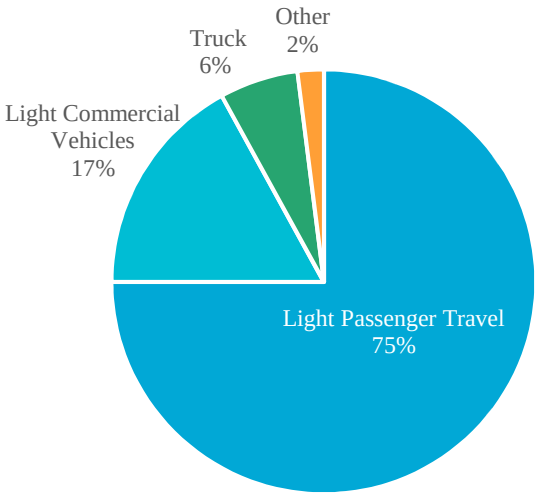
The U.S. Congress has expressed its interest in knowing more about these alternative funding mechanisms. Under Section 6020 of the Fixing America's Surface Transportation (FAST) Act, the Surface Transportation System Funding Alternatives (STSFA) program was authorized to systematically study a variety of funding approaches. This work intends to provide a test-bed and solid analytical research to support future RUC consideration. A series of exploratory pilots and research by Washington, Texas, California, Oregon, Minnesota, Colorado, I-95 Corridor Coalition, University of Iowa, and the Western Road Usage Charge Coalition (RUCC—West) have all demonstrated an interest in innovative funding approaches. These efforts enable sponsors to test aspects of a RUC system, such as privacy concerns, fairness, technology requirements, cost/economics, ease of use, and public perceptions.

## New Zealand Context

Transportation infrastructure in New Zealand is well developed, especially in and near populated areas. There are approximately 100,000 km (about 62,000 miles) of roads (highways, local roads, and other roads) within the country and 4,000 km (about 2,500 miles) of rail track (freight, passenger and light rail). New Zealand also has 14 seaports and seven international airports—all of which play a role in the movements of freight and people around the country.

New Zealand's 11,000 km (about 6,800 miles) of nationally managed highways (called in-country "State Highways") and 80,000 km (about 50,000 miles) of maintained local roads make up the backbone of its domestic transportation system. These highways only account for 12 percent of total roads distance, but carry about 50 percent of all annual motor vehicle traffic. The road network also transports about 70 percent of overall freight movement in the country.

Currently, New Zealanders drive approximately 45 billion km (28 billion miles) annually, roughly the same as the U.S. State of Nevada. More than 84 percent of all trips are by individuals by car. The New Zealand MoT estimates that annual vehicle distance traveled could likely increase to 60 billion km (37 billion miles) by the late 2030s and early 2040s. A breakdown of VMT by vehicle type can be seen in Figure 1. Average New Zealanders now travel approximately 6,000 km annually (about 3,700 miles), the highest level since 2007.




Source: New Zealand Ministry of Transport.

***Figure 1. Distribution of total vehicle distance traveled in New Zealand by vehicle type.***

## Governmental Structure

New Zealand has a unitary form of government, rather than a federated one, meaning there are no independent state- or county-level governments. The New Zealand Government (national level) governs the country and makes day-to-day decisions on how New Zealand's public sector will operate, and where and how to spend tax dollars. The executive branch of government is made up of both career civil servants and Ministers of the Crown, who also must be Members of Parliament. Ministers lead government agencies, such as the MoT, and are part of the overall Cabinet, led by the Prime Minister.

The overall responsibility and authority for matters of transportation in New Zealand fall to the MoT, including the RUC system. The mission of the MoT is to improve the overall performance of New Zealand's transportation system and achieve better value-for-money for the Government from its transportation investments. The MoT is tasked with advising on issues of transportation policy and managing investments in transportation infrastructure, as well as partnering with transport-specific "Crown Entities."

Crown Entities are organizations within the New Zealand system of Government with unique governance and accountability relationships to ensure transparency and nonpolitically motivated actions. The New Zealand Transport Agency (NZTA) is a Crown Entity under the responsibility of the MoT that promotes safe and functional transport by land. This includes driver and vehicle licensing, administration of the New Zealand national highway network, and coordination/partnership with regional Governments on local roads. The NZTA has responsibility delegated from the MoT for day-to-day operations of the New Zealand Road User Charge (RUC) system.

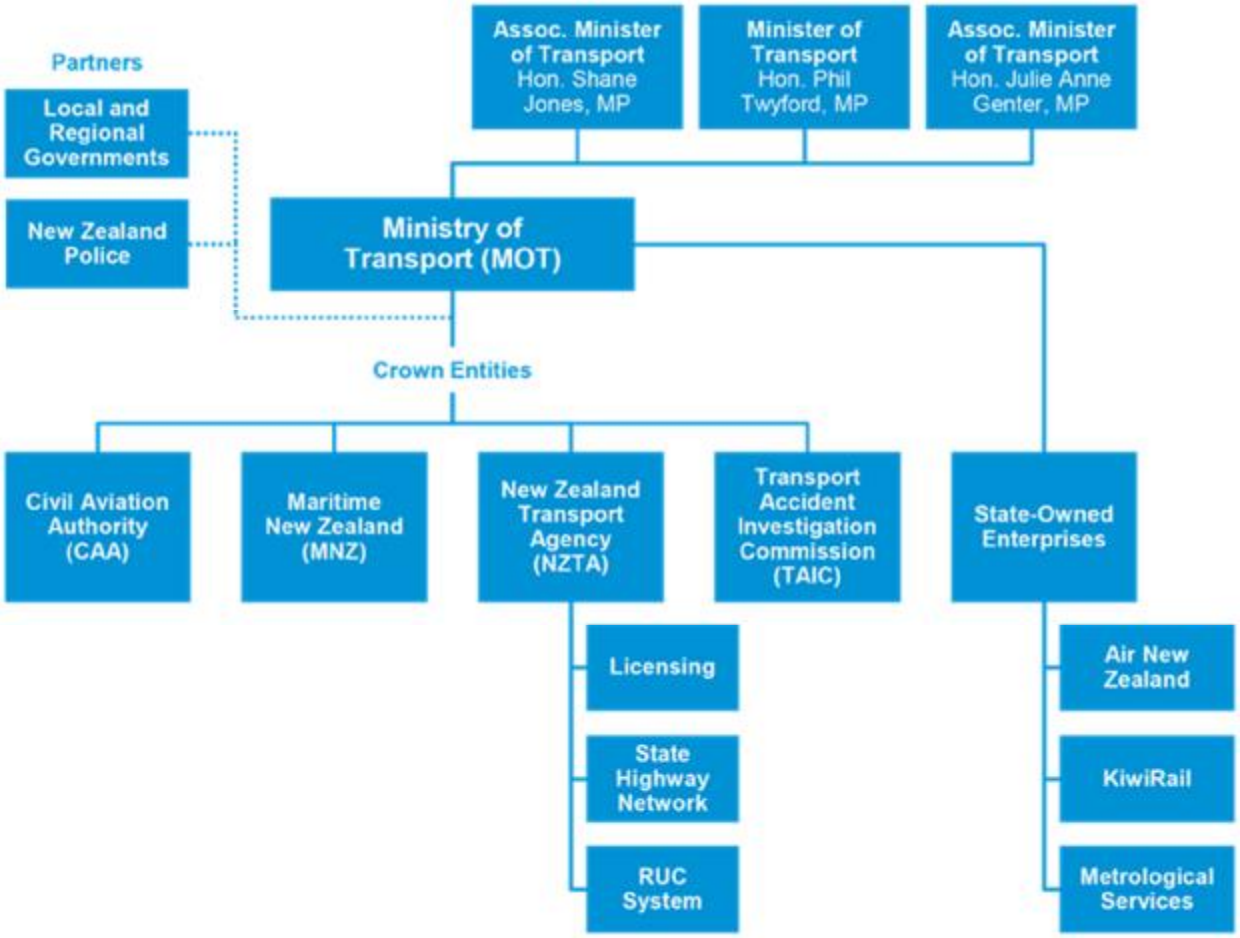



***Figure 2. Structure of the New Zealand Government in regards to transportation.***

Further, the New Zealand Police is the national police force. They have responsibility for direct enforcement of the RUC system. For example, they carry out compliance enforcement through routine traffic stops and weight checks. The NZ Police are an independent branch of the Government and are only responsible with ensuring RUC enforcement. The NZTA and MoT handle any legal action against noncompliance.

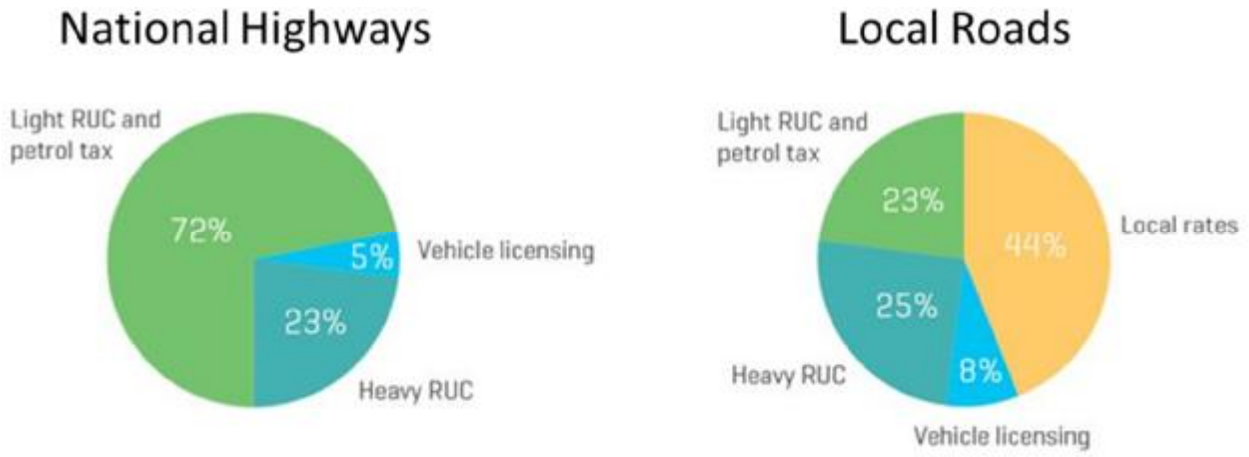
Local governments are responsible for administering transportation assets and operations which are not directly controlled by the national Government (e.g., MoT or NZTA). These include the maintenance and repair of local roads and regional transit systems. Local governments do not directly enforce or receive money from the RUC system, but partner with the national Government as needed. Funding for local roads derived from the RUC system is centralized by the national Government and distributed based on policy priorities, needs analysis, and formula funding mechanisms.

## Transport Funding Process

New Zealand has a highly centralized process for funding its transportation infrastructure. Every three years, the Government, through the MoT, will author a Government Policy Statement (GPS) on land transport, which describes the rationale for national government transport priorities and sets out funding ranges for different transport activities. These are formalized within the National Land Transport Programme (NLTP) which is developed by the New Zealand Transport Agency (NZTA). It is prioritizes,

selects, and funds transportation projects throughout the country. The NLTP must take in account Regional Transport Plans created at the local level.

Projects considered "national" in nature, including all work on the national highways, are fully funded through the NLTP. Local transport projects are usually completed with a mix of around 49 percent local funding, and the remaining amount through national funding and, in some cases, user fees. Local funding is generally generated from local taxes collected on residents, known in New Zealand as "Rates." These local taxes are described for revenue purposes as "Ratepayer Funds."

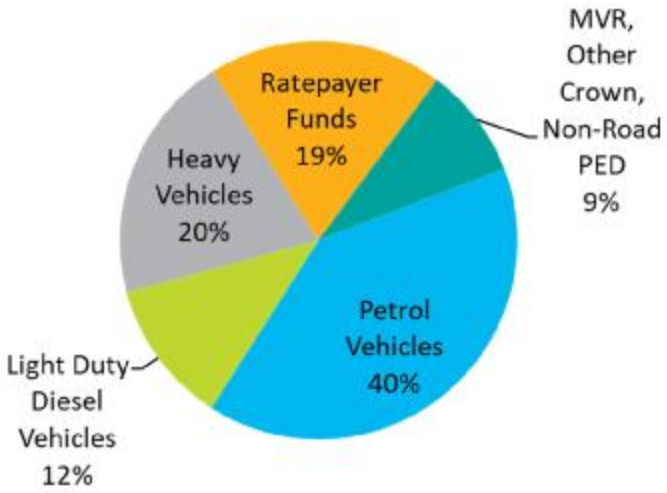



Source: New Zealand Ministry of Transport.

***Figure 3. Revenue source breakdown for national highways and local roads.***

To fund projects under the NLTP and contribute support to local transport projects, the NZ Government established the National Land Transport Fund (NLTF). This is an independent fund, similar to the Federal Highway Trust Fund, and receives dedicated ("hypothecated") revenues from road user fees, either through fuel excise duties or RUC, and motor vehicle licensing/registration (MVR). All road user fees must be deposited into the NLTF and cannot be used for non-transportation related projects or infrastructure.

Figure 4 shows the breakdown of total NLTP annual expenditures by revenue source. Except for local taxes "ratepayer funds" (19 percent), the remaining amounts are from sources directly hypothecated to the NLTF. Gasoline ("petrol") fuel excise duties, still make up a large portion of NLTP revenues sources, but RUC (represented by light-duty diesel and heavy vehicles) accounts for 32 percent.




Source: New Zealand Ministry of Transport.

***Figure 4. Total NLTP expenditures by sources of revenue.***

Table 1 below shows the current rates of fuel excise duties in measurements of New Zealand cents per liter.

**Table 1. New Zealand overall fuel excise tax rates (with component rates as NZ cents per liter).**

| Fuel Type | Fuel Tax/Levy (NZD Cents/Liter) | | | | | Total Levy (NZD Cents/Liter) | Auckland Regional Fuel Tax (Additional) |
|---|---|---|---|---|---|---|---|
| | CBA | NLTF | ACCL | PEFML | LAFT | | |
| Unleaded 91 RON "Regular" | 0 | 59.52 | 6 | 0.30 | 0.66 | 66.48 | 10.00 |
| Unleaded 95 RON "Premium" | 0 | 59.52 | 6 | 0.30 | 0.66 | 66.48 | 10.00 |
| Petrol/ethanol blends | 0 | 0 | 6 | 0.30 | 0.66 | 6.96 | 10.00 |
| Automotive Diesel | 0 | 0 | 0 | 0.30 | 0.33 | 0.63 | 10.00 |
| Biodiesel | 0 | 0 | 0 | 0.30 | 0.33 | 0.63 | 10.00 |
| Methanol | 30.20 | 0 | 0 | 0 | 0.66 | 30.86 | 10.00 |
| Liquefied Petroleum Gas (LPG) | 0 | 10.4 | 0 | 0 | 0 | 10.4 | 10.00 |
| Condensed Natural Gas (CNG) | 0 | 10.5 | 0 | 0 | 0 | 10.5 | 10.00 |

Key:

**CBA—**Crown Bank Account

**NLTF—**National Land Transport Fund

**ACCL—**Accident Compensation Corporation Levy

**PEFML—**Petroleum or Engine Fuel Monitoring Levy

**LAFT—**Local Authority Fuel Tax

## New Zealand and United States Comparative Scale

The below Table 2 is meant to provide an useful reference for the comparison of relative size of the U.S. and New Zealand transportation systems. As the geographic size and population of the two countries are vastly different, the State of Colorado has also been highlighted to allow for more relevant U.S. comparison to New Zealand.

**Table 2. Comparison of New Zealand and U.S. transportation systems (with the State of Colorado added for better comparison on geographic size and population).**

| | New Zealand | United States | Colorado |
|---|---|---|---|
| Geographic Size (square miles) | 103,483 | 3,531,905 | 103,730 |
| Population (in thousands) | 4,907 | 328,364 | 5,695 |
| Driver Age Population—16 years or older (in thousands) | 3,802 | 255,797 | 4,320 |
| Register Drivers (in thousands) | 3,384 | 218,084 | 3,974 |
| Approximate Annual VMT (in billions of miles) | 28 | 3,174 | 52 |
| Number of Total Vehicles Registered (in thousands) | 3,972 | 268,799 | 5,116 |
| **Total Public Roadway Length (in miles)** | **58,409** | **4,140,108** | **88,828** |

Data Sources: Statistics New Zealand, U.S. Census Bureau, U.S. FHWA (Highway Statistics).

[0] https://www.nzta.govt.nz/planning-and-investment/national-land-transport-programme/.
[0] https://www.transport.govt.nz/multimodal/keystrategiesandplans/gpsonlandtransportfunding/.

CHAPTER 2

# New Zealand's Road Usage Charge

This section will give an overview of the RUC system within New Zealand: its original establishment, changes to the system, vehicle eligibility, RUC charging structure, and possible future changes to the system.

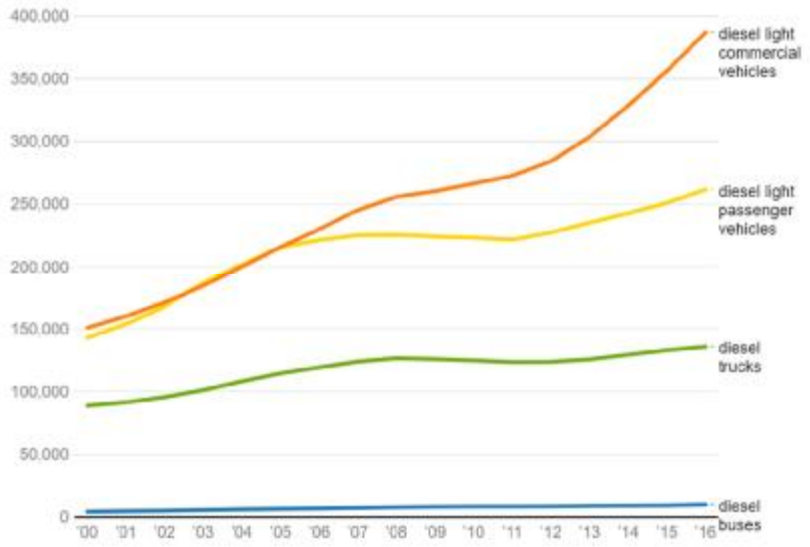
## History of the RUC System

New Zealand established the RUC system under the Road User Charges Act 1977 as a means for collecting revenue from all users of diesel vehicles. The original focus and intent of the RUC system was to recover road wear and damage costs caused by heavy-duty vehicles (those greater than 3.5 metric tons — 3,500 kg or 7,716 lbs.). Diesel fuel vehicles were singled out for the RUC system as heavy-duty vehicles were the largest users of diesel and light-duty diesel adoption was low at the time.

The system was also meant to minimize the administrative burden of productive sectors of the New Zealand economy. Subsequent reforms addressed sectors such as agriculture for exemption since agricultural equipment was rarely ever used on the roadways. Thus, it was viewed as unfair for those users to pay diesel excise taxes for road damage they were not causing. New Zealand had considered the potential of a red-dyed diesel system, which is common in the U.S. as a form of evasion control, but decided against the plan due to its administrative burden and enforcement challenges. It was agreed that a method focused on payment for weight and distance traveled for eligible heavy vehicles would be sufficient.

As a market response, based on the public perception that diesel prices were significantly lower (with the removal of fuel excise taxes), more light-duty vehicle owners (passenger and commercial) began to transition over to diesel. The perception of diesel vehicles as the cheaper option compared to gasoline (which was still subject to fuel excise duty) did not take into account the requirement to pay eRUC. Source: New Zealand Ministry of Transport.

Figure 5 below shows the growth of the diesel vehicle market across all fleets in New Zealand since 2000.




Source: New Zealand Ministry of Transport.

***Figure 5. Growth of diesel vehicles in New Zealand fleet since 2000.***

The RUC system has been subject to independent oversight reviews by the Government throughout the early 2000s to ensure the system was fair, adequate and enforceable with new technology and social trends. The most significant of these reviews came in 2008 when the Government set up a formal Road Usage Charges Review Group. In 2012, a new Road User Charges Act replaced the initial 1977 legislation and sought to simplify and modernize the RUC system, including adoption of many of the Review Group recommendations. The new legislation introduced a policy to lower the compliance cost for users and reduce the administrative cost and burden for Government. Significant changes under the 2012 legislation included:

- All revenues from the RUC system would now be placed directly in the National Land Transport Fund (NLTF).
- Permanent RUC weight bands were established (See Appendix C). Vehicles would pay based on the standard weight of the vehicle or its average load capacity. This standardization of the RUC rates was meant to simplify the information required for the user and minimize potential evasion present in previous vehicle- weight self-reporting system.
- Elimination of previously available timed license. Previously, RUC users whose vehicles spent a majority of time off-road could buy a RUC license in 30-day increments. This was deemed unnecessary and overly burdensome, so those vehicles could now apply for RUC exemption.
- The list of vehicles exempt from paying RUC, such as off-road and agricultural vehicles, was simplified. A list of RUC exempted vehicle types or usage purposes is shown in Appendix C.

## Stakeholder Response

Over time, the current RUC system appears to have been accepted as fair and useful. During the Study Tour, delegates explored with various presenters the receptiveness of the public, including the tax payers, to this mechanism. We were told that the commercial vehicle industry now supports it but that this was not always the case. The biggest concerns were (as initially articulated by the New Zealand Road Transport Forum):

- Complexity.
- High administration and compliance costs.
- High evasion rate.

- Operating cash flow and working capital constraints.
- Use of the funds that were raised.

Since the 2009 to 2012 reform process has been put into place, this has gradually changed.

The main changes that garnered such support were:

- Introduction of eRUC in 2010 which simplified paperwork, including claiming off-road refunds, and brought down administrative and compliance costs for users and agencies.
- Smaller prepayments/more frequent license purchases were facilitated with eRUC, helping to free up working capital for commercial motor carriers.
- Changes to weight bands based on gross vehicle mass reduced administrative costs and were perceived as reducing evasion.
- Reforms to the cost allocation model which improved confidence that the tax rates represented a fair share of government investments.

## Organization of the Current RUC System

The current RUC system is organized under the changes made within the 2012 legislation. The MoT has the lead role in determining any legislative or statutory changes to the system, as well as determining the appropriate RUC rates. New Zealand Transport Agency (NZTA) collects all RUC revenue, processes refunds, conducts audits for noncompliance, and administers the system on a day-to-day basis. The New Zealand Police has responsibility for conducting on-road enforcement of RUC obligations on eligible vehicles, both in the private and commercial fleet. Figure 6 below shows the structure the responsibility of all relevant actors in the RUC system.

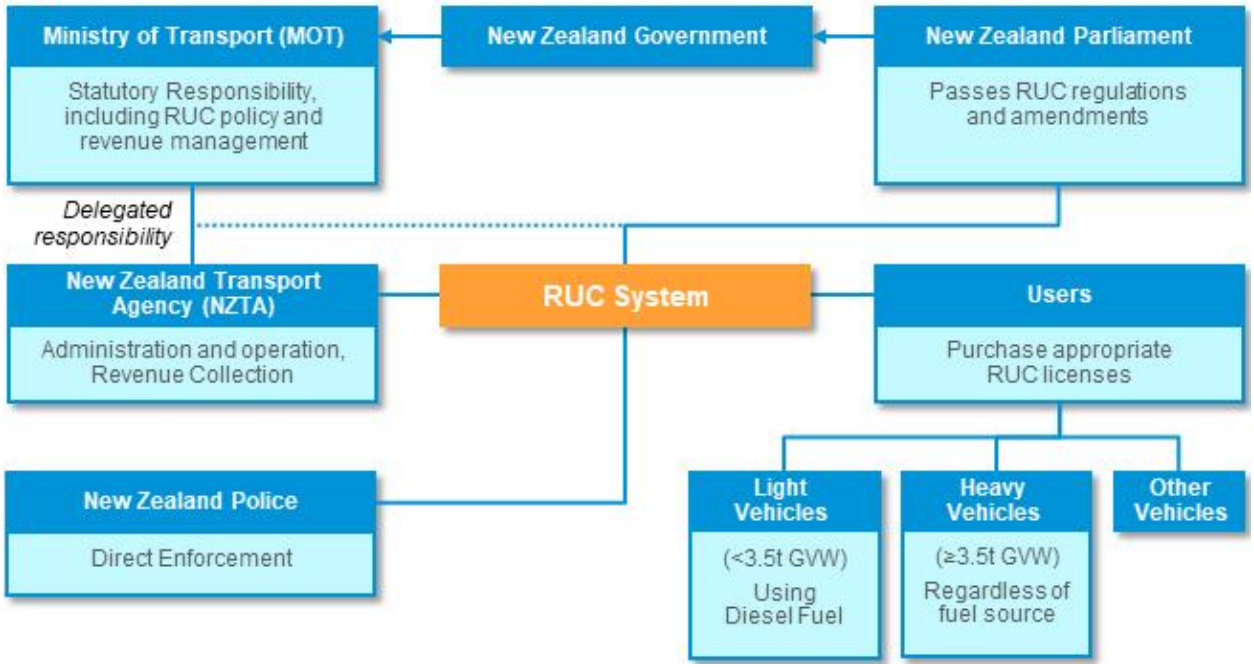



***Figure 6. Roles and responsibilities with the RUC system.***

## Mandatory RUC Vehicles

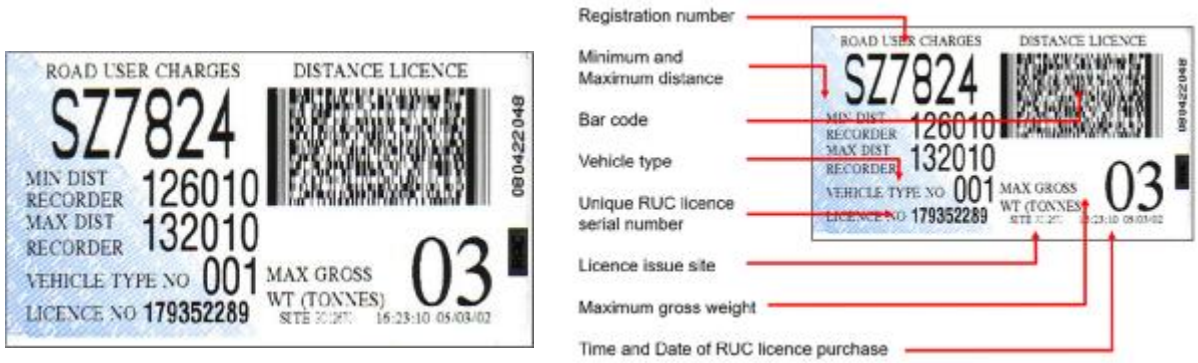
All light-duty vehicle (less than 3.5t GVW) that use diesel and all vehicles over 3.5 metric tons GVW (regardless of their fuel source) must have a distance license associated with its license. Today, the RUC system applies to nearly 20 percent of the overall New Zealand vehicle fleet, with 150,000 heavy-duty vehicles (greater than 3.5t GVW), and approximately 700,000 light diesel vehicles.

Certain vehicles are currently exempted from the RUC system. These exemptions include: all electric and hybrid vehicles less than 3.5t GVW), any vehicles whose purpose or design is not meant for regular road use (i.e., construction equipment, agriculture/landscaping, road repair equipment, others), and any regular light-duty vehicles which are used exclusively for off-road purposes (90 percent or more of operation and stays within 10km of the vehicle's usual storage and operation area).

The Government has taken the position to continue to promote and encourage the purchase of electric vehicles by keeping them RUC exempt at this time. The current strategy would sunset the RUC exemption for these vehicles in 2021 or when the percentage of the electric vehicles in the overall vehicle fleet reaches 2 percent, whichever occurs first.

## Requirements of the RUC System

All RUC eligible vehicles are required to obtain and be able to correctly display RUC licenses at all times of road operation. Light duty vehicles must display their RUC paper license on the inside of the windshield. Drivers of heavy-duty vehicles may carry their paper license on their person, but it must be produced on demand by any enforcement officer or official. (Note: If the driver relies on an electronic RUC license system (e.g., those provided by electronic service providers), then the device must be able to display the current validated RUC license if requested by an enforcement official. Electronic systems are discussed more fully below.)




Source: New Zealand Police.

***Figure 7. RUC distance license and the component contained.***

A RUC license is linked to a specific vehicle, through its vehicle license plate, and to the vehicle's primary owner. The *owner* is responsible for ensuring the vehicle has a valid RUC license, regardless of who drives the vehicle.

RUC licenses are distanced based and purchased in units of 1000 km (621 miles), or multiples (ex. 7000 km, 9000 km) for continuous distances. Once the distance on the current license is reached, a new license must be purchased. RUC licenses for light-duty vehicles have no expiration date and may be used until the registered distance is expended. Heavy-duty vehicles (greater than 3.5 metric tons) have licenses valid only for the period of the current RUC rate, plus 30 days.

Users must *pre-purchase* RUC licenses before driving any distances on public roads. Licenses may be purchased directly from NZTA (either online or phone/fax), or authorized RUC agents throughout the country. All light-duty drivers will purchase a license for their desired distance at a flat rate ($68 NZD per 1000km). Since rates for heavy-duty vehicles are variable and depend on weight and number of axels on the vehicle, heavy-duty vehicle operators will usually buy a RUC license for the average weight load they carry. They may need to pre-purchase additional RUC licenses for trailers or heavy-load movements.

All vehicles operating with an RUC distance license must be fitted with an approved distance recorder that is a type proven to accurately capture the vehicle distance traveled. For light vehicles, this can be the vehicle's odometer or a separate vehicle recorder. Heavy-duty vehicles must have a "hubodometer" which is a distance recorder directly attached to the vehicle's axel.

A timed license (in monthly blocks, with a maximum of 12) used to be available to specific RUC eligible vehicles, which had significant off-road usage and thus made distance monitoring difficult. This license type was considered an administrative burden and was removed with the 2012 reform legislation. Many vehicles which had used the timed license system were moved into the exempted vehicle category.

Should a RUC eligible vehicle be traveling some distance off-road, the user may petition NZTA for a RUC refund for the distance. The user must provide all necessary information to demonstrate the off-road use, and meet certain overall refund minimum amount to limit frivolous claims.

### Electronic RUC (eRUC) Systems

Between 1978 and 2012, the RUC system in New Zealand operated only as a manual, paper-based system. About 2010, electronic distance recording systems (eRUC) were piloted to evaluate if they could be a more efficient method of RUC compliance and collection. The overall use of the eRUC systems was codified within the 2012 legislation.

New Zealand currently has certified four companies to operate as eRUC providers: EROADS Ltd., Coretex Ltd., Mobile Intelligence Ltd., and Navman Wireless Ltd. These electronic system providers (ESPs) operate the eRUC systems as a contract agent for the NZTA. The ESP handles the RUC permitting, administration, and collection of RUC funds on behalf of the NZTA. ESPs must provide all legally required RUC rate payments to the NZTA. They generate operating revenues by charging fees for purchasing the RUC license, and leasing the necessary technology to the end user—typically in the form of a monthly subscription fee in combination with other services. The NZTA has a formal process to evaluate and certify an ESP for operation; this is classified under the Code of Practice for Electronic Road User Charges Management as published by NZTA.

Overall, ESPs must be able to demonstrate to NZTA that their system(s) can: accurately measure and record RUC data (including distance, time and location), legally display necessary RUC information in each vehicle in a manner consistent with the law, be able to isolate and attribute RUC data to a specific vehicle and/or operating fleet, and securely collect and transmit to NZTA the appropriate RUC revenue from each vehicle.

Current adoption rates for the eRUC system is approximately 50 percent in the heavy-duty and commercial fleets. The light-duty private sector has seen little adoption at this point.

## Rate Setting in the RUC System

Under New Zealand legal classification, the RUC system is a levy, rather than a tax or charge. This designation means the rates charged by the RUC can be set via secondary Government action, rather than legislating a change in statute.

### Cost Allocation Model

NZTA calculates RUC rates using a Cost Allocation Model, or CAM. This model does not calculate rates to capture revenue but instead determines what the rate would need to be to cover the road damage costs forecasted for the following year. The calculation is based on the average estimated per-kilometer cost share for a vehicle type, rather than tied to specific routes traveled by the individual user.

The CAM calculates the impacts on road damage using both the weight and distance of the vehicles. NZTA has adopted a "Fourth Power Rule" meaning that the damage to a roadway is proportional to the fourth power of the axle load of that specific vehicle. This rule means for every doubling of the weight on an axle, road damage increases by sixteen fold.

### Rate Setting Process

Changes to the RUC rate is a policy decision of the MoT. There is no legislatively mandated process that addresses when or how often RUC rates must be analyzed or changed. It appears to be within the authority of the Government to decide when RUC rates are to be adjusted. Usually, this rate-setting process follows the completion of a new Government Policy Statement in coordination with new NLTP priorities. As a matter of practice, RUC rate increases have been set to coincide with changes to the fuel excise duty as a means to ensure fairness in the system. The most recent RUC rate increases were on October 1, 2018. More appear to be planned for 2019 and 2020.

## RUC Compliance and Evasion

Enforcement is handled in the system by the New Zealand Police during annual vehicle inspections. The New Zealand Police also will check for RUC compliance during routine traffic stops, and at weigh-in stations for the heavy-duty fleet. Vehicles odometers and hubodometers will also be checked when the vehicle is inspected annually. If a vehicle is found to be operating with a distance overrun, the operator will need to purchase a RUC license to cover the gap. If an overrun is detected, and the vehicle is not made legal, the NZTA will issue a binding "Debt to the Crown" to retrieve the associated RUC revenue.

The RUC system in New Zealand has a high degree of personal trust built into the system, and since the RUC relies (to an extent) on the honesty of the vehicle owner, it has been difficult to accurately quantify the level of evasion. RUC distance overruns are frequent in the system, with the New Zealand Government estimating that around 20 to 25 percent of vehicles are shown to have overruns during required inspections. Most of these overruns are perceived as a nonmalicious human error and are usually quickly rectified by the driver.

A 2015 Government survey estimated that heavy-duty vehicle RUC evasion accounted for about one percent of total fleet requirements. Much of this is due to specific methods in which drivers could cheat the system, such as tampering or destroying a hubodometer showing a distance overrun. Overall, though evasion is likely within the system, the New Zealand Government believes that the issue is minimal, and the administrative cost of trying to ensure complete compliance will likely be higher than the lost revenue from current evasion.

## Proposed Future of RUC

RUC within New Zealand has seen many iterations, but it is essentially a static distance- and weight-based system on all diesel vehicles and any vehicle over 3.5 metric tons. While this system structure was mostly due to limited technology available and prior policy incentives, new procedures are being discussed.

One of the most significant RUC changes being discussed would be the move to a "dynamic" RUC, where users would be charged a variable RUC rate dependent on factors like type of road (highway vs.

local road), location, time of day, and traffic patterns. If adopted, such a fee could be linked to proposed congestion pricing efforts. Such use of the RUC mechanism would require higher levels of technology to be present in all vehicles to allow real-time tracking and the possible movement away from the prepay distance system currently being used.

According to New Zealand officials, there have also been broader conversations among both governmental agencies and electronic system providers about moving all vehicles (regardless of fuel type or size) onto a RUC system. This shift would need to be preceded by an all eRUC system to make compliance in the light-duty sector easier and more efficient. This discussion is taking place in the context of potential incentives to purchase and use alternative fuel vehicles, along with new connected and autonomous vehicle (CAV) technology.

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[0] https://www.transport.govt.nz/land/road-user-charges-ruc-and-petrol-excise-duty-ped/roaduserchargesreview/.

[0] https://www.transport.govt.nz/land/road-user-charges-ruc-and-petrol-excise-duty-ped/roaduserchargeslegislationchanges/.

[0] Code of Practice for Electronic Road User Charges Management. NZTA. https://nzta.govt.nz/assets/resources/road-user-charges/eruc-guidelines/docs/ERUC-code-of-practice.pdf.

CHAPTER 3

# Lessons Learned from Study Tour Program

The major objective of this study tour was to observe and discuss with New Zealand officials their experience with a RUC system to facilitate a better understanding and lessons that could be applied in the U.S. Of the issues raised over the course of the study tour, the following five aspects were considered key takeaways. In this report, "takeaways" are observations within the New Zealand context as distinguished from findings that are discussed in the next sections that address application to the United States.

## RUC and Fuel Excise Tax

New Zealand operates a dual revenue collection system, with RUC for vehicles operating on diesel and/or over 3.5 metric tons and a fuel excise tax for vehicles running on gasoline. Throughout discussions with New Zealand representatives it was stated there are no active plans at this time to change this policy. New Zealand attempts to balance the rates to both the RUC and fuel excise duties to ensure relatively equal financial burden to all drivers. The New Zealand RUC is a hybrid weight-mile/RUC type model. The system requires the presale of "blocks" of distances rather than charging for the "actual" miles traveled.

RUC systems based on mileage have an advantage over volume-based taxes because they can provide more consistent funding regardless of type of fuel, the price of fuel, or fuel economy. Thus, the revenue stream is not impacted by market forces beyond the level of travel.

**Key Takeaways**

- NZ uses a hybrid weight-mile/RUC type model.
- Payments are made in advance of miles traveled, based on anticipated mileage use as opposed to retrospectively on actual use.
- RUC and Fuel Tax revenue systems are operated simultaneously for different parts of the vehicle fleet.
- This RUC system has more administrative requirements and burden on drivers than fuel excise taxes systems, as currently operated.

## Light Duty versus Heavy Duty

Although the coverage of New Zealand's RUC program extends to diesel fueled passenger cars, it is fair to say that the emphasis has been to capture the cost of road damage caused by heavy-duty vehicle traffic. The effect of RUC policy on the price of diesel encouraged many private light-duty drivers to switch to diesel vehicles, thus bringing more of them under RUC whether they recognized that in the purchase decision or not. New Zealand officials stated that even though RUC light-duty vehicles outnumber RUC heavy-duty vehicles by over 4-to-1, the increase in the number of these vehicles is viewed as somewhat an unintended consequence of the RUC policy. New Zealand officials believe that many owners of light-duty vehicles subject to RUC are not always aware of their roles and responsibilities within the RUC overall system. Only 15 percent of light-duty vehicle owners were made aware of RUC requirements at the time of purchase, which is seen as an educational problem.

Most RUC policy discussions have focused on the impact on the heavy-duty sector. Heavy-duty vehicle operators were initially opposed to the RUC, but with 2012 reforms, there has been greater acceptance throughout the industry. Clear goals and transparency have also contributed to this acceptance over time.

**Key Takeaways**

- A clear and transparent purpose and operating structure for the RUC are important ingredients to consensus and acceptance.
- Engagement with users under the RUC system helps to ensure they understand the system and requirements. Stakeholder engagement with targeted messaging and articulation of RUC objectives is critical, especially to the public and affected industries. The requirements for fleets and individual operators are easier to meet when specifically tailored to each of those markets.
- The market responses to rates and requirements (e.g., transition of light-duty vehicles to diesel) were understood as rational responses by New Zealand officials even though they were not expected at the time of the regulatory change.
- A RUC system can be adapted over time to encompass new vehicle fleets, so transition phases are possible and practical.

## RUC Rate Setting Process

The New Zealand RUC system uses a Cost Allocation Model (CAM) to evaluate potential rates for each vehicle type and weight class. Rates focus strictly on costs imposed by vehicle class as well as expenses uniformly borne by all road users, such as enforcement and road safety. The CAM establishes a defined process and allows the public to see and scrutinize RUC rates setting.

**Key Takeaways**

- The New Zealand RUC model sets expectations that rates will be updated as needed to capture road impacts rather than solely generating revenue.
- Rate setting procedures, whether for RUC or per-gallon fuel taxes, are subject to both policy and political challenges.
- Cost allocation models are complex and can be arcane. Regardless, their use benefits from transparency stakeholders and other interests. Establishing the responsible entity for conducting the studies and updating them can facilitate a constructive dialogue.
- It appears that policy makers are considering expanding this mechanism to also address externalities and congestion impacts. This will be challenging and require modifications to the basic RUC system to fit urban situations if it is to achieve the transparency and fairness that were key to public assessment of fairness and thus consensus.

## Administration and Program Costs

New Zealand officials discussed the costs to administer their RUC in terms of their government costs but had very limited data to report. The NZTA is the agency responsible for collecting and managing all RUC revenues, whether directly or through electronic service providers. Even with a streamlined approach which leverages as much efficiency as possible, they roughly estimated that a RUC system is two times more expensive to administer than the fuel excise tax. This additional cost is due to the RUC being a more complex system requiring for example, linkages with registration/ownership of vehicles, refund processes to reimburse drivers for distances traveled off-road, and continuous comparison of prepayment balances with actual travel. Some costs are absorbed and covered by vendor fees which are paid by users of those eRUC systems as part of comprehensive packages of services beyond the RUC payments. Overall, the New Zealand officials engaged with the system did not seem concerned with the level of administrative

costs, as they view the mechanism to be successfully delivering the necessary revenue in an equitable manner. Thus they feel that it is worth the extra cost.

**Key Takeaways**

- Government administrative and other program management costs for a RUC system will likely remain higher than a fuel excise tax system, at least in the short term.
- When coupled with fleet management systems, some administrative costs are shared with other government requirements and value-added benefits.
- New Zealand officials observed that should higher revenues be collected through the RUC, they might be able to use those revenues to offset the additional system costs.
- With a single responsible government entity for all RUC and other revenue collection, administration costs associated with coordination are avoided. Should they embark local expansions, for example for congestion pricing, coordination across different jurisdictions will add complexity and cost. That increase is acknowledged by New Zealand officials but the level is unknown.

## Compliance and Evasion

The current New Zealand RUC system is built on a high degree of personal trust in compliance, essentially operating on an honor system. It is consistent with the culture and governance norms of the country. In most discussions with New Zealand officials concerning this issue, they were unconcerned about compliance problems and evasion within the RUC revenue system as it has achieved an accepted level of revenues. External compliance measures are incorporated into relatively frequent inspections, e.g., RUC checks are part of routine traffic stops or truck weigh-ins by New Zealand Police, and certification of RUC distances during regular vehicle inspections. Personal vehicle inspections take place every 12 months if the vehicle is less than 6 years old, and every 6 months if the vehicle is older than 6 years. Commercial vehicles and heavy-duty vehicles are inspected every 3, 6 or 12 months depending on vehicle type and usage. RUC enforcement and compliance has been concentrated towards the commercial sectors due in part preexistence of highway weigh stations, industry structure, and higher RUC rate-levels/revenues.

The New Zealand RUC system also has a regulatory back-stop for those vehicles using electronic systems (eRUC) as they trigger renewal when distance licenses run out. Self-reporting of miles driven on and off the road system is generally relied upon, since usage patterns are believed to be easily available for compliance audits.

**Key Takeaways**

- Enforcement and evasion are considered issues of governance and revenues system design. On balance, the cost of ensuring total compliance is considered to be higher than the missing revenues potentially recoverable.
- When noncompliance is determined, the preferred remedy is to secure payment.
- Safety and other enforcement activities are augmented to include RUC inspection. The complexities of commercial vehicle RUC enforcement, particularly when paper systems are in use, requires additional training of police forces.

## RUC Technology Requirements

New Zealand officials believe (although one tour participant expressed skepticism about satellite and other network coverage in New Zealand) that technology per se is not a barrier to RUC design and execution of a RUC system. Their approach is based on understanding the capabilities that are needed and desired from the technology as well as having the commitment to certify an ESP for operation. From the viewpoint of the officials, the reforms and policy direction that were passed into law went hand-in-hand with the

manner in which the private sector was directed to provide these capabilities as well as policies to encourage eRUC adoption. In this case, ERUC adoption is at about 50 percent of the heavy duty and commercial fleets with lower adoption rates among private light-duty users. The technology is being used in this context to facilitate purchase of distance licenses, rather than monitoring and payment for use as is being explored in parts of the U.S. The technology-based New Zealand model essentially requires advance purchase of in-vehicle equipment (estimated at $500 to $1000 NZD) with a monthly subscription charge to utilize the ESP systems and other value-added fleet management services. Such a business model discourages eRUC usage in the light-duty vehicle as the benefits (for RUC payment alone) are not commensurate with the costs incurred. The possible shift to a new dynamic RUC system based on time, day and location of vehicle travel, would likely require greater technology (eRUC) adoption.

**Key Takeaways**

- New Zealand's use of eRUC systems demonstrate that it is plausible to move from an initial simpler, manual system to a technology-based system. New Zealand's use of eRUC also demonstrates that a reliable automated eRUC system is realistic and can be tailored to market and governance conditions.
- Even where technology options are mature, providing users with a choice of mechanisms has its benefits, mostly in terms of public acceptance.

## Centralized RUC Collection

Transportation fees are assessed and collected primarily at the national level, in parallel to funding and project selection. Local entities do not have any direct role in the administration or collection of RUC revenues. RUC rates are the authority of the Ministry of Transport (MOT) and the day-to-day operations and collection by New Zealand Transport Agency (NZTA).

**Key Takeaways**

- A single national user fee mechanism is in place.
- Regional and/or local systems are being explored that might piggyback onto the national system.
- Individual investment decisions are made at the program-level consistent with national priorities that take into account regional needs. Distribution of revenues are not directly linked to where they are collected.

[0] Based on conversations with MoT representatives. There are 700,000 light-duty vehicles versus 150,000 heavy-duty vehicles operating under the RUC system currently.

[0] As described by Ministry of Transport (MoT) representatives during meeting with tour participants, see Appendix D for more detail.

CHAPTER 4

# Conclusions

The above findings are key aspects of the New Zealand system and operation. The conclusions briefly stated below offer interpretations of their implications should they be considered for adoption in the United States. Lessons learned from the New Zealand experience can offer insights as to how barriers to public acceptance might be addressed.

## System Architecture That Acknowledges Individual Travel Markets

The New Zealand system's treatment of heavy, commercial vehicles RUCs highlights the feasibility of the U.S. to incorporate those vehicles in future revenue mechanism options. To date, the pilots under STSFA have not addressed trucks and, as such, this is a gap in the information that is being developed to inform the policy process. The I-95 Corridor Coalition and the Delaware Department of Transportation are leading a pilot with a second phase that will experiment with commercial trucking fleets to assess reporting requirements in relation to these mileage-based user fees. This six-month pilot, which will include 50 vehicles, is scheduled to begin in 2019.

Considering the variety of vehicles and operations across the U.S., it is plausible to employ a variety of approaches whether during pilot phases or in full implementation. Trucks can be treated differently than passenger cars. Different trucking subsectors (e.g. private carriage, common carriage, truckload, less than truckload, etc.) and automobile sectors (e.g., personal use, taxi fleets, rental car fleets, etc.) can be accounted for differently. Neither the trucking or passenger car sectors are monolithic—they operate in different ways in different markets, serving different customers and filling different roles in the marketplace. The observations made in New Zealand illustrate that a regulatory and funding scheme can be designed to apply to individual markets—one size does not have to fit all. It is further observed that trends in automobile usage may drastically change in terms of responsibility and payment systems should the dominant pattern of individual private ownership significantly shift in favor of various forms of car-sharing.

Another form of market segmentation is illustrated by the New Zealand experience. The major way that New Zealand differentiates RUC vs. taxation is by the type of fuel. RUC is the common element across all of the vehicles in terms of how they interact with the roadway network. However, it is conceivable that in the face of increasing use of alternative fuels such as ethanol, hydrogen, natural gas, and electricity, different revenue collection systems could apply to different fuels.

## Privacy Concerns

Privacy advocates have resisted mileage based systems because of the fears associated with the potential to track the traffic patterns of drivers. These concerns are less of an issue for commercial vehicles where individual privacy concerns are limited in the workplace environment already using automation to monitor driver actions by the government for safety purposes as well as for efficiency by employers. Data privacy has many aspects including collection of personal data, financial transactions, and location tracking. These are not technology issues per se but basic to system architecture requirements. These systems can be designed to protect privacy, depending upon devices used, storage and transmission parameters for trip data, and the degree to which vehicle identification is associated with individual trips. By offering manual

system alternatives, possibly with a different fee structure, the public can choose their preferred degree of privacy as a tradeoff for convenience. Testing using vehicle fleets with lower privacy concerns can isolate those concerns.

## Technology

As stated above, it is clear that technology per se is not inherently a barrier to RUC design and execution. In making this assessment, one can refute the notion that technology needs to be developed to apply to these issues before the approach can be advanced. Proven technology exists along a wide range from low-tech paper systems to high tech in-vehicle GPS-based systems. Technology has the potential to be the "handmaiden" of the public policy, not the reverse. Clear definitions of the capabilities are needed and desired. The learning that has gone into existing eRUC systems can be built upon at the margins or with major revision, depending upon the public determination of goals and tolerances. Prepurchase licenses as in New Zealand raises an option that has not been discussed in the U.S., where the focus has often been on paying for actual mileage after the fact. This is not to dismiss the challenges of the out of pocket costs to acquire and operate such systems.

One aspect to be evaluated is whether reducing system complexity and a high level of driver interaction with technology can ***bring down*** the cost of compliance and encourage adoption or would that be better fostered by bundling with other value-added services to increase chances for adoption? If the number of participants increase, costs could significantly be reduced and greater familiarity with technology in their vehicles could increase both their comfort with the systems and their overall willingness to pay. When compared to telecomm services that bundle internet, phone, and premium cable, for example, the costs of these tax collection systems may turn out to be insignificant. This is speculative at this time but further experience could shed light on the market dynamics. The business models of many commercial fleets allow them to see the value in making technology investments that would facilitate other services in addition to RUCs, as has been seen in New Zealand. In a large market such as the U.S., an added consideration is the time that it takes to penetrate the market with vehicles containing original manufacturers equipment as opposed to after-market add-ons or retrofits.

## Administrative Apparatus: Costs and Scale

A very challenging aspect for the effective operation of a mileage-based user fee system across the U.S. would be putting into place an administrative apparatus that could collect and process fees from millions of drivers. The power of modern computing and data systems has been demonstrated at a scale that few would have anticipated a decade ago—think of all the app's and automated payment applications that make us more mobile than ever and handle "big data."

Another relevant issue is whether the revenue system will be national in character, executed on a state-by-state/regional basis (as the pilot experimentation is being conducted), or as a hybrid. The hybrid is essentially the current approach from the perception of the public, with state and local taxes on fuel "piggybacking" on the federal. However, non-federal collection does not take place in tandem. The New Zealand experience demonstrates the simplicity of a governance without state or local entities—most everything is done at the national level. It is observed that New Zealand is struggling with the concept of incorporating a congestion pricing arrangement for their only big city—Auckland. They have not yet determined whether such fees should be charged and if they do, whether this would be completely separate from the RUC or integrated into its administrative system.

One could observe that the U.S. non-federal pilots were only intended as experiments and opportunities for those sponsors to influence the ultimate national approach. Others are comfortable with the idea that multiple mechanisms are as acceptable as the current differential among state rates. A national system would parallel the interstate movements of many vehicles in our modern society. However, if state or

municipal jurisdictions were to arrange for their own RUCs, many of the issues associated with interoperability now working themselves out with various toll collection systems would also apply. Standardization and interoperability of technology across different jurisdictions in the U.S. has been difficult. One could also envision an approach that mirrors institutions such as the IFTA/IRP arrangements that attempt to bridge the gap and facilitate payments. The appropriate institutional framework for implementing mileage based charges is unclear. Depending on whether VMT tolling is implemented at a state, national, regional or multistate level, different oversight agencies and institutions would be needed.

Should a national system be adopted, comparisons have been made between it and the current system of gas tax collection where motorists "pay back" taxes that were advanced by a limited number of oil refineries at the "rack" – and focuses on the budgeted costs of the Federal Internal Revenue Service. Another relevant comparison is with electronic toll collection (including open road tolling) where the cost to owner/operators has been significantly reduced from old, manual systems. Pilot studies can address some of these aspects however, the true cost at a significantly different scale is hard to credibly estimate. No studies were provided to prove the assertion but it is realistic that some economies of scale can be expected. Historically, decisions about tax collection and rates are not based on the yield or efficiency but on a public policy basis. Faced with the possibility of changing the mechanism, the importance of the cost of collection is elevated. Thus, there is little comparable literature beyond the toll collection experience, itself in a state of change.

## Fairness

The New Zealand experience demonstrates how a clear national policy direction is critical to public acceptance, including that the revenue mechanism is fair across the range users. The general public doesn't relate to arguments based on the long-term vulnerability of the legacy system of volume-based fuel taxes, lack of stability, greater economic efficiency, and large potential yields. They do understand when infrastructure is at risk due to damage by large vehicles and avoidance of tax by alternative fueled vehicles. In New Zealand, cost recovery and equity across classes of vehicles was paramount. Another element of fairness that contributes to confidence in a new system is a clear delineation of roles for the public and private sectors in establishing a program structure that is efficient yet effective.

Due to the rural nature of most of New Zealand, the fairness perceptions related to distances driven by urban and rural drivers is not a major issue. The reforms that were put into place that simplified and waived off-highway use by the agricultural and forestry sectors avoided some of the associated issues.

We also observe that there is a close similarity between the RUC system for heavy commercial vehicles in New Zealand and the weight distance permit systems that are currently in place in New York State, New Mexico, Kentucky, and Oregon. Each one is different but the rationale is similar to that of the New Zealand RUC. This tax has been very unpopular with the trucking industry, with only these four states currently applying it.

Also, at the federal level, an annual Heavy Vehicle Use Tax is in place which is to be paid by vehicles over 55,000 pounds that are operated on public highways. Some exemptions are built into the law including those for low use vehicles and for public entities. The rates are set by the gross taxable weight of the vehicle rather than how much weight is being hauled. Over 75,000 pounds, the fee tops out at $550 per year. This was set as part of the compromise package on federal fuel tax rates which distinguished between gasoline and diesel. Further, many states charge additional registration fees for large trucks. Since it does not truly relate to wear and tear on the road, such fees have been characterized by many who have resisted its imposition as more of a "property tax" than a user fee.

## Compliance Issues

Issues associated with compliance were not a significant focus for the New Zealand officials with whom the delegates met and no reliable cost estimates are available that could give an indication of the challenge

in the U.S. With a significantly different scale in the U.S., this would likely be problematic, particularly since compliance is considered relatively innocuous at the federal level at this time. (One should remember that dyed fuel and shifting the tax responsibility up the distribution chain to the rack were but two changes made in response to accusations that significant losses were occurring to the U.S. Federal Highway Trust Fund, including the involvement of organized crime due to the significant difference between roadway fuel tax and heating oil rates.)

New exemptions created for those New Zealand vehicles which were problematic for compliance (non-regular road users and exclusive off-road purposes such as construction equipment, agriculture/landscaping, road repair equipment) simplified compliance administration. The cost of RUC inspections undertaken during the course of safety and enforcement activities are not estimated but use some resources.

## Synergy with Other Policy Directions

Similar to the fairness issues described above, New Zealanders are very aware of the implications of a move toward alternative and "green" fuels. Current New Zealand government initiatives reflect that they are very serious about integrating a number of transport policies which they believe can be mutually supportive of environmental goals. These include:

- In the long run, moving to market based pricing that will address congestion.
- Integrating land use policies with transportation to a greater degree.
- Promoting and encouraging the purchase of electric vehicles.

The Government's current strategy is to keep electric vehicles exempt from RUC for now but to sunset the RUC exemption for these vehicles sunset in 2021 or when the percentage of the electric vehicles in the overall vehicle fleet reaches 2 percent, whichever occurs first. The Government itself is purchasing more fuel efficient and alternative fuel vehicles.

The Government is sensitive to the fact that replacing the per gallon fuel tax might eliminate one of the few tax-related incentives for purchasing more fuel-efficient vehicles. Thus it sees expansion of the RUC, administered through efficient eRUC systems, as a means of creating a "win-win" for transportation and climate policies.

APPENDIX A

# New Zealand Study Tour Overview

## Objective

Provide an "immersion" opportunity for U.S. transportation executives (Secretarial level or designees) from individual state DOTs to observe and engage with New Zealand authorities and stakeholders as to their experience with road user charge (RUC) mechanisms. The visitors hoped to gain: (1) an understanding of the evolution of the mechanism and its acceptance, (2) insights into the equity and policy considerations associated with road user charges, and (3) knowledge of the administrative costs and institutional challenges. Overall, the visitors hoped to gain insights into the New Zealand RUC experience to better evaluate whether similar systems could be viable within their home state.

## Approach

With the support of our New Zealand hosts, an ambitious itinerary of government-to-government meetings, briefings, and on-site tours was developed.

Speakers and presenters were arranged who have direct policy or operations experience with RUC system and can answer both broad and technical questions. This included stakeholders/system users.

Opportunities include:

- Dialogue with relevant policy leaders in the Cabinet and Parliament to learn how RUC policies were developed and executed including legislative and political challenges such as equity and fairness in design and execution, general finance, and investment policies. (Meetings with the Ministers of Finance and Transport, Legislative leadership).
- Frank conversations with New Zealand Transport Agency (NZTA) officials and agency staff about fee collection, pricing, compliance/enforcement and costing policies. Focus on technical implementation, cost to administer, info technology, institutional aspects and potential future innovations (Meetings with Ministers of Revenue and Police).
- Meet with a variety of stakeholders to get their perspectives on industry and fleet impacts and benefits, public acceptance, compliance, privacy, data security, regulatory regimes (e.g., from commercial vehicle, coach and bus tourism, individual passenger, and service providers).
- Visit regarding Auckland Congestion Pricing project.

## U.S. Delegation

Attendance on the study tour under NCHRP 20-24 was directed at senior-level decision-makers within individual state DOTs, who had responsibility and authority to explore potential road user charge, or mileage-based user fee systems. Panel members for NCHRP 20-24 projects are state DOT secretarial-level individuals.

It is important to note that attendance on this study tour by any state delegate does not guarantee, nor indicate that individual state is currently planning a RUC-like system, only that there was interest by the state's leadership in learning more about the system and its potential.

The following delegates attendees participated in the study tour on behalf of NCHRP panel members:

- Shante Hastings—Director of Policy, Delaware DOT.
- Charles G. Glass—Asst. Secretary of Transportation, Maryland DOT.
- Kenneth Buckeye—Program Manager, Minnesota DOT.
- Huberto "Burt" Tasaico—Strategic Initiatives Director, North Carolina DOT.
- Anthony Buckley—Director, Innovative Partnerships Program, Washington State DOT.
- Michael DeMers—Division Director, Missouri DOT.
- Teri Newell—Deputy Director, Utah DOT.

Leading the tour were Susan Binder and Ryan Nalty from Cambridge Systematics, Inc., managing tour content, facilitation, organization, and logistics.

Also accompanying the delegation were members of the Mileage Based User Fee Alliance (MBUFA). These individuals included their Executive Director, Barbara Rohde, MBUFA staff Theodore Bristol, MBUFA Board Member Lee Munnich as well as a number of other interested members.

## Roles

Nationally Coordinated Highway Research Program (NCHRP), a panel of the National Academy of Sciences' Transportation Research Board sponsored this visit program and this lesson learned document.

Professional and logistical support were provided on behalf of NCHRP and AASHTO. Cambridge Systematics, Inc. (CS) staff, led by Susan Binder and supported by Ryan Nalty provided program design, advance briefing and report preparation, and arrangements for international travel, air and ground transportation, and accommodations.

## Itinerary

The study tour was conducted across 4-days in both Auckland and Wellington, New Zealand. The group departed the United States on Friday, October 12, 2018 and arrived in Auckland, New Zealand on Sunday, October 15th, 2018. The tour officially ended on the evening of Thursday, 18 October, 2018. Participants returned to the U.S. on Friday, October 19, 2018, or took additional personal time.

Meetings in Auckland focused on the RUC system from an industry perspective, while Wellington meetings were primarily governmental focused. Delegates were also given the honor while in Wellington to sit down with the New Zealand Minister of Transport, the Honourable Philip Twyford, to discuss RUC policy and thoughts on the system moving forward.

Discussions were held with the following participants:

1. **New Zealand Ministry of Transport** (MoT)—Has overall responsibility for the RUC system within New Zealand. Also manages investments in transportation infrastructure and advises the Government and Parliament on matters of Transportation Policy.
2. **New Zealand Transport Agency** (NZTA)—A "Crown Entity" under the administration of the Ministry of Transport. Overseas much of the day-to-day operations on the RUC system, including program administration, system oversight, and compliance/evasion.
3. **New Zealand Police**—The national police force within New Zealand, has responsibility for enforcement of the RUC system.
4. **New Zealand Trade & Enterprise** (NZTE)—The New Zealand Government's economic development and trade promotion agency. Although they do not have any direct oversight within the RUC program, they assisted the U.S. delegates with understanding and translating New Zealand's experience in RUC, as well as organizing and facilitating meetings.
5. **Electronic RUC (eRUC) Providers**—Private sector companies who are currently providing electronic systems which can fulfill on RUC requirements. These meetings included New Zealand firms

EROADS and Coretex. Sessions also discussed the down channel benefit to transportation planning of data collected through eRUC systems.

6. **Port of Auckland**—New Zealand's largest port facility, and the third largest in the Australasia region. While the Port of Auckland does not necessarily influence RUC policy, approximately 15-20% of heavy-duty vehicle traffic in an around the Auckland metro region will begin or end at the Port.
7. **Trade Associations**—These groups represented the views of the end-user of RUC.
   - ***New Zealand Road Transport Association***—Represents road freight operators of all class and size types, including small courier firms, owner/operators, and large fleet operators. The NZRTA provided an overview of the RUC requirements for the heavy-duty vehicle fleets.
   - ***Road Transport Forum New Zealand***—The overarching national body organized to promote and advance the interests of the road transport industry. Discussed with the delegation about RUC policy in the context of heavy-duty fleets, and spoke on changes made under the 2012 RUC legislation.
   - ***New Zealand Automobile Association***—Similar to the AAA in the U.S., the NZ AA is a membership organization of motorists, and also advocates on behalf of its members for safer and more efficient driving conditions in the country. They discussed with the delegation about RUC from a light-duty vehicle perspective, including perception and understanding of RUC by everyday users.

Although the tour concentrated on the RUC system, additional meetings were added to the schedule, including a discussion with the Auckland City Government on a potential Congestion Charge, and a diplomatic reception by the U.S. Embassy in New Zealand, hosted by U.S. Deputy Chief of Mission, Susan Niblock.

APPENDIX B

# Background on New Zealand Transport Networks

*Excerpts from Section 5 of Study Tour Advance Briefing Book*

Infrastructure around New Zealand is well developed, especially in and near populated area. There is approximately 100,000 km of roads within the country (highways, local roads, and other roads) and 4000 km of rail track (freight, passenger and light rail). New Zealand also has 14 sea ports and 7 international airports—all of which play a role in the movements of freight around the country.

## Road Network

New Zealand's 11,000 km of national highways and 80,000 km of maintained local roads make up the backbone of its domestic transportation system. More than 84 percent of all trips are by individuals within a car and road network support more than 100 million bus journeys per year. The road network also carries 70 percent of total freight movements in the country. The Ministry of Transport, through the New Zealand Transport Agency, manages the country's road network in collaboration with local authorities.

## National Highways

National Highways only account for 12 percent of total roads but carry 50 percent of all annual motor vehicle traffic. Certain sections of highways are given the designation 'high-volume highways' and account for only 700 kilometers of road, but handle 17 percent of total vehicle traffic and 19 percent of freight volume. NZ Transport Agency (NZTA) administers and funds 100 percent all national highways through national funding mechanisms.

NZTA uses 6 designations for highways to prioritize investment and set performance targets:

- **National:** roads linking the largest urban areas (with populations greater than 100,000), major ports, and major airports. Annual average daily traffic volume (AADT) is 15,000 vehicles or more.
- **Regional:** roads linking urban areas (with populations greater than 30,000), medium-sized ports, medium-sized airports, and major tourist destinations, or are the major route linking an isolated region. AADT is 10,000+ vehicles.
- **Arterial:** roads linking secondary urban areas (with populations greater than 10,000 but below 30,000), medium-sized ports and regional airports, or are the only route linking isolated areas or provide an important detour function. AADT is 3,000+ vehicles.
- **Primary collector:** roads linking minor urban areas (with populations greater than 2,000 but below 10,000). AADT is 1,000+ vehicles.
- **Secondary collector:** roads linking rural towns (with populations less than 2,000) or rural areas. AADT is less than 1,000 vehicles.

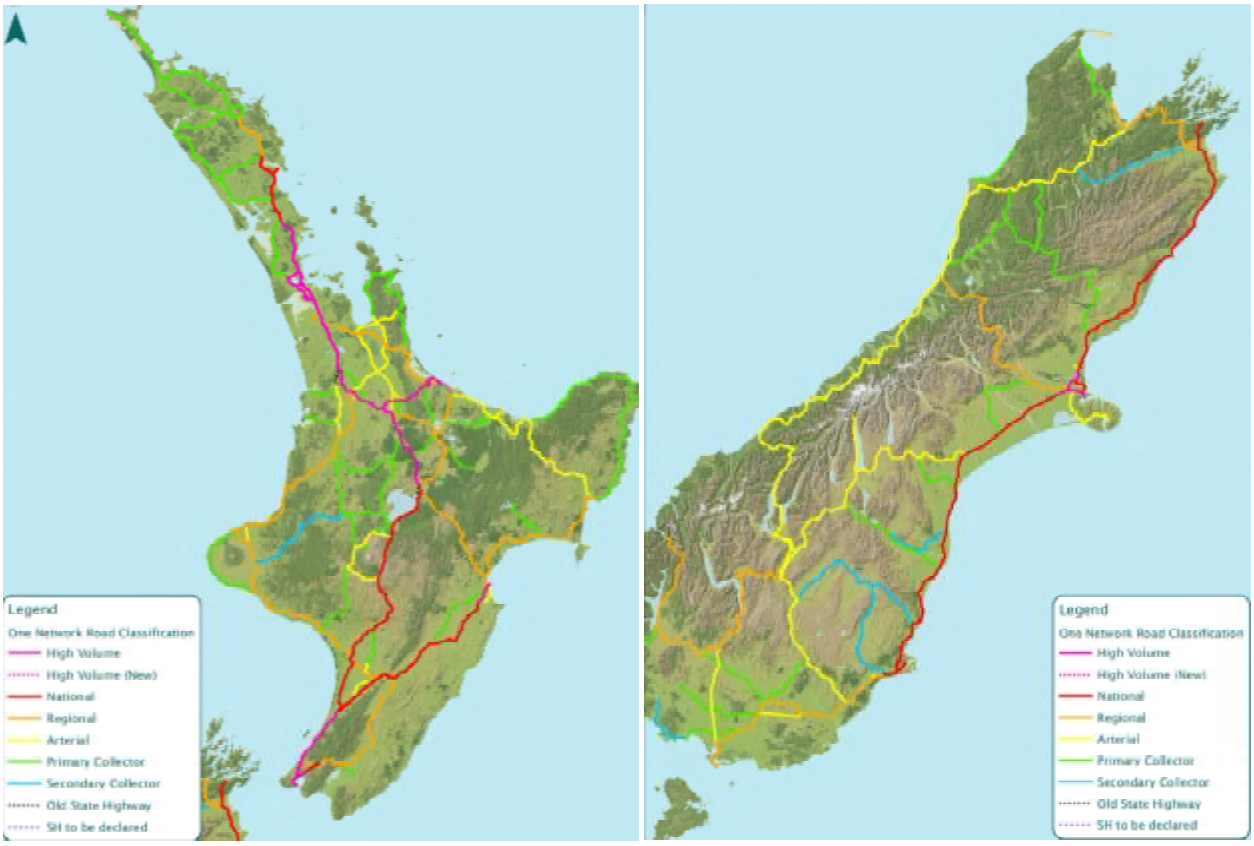



***Figure A.1 National Highway Network (North Island and South Island) with classification.***

## Local Roads

Local roads are those that form a regionally strategic purpose in moving people and goods within regions, but have not been designated as a national highway. These roads strategically connect to the national highway system. Local Government or regional authorities manage local roads, which are funded through a mix of national sources and local taxation.

## Overall Road Usage Trends

Currently, New Zealanders drive approximately 45 billion kilometers (28 billion miles) annually, approximately the same as the U.S. State of Nevada. Almost 84 percent of this distance are driven by individuals within a personal vehicle and public transportation options only represent 3 percent of total distance driven. The New Zealand Ministry of Transportation estimates that annual vehicle distance traveled could likely increase to 60 billion kilometers (37 billion miles) by the late 2030s and early 2040s. Although fewer young people are getting drivers licenses, this is offset by an ageing population staying in the workforce, as well as the rapid rise of car-sharing services.

## Vehicle Ownership

New Zealand has historically been a car-dependent Nation, with vehicle ownership at 0.84 vehicles per capita in 2016, almost on par with the United States. Generally, vehicle ownership levels have been increasing, due in large part to stable fuel prices and economic growth. As of 2016, New Zealanders owned

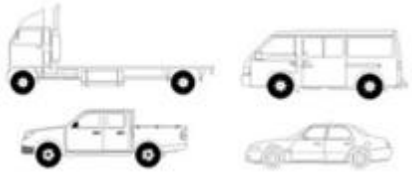
or operated 4 million vehicles. Similar to the U.S., car ownership levels are higher in rural/suburban areas and slightly lower in urban locations with public transit options.

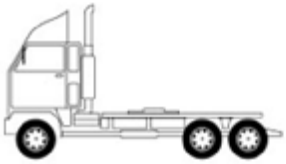
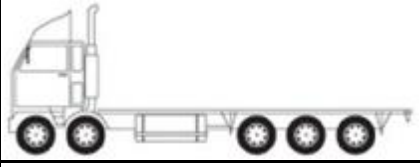
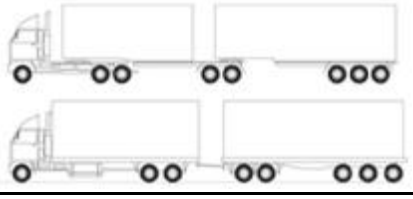
Currently, light passenger vehicles (both personal and commercial) make up 91.4 percent of the total road fleet within New Zealand. Total fleet volumes have increased by 16 percent since 2010, with light vehicles contributing most of the growth.

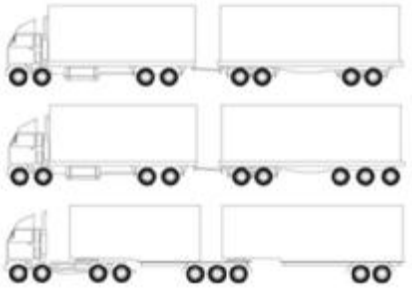
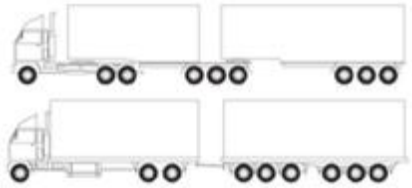
APPENDIX C

# RUC Rates

## With Rates Effective 1 October 2018

| RUC vehicle type number | Description and example (images are indicative only) | Weight bands | RUC rate ($ NZD per 1000km GST inclusive) up to 30 Sep 2018 | RUC rate ($ NZD per 1000km GST inclusive) as of 1 Oct 2018 |
|---|---|---|---|---|
| 1 | Powered vehicles with 2 axles (except type 2 or type 299 vehicles)  | Not more than 3.5 tons | 62 | 68 |
| | | More than 3.5 tons and not more than 6 tons | 68 | 74 |
| | | More than 6 tons and not more than 9 tons | 138 | 151 |
| | | Any RUC weight more than 9 tons | 291 | 317 |
| 2 | Powered vehicles with 1 single-tyred spaced axle and 1 twin-tyred spaced axle  | Not more than 6 tons | 66 | 72 |
| | | More than 6 tons and not more than 9 tons | 104 | 114 |
| | | More than 9 tons and not more than 12 tons | 142 | 155 |
| | | Any RUC weight more than 12 tons | 278 | 284 |
| 311 (Bus) | Powered passenger service vehicles with 3 axles  | Not more than 18 tons | 278 | 303 |
| | | Any weight more than 18 tons | 372 | 372 |

| RUC vehicle type number | Description and example (images are indicative only) | Weight bands | RUC rate ($ NZD per 1000km GST inclusive) up to 30 Sep 2018 | RUC rate ($ NZD per 1000km GST inclusive) as of 1 Oct 2018 |
|---|---|---|---|---|
| 6 | Powered vehicles with 3 axles, (except type 308, 309, 311 or 399 vehicles).   | Not more than 12 tons | 90 | 99 |
| | | More than 12 tons and not more than 18 tons | 292 | 321 |
| | | Any RUC weight more than 18 tons | 391 | 391 |
| 14 | Powered vehicles with 4 axles (except type 408 or type 499 vehicles).  | All RUC weights | 361 | 392 |
| 19 | Powered vehicles with 5 or more axles (except type 599 vehicles).  | All RUC weights | 321 | 350 |
| 308 | Towing vehicles with 3 axles that are part of a combination vehicle with a total of at least 8 axles.  | All RUC weights | 359 | 388 |

| RUC vehicle type number | Description and example (images are indicative only) | Weight bands | RUC rate ($ NZD per 1000km GST inclusive) up to 30 Sep 2018 | RUC rate ($ NZD per 1000km GST inclusive) as of 1 Oct 2018 |
|---|---|---|---|---|
| 408 | Towing vehicles with 4 axles that are part of a combination vehicle with a total of at least 8 axles.  | All RUC weights | 333 | 362 |
| 309 | Towing vehicles with 3 axles that are part of a combination vehicle with a total of at least 9 axles.  | All RUC weights | 284 | 312 |

Source: “Road User Charges” booklet, October 2018, NZ Transport Agency.

## RUC Exempted Vehicles

- Heavy- or light-duty vehicles which were not initially designed for road traffic (e.g. forestry equipment, construction/industrial mobile cranes, tractors).
- Light diesel vehicles (i.e., weigh less than 3.5 tonnes) used almost exclusively for off-road purposes may be eligible to be granted a permanent RUC exemption. Relevant purposes include:
  - Agricultural.
  - Defense.
  - Education.
  - Forestry.
  - Medical.
  - Search and Rescue.
  - Off-road Tourism.