Heavy vehicle charges determination: consultation regulation impact statement

June 2021

National Transport Commission

Report outline

Title	Heavy vehicle charges determination: consultation regulation impact statement, June 2021
Type of report	Consultation regulation impact statement
Purpose	For consultation as part of the heavy vehicle charges determination to inform heavy vehicle charges from 2022–23 onwards.
Abstract	This consultation regulation impact statement seeks feedback on a range of options for setting heavy vehicle charges that would apply from 2022–23 onwards. It considers a range of technical changes to the PAYGO model and presents alternative options for cost allocation and implementation.
Attribution	This work should be attributed as follows: Source: National Transport Commission 2021, *Heavy vehicle charges determination*: *consultation regulation impact statement*, NTC, Melbourne. If you have adapted, modified or transformed this work in any way, please use the following: Source: Based on National Transport Commission 2021, *Heavy vehicle charges determination*: *consultation regulation impact statement*, NTC, Melbourne.
Key words	Heavy vehicle charges, PAYGO, RUC, registration charges
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Executive summary

This consultation regulation impact statement (C-RIS) seeks feedback on options for setting future heavy vehicle charges to recover the cost of road construction and maintenance attributed to 27 classes of heavy vehicles that form the basis of the heavy vehicle charges determination.

The National Transport Commission (NTC) was directed by transport ministers in November 2019 to conduct a new heavy vehicle charges determination that would form the basis for setting heavy vehicle charges to apply from 2022–23.

Heavy vehicle charges consist of a yearly registration charge and a road user charge (RUC) on diesel fuel. These charges are set under a charging framework known as 'pay as you go' (PAYGO).

The overarching regulatory problem for this determination is to recommend an efficient and equitable set of heavy vehicle charges that adequately recovers the cost of road construction and maintenance from heavy vehicles in Australia (the problem and related limitations are discussed in chapter 2). This must occur while complying with a range of pricing principles.

Context

In making recommendations for setting heavy vehicle charges, the NTC must adhere to a set of pricing principles set by transport ministers. These principles are:

> 'National heavy vehicle road use prices should promote optimal use of infrastructure, vehicles and transport modes.
>
> This is subject to the following:
>
> - full recovery of allocated infrastructure costs while minimising both the over and under recovery from any class of vehicle
> - cost-effectiveness of pricing instruments
> - transparency
> - the need to balance administrative simplicity, efficiency and equity (e.g. impact on regional and remote communities/access)
> - the need to have regard to other pricing applications such as light vehicle charges, tolling and congestion.'

This determination is being prepared against a backdrop of a global pandemic that has caused significant social and economic disruption for Australia, consideration of Heavy Vehicle Road Reform which is expected to replace the PAYGO model, and inherent limitations of the PAYGO model. Collectively, these shape the options that are feasible within the scope of the determination.

We have examined a wide range of technical issues. Key recommended technical changes include:

- exploring options to ensure the ongoing availability of usage data
- using new, updated ESA values to allocate costs

- removing MaxMan from the model
- adjusting fuel usage estimates for leakages due to RUC exemptions for fuel used to drive auxiliary equipment
- reviewing and updating the unsealed road travel discount based on a new survey
- removing the community service obligations discount
- recalculating the regulatory component of registration charges using the current formula, updated usage data and the current approved NHVR budget as inputs.

The recommended technical model improvements underpin all options explored in this determination. We now seek your views on them, putting forward a series of questions that we invite all interested stakeholders to respond to.

Usage data

One of the key issues noted in chapter 4 relates to usage data. PAYGO relies on data derived from an Australian Bureau of Statistics' Survey of Motor Vehicle Use (SMVU). The ABS will discontinue the SMVU after the 2020 survey. The SMVU has been the NTC's only source of road use and fuel use data in the past, and no alternate source is readily available. Discontinuing the SMVU after 2020 means the PAYGO model could become inoperable unless an alternative approach to source the essential usage data is found.

The options

Incorporating the technical changes recommended in chapter 4, this C-RIS seeks feedback on three cost allocation options (discussed in chapter 5) and three implementation options (discussed in chapter 6). In developing these options, the NTC conducted a series of initial workshops with industry and government stakeholders to assist with exploring a variety of technical and implementation aspects related to a charges framework. The information gained from these workshops has influenced the development of this C-RIS.

Cost allocation options

Under PAYGO, costs to each vehicle class are allocated using a combination of a cost allocation matrix and data on vehicle use, commonly referred to as 'usage data'. This process determines the percentage of total costs allocated to heavy vehicles and light vehicles respectively.

The size of the heavy vehicle cost base, and the level of heavy vehicle charges, are sensitive to the cost allocation specified in the cost allocation matrix. Government revenues from heavy vehicle charges are also directly affected by the cost allocation process.

After analysis, the challenge that emerged for this C-RIS is that all options produce outcomes that comply with the principle that the cost allocation to a particular group of users should fall between stand-alone and incremental cost. This means that the choice between cost allocation approaches is one of judgement based on wider considerations, rather than pure economic or scientific analysis. One of the motivating factors to consider a possible change is that some options may allocate road wear costs more accurately than others. However, the benefits of doing so are likely to be limited by the highly averaged nature of heavy vehicle charges.

We therefore recommend that the options for this determination be built around the three possible cost allocation approaches, being the:

- current approach – this is the status quo and retains the current cost allocation matrix
- modified current – modify the current cost allocation matrix to allocate 70 per cent of costs in expenditure category B2 using equivalent standard axle per kilometre as the measure
- VIC DTF/DOT – use the work commissioned by Victorian Department of Treasury and Finance and the Victorian Department of Transport to develop alternative cost allocators, which broadly reflect the cost allocators recommended by the Australian Road Research Board in its report (ARRB, 2019).[1]

Table 1 describes the impact of the three cost allocation options on the estimated heavy vehicle cost base and the gap between estimated revenue and the heavy vehicle cost base.

Table 1. Cost allocation options – estimated heavy vehicle cost base and revenue gaps

Estimated revenue gap 2021–22	$m	Gap ($m)	Gap (%)
Estimated revenue from heavy vehicle charges in 2021–22	3,449		
2021–22 heavy vehicle cost base – current	3,817	368	10.7
2021–22 heavy vehicle cost base – modified current	3,934	485	14.1
2021–22 cost base VIC DTF/DOT	4,184	735	21.3

The decision between these options needs to focus on the following considerations:

- The revenue from current heavy vehicle charges is insufficient to recover the heavy vehicle cost base under the current cost allocation approach. Changing cost allocators will increase this gap.
- The modified current approach represents a small technical change to the current approach, which seeks to better reflect the relationship between vehicle weight and road wear.
- The VIC DTF/DOT approach is a fundamental departure from the current and modified current approaches. It is based on Victorian data only and has not yet been externally reviewed.

[1] This work was developed by the Victorian Department of Transport and Department of Treasury and Finance to inform discussions around cost allocation. It is not approved Victorian government policy.

- The choice between cost allocation approaches is one of judgement based on wider considerations rather than pure economic or scientific analysis.

We are seeking the views of stakeholders on which of the options achieves the best balance for the purpose of this determination.

Implementation options

In line with the pricing principles, the objective of the determination is to deliver full cost recovery over time. Direct implementation is the approach followed in most previous determinations and would move immediately to full cost recovery. This would be likely to require an increase of more than 13 per cent.

The current economic conditions and the impact of COVID-19, and questions around the ability of industry to absorb such a significant increase in charges, make it questionable whether this this option is feasible. The C-RIS has therefore explored two other alternative options that seek to moderate the impact on industry.

An alternative to an immediate move to full cost recovery is to consider a multi-year price path that would seek to move towards recovering costs over a longer timeframe. Setting charges for multiple years would allow the transition towards full cost recovery to begin at a measured pace in a way that recognises the cost recovery principle underpinning PAYGO while also recognising that moving to full cost recovery immediately would impose an unreasonable burden on heavy vehicle operators.

Agreeing a multi-year price path has the potential to reduce administrative and compliance costs for governments and industry.

A defined price path may offer additional advantages in that it would provide industry with certainty about the heavy vehicle charges that would apply in the medium term, allowing vehicle operators to make better pricing decisions and reflect them in contracts.

We recommend exploring options for a three-year price path as the best compromise between providing certainty and reducing the risk of the gap between the heavy vehicle cost base and heavy vehicle charges revenue widening significantly during the price period. We seek stakeholders' views on two separate options built on this approach.

In consideration of the range of complexities, the following implementation options are explored in this C-RIS:

- Direct implementation in 2022–23 with automatic annual adjustments to ensure full recovery of the identified heavy vehicle cost base in subsequent years. This is the baseline option.
- Three-year fixed price implementation pathway where transport ministers agree to fixed yearly price changes for three years
    - Example 1: Three-year price path with average increases of 3.5 per cent per annum over the three years. The increases of 3.5 per cent in the fixed yearly increase are intended to reflect the actual average annual growth rate in the heavy vehicle cost base from 2012–13 to 2021–22. This option would most likely maintain any current gap between charges and cost recovery.
    - Example 2: Three-year price path with average increases of 6 per cent per annum over the three years. This option would see charges increase

above the recent growth rate in an attempt to move closer to full cost recovery over time.

The NTC considers that the choice between the three implementation options lies in the trade-off between achieving cost recovery over time and the need to consider the impact on industry, with particular consideration for equity issues such as the likely impact on remote and rural communities. We are seeking the views of stakeholders on which of the three implementation options would achieve the best overall trade-off between these competing objectives.

Consultation and next steps

Underpinning the options are a series of assumptions that were tested with industry and government stakeholders in the workshops and are discussed in chapter 4. We now seek your views on these assumptions and the options and invite you to respond to the list of consultation questions at section 1.7, along with any additional remarks you wish to offer.

Following the end of the consultation period, we will analyse the information we receive and formulate recommendations for a decision RIS. The decision RIS will make recommendations to transport ministers at the Infrastructure and Transport Ministers' Meeting (ITMM) in November 2021 for a new determination to apply for heavy vehicle charges applying from 2022–23. Following the meeting, Ministers will consult further on any proposed increase, in line with the Fuel Tax Act 2006.

ITMM will then consider any submissions received on the preferred option/s and make a final decision on registration charges and RUC to apply from 2022–23 onwards.

1 Introduction

1.1 ITMM directions to the NTC

In November 2019 the then Transport and Infrastructure Council (now Infrastructure and Transport Ministers' Meeting, ITMM) directed the National Transport Commission (NTC) to conduct a new determination that recommends heavy vehicle charges that would apply from 2022–23 onwards.

1.2 What are heavy vehicle charges?

Heavy vehicles apply to all vehicles with a gross vehicle mass (GVM) of over 4.5 tonnes.

There are three components to the charges paid by heavy vehicles:

- the road user charge (RUC) administered by the Commonwealth Government
- the roads component of the registration charge, as applied by state and territory governments
- the regulatory component of the registration charge (regulatory charge), which covers the operating cost of the National Heavy Vehicle Regulator (NHVR).

The RUC and registration charge are designed to reflect the cost to governments of building and maintaining roads for trucks. The amount to cover the cost of the NHVR is designed to vary in line with the NHVR's budget, which is approved by ITMM.

1.3 Background to the PAYGO system

Heavy vehicles in Australia are defined as any vehicle weighing over 4.5 tonnes. These vehicles are charged an annual registration charge and a RUC, which is levied on each litre of fuel (diesel, petrol or blended fuels).

These charges are set under a charging framework known as 'pay as you go' (PAYGO). The primary objective of the PAYGO system is to deliver nationally consistent heavy vehicle charges that recover both capital and operating expenditure by governments related to heavy vehicle use in the year they are incurred. Governments have agreed several pricing principles that underpin the operation of the PAYGO system.

The NTC has been administering the PAYGO system for almost two decades. During that time the NTC has completed several heavy vehicle charges determinations aimed at refining the PAYGO system and ensuring heavy vehicle charges reflect the most up-to-date information on road expenditure and road use.

The last heavy vehicle charges determination was delivered to governments in early 2014. Since then, several changes to government road expenditure and road use by heavy vehicles have occurred. This determination provides an opportunity to review the PAYGO system, its assumptions and data to ensure it remains current.

1.4 High-level approach and scope for this determination

1.4.1 Approach

This heavy vehicle charges determination uses the work that was conducted as part of the previous determination in 2014 as its starting point.

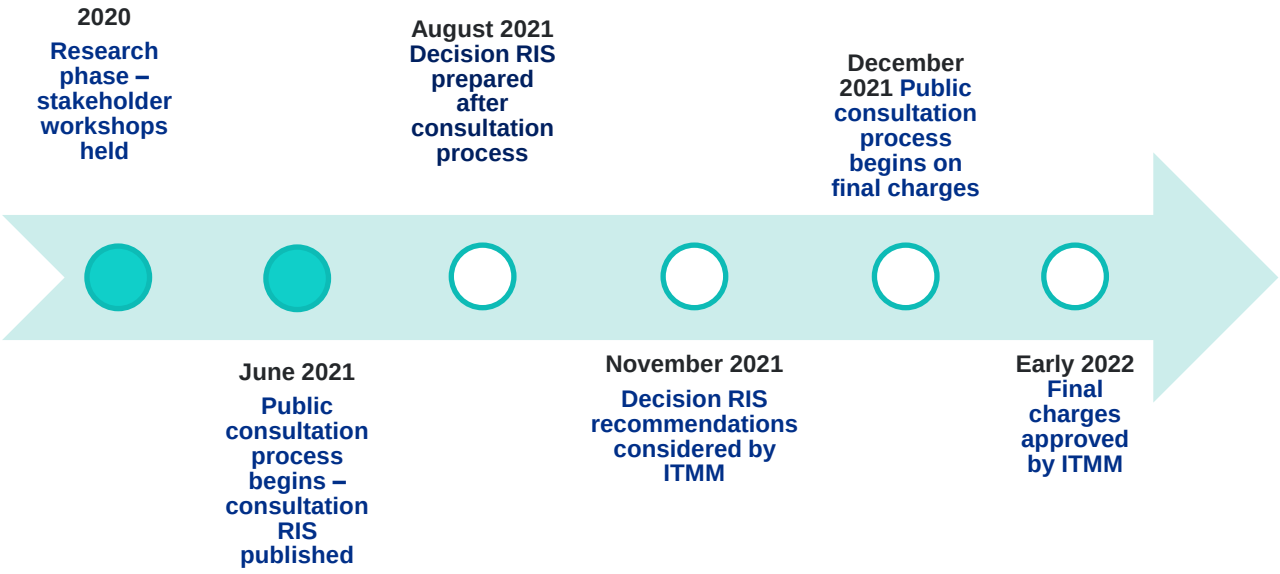
The determination is conducted while work on the Heavy Vehicle Road Reform (HVRR) agenda proceeds. This determination is designed to be consistent with and provide a platform for implementing future reform if agreed. The HVRR direction affects and provides a boundary for the scope of this determination. The HVRR agenda, as it affects this determination, is set out in more detail in section 3.3.

The determination will consist of several phases:

- scoping
- analysis and investigation (in several workstreams)
- option definition
- option modelling
- regulation impact statement (RIS) development (including consultation on the draft RIS)
- implementation.

Engagement with governments, industry associations and individual operators will occur during all phases. A high-level timeline is depicted in Figure 1.

Figure 1. Project timeline



1.4.2 Scope

A heavy vehicle charges determination typically involves examining all aspects of the PAYGO methodology to ensure it produces outcomes that are consistent with the pricing principles.

What is in scope

Specifically, the scope will include reviewing the following aspects of the current PAYGO methodology and, where possible, explore alternative options:

- measuring road expenditure by state and territory governments over time, including investigating options to improve the reliability and quality of data sources
- measuring local government road expenditure, including the reliability and quality of data sources
- exploring possible approaches to minimise the volatility of heavy vehicle charges without compromising cost recovery in the longer term
- allocating expenditure between the different vehicle classes, including the cost allocation matrix used in the cost allocation process
- road use and fuel consumption data, and how it is used in the model
- how toll roads, partially tolled roads, public–private partnerships (PPPs) and other innovative financing models are treated
- the relativity of charges paid by different heavy vehicle classes.

In assessing the current model and potential changes, the NTC will comprehensively assess:

- the impact on the heavy vehicle industry in general, and on different operators within the industry
- the impact on remote and rural communities
- overall economic and fiscal implications.

What is out of scope

The following issues will not be considered as part of the determination:

- changes to the PAYGO pricing principles
- changes to the responsibility of ITMM for approving heavy vehicle charges
- implementation of a forward-looking cost base (FLCB)
- changes to the way the NHVR's approved budget is recovered through the regulatory component of heavy vehicle registration charges (although changes to the amount of the regulatory component of registration charges and the relativities between different heavy vehicle types may be considered)
- changes to any of the current pricing mechanisms consisting of registration charges and the RUC
- changes to the way heavy vehicle charges revenue is collected.

1.5 Consultation to date

As part of preparing this consultation RIS (C-RIS), we held several workshops with industry and government stakeholders. The workshops covered the topics listed in Table 2.

Table 2. Topics covered at workshops

Workshop number	Topic
1	Scope and process Trust in and quality of expenditure data Expenditure categories Treatment of toll roads
2	Overview of cross-subsidy check Multi-year price setting, dealing with under charging and over charging Usage data Cost allocation process overview and issues
3	MaxMan – role and effect Leakages Concessions – summary and current approach Averaging and other related issues
4	Equivalent standard axles Cost allocation options overview Vehicle operating costs
5	Annual adjustment Implementation/transition Other outstanding issues
6	Developing coherent options to be included in the RIS Process to C-RIS and beyond

The feedback received through these workshops has allowed the NTC to test a range of ideas. The information gained from these workshops has directly influenced the proposed model enhancements and determination options set out in chapters 4 and 5 respectively.

1.6 This consultation RIS

This C-RIS is structured as follows:

- Chapter 2 outlines the regulatory problem this determination is trying to solve.
- Chapter 3 provides the context within which this determination is being carried out.
- Chapter 4 explores a range of possible improvements to the PAYGO model and the assumptions and data used.
- Chapter 5 presents three broad determination options and compares them.
- Chapter 6 explores different implementation options.
- Chapter 7 outlines further recommended work that is not part of this determination but would serve to enhance the heavy vehicle charges system.

1.7 Consultation questions

We are seeking your views on the following questions:

2 Problem statement

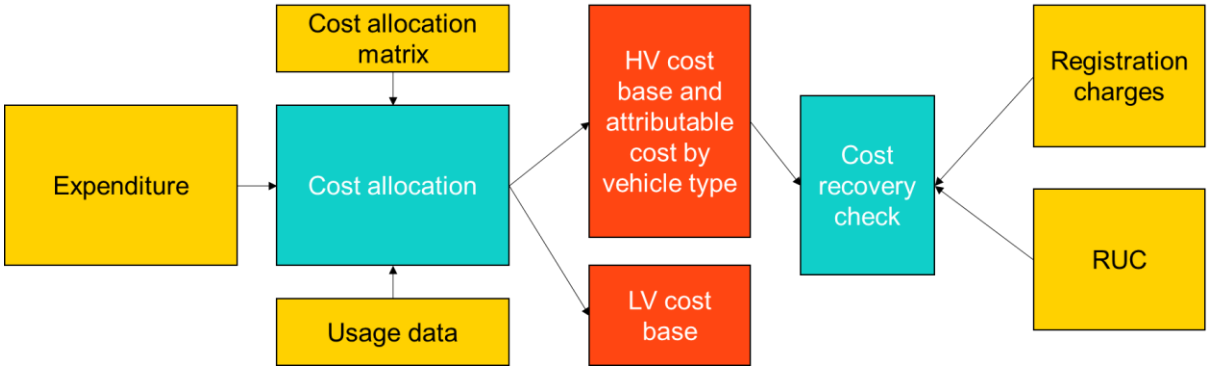
2.1 Cost recovery over time in an efficient and equitable manner

The overarching regulatory problem for this determination is to recommend an efficient and equitable set of heavy vehicle charges that adequately recovers the cost of road construction and maintenance for heavy vehicles in Australia.

The current PAYGO model has now been in use since the 2014 determination. There have been many changes to the way the heavy vehicle fleet operates and some key inputs, such as equivalent standard axle (ESA) values, are likely to have become outdated. It is therefore necessary to subject the current model to a comprehensive review to ensure inputs and assumptions are up to date and reasonable.

Figure 2 provides a high-level overview of the PAYGO model. Seven years of expenditure data in each expenditure category is averaged using the exponential moving average methodology. The cost allocation matrix specifies cost allocators for each expenditure category, and this is combined with usage data (for each cost allocator) and the averaged expenditure data to allocate costs to heavy vehicles and light vehicles. The cost allocation process also calculates attributable costs for each vehicle class, which are used in the cost recovery check. The cost recovery check compares the attributable costs for a vehicle class with the registration charges and RUC paid to ensure there is no cross-subsidisation between heavy vehicle classes (as well as checking that the aggregate charges paid by all heavy vehicles is equivalent to the heavy vehicle cost base).

Figure 2. Overview of the PAYGO model



2.1.1 The pricing principles

In doing so, the NTC is required to adhere to the pricing principles that originate from the Australian Transport Council (ATC) (now called the Infrastructure and Transport Ministers' Meeting, ITMM) and the National Cabinet (formerly the Council of Australian Governments). These principles are:

> 'National heavy vehicle road use prices should promote optimal use of infrastructure, vehicles and transport modes.
>
> This is subject to the following:
>
> - full recovery of allocated infrastructure costs while minimising both the over and under recovery from any class of vehicle

- cost-effectiveness of pricing instruments
- transparency
- the need to balance administrative simplicity, efficiency and equity (e.g. impact on regional and remote communities/access)
- the need to have regard to other pricing applications such as light vehicle charges, tolling and congestion.'

Following the Productivity Commission's inquiry into road and rail infrastructure pricing in 2006, the ATC provided further direction to the NTC:

> *ATC direct the NTC, in developing its determination, to apply principles and methods that ensure the delivery of full cost recovery in aggregate, further develop indexation adjustment arrangements to ensure the ongoing delivery of full expenditure recovery in aggregate and remove cross subsidisation across different heavy vehicle classes, recognising that transition to any new arrangement may require a phased approach (ATC, 2007).*

2.1.2 Objective of the determination

This determination sets out the options available in accordance with the pricing principles and notes the limitations associated with each option to address the variety of issues that have arisen. While the determination takes into consideration the issues raised through consultation and the broader context outlined in this report, it is limited in its ability to fully address these because it is bound by the pricing principles and the limitations of the PAYGO system.

2.2 Features and limitations of the current charging framework

There are inherent limitations in the PAYGO methodology that cannot be resolved without more extensive reform, as being considered through the HVRR agenda.

These limitations are outlined below.

2.2.1 Recovery of capital costs up-front

The PAYGO methodology recovers annual government capital and operating expenditure on roads in a single year. Capital expenditure is volatile and 'lumpy' in that a single large project can have a significant effect on total expenditure. This leads to the heavy vehicle cost base and heavy vehicle charges being more volatile than they would be if set under a methodology that spreads capital expenditure over the life of the asset (which may be up to 100 years).

2.2.2 Averaging

It is common for an infrastructure charging regime to apply averaging to some degree because deriving a user's precise cost on the network is either impossible or too costly to ascertain. The PAYGO charging framework uses several types of averaging to calculate heavy vehicle charges. This includes averaging expenditure over time, averaging usage data, and then comparing allocated costs with charges paid by the average vehicle in each class.

The model uses the Survey of Motor Vehicle Use (SMVU) data from the Australian Bureau of Statistics (ABS) for vehicle kilometres travelled (VKT), fuel consumption and gross tonne

kilometres (GTK) by vehicle class (e.g. 3-axle rigid truck). These inputs are in the form of an average for each vehicle class (e.g. 2-axle rigid truck under 7 t GVM, 6-axle articulated truck). Costs are allocated to each vehicle class based on these average values. Therefore, the registration charges applying to each vehicle class will reflect the costs allocated to the average vehicle in this class.

The result is that individual operators of a particular type of vehicle who travel less, or operate at below average weights, will pay a higher registration cost per tonne/kilometre than another user who travels above the average distance or operates above average weights.

This 'inequity' within a vehicle class typically affects certain types of operators (e.g. primary producers who only use their vehicle seasonally to move livestock from the paddock to the point of sale). Similarly, volume-constrained operators will fare differently from mass-constrained operators. Effectively, the fact that charges for different vehicle classes are set based on average usage characteristics creates a disparity between what operators ought to be charged to accurately reflect their road use and what they are actually charged. Which operators are charged less than they ought to be charged and which operators are charged more than they ought to be charged depends on the structure of charges, the balance between registration and the RUC, and the nature of the operator's usage.

2.2.3 Setting average national charges to recover national expenditure

The heavy vehicle cost base is derived by measuring heavy vehicle–related road expenditure across all jurisdictions and calculating a national heavy vehicle cost base. Heavy vehicle charges are then set to recover the cost base through charges that are set on a national basis. This methodology does not ensure the revenue received by each a state or territory equals their historic or future expenditure, thus creating a possible disjoint between investment and revenue for states and territories.

A state or territory undertaking additional new capital or maintenance works will not necessarily recoup the full value of the additional expenditure, while those jurisdictions that did not increase expenditure still benefit from the resulting increase in heavy vehicle charges to some degree, thus introducing geographic cross-subsidisation.

2.2.4 Charges apply nationally on all road types

Heavy vehicle charges apply nationally regardless of location or road type. This necessarily means that a vehicle travelling on a poor-quality road may perceive that they are receiving a poor service quality compared with an identical vehicle travelling on a well-constructed, smooth road.

Road quality will affect fuel consumption for a given vehicle and load, with fuel consumption likely to be higher on poor-quality roads. This may result in those operators travelling on the worst quality roads paying more in RUC while experiencing a poor level of service.

On the other hand, well-constructed roads are likely be damaged less by heavy vehicle use, resulting in lower unit costs compared with poorly constructed roads that wear out more. Therefore, if charges apply uniformly, it is also possible that users of high-quality roads are disadvantaged compared with the users of lower quality roads. The same may apply in respect of high and low traffic volumes.

2.2.5 Limited number of pricing instruments

Heavy vehicle charges consist of registration charges for different types of vehicles and the RUC, which applies to all vehicles. This limited number of pricing instruments, and the fact that these charges are intended to be applied nationally, mean it is not possible to achieve precise pricing outcomes. For example, it is not possible to ensure all vehicle classes pay precisely their allocated costs.

2.2.6 Input data limitations

The PAYGO model uses SMVU datasets from the ABS to calculate heavy vehicle charges. The ABS published these datasets annually until 2007. No data was collected in 2008 or 2009. In 2010 the survey recommenced, with the collection frequency reduced to once every two years (biennially). Reducing the frequency of the SMVU to once every two years has required usage data to be estimated for intermittent years, reducing reliability and accuracy in those years.

Furthermore, the SMVU dataset originates from a survey rather than a full census of heavy vehicle usage, making it an estimate rather than a precise measure. This is reflected in the standard errors associated with certain vehicle classes. A further limitation of the survey method used to produce the SMVU dataset is the self-report method of data collection. Poor recollection of the required information or misunderstanding of the question can contribute to inaccuracies in the data.

The ABS has further indicated that the 2020 SMVU will be the last produced, which will make it necessary to source alternative usage data for future use. Section 4.5 discusses this in more detail.

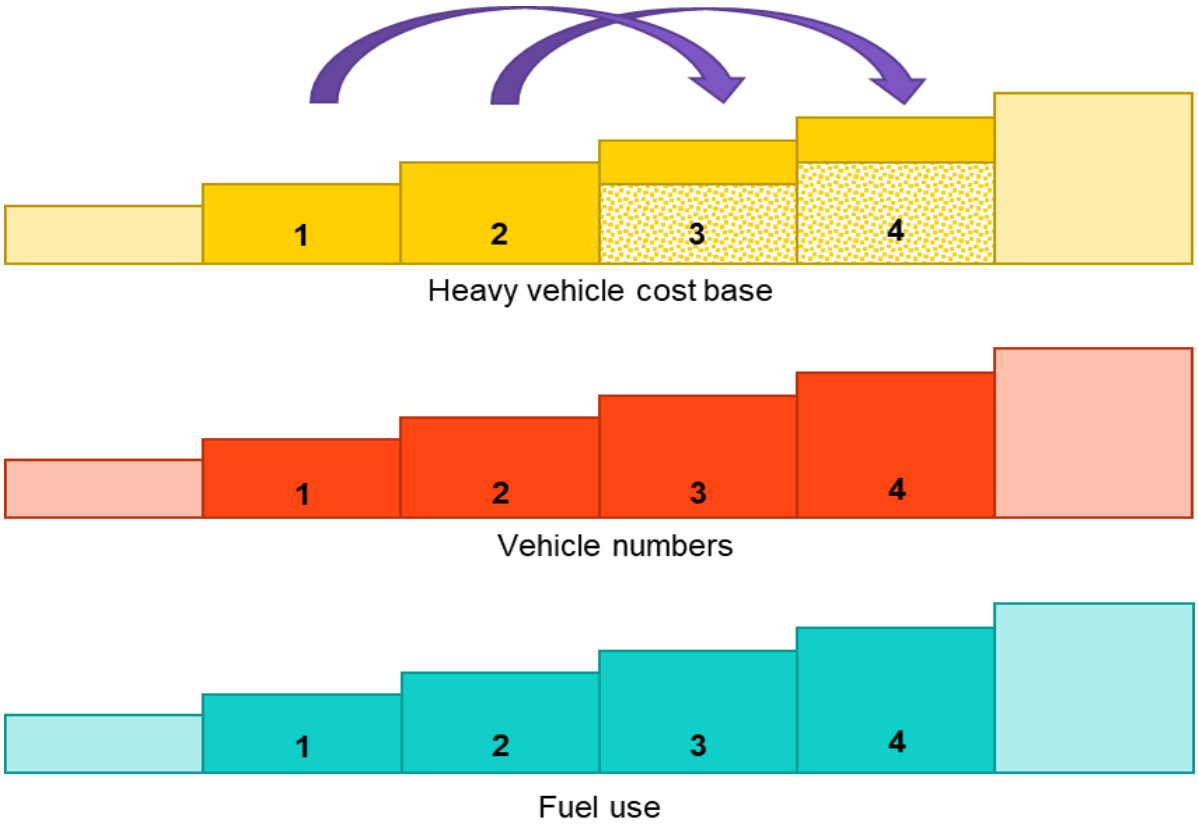
2.2.7 Non-deterministic charge setting framework

The NTC makes what is effectively a recommendation on national charges, which is not technically binding on state and territory governments. Non-implementation and a wide range of concessions being offered across state and territory governments have the potential to undermine the national nature of the charges. The charging framework also lacks a defined and comprehensive governance framework to guide what conditions should trigger a new determination. This lack of clarity leads to price reviews being initiated on an ad hoc basis.

2.2.8 Lag between cost base measurement and implementation of charges

The current PAYGO methodology involves a lag between the measurement of the cost base and the implementation of charges that are set to recover the cost base. For example, the charges that will be outlined in the decision RIS are based on expenditure data for the seven years up to and including the 2020–21 financial year. However, any charges approved by ITMM would not become effective until 1 July 2022 at the earliest. This has always been a feature of PAYGO and any associated annual adjustment mechanism. Figure 3 illustrates the delay.

Figure 3. Timing difference illustration



Under PAYGO, the expenditure data and vehicle numbers are collected after the end of year 1 (based on the seven years of expenditure and fuel consumption data leading up to and including year 1). This information is then used to determine the cost base and set charges during year 2. The earliest that they can then be applied is in year 3. These charges, which reflect the cost base and vehicle numbers in year 1, are then collected in year 3 from the actual number of vehicles registered in year 3, and on the actual amount of fuel used in year 3.

Changes in the estimated cost base over time will be different from changes in vehicle numbers and fuel use. This is illustrated above where the cost base expands more rapidly (measured as a percentage change) than either the number of registered vehicles or fuel consumption. Where this is the case, the following outcomes are likely to occur:

- Actual revenue in year 3 will usually be higher than the expected revenue calculated at the time the charges are set. This is because expected revenue is calculated based on vehicle numbers and fuel consumption in year 1 because this is the latest available information when charges are set.
- Where the cost base expands rapidly it is possible that actual revenue in year 3 is lower than the cost base would be for that year.
- Over time, revenue will ‘catch up’ to the cost base during periods where the cost base grows more slowly than the combined revenue base of fuel consumption and vehicle numbers.
- Even under a worst-case scenario where growth in the cost base permanently outpaces the combined growth in fuel consumption and vehicle numbers, the outcome is that the growth in revenue will lag the growth in the cost base. However, in the long run, total

revenue will exceed total expenditure due to the revenue uplift provided by the growth in fuel consumption and vehicle numbers.

The only effective way to eliminate circumstances where there is a delay in collecting the appropriate level of revenue (to match the actual cost base) would be to set charges based on an FLCB derived from forecast expenditure. While adopting an FLCB would be desirable for several reasons, this is out of scope for this determination. An FLCB is part of the reforms being considered under HVRR.

2.2.9 Decoupling of charges from the PAYGO model

Heavy vehicle charges have not been set to fully recover the heavy vehicle cost base since 2014–15. Since then, there have been some fixed percentage annual adjustments, revenue freezes and charges freezes. Most recently, in March 2021, ITMM decided to increase heavy vehicle charges for 2021-22 by 2.5 per cent.

There have been several reasons why charges have not been set to accurately recover the heavy vehicle cost base including:

- an inability of governments to support continued investment in the road network if heavy vehicle charges were to reduce at times where charges revenue exceeded the heavy vehicle cost base
- consideration of adverse economic conditions including fires and drought
- the impact of the COVID-19 pandemic on the economy.

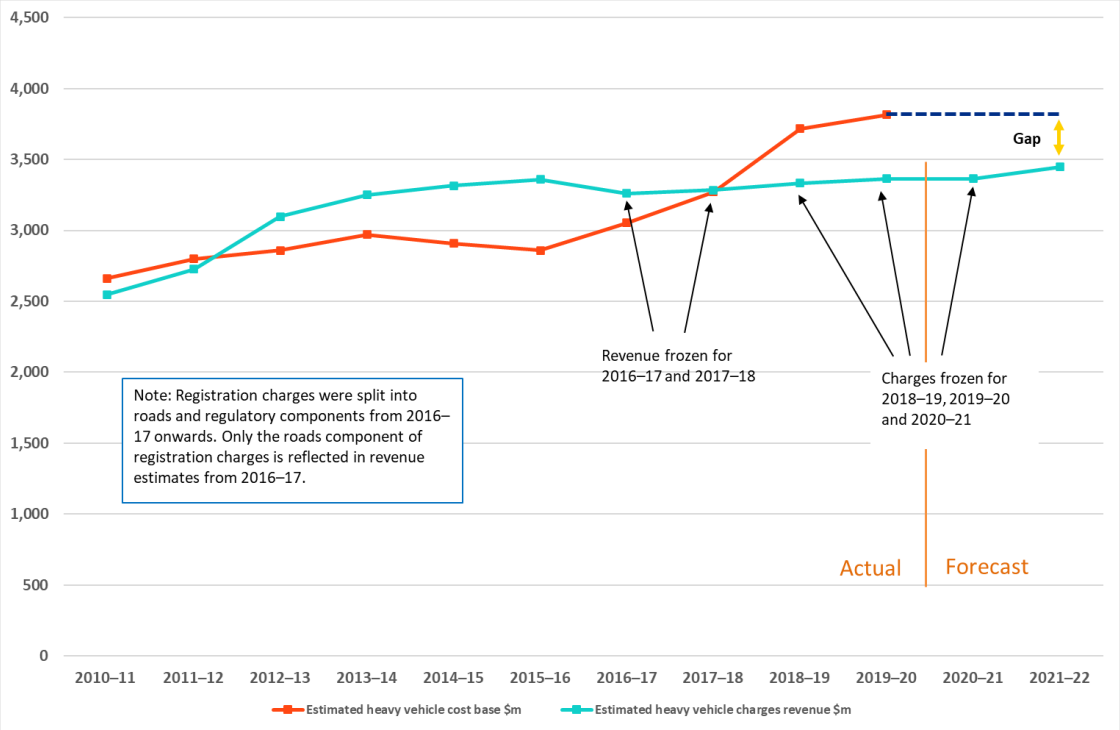
Industry has further highlighted that the predictability of changes to heavy vehicle charges is important to allow operators to plan and to reflect cost changes in their pricing and contracts.

These frequent departures from full cost recovery have led to both over- and under-recovery of heavy vehicle costs over time. This is shown in Figure 4. It is important to note that there is a two-year lag between cost base measurement and the implementation of heavy vehicle charges as outlined in section 2.2.8 and shown in Figure 3.

Therefore, one would not expect the cost base and estimated revenue to be the same in any year. Instead, if charges were accurately set to fully recover the identified cost base, one would expect the two lines to be similarly shaped, but with a two-year lag.

The graph in Figure 4 shows how the 2.5 per cent increase in heavy vehicle charges in 2021–22 will be insufficient to fully recover the identified heavy vehicle cost base measured in 2019–20. The estimated gap is approximately $368 million.

Figure 4. Heavy vehicle cost base and estimated revenue ($m)



One of the objectives of this determination is to provide a reasonable path towards re-establishing full cost recovery over time, in accordance with the pricing principles.

3 Context

The determination focuses on making recommendations for heavy vehicle charges within the applicable scope, and in accordance with the pricing principles.

While it is not within the realm of the determination to address broader issues, the recommendations of the determination recognise the reality of the broader issues affecting the heavy vehicle sector now and that are likely to continue into the foreseeable future. Therefore, the recommendations offered in the determination are considered reasonable given the broader Australian context. This section outlines the broader Australian context as it existed at the time of drafting this C-RIS.

The context for the determination includes the following:

- economic conditions, including the effect of COVID-19 on the broader economy and the operating environment of heavy vehicle operators
- government finances and plans for expenditure on road infrastructure
- the potential for HVRR to replace the PAYGO methodology in the future – the determination seeks to provide a platform for the implementation of future reform
- changes in the heavy vehicle fleet including the emergence of electric and alternative fuel vehicles, and the possible emergence of greater vehicle automation over time.

These themes are addressed in more detail below.

3.1 Economic conditions

The overall economic climate of Australia has been adversely affected by the COVID-19 global pandemic. At the time of writing this C-RIS, the pandemic was still globally active, meaning that economic conditions are expected to be challenging for the foreseeable future. The 2021–22 Federal Budget noted that 'while the outlook is more positive, we are still in the midst of a once-in-a-century pandemic. The virus remains a significant threat as recent events in India attest. The global economic recovery is fragile and expected to be uneven across different economies highlighted by a double-dip recession in the euro' (Australian Government, 2021).

The options identified in this C-RIS have taken into consideration the pandemic-induced fall in economic growth in Australia and the resulting economic impact for the heavy vehicle industry. This consideration has limited approaches that could be considered viable for both a charges framework and cost recovery measures to address the current difference between the revenue provided by heavy vehicle charges and the identified heavy vehicle cost base.

3.2 Government finances and infrastructure expenditure

Governments have increased expenditure on infrastructure generally, and on road infrastructure specifically in recent years. At the same time, the additional expenditure and lower receipts associated with the COVID-19 global pandemic have led to deteriorating government financial positions. For example, the Australian federal government's budget strategy and outlook for the 2021–22 budget shows that increasing public debt levels are expected to persist for several years (Australian Government, 2021).

This highlights the need for this determination to acknowledge the contribution that heavy vehicle charges make to government revenues, and the contribution they can make towards governments' overall fiscal position.

3.3 Heavy Vehicle Road Reform project

Australian governments are working together to progress HVRR. This work is being overseen by transport and infrastructure ministers. If implemented, these reforms would replace the current PAYGO system for setting heavy vehicle charges.

HVRR aims to achieve productivity gains, improve roads for all users, and put in place an assured funding stream to allow road managers to maximise benefits from the existing road network. This is in the context of a burgeoning freight task and plateauing industry productivity.

Transport ministers have directed officials to prepare advice on heavy vehicle supply-side reforms. The reform elements include:

- infrastructure and transport ministers set national service-level standards for roads to guide road expenditure decisions
- an independent body to review state and territory government road expenditure decisions
- an independent body to set heavy vehicle charges
- all governments dedicate (hypothecate) revenue from heavy vehicle charges to road expenditure.

Of these elements, transport ministers have agreed to develop the service-level standard framework, but no decision has been taken on other supply-side reform elements.

Further information on HVRR can be found under **https://www.infrastructure.gov.au/roads/heavy/**.

The key implications for this determination are that it needs to provide a platform for heavy vehicle charges to be set until HVRR is implemented, in a way that is compatible with future reform and provides a suitable platform for possible future reform implementation.

The timing of reform implementation is uncertain. Therefore, this determination needs to provide flexibility for reforms to be implemented if and when they are approved by governments.

3.4 Heavy vehicle fleet and industry trends

Based on road use data sourced from the SMVU and state/territory registration authority fleet data, the following changes have occurred in the past seven years since the last determination:

- The heavy vehicle fleet has grown more slowly than the light vehicle sector, with heavy vehicle registrations up by 10 per cent over the period compared with 14 per cent for light vehicles. The growth in the light vehicle fleet has been led by light commercial vehicles, whose registrations are up by 28 per cent.
- Within the heavy vehicle sector, vehicle population growth has been largely focused on the truck-and-dog rigid combinations with a gross combination mass (GCM) over 42.5 tonnes up by 28 per cent and B-double combinations up by 32 per cent. Other heavy

vehicle types where the number of vehicles is rising strongly are 4-axle rigids over 25 tonnes GVM with no trailer up 68 per cent and single-trailer articulated trucks over six axles more than doubling.

- Total VKT by both the heavy vehicle and light vehicle sectors have increased by 7 per cent over the past seven years. In the most recent year, light vehicle VKT fell by 7 per cent due to the impact of COVID-19 on travel, but heavy vehicle VKT was up by 2.5 per cent. The annual average distance travelled by heavy vehicles reduced by 3 per cent over the past seven years. Growth in total VKT was strongest in those vehicle classes with high population growth, with truck-and-dog rigid combination over 42.5 tonnes up by 33 per cent, 9-axle B-doubles up 29 per cent, 4-axle rigid trucks over 25 tonnes GVM up by 83 per cent and single-trailer articulated trucks over six axles more than doubling.
- The average fuel efficiency of heavy vehicles has improved since the last determination, with fuel use per 100 kilometres of travel reduced by 2 per cent. Light vehicles overall experienced a fall of 0.7 per cent over the same period. Both the truck-and-dog rigid combinations over 42.5 tonnes and 9-axle B-doubles achieved fuel efficiency gains of 5 and 8 per cent respectively over the period.
- Average tonne kilometres by the heavy vehicle sector rose by 13 per cent during the period, with truck-and-dog rigid combination tonne kilometres up by 30 per cent and 9-axle B-double tonne kilometres up by 26 per cent. Average gross mass (AGM) across the entire heavy vehicle fleet was up by 6 per cent over the period, which indicates the fleet is getting heavier over time as operators and their customers look to gain greater efficiencies by operating trucks and heavy vehicle combinations that have a truck and trailer combination (whether it be a rigid truck combination or an articulated truck combination) being able to haul heavier loads.
- Recent years have seen the emergence of alternative fuels for light vehicles with electric-only and hybrid electric/petrol vehicles. However, so far this is yet to materialise in the heavy vehicle market. A total of 128 electric or hybrid electric heavy vehicles are currently identified by registration authorities, out of a total of half a million heavy vehicles registered nationwide. Over 99 per cent of heavy vehicles use diesel, with most of the remainder being compressed natural gas used in buses.
- The significance of these trends is that the heavy vehicle fleet is continuing to improve its fuel efficiency and productive efficiency in carrying heavier loads on average but with less fuel required. This results in fewer heavy vehicles being required for a given national freight task and results in less environmental and congestion impacts than otherwise would occur.
- In terms of national heavy vehicle charging, these trends mean there will be relative shifts in the share of national road expenditure allocated to the light vehicle sector versus the heavy vehicle sector and with relative road expenditure allocated between heavy vehicle classes, as some vehicle classes increase in significance relative to others. The fall-off in light vehicle travel over the past year due to COVID-19 (and the heavy vehicle travel continuing to grow) means the heavy vehicle sector attracts a greater share of overall road expenditure that needs to be covered by a higher level of heavy vehicle charges than would otherwise occur.

3.4.1 Operating costs

HoustonKemp consultants were contracted to update the vehicle operating cost model. The update was conducted in consultation with key industry stakeholders. The key updates compared with the model produced in 2013 were:

- Labour costs have increased significantly as it reflects the most recent award wages and includes costs previously not considered in the previous model.

- Fuel costs have decreased because the pump price for diesel excluding fuel excise has declined.
- Vehicle and capital costs have remained largely the same because the increase in market prices and the inclusion of stamp duty have been largely offset by lower financing rates.
- The tyres/maintenance costs have increased significantly for some vehicle types (e.g. rigid vehicles and buses) to reflect costings in the Australian Transport Assessment and Planning guidelines and stakeholder feedback.
- Other costs have increased to cover costs previously not considered in the model – for example, compliance training, parking and tolls and the introduction of new technology such as electronic work diaries.

Analysis showing changes in operating costs for common vehicle classes is provided in section 6.6.3.

4 PAYGO model improvements

4.1 Overview

The NTC has considered a range of issues as part of this determination and assessed them, in early consultations, for their value to supporting an accurate determination of heavy vehicle charges. Broadly, these fall into the following categories:

- no changes to be made – generally because either there was no material basis for a change to be made or the issue is being addressed under HVRR
- improvements to the PAYGO model are recommended – generally due to technical and/or non-controversial changes being made, including due to updated data
- options parameters – where changes are potentially justified but are of a more contestable nature and therefore warrant deeper assessment as a core focus of the options assessed in this C-RIS.

These issues and their assessment are summarised in Table 3.

Table 3. Summary of model improvements considered

Section	Topic	Summary of recommended approach
Road expenditure		
4.2	Trust in expenditure data	No changes recommended because no cost-effective mechanism to address the issue has been identified. This issue will be better addressed as part of HVRR.
4.3	Expenditure categories	No change recommended because there is no clear advantage to changing expenditure categories under PAYGO and there is no certainty on the categories that would be used under HVRR.
4.4	Treatment of innovative funding and financing models	Treatment on net neutral basis in accordance with broad principles recommended.
Input data and assumptions		
4.5	Usage data	Ensuring ongoing availability of usage data identified as an important issue. The NTC to develop and recommend alternative sources in the future.
0	Review of ESA values	Use of new, updated ESA values recommended.
4.7	Cost allocation	Recommendation to build determination options around three different options for the cost allocation matrix.

Modelling approach and adjustments		
4.8	MaxMan	Removal of MaxMan recommended.
4.9	RUC leakages	Recommendation that fuel usage be adjusted for leakages using conservative estimate based on ATO fair and reasonable rates.
4.10	Unsealed road travel discounts	Review/update based on new survey recommended – results to be incorporated in the final RIS.
4.11	Community service obligations discount	Removal recommended because this has minimal impact in practice.
4.12	Concessions	No changes recommended as part of determination. Separate process recommended for states and territories to review and harmonise, where possible.
4.13	Electric vehicle fleet	No action recommended as part of this determination. Regular reporting and monitoring recommended.
Recovery of regulatory costs		
4.14	Recovery of regulatory costs	Recalculate regulatory component of registration charges using current formula, updated usage data and current approved NHVR budget.

The following sections provide a detailed analysis for each topic, outlining the issue and possible options before presenting a recommended approach.

4.2 Trust in expenditure data

A relative lack of trust by industry in the expenditure data submitted by states and territories and its allocation to PAYGO cost categories has been a persistent issue across previous determinations.

As part of the previous determination, the NTC commissioned a review conducted by EY to develop a possible audit program designed to check the accuracy of expenditure data submitted by jurisdictions.

The scope of this work included:

- identifying key risk areas associated with preparing NTC road construction and maintenance data
- developing audit design options to address key risks
- designing a range of audit options to assist the NTC in increasing stakeholder confidence on the accuracy, consistency and categorisation of the reported expenditure.

The report provided a range of options for an audit program which were assessed by the level of confidence provided and the cost of implementation, as outlined in Table 4.

Table 4. Audit program options

Audit option	Description	Level of confidence	External cost estimate
Option 1: Status quo with CEO attestation, increased guidance from improved guidelines and expenditure template	Improve the expenditure template and guidelines to help achieve consistent application across all jurisdictions. A sign-off statement should be provided by each organisation's CEO or equivalent when lodging the NTC expenditure template.	Low	There would be no audit fee to be paid to external parties.
Option 2: Analytical review for reasonableness	Perform a high-level analytical assessment of the expenditure data reported by each jurisdiction to identify variances and trends including a comparison between jurisdictions.	Low	The cost paid to external parties to implement this audit was estimated as $30–35k across all jurisdictions.
Option 3: Desktop audit examining key inputs and assumptions	Each jurisdiction to provide documentation to support the expenditure data it has reported in the NTC expenditure template using a standard format prescribed by the NTC. The auditor performs a desktop review of all data provided on a line-by-line basis to confirm the calculation has been executed in accordance with NTC's instructions and the source appears appropriate.	Medium	The cost paid to external parties to implement this audit was estimated as $60–65k across all jurisdictions.
Option 4: Site visit with detailed testing	A team of auditors will comprehensively examine the data inputs and calculation of figures reported in the NTC's expenditure template. Key controls governing the template population process will be identified and tested on a sample basis. A sample of transactions will be traced from the template to each jurisdiction's finance system and through to source input information. Manual calculations will be re-performed to confirm accuracy and reviewed for consistency with the intent of the guidelines.	High	The cost paid to external parties to implement this audit was estimated as $115–125k across all jurisdictions.
Option 5: Expenditure data checked by each jurisdiction's external auditor or other third-party auditor	Jurisdictions are to include the expenditure data reported to the NTC as an additional note disclosure to its annual financial statements. Jurisdiction external auditors assess the material accuracy of reported expenditure data as part of their annual financial statement audits.	High	The cost paid to external parties to implement this audit was estimated as $185–200k across all jurisdictions.

Option 1, which was to retain the status quo, was implemented as part of the 2014 determination with the addition of a CEO (or delegate) sign-off statement now supplied annually to the NTC together with the PAYGO expenditure data.

The options in Table 4 were again presented to the industry and governments as part of the workshops for this determination:

- While industry retains a desire for increased transparency of expenditure reporting, they expressed an unwillingness to pay for an expensive auditing regime.
- Governments suggested that the options presented may not provide much greater transparency, despite the cost, given the range of skills and knowledge that is necessary for expenditure allocation.

On this basis, the NTC proposes to make no changes to expenditure auditing at this time. The NTC recommends that mechanisms for greater transparency be considered under HVRR, specifically in the proposed responsibilities of the organisations tasked with implementing an FLCB model under an independent price regulator.

4.3 Expenditure categories

4.3.1 Background

Road expenditure is entered into the PAYGO model in different expenditure categories. This allows for a different allocation of costs to heavy vehicles and light vehicles depending on the nature of the expenditure and the degree to which it is affected by different cost drivers. Cost allocation is discussed further in section 4.7.

Over recent years, the NTC has been working on a prototype FLCB model in support of HVRR. As part of this work, Opus (now WSP) developed a set of expenditure categories for the NTC to use in the prototype FLCB model (Opus, 2017). The NTC has since made some modifications to those expenditure categories in the prototype FLCB model, based on feedback from road agencies and research completed under Austroads' *AAM2102 Guidelines for minimum levels of asset componentisation* project (Austroads, 2018).

The key considerations in developing the prototype FLCB asset/expenditure categories included:

- separating expenditure by combined work categories, namely capital expenditure (including upgrade, development and renewal) and operating expenditure (including operating and maintenance) – this is important in lifecycle FLCB model (or building block model) because capital expenditure is recovered over the entire life of the asset, in contrast to operating expenditure which, similar to PAYGO, is recovered as it is incurred
- separating asset/expenditure categories with different asset lives to allow for recovery of costs over the asset's economic lifetime to be modelled more appropriately
- separating expenditure categories based on the degree to which heavy vehicles drive the road wear or construction requirements (similar to the approach for PAYGO)
- applying a materiality test to avoid having an excessive number of asset/expenditure categories; for example, there may be categories that road agencies do not collect data for (and will continue not to in the future) and/or others that may have a very low collective asset value.

4.3.2 Analysis

Although the prototype FLCB model itself is out of scope for this determination, the NTC considered the option of using its expenditure categories for the purposes of the PAYGO model in this determination. The NTC has analysed the potential advantages and disadvantages of using the existing PAYGO expenditure categories or changing to the prototype FLCB expenditure categories in Table 5.

Table 5. Advantages and disadvantages of using PAYGO or FLCB categories

	Advantages	Disadvantages
PAYGO categories	Existing and established process. Avoids any uncertainty about accuracy of data provided in any alternative expenditure categories.	State and territory road agencies may incur some additional administrative costs if the prototype FLCB model expenditure data continues to be provided alongside the PAYGO data in the coming years. That is, under this option road agencies would continue to provide two datasets rather than one (assuming the NTC continues to request data for the prototype FLCB model in the coming years).
FLCB categories	Potential to reduce some administrative costs if only one dataset (for the FLCB model) were to be provided by road agencies in the coming years.[2] Potentially begins transition towards a future use of FLCB expenditure categories under HVRR.	It is not certain that any future FLCB model that may be used under HVRR would use the exact expenditure categories used by the NTC for the prototype FLCB model (which would be the basis under which the NTC would request data under this option). Road agencies would need to provide seven years of historical data in order to operate the PAYGO model's exponential moving average. This would be likely to more than offset any administrative cost savings for road agencies for the next few years that could arise from providing only one dataset under this option. There would also be administrative costs incurred by the NTC in significantly redesigning the PAYGO model to reflect the new, larger number of expenditure categories. The split into capital expenditure and operating expenditure in the FLCB categories is irrelevant for the PAYGO model, which treats both types of expenditure in the same way. It would require new cost allocators, albeit these could be based on those currently used in the NTC's prototype FLCB model. However, the cost allocators currently used in the prototype FLCB model are based on a best-effort translation of the PAYGO cost allocators, and therefore they have not been subject to any significant testing or review of appropriateness and accuracy.

4.3.3 Conclusion

Based on the analysis in Table 5, the NTC proposes to retain the existing PAYGO expenditure categories as part of this determination.

Question 1: Do you agree with the NTC's recommendation to continue using the existing PAYGO expenditure categories? Why or why not?

[2] This potential reduction assumes that the NTC would continue to request data for the prototype FLCB model.

4.4 Treatment of innovative funding and financing methods

4.4.1 Background

A 2016 report from the Bureau of Infrastructure, Transport and Regional Economics (BITRE, 2016) about Australia's toll roads noted there were 16 toll roads in Australia. Since that time, the Toowoomba Bypass has opened in Queensland, new toll roads have opened in Sydney and more new toll roads are expected to open in the coming years.

Increasingly, governments are using innovative financing and funding methods in partnership with private enterprises to deliver new roads, bridges and tunnels, and to maintain them. There is no one single PPP model that has emerged as the dominant, or preferred, financing and funding model. In fact, recent PPPs are becoming more diverse and complex. For example, the CityLink–Tullamarine widening project and West Gate Tunnel projects in Melbourne are being funded at least partially by tolls, and by amending existing tolling arrangements on other roads owned by the private sector entity undertaking the project (Transurban, 2015; 2020).

Toll roads generate revenues that help pay for their construction and ongoing maintenance. Under PAYGO, expenditure relating to tolled roads has historically been excluded from the cost base on the basis that the costs of these roads were already recovered through tolls.[3] This treatment is likely to be appropriate where all of a road's costs are funded by the toll revenue (regardless of whether the road is owned by the private sector or government). Under any future price setting mechanism, whether PAYGO or an FLCB, this is also expected be the case.

For fully tolled roads, as described in the previous paragraph, the case is straightforward. However, in practice, there are a growing variety of PPP approaches to road provision that differ in how planning, funding and investment, operation, maintenance and ownership are allocated between government and private partners over time. This adds complexity to how road costs and revenues should be treated, and this workstream aims to address the potential deficiency in the current PAYGO guidelines regarding the treatment of these innovative financing and funding models.

The increasing prevalence and complexity of these innovative financing and funding models in the roads sector demonstrate a need to reconsider how these models are treated under the PAYGO system. As part of our FLCB program of work in previous years, the NTC identified several principles and approaches for dealing with these innovative financing and funding models, and the current workstream builds on that work.

The objective of this workstream is to identify a methodology for treating PPPs, toll roads and other innovative financing approaches in a pragmatic and non-distortionary way. Any proposed treatment under PAYGO should ideally not distort government decisions and should be based on available and identifiable information.

4.4.2 Issues

The following dot points outline the problem to be addressed in this workstream:

[3] The NTC's expenditure template guidelines state: 'All road expenditure related to roads where a toll applies or other source of direct charge applies to use of the road should not be included in reported expenditure'.

- The PAYGO system aims to recover government expenditure on roads that is not funded through other sources of revenue (e.g. insurance or disaster relief money).
- Government road procurement processes and funding/financing models have changed over the past 20 years and are continuously evolving. The current expenditure guidelines were developed during a different era of government road procurement and may not appropriately reflect developments since that time.
- The current PAYGO expenditure guidelines may lead to relevant government expenditure not being reported and government revenue sources not being adequately removed from reported expenditure (and therefore the cost base). As a result, the current expenditure guidelines could lead to an incorrect measurement of the heavy vehicle cost base, and therefore incorrect heavy vehicle charges, if they remain unchanged.

4.4.3 Analysis

Under the current PAYGO approach, expenditure relating to tolled roads is excluded from the cost base on the basis that the costs of these roads were already recovered through tolls. This treatment is appropriate where all of a road's costs are funded by the toll revenue (regardless of whether the road is owned by the private sector or government).

In practice, however, governments may make contributions to toll roads in a variety of ways, and toll revenue may not adequately recover the costs borne by the government or private sector for building, operating and maintaining the road. For example, a government may own a road that is tolled but could potentially choose to levy tolls at a level where the road's costs are not fully recovered through tolls. Even where a private sector entity has a concession to levy tolls, governments may choose to make grants, loans or other payments to the private sector entity to help ensure the viability of a project where expected future toll revenue may be perceived to be inadequate.

Both of the above are examples of where the toll is in effect a 'partial toll', since the arrangements are not achieving full cost recovery from the users of that road and the government is making up the shortfall of revenue. There is an argument that, in principle, governments should recover these costs from road users on the wider road network, since the tolls are not achieving cost recovery (as anticipated by the PAYGO expenditure guidelines).

Although governments may make contributions to toll roads to help ensure their viability, they may also receive revenues from alternative road-related sources. For example, governments may receive tolls on certain government-owned roads. Another potential model is where a government may receive any toll revenue raised on a road, and in return make availability payments[4] to a private sector participant, in effect meaning the government bears any risks relating to traffic demand levels or toll collection for that project. Apart from potentially receiving revenue from toll roads, governments may also raise revenue through other sources such as value capture[5] and asset recycling.[6] In addition to these funding sources, governments may receive 'gifted'/contributed assets (e.g. as part of new

[4] The Productivity Commission's 2014 Public Infrastructure inquiry report describes availability payments as: 'the government making payments to a private provider which are not linked to service utilisation or patronage levels, but some other "service based" metrics determined by government' (Productivity Commission, 2014, p. 240).

[5] The Productivity Commission's 2014 Public Infrastructure inquiry report identified four possible methods of value capture: betterment levies; tax increment financing; hypothecation of tax increments to an infrastructure fund; and property development (Productivity Commission, 2014).

[6] Asset recycling involves governments raising revenue from privatising existing infrastructure and hypothecating it to invest in new infrastructure.

developments) that the government is then responsible for maintaining and operating on an ongoing basis.

The current road charging system is designed to recover the costs of roads from road users – at present from heavy vehicles only but in the future potentially including light vehicles. The additional sources of funds and assets outlined in the previous paragraph need to be considered so the funding necessary to recover the identified cost of roads is not recovered more than once. That is, if a road has already been funded through another funding source (e.g. toll road users, taxpayers or developers) its costs should not then be recovered from road users.

This workstream is primarily concerned with achieving adequate funding of roads, having regard to the increasingly diverse methods of financing and funding roads, and the diversity of entities involved in the construction and management of roads. As the Productivity Commission has noted in its 2014 Public Infrastructure inquiry report, road funding ultimately must come from road users/beneficiaries or governments (which effectively means either current taxpayers or, if the government chooses to borrow funds, future taxpayers) (Productivity Commission, 2014, p. 142).

The current heavy vehicle charging system is designed to achieve the recovery of identified costs in the PAYGO model from the relevant road users (heavy vehicles). Although revenues raised through tolling or value capture could be perceived as achieving a number of possible goals – including potentially addressing externalities such as congestion or noise – the NTC proposes (for the purpose of this analysis) to simply treat revenues raised by these innovative funding methods as being for the purpose of cost recovery.

In considering the various innovative financing and funding methods for roads, we have established high-level principles for their application in a pricing context as described in section 4.4.4.

4.4.4 Proposed principles for innovative funding and financing

The NTC's proposed high-level principles are:

1. The principal aim is to achieve cost recovery.

2. All costs incurred by road agencies in building, maintaining and operating the road network for providing road services should be included in the cost base.

3. All revenue received by governments through tolls or other charges (or from value capture) on assets used to provide road services should be counted against the cost base.

4. The treatment of PPPs and toll roads should not distort government decisions on financing and funding road infrastructure.

5. Where necessary, pragmatic, implementable solutions that build on available information should be used (with the view that some aspects may need to be revisited in the future).

We note that certain PPP/toll road projects will be unique, meaning that despite the proposed high-level principles, the treatment of these projects for modelling purposes may need to be assessed on a case-by-case basis.

4.4.5 Potential options for treating innovative funding and financing

The previous section outlined some of the potential principles and treatments for innovative financing and funding models that governments may use in the roads sector. However, there is a choice to be made about whether and how much to change the current treatment of innovative financing and funding models under PAYGO. Table 6 outlines several options and each option's advantages and disadvantages.

Table 6. Treatment approaches for innovative funding and financing

Option	Advantages	Disadvantages
1. Status quo (leave expenditure guidelines unchanged)	Simple approach, with no costs/effort incurred by road agencies to change current processes. The current PAYGO system may not be in place for much longer, so this would avoid incurring any unnecessary costs.	Guidelines do not allow reporting of genuine government costs on roads that are tolled, therefore potentially leading to an incorrect measurement of the cost base and a potential inconsistency with cost recovery principles. Greater prevalence of toll roads and other innovative funding/financing approaches over time may mean that cost base measurement becomes increasingly inaccurate or unrepresentative under the current expenditure guidelines.
2. Change guidelines to require reporting of government expenditure on roads that are tolled but do not require any toll revenue received by governments to be reported.	Allows for more accurate reporting of all costs relating to roads that are incurred by governments (relative to status quo).	Does not take into account road-related revenue received by governments through toll roads or other innovative funding or financing models, potentially creating inconsistencies in the treatment of these roads/projects.[7] Unlikely to be consistent with cost recovery principles. Potential for minor increase in administrative costs and effort for some road agencies to report this data (relative to the status quo).
3. Change guidelines to require reporting of government revenue from roads that are tolled but do not require any expenditure on these roads to be reported.	Allows for more accurate reporting of road-related revenue received by governments (relative to the status quo).	Does not take into account road-related expenditure by governments on tolled roads or any other innovative funding or financing models used by governments, potentially creating inconsistencies.[8] Also, unlikely to be consistent with cost recovery principles. Potential for minor increase in administrative costs and effort for some road agencies to report this data (relative to the status quo).

[7] The inconsistency arises because the current exclusion of toll roads from the cost base is on the basis that the revenue fully funds the relevant costs. Adding the costs but not offsetting them with any revenue received would overstate governments' true net cost.

[8] The inconsistency arises because the current exclusion of toll roads from the cost base is on the basis that the revenue fully funds the relevant costs. Subtracting the revenue received but not considering any government costs incurred would understate governments' true net cost.

Option	Advantages	Disadvantages
4. Change guidelines to allow reporting of government expenditure on tolled roads but also require government revenue from tolls to be reported.	Option would correctly capture governments' net costs relating to toll roads and allow them to be treated in an internally consistent manner.	Does not take into account other models of innovative funding and financing that may be used by governments. Potential for minor increase in administrative costs and effort for some road agencies to report this data (relative to the status quo).
5. Change guidelines to properly account for tolled roads and any other types of innovative funding or financing models used by governments that change the timing or nature of expenditure incurred or revenues received by governments. Intended treatment would be to ensure that any net road-related costs incurred by governments would be included in the cost base.	Most consistent with intent of PAYGO cost recovery system, and the cost recovery principle, because it would capture all net road-related costs incurred by governments regardless of the financing/funding model used. Potentially more consistent with the expenditure policies that would be applied under possible future developments in HVRR (e.g. an independent price regulator and FLCB model).	Some types of innovative funding and financing will be difficult to foresee and/or develop detailed guidance for ahead of time. This may require assessment on a case-by-case basis as to whether the relevant expenditure or revenue is appropriate for inclusion. Potential for minor increase in administrative costs and effort for some road agencies to report this data (relative to the status quo). This option is likely to have the highest administrative costs of all the options.

At a stakeholder workshop on this topic in August 2020, some government stakeholders were supportive of amending the expenditure guidelines. Industry stakeholders expressed the following views:

- the need for toll roads to be declared under Part IIIA of the *Competition and Consumer Act 2010*
- the level of tolls charged, including the relative amounts paid by trucks (or commercial vehicles) relative to light vehicles, and the need for tolls to reflect cost savings to users
- that governments should not charge industry for roads that trucks cannot use (except when accessing a local destination only accessible using that road), such as Pennant Hills Road in New South Wales.

The NTC notes that the first two dot points above are outside the scope of this determination. The third point is something that can potentially be addressed if the expenditure on the relevant types of roads is by state or territory governments.[9] This could

[9] The local government expenditure that is included in the PAYGO model is based on the ABS's *Government Finance Statistics* publication. However, expenditure on local roads in the PAYGO model has a large percentage excluded from the cost base calculations – 75 per cent in urban areas and 50 per cent in rural areas – on the basis that local roads provide access and amenity benefits, and therefore costs should be recovered through other funding sources such as council rates.

potentially be achieved by amending the PAYGO expenditure guidelines to specify that this type of expenditure should not be included by states and territories. There is a question whether it would be feasible for states and territories to consistently exclude this expenditure. It is also likely that the amount of expenditure that would be excluded would be minor.

Based on the evaluation presented in Table 6, the NTC prefers option 5 because it is consistent with the principle of full cost recovery and is flexible to allow the treatment to be tailored to individual projects if necessary.

It is not possible to estimate by how much the proposed approach under option 5 would change the heavy vehicle cost base going forward. We propose to collect this data as part of the regular collection of road expenditure data for the 2020–21 financial year. This will allow the financial impact of implementing option 5 to be quantified before ITMM considers the final RIS in November 2021.

We are seeking your views on the potential options for treating innovative funding and financing under PAYGO, as specified in the questions below.

Question 2: Do you agree that option 5 in Table 6 is the best option for treating innovative funding and financing under PAYGO? Please provide reasons to support your views.

Question 3: Are there any other options for treating innovative funding and financing not presented in Table 6 that the NTC should consider?

Question 4: Should the PAYGO expenditure guidelines be modified to specify that expenditure should not be reported where it occurs on roads that heavy vehicles cannot use (e.g. Pennant Hills Road in New South Wales)?

4.5 Usage data

Usage data in this C-RIS refers to data about vehicle use that is used in the PAYGO model as part of the cost allocation process.

4.5.1 Issues

The ABS has announced it will discontinue the SMVU after the 2020 SMVU is completed. The SMVU has been the NTC's only source of road use and fuel use data in the past, and no other alternate source is readily available. The key reasons for discontinuing the SMVU are an ABS decision to focus on their core business of the National Accounts and the Census, as well as the $2.6 million cost of undertaking the survey every two years.

The ABS also plans to discontinue the annual Motor Vehicle Census but not before it can be proven that the National Exchange of Vehicle and Driver Information System (NEVDIS) system can effectively provide an equivalent collection of the nation's motor vehicle population. The Motor Vehicle Census, or a NEVDIS equivalent, is essential for the continuation of the SMVU (or an equivalent) because it provides the national vehicle population totals by vehicle type for any survey outcomes to be projected up to the national level.

4.5.2 Description of the Survey of Motor Vehicle Use

Every two years, the ABS conducts the SMVU based on a random sample of 16,000 vehicle owners using either online or hard copy surveys. It is the only survey of national road use by vehicle type or vehicle combination, with data provided by state/territory across both urban and rural areas and measures of interstate travel. The vehicle population frame for the SMVU is provided by the Motor Vehicle Census.

This survey is conducted over one financial year in three periods: July–October, November–February and March–June.

The sample of 16,000 vehicle owners is allocated into one of these three periods, with the results annualised. Survey questionnaires are provided at the start and end of each period so that data such as travel start/end odometer readings, fuel use, types of travel and average loads can be determined. The 2020 SMVU states that the survey sample consisted of passenger vehicles (18.0 per cent), motor cycles (5.0 per cent), freight vehicles (including light commercial, 65.9 per cent), buses (8.1 per cent) and non-freight carrying vehicles (3.0 per cent). The sample size chosen gives a suitable level of reliability for estimates of total distance travelled and tonne kilometres travelled for each state/territory of registration by type of vehicle category over the survey period.

At the national level, relative standard error (RSE)[10] results of less than 2 per cent are achieved with the 2020 SMVU having aggregate RSE results of 1.9 per cent for VKT, 0.69 per cent for vehicle in use numbers, 1.7 per cent for fuel use and 1.81 per cent for average tonne kilometres.

The SMVU provides disaggregated vehicle data to the NTC, with results for 40 vehicle classes: eight light vehicle classes and 32 heavy vehicle and vehicle combination classes.

4.5.3 Essential data provided by the Survey of Motor Vehicle Use

The following three datasets that only the SMVU provides are each essential for running and updating the PAYGO model:

- total distance travelled (VKT) by area of operation (urban and rural) by type of vehicle and by state/territory of registration
- total fuel consumed by area of operation (urban and rural) by type of vehicle and by state/territory of registration
- gross tonne kilometres by area of operation (urban and rural) by type of vehicle and by state/territory of registration. Although labelled gross tonne kilometres, this dataset measures average tonne kilometres and takes into account both loaded and unloaded travel.

[10] The RSE is a measure of the reliability of the data. The ABS notes the following about sampling error and the RSE:

'Estimates from the SMVU are based on information collected for a sample of registered motor vehicles, rather than all registered vehicles. The estimates may differ from those that would have been produced if all registered motor vehicles had been included in the survey. This difference is referred to as sampling error. One measure of sampling error is the Relative Standard Error (RSE), which indicates the extent to which a survey estimate is likely to deviate from the true population, expressed as a percentage of the estimate. Estimates with a RSE of 25% or greater are subject to high sampling error and should be used with caution…It is important to consider the RSEs when using estimates produced from the SMVU as it affects the reliability of the estimates, and therefore the importance that can be placed on interpretations drawn from the data.' (ABS, 2020)

Discontinuing the SMVU after 2020 means the PAYGO model could become inoperable unless an alternative approach to source the essential usage data is found.

In addition to using the data outlined above to operate the PAYGO model, the NTC relies on other SMVU data for analysis:

- Three fuel-related datasets show total distance travelled, number of vehicles and type of fuel consumed by vehicle type and state of registration.
- The GVM/GCM dataset is used to assess the distribution of GVM/GCM by vehicle type compared with average values used in the PAYGO model.
- The two distance travelled distribution datasets show the distribution of total distance travelled and number of vehicles by type of vehicle and by state of registration.
- Two load level/reason datasets show a breakdown of loaded and unloaded travel by distance travelled and number of vehicles by vehicle type and state of registration.
- The by-business type dataset shows a breakdown of fleet use between hire and reward and own business ancillary by vehicle type and state of registration.

The vehicle population frame used by the NTC is collected directly from state/territory road authorities for the PAYGO model.

In the long run, it is possible that the information required to operate PAYGO or a similar alternative methodology for setting heavy vehicle charges could be provided through telematics, possibly through a future electronic charging mechanism. It is unclear when or if this will become feasible. In the interim, the data currently produced by the SMVU will be needed to operate PAYGO or any similar pricing model based on forward-looking costs that is currently being considered under HVRR.

4.5.4 Possible interim approaches

Given the SMVU is crucial to the ongoing viability of PAYGO, and also provides important data for analytical purposes, it is likely that a short-term solution would involve contracting with a private or public organisation other than the ABS to undertake the SMVU or equivalent in future, noting that this will require an ongoing source of funding.

This approach presents an opportunity to expand or improve the survey to collect additional data that may be useful to governments generally.

There are several key steps to determine before investigating possible alternate providers, including:

1. Confirm which usage data would be required by the NTC (to operate PAYGO and conduct analysis) and other transport agencies and specify confidence levels required. This step would also include approaching other key users of this dataset to obtain their input and support.

2. Establish whether any usable road usage data is being collected currently by other organisations and could possibly be used instead of survey data.

3. Design guidelines as to what will be required in an alternate SMVU data collection to maintain continuity with the former SMVU across the key usage data fields that are used in PAYGO.

4. Specify how often updated data will be required. It will take time to establish an alternate collection and at this stage a collection covering the 2021–22 year would be required to

maintain continuity. However, it may be necessary to delay this to have time to confirm funding and to set up an alternate data collection process.

5. Participate and keep up to date with the Commonwealth Government's plans to establish a substitute for the SMVU.
   - The Bureau of Infrastructure, Transport and Regional Economics is seeking an agreement with Austroads to run a NEVDIS count at the same time as the last ABS Motor Vehicle Census survey (the census snapshot will occur on 31 January 2021). This will enable a comparison to determine if NEVDIS can be an alternate population frame in future.
   - The hope is that NEVDIS will provide the same data to generate current Motor Vehicle Census table builder outputs down to a postcode level.
   - However, this would not provide usage data such as VKT, fuel use and gross tonne kilometres.
   - The National Freight Data Hub's role is so far one of being a hub for obtaining data collected by others and then making it more accessible rather than one of collecting new data series.

6. Determine a source of funding.

7. Establish what governance and legal provisions will be required for this data collection relating to privacy and confidentiality.

8. Establish how the outputs from this data collection are to be presented and made available.

9. Establish a list of potential providers and establish whether contracting for the required data provision is feasible.

4.5.5 Conclusion and recommendation

With the ABS discontinuing the SMVU, it will be necessary to explore whether there are viable alternative available that meet required statistical practices and confidence levels and enables continuity in the national road usage data series.

We recommend that we explore, as a first step, the feasibility of contracting with another agency to provide the usage data necessary to operate PAYGO into the future.

The NTC would then provide final recommendations to ministers as part of the final RIS in November 2021.

Question 5: Do you agree the NTC needs to take action now to ensure the ongoing availability of usage data? Why or why not?

Question 6: Are there any options relating to potential alternative sources of usage data that the NTC has not considered? If so, what are they?

4.6 Review of equivalent standard axle values

4.6.1 Issues

ESA values are a key cost allocator in the PAYGO model, particularly for heavy vehicles. ESA values measure deep road wear by vehicles, with heavy vehicles traditionally accounting for around 94 per cent of ESA-kilometre (ESA-km) allocated cost in aggregate across the entire heavy vehicle fleet.

ESA is a non-dimensional measure of the relative pavement wear associated with different loads, axle groups and tyre configurations. The ESA for a particular vehicle is the sum of the ESA for each of the vehicle's axle groups. The ESA values used in the PAYGO model were last revised in 2013 for the 2014 heavy vehicle charges determination.

We undertook a review of a sample of five heavy vehicle classes in 2019. This found there had been sufficient change in ESA values for this sample of heavy vehicle classes to warrant a full review of ESA values for all heavy vehicle classes. This comprehensive review is now complete.

4.6.2 Approach

The approach used in this review is similar to that used in 2013. The calculations include the most recent available weigh-in-motion (WIM) data, which provides the basis for the ESA estimates for all heavy vehicle classes, except those that cannot be separately identified. A WIM device measures the dynamic axle weight of a moving vehicle to estimate the corresponding static axle weight. In Australia WIM devices are installed on selected roads to monitor the weights in practice that are occurring by axle group on the road surface. The WIM system works effectively to assess the effect of heavy vehicle traffic on the road network.

The NTC contracted Pekol Traffic and Transport (PTT) to undertake the review. It analysed WIM data covering a three-year period from 2017 to 2019 for all States and Territories except the Northern Territory where no WIM data is available.

WIM data does not provide a means of distinguishing individual light vehicle classes because many different classes have a similar axle spacing. However, PTT calculated national estimates of the AGM and ESA values for PAYGO light vehicle classes using a 'first principles' approach, based on the kerb weight of the more popular makes and models.

PTT estimated national estimates of the AGM and ESA values for the PAYGO heavy vehicle categories based on 208 million 'clean' WIM records. The raw WIM data supplied by the state road authorities and Transmetric underwent a series of quality checks to identify and remove: (a) out of scope records; (b) records with partial or inconsistent data; (c) records associated with equipment failure; and (d) outliers. The latter were defined as records with an ESA value outside a band of ±1.5 standard deviations from the initial state mean for each PAYGO vehicle class.

The 'clean' WIM records were then weighted to reflect the observed distribution in VKT reported in the SMVU. This step is required to minimise the potential for bias introduced by the non-uniform distribution of WIM sites between and within states. PTT used a modular approach to estimate final ESA values by vehicle type by summing the ESA values for each axle group in the vehicle or vehicle and trailer combination. This is the same approach used for the 2014 determination.

4.6.3 Analysis of outcomes

The approach taken to assess and analyse WIM data is the most comprehensive undertaken to date. The outcomes are shown in Table 7, which highlights the changes in ESA values that have occurred compared with those estimated in 2013.

The revised national weighed ESA values in the table show there have been some significant changes for a number of vehicle classes. The values in red show where reductions have occurred including, in particular:

- light commercial vehicles
- light rigid trucks
- 2-axle rigid trucks ≤ 12 tonnes
- 3 axle rigid trucks ≤ 18 tonnes and 4 axle rigid trucks ≤ 25 tonnes
- 2- and 4-axle rigid trucks with trailers ≤ 42.5 tonnes
- the smallest of the single-trailer articulated truck fleet
- road trains with three trailers
- special (non-freight) heavy vehicles

The ESA values for all other vehicle classes in Table 7 have increased and are in a green font.

For the first time, passenger vehicles and light buses have had an ESA value recorded. In the past the impact of passenger vehicles was considered to be too insignificant to measure. However, the methodology used in this research established that there is still some impact, albeit small.

Some rigid truck classes recorded large increases in their ESAs, in particular the heavier 2-axle trucks with no trailer and the 3 and 4 axle rigid trucks with trailers up to 42.5 tonnes. Most articulated trucks and most buses experienced increased ESAs.

Table 7. Revised national weighted ESA values

PAYGO vehicle classes	Current ESA values	New ESA values	ESA difference
Passenger cars	0	0.0010	0.0010
Passenger vans and light buses	0	0.0029	0.0029
4WDs: passenger	0	0.0046	0.0046
4WDs: light commercial	0.0441	0.0062	−0.0379
Light commercials & other light vehicles	0.0419	0.0039	−0.0380
Light rigid trucks	0.0471	0.0136	-0.0335
Rigid trucks: 2 axles, no trailer: 4.5 < GVM ≤ 7.0 t	0.1160	0.0277	-0.0883
Rigid trucks: 2 axles, no trailer: 7.0 < GVM ≤ 12.0 t	0.6104	0.2033	-0.4071
Rigid trucks: 2 axles, no trailer: GVM > 12.0 t	1.5624	2.3474	0.7850
Rigid trucks: 2 axles, with trailer: GCM ≤ 42.5 t	1.1421	0.4286	-0.7135

PAYGO vehicle classes	Current ESA values	New ESA values	ESA difference
Rigid trucks: 3 axles, no trailer: 4.5 < GVM ≤ 18.0 t	0.9663	0.1845	-0.7818
Rigid trucks: 3 axles, no trailer: GVM > 18.0 t	2.0639	2.0907	0.0268
Rigid trucks: 3 axles, with trailer: GCM ≤ 42.5 t	1.6659	2.7245	1.0586
Rigid trucks: 4 axles, no trailer: 4.5 < GVM ≤ 25.0 t	1.1762	0.1566	-1.0196
Rigid trucks: 4 axles, no trailer: GVM > 25.0 t	2.4694	2.6250	0.1556
Rigid trucks: 4 axles with trailer: GCM ≤ 42.5 t	1.8781	3.0546	1.1765
Rigid trucks: 3,4+ axles with trailer: GCM > 42.5 t	4.5124	4.6552	0.1428
Articulated trucks: single trailer: 3-axle rig	1.2617	0.9473	−0.3144
Articulated trucks: single trailer: 4-axle rig	1.4485	1.9694	0.5209
Articulated trucks: single 3-axle trailer: 5-axle rig	1.5137	1.7426	0.2289
Articulated trucks: single 2-axle trailer: 5-axle rig	1.9876	2.7853	0.7977
Articulated trucks: single trailer: 6-axle rig	2.1036	2.7071	0.6035
Articulated trucks: B-double: < 9-axle rig	2.8095	3.9369	1.1274
Articulated trucks: B-double: ≥ 9-axle rig	2.9454	4.2018	1.2564
Articulated trucks: B-triple	3.5240	4.4652	0.9412
Articulated trucks: road train: 2 trailers	3.2747	3.3056	0.0309
Articulated trucks: road train: 3 trailers	4.1204	4.0652	−0.0552
Articulated trucks: single trailer: > 6-axle rig	2.2993	2.7851	0.4858
Other trucks (non-freight)	1.5458	1.5120	−0.0338
Buses: 2 axles: 3.5 < GVM ≤ 4.5 t	0.0200	0.0410	0.0210
Buses: 2 axles: 4.5 < GVM ≤ 10.0 t	0.0500	0.1150	0.0650
Buses: 2 axles: GVM > 10.0 t	1.0800	2.3777	1.2977
Buses: ≥ 3 axles	0.9100	3.8536	2.9436
Buses: articulated	1.3250	2.5275	1.2025

4.6.4 Results

The impact of the revised ESAs on ESA-km cost allocation in the PAYGO model by NTC vehicle class is shown in Table 8. An important aspect of the result shown in this table is that the overall amount of cost allocated nationally on an ESA-km basis remains unchanged

when a revision to ESA values by vehicle class occurs. What changes is the distribution of that ESA-km allocated costs between one vehicle class or group and another. As shown in the table, the total amount of ESA-km allocated cost remains unchanged at $1,968 million under both the current ESAs and revised ESAs for the 2021–22 charges year. However, there are changes in ESA-km allocated cost by vehicle subgroup. Note, the revised values in Table 8 are similar but not the same as occurs in the PAYGO model options referred to later in this report that incorporate other model changes as well.

The new ESA values have resulted in the heavy vehicle sector increasing its share of ESA-km attributable cost from 94 per cent currently to 99 per cent. Light vehicles in aggregate reduced their share of ESA-km allocated cost by $93 million (due to reduced ESA values for light commercial and light rigid trucks).

In contrast the heavy vehicle share of ESA-km allocated cost rose by $93 million. Within the heavy vehicle subgroups in Table 8, ESA-km allocated cost rose by $101 million for articulated trucks and by $67 million for buses. However, ESA-km allocated cost for rigid trucks overall fell by $73 million and for non-freight trucks by $1 million.

Table 8. Impact of new ESAs on allocated cost

Vehicle group	Current modular ESAs	Revised modular ESAs	Change in ESA attributable costs
	ESA allocation $m	ESA allocation $m	$m
Light vehicles	120	27	-93
Rigid trucks	638	565	-73
Articulated trucks	1,133	1,234	101
Other trucks (non-freight)	11	10	−1
Buses	65	132	67
Total all vehicles	1,968	1,968	0
Total for heavy vehicles	1,848	1,941	93
Heavy vehicle share of total costs allocated on the basis of ESA-km	93.9%	98.6%	

4.6.5 Recommendation

The NTC recommends adopting the revised ESA values for use in this determination.

Question 7: Do you agree that the PAYGO model should use new, updated ESA values for this determination? Why or why not?

4.7 Cost allocation

4.7.1 Background

PAYGO uses a combination of a cost allocation matrix and usage data to allocate costs to each vehicle class. This process determines the percentage of total costs allocated to heavy vehicles and light vehicles respectively.

The size of the heavy vehicle cost base, and the level of heavy vehicle charges, are sensitive to the cost allocation specified in the cost allocation matrix. Government revenues from heavy vehicle charges are also directly affected by the cost allocation process.

The current cost allocation matrix has not been changed since 2005. We understand that the current cost allocators were developed by an expert panel based on econometric evidence available at the time. We also understand that the expert panel sought to achieve an acceptable compromise at the time, rather than drawing purely on quantitative research.

More recently, there have been some developments that suggest that updating the cost allocation parameters may be desirable.

In 2017 the NTC commissioned HoustonKemp to review the current cost allocators and to investigate whether there is strong evidence to depart from them. The review concluded that:

> *... the current PAYGO framework is consistent with the economic principles of avoidable and stand alone cost.[11] Based on current cost allocators, the approximately $3 billion of revenue collected from heavy vehicles in 2015–16 through the application of the PAYGO methodology lies between our estimates of the avoidable and standalone cost of providing heavy vehicle road services of $2.3 billion and $7.4 billion in 2015–16, respectively (HoustonKemp, 2017, p. 2).*

It further concluded: 'We found that new research on the relationship between heavy vehicle road use and road costs since the last NTC review was insufficient, in and of itself, to support a departure from the current PAYGO allocators' (HoustonKemp, 2017, p. 3).

[11] Economic theory suggests that the price paid by different groups of users of shared infrastructure should fall between avoidable and standalone cost. The avoidable cost is the extra cost of providing the infrastructure to a group of users where the infrastructure is already provided to other groups. The standalone cost is the cost of providing the infrastructure to that group where the infrastructure would be built for the use of that group alone.

The HoustonKemp report is not definitive about the preferred allocator(s) for category B2 (refer to Table 9) but does suggest that 70 per cent attributable costs is reasonable and passenger car unit (PCU) per kilometre has no theoretical basis. From this perspective, it is reasonable to interpret this statement as supporting the allocation of 70 per cent of attributable costs based on ESA-km as an improvement over the current cost allocation approach.

More recently, the Victorian Department of Treasury and Finance (VIC DTF) and the Victorian Department of Transport (VIC DOT) commissioned consultants to develop a suite of alternative cost allocators that could be used in an alternative design of an FLCB (AARB, 2017a; 2017b; 2019).

The consultants developed a range of recommended cost allocators on an engineering basis, using Victorian data and a new roads classification system. These cost allocators are not in a format that could be directly used in PAYGO, although it would be possible to develop an approximation of those cost allocators that could be used in PAYGO.

4.7.2 Key question for the determination

The key question for this determination is whether the current cost allocators should be changed. If so, how should they be changed, and on what basis?

4.7.3 Cost allocation options

Developing a new set of cost allocators from a zero basis would require a considerable amount of primary research to be carried out. Even if this research were carried out, it is still not certain that it would produce conclusive results.[12] This type of research is time consuming and costly and could not easily be completed within the timeframe available for this determination.

Notwithstanding this, the NTC has considered the merits of three approaches, all of which can be modelled and tested relatively easily and do not require significant work to develop.

These approaches are:

1. Retain the current cost allocation matrix – 'current'.

2. Modify the current cost allocation matrix to allocate 70 per cent of costs in expenditure category B2 (refer to Table 9) using ESA-km, as proposed in the HoustonKemp report – 'modified current'.

3. Use the work commissioned by VIC DTF and VIC DOT to develop alternative cost allocators that broadly reflect the cost allocators recommended by ARRB in its report (ARRB, 2019) – 'VIC DTF/DOT'.[13]

We have used our best endeavours to translate the work undertaken by VIC DTF and VIC DOT into a set of cost allocators that can be applied in the PAYGO model. We invite comment on whether this translation could be improved.

[12] HoustonKemp, 2017 notes that some research carried out in the past suffered from a range of data and methodological issues and did not provide conclusive results (HoustonKemp, 2017).

[13] This work was developed by the Victorian Department of Transport and Department of Treasury and Finance to inform discussions around cost allocation. It is not approved Victorian government policy.

The cost allocation matrices that represent the three options are shown in Tables 9–11.

Table 9. Current cost allocators

		VKT	PCU-km	ESA-km	AGM-km	HV-VKT	Non-attributable	Total
A	Servicing and operating expenses	100%	0%	0%	0%	0%	0%	100%
B1	Routine maintenance	0%	38%	0%	38%	0%	24%	100%
B2	Periodic surface maintenance of sealed roads	0%	10%	0%	60%	0%	30%	100%
C	Bridge maintenance & rehabilitation	0%	0%	0%	33%	0%	67%	100%
D	Road rehabilitation	0%	0%	45%	0%	0%	55%	100%
E	Low-cost safety & traffic improvements	80%	20%	0%	0%	0%	0%	100%
F1	Pavement improvements	0%	0%	45%	0%	0%	55%	100%
F2	Bridge improvements	0%	15%	0%	0%	0%	85%	100%
F3	Land acquisition, earthworks, other extensions/improvement expenditure	0%	10%	0%	0%	0%	90%	100%
G1	Corporate services	0%	0%	0%	0%	0%	100%	100%
G2	Heavy vehicle regulatory costs	0%	0%	0%	0%	100%	0%	100%

Table 10. Modified current cost allocators

		VKT	PCU-km	ESA-km	AGM-km	HV-VKT	Non-attributable	Total
A	Servicing and operating expenses	100%	0%	0%	0%	0%	0%	100%
B1	Routine maintenance	0%	38%	0%	38%	0%	24%	100%
B2	Periodic surface maintenance of sealed roads	0%	0%	70%	0%	0%	30%	100%
C	Bridge maintenance & rehabilitation	0%	0%	0%	33%	0%	67%	100%
D	Road rehabilitation	0%	0%	45%	0%	0%	55%	100%

		VKT	PCU-km	ESA-km	AGM-km	HV-VKT	Non-attributable	Total
E	Low-cost safety & traffic improvements	80%	20%	0%	0%	0%	0%	100%
F1	Pavement improvements	0%	0%	45%	0%	0%	55%	100%
F2	Bridge improvements	0%	15%	0%	0%	0%	85%	100%
F3	Land acquisition, earthworks, other extensions/improvement expenditure	0%	10%	0%	0%	0%	90%	100%
G1	Corporate services	0%	0%	0%	0%	0%	100%	100%
G2	Heavy vehicle regulatory costs	0%	0%	0%	0%	100%	0%	100%

Table 11. VIC DTF/DOT cost allocators

		VKT	PCU-km	ESA-km	AGM-km	HV-VKT	Non-attributable	Total
A	Servicing and operating expenses	100%	0%	0%	0%	0%	0%	100%
B1	Routine maintenance	0%	10%	0%	0%	0%	90%	100%
B2	Periodic surface maintenance of sealed roads	0%	0%	56%	0%	0%	44%	100%
C	Bridge maintenance & rehabilitation	0%	11%	0%	4%	0%	85%	100%
D	Road rehabilitation	0%	0%	56%	0%	0%	44%	100%
E	Low-cost safety & traffic improvements	95%	5%	0%	0%	0%	0%	100%
F1	Pavement improvements	0%	0%	68%	0%	0%	32%	100%
F2	Bridge improvements	0%	8%	0%	8%	0%	85%	100%
F3	Land acquisition, earthworks, other extensions/improvement expenditure	0%	5%	0%	0%	0%	95%	100%
G1	Corporate services	0%	0%	0%	0%	0%	100%	100%
G2	Heavy vehicle regulatory costs	0%	0%	0%	0%	100%	0%	100%

4.7.4 Impact of options

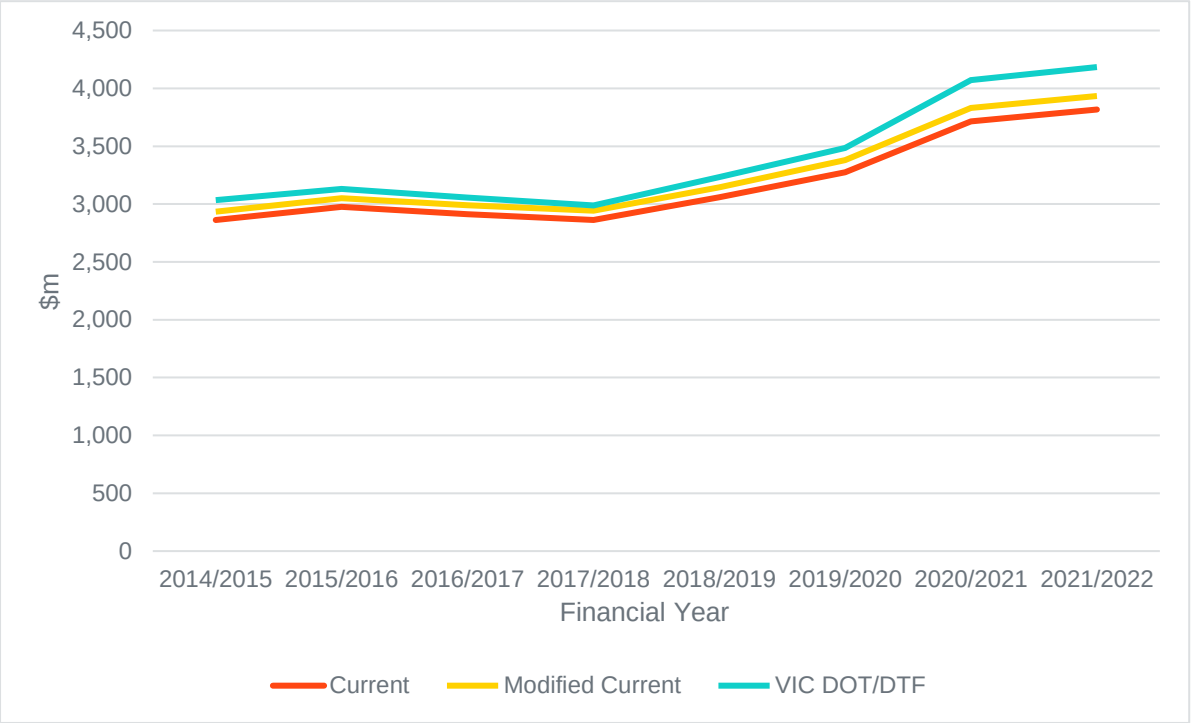
Compared with the current approach, adopting either the modified current and VIC DTF/DOT options would have the effect of increasing total costs allocated to the heavy vehicle fleet (Table 12). The modified current option adds approximately 3 per cent to the heavy vehicle cost base, whereas the VIC DTF/DOT option adds close to 10 per cent to the heavy vehicle cost base in recent years.

Table 12. Effect on heavy vehicle cost base over time under different cost allocators

Option	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
Current ($m)	2,862	2,975	2,912	2,863	3,059	3,275	3,714	3,817
Modified current ($m)	2,934	3,050	2,989	2,943	3,144	3,381	3,832	3,934
% increase vs current	2.5%	2.5%	2.6%	2.8%	2.8%	3.2%	3.2%	3.1%
VIC DOT/DTF	3,033	3,132	3,056	2,988	3,234	3,485	4,070	4,184
% increase vs current	6.0%	5.3%	4.9%	4.4%	5.7%	6.4%	9.6%	9.6%

This effect is shown graphically in Figure 5.

Figure 5. Estimated heavy vehicle cost bases under different cost allocators



The gap between the revenue provided by current heavy vehicle charges and the heavy vehicle cost base under each option further illustrates the likely effect of changing the cost allocation approach.

Table 13. Estimated revenue gap 2021–22

Estimated revenue gap 2021–22	$m	Gap ($m)	Gap (%)
Estimated revenue from 2020–21 heavy vehicle charges in 2021–22	3,449		
2021–22 heavy vehicle cost base – current	3,817	368	10.7
2021–22 heavy vehicle cost base – modified current	3,934	485	14.1
2021–22 cost base VIC DTF/DOT	4,184	735	21.3

This shows that heavy vehicle charges would need to increase by 10.7 per cent[14] in 2021–22 to fully recover the heavy vehicle cost base under the current cost allocation approach. This

[14] The corresponding figure in the NTC's public consultation on 2021–22 charges (NTC, 2021) was 13.4 per cent. This figure was calculated based on freezing 2020–21, to work out the percentage increase in charges needed to achieve full cost recovery as part of the annual adjustment process. The 10.7 per cent figure reflects the agreed 2.5 per cent increase to heavy vehicle charges, relative to the $3,817m cost base published in the consultation document (NTC, 2021).

gap increases to 14.1 per cent under the modified current option and to 21.3 per cent under the VIC DTF/DOT option.

4.7.5 Economic efficiency of cost allocation options

Economic theory does not provide a precise answer on how costs should be allocated between users of a common network asset such as roads. Instead, it provides the following broad principles to guide the cost allocation process:

- Road charges to all road users should recover the total cost of providing and operating the road network.
- Heavy vehicle road users should pay at least the costs caused by having access to the road network, including costs related to wear and tear as well as the new road infrastructure costs that would otherwise be avoided.
- The total revenue recovered from a particular type of road user should lie between the standalone cost of providing road infrastructure to that road user and avoidable cost of providing road infrastructure to that type of road user.

Applying these principles is often made difficult by a relative lack of data.

In its 2017 report, HoustonKemp estimated that the avoidable cost for heavy vehicles was $2.3 billion in 2015–16, and the standalone cost was $7.4 billion (HoustonKemp, 2017). Adjusted for CPI increases between September 2015 and September 2020, these figures would now be approximately $2.5 billion and $8.0 billion respectively.

Under all three options, the resulting heavy vehicle cost base falls between these boundaries and would therefore be expected to be economically efficient.

4.7.6 Recommendation

Overall, none of the three options being considered is clearly and objectively superior to the others from a pure economic or scientific perspective. However, the motivation for considering change may include that some options may be more accurate than others. On the other hand, the value of added precision is likely to be limited by the highly averaged nature of heavy vehicle charges.

This means that the choice between cost allocation approaches is one of judgement based on wider considerations, rather than pure economic or scientific analysis.

We therefore recommend that the options for this determination be built around the three possible cost allocation approaches being the current approach, modified current and VIC DTF/DOT.

4.7.7 Questions

Question 8: Do you agree that the options for this determination should centre on the three alternative cost allocation approaches identified above?

4.8 MaxMan

4.8.1 Background

MaxMan is a separate module of the PAYGO model applying cost allocation to road trains. It has been part of the heavy vehicle charge-setting process since the second heavy vehicle charges determination in 1998. Its name comes from the MAtriX MANipulation software that was originally used for the calculations, although these calculations were more recently brought into Microsoft Excel to sit as a module of the PAYGO model.

The original rationale for introducing MaxMan was that road trains do not use the entire road network because they are not allowed to operate in certain states or territories or are only allowed on certain parts of the network in other jurisdictions. There was a view that cost allocation for road trains should be performed separately because of this.

The current MaxMan module assumes that road trains can operate:

- in rural areas of New South Wales and Queensland
- in both urban and rural areas of South Australia, Western Australia and the Northern Territory.

One of the main reasons for introducing MaxMan was to try to reduce the costs allocated to road trains in the model because the quality of roads that they operate on tends to be lower.

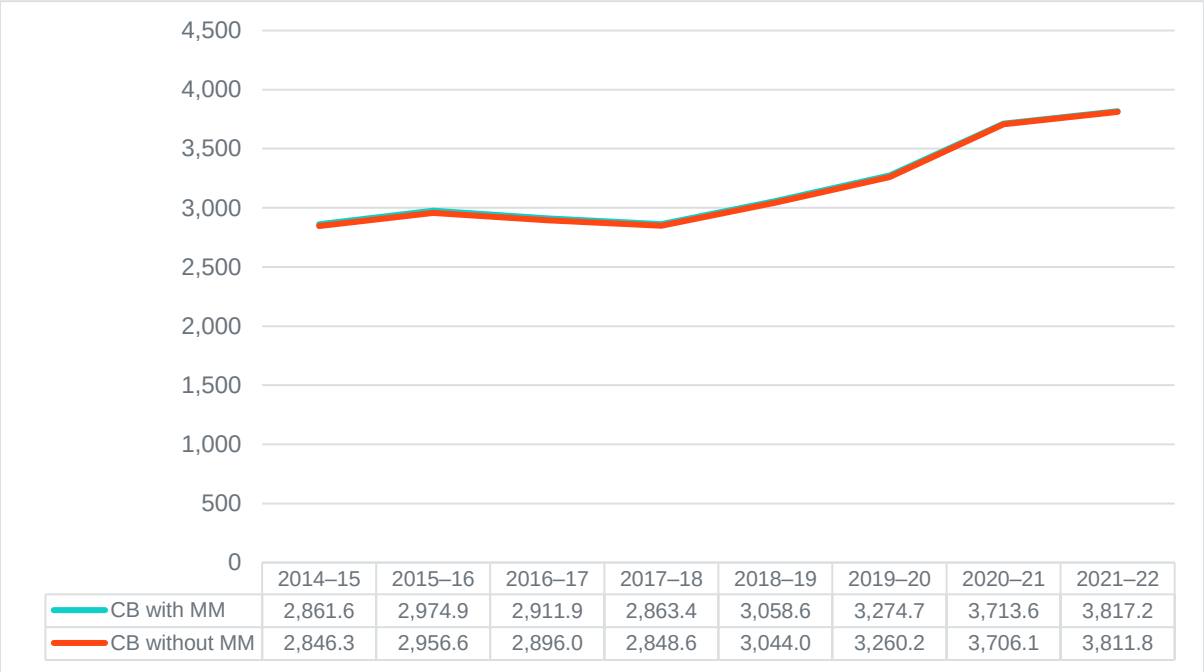
4.8.2 Analysis

MaxMan does not change the amount of attributable expenditure but affects how it is allocated between heavy vehicles and light vehicles. As shown in Figure 6, the use of MaxMan has allocated slightly higher costs to heavy vehicles than would have been the case if it was not used.[15] However, the overall difference that MaxMan makes is relatively small as a proportion of the total heavy vehicle cost base. The difference between the numbers in the years shown is at most 0.6 per cent.

As expected, given the above finding, MaxMan has also increased rather than reduced the costs allocated to road trains (as shown in Figure 7). This is contrary to the original rationale for using MaxMan, which was to lower the allocated costs for road trains to reflect the generally poorer quality of roads used by them.

[15] The numbers in Figures 6 and 7 reflect the PAYGO model settings as they applied prior to any of the technical changes proposed as part of this determination, which is appropriate as a point of comparison since they were the agreed settings for the PAYGO model during that time period.

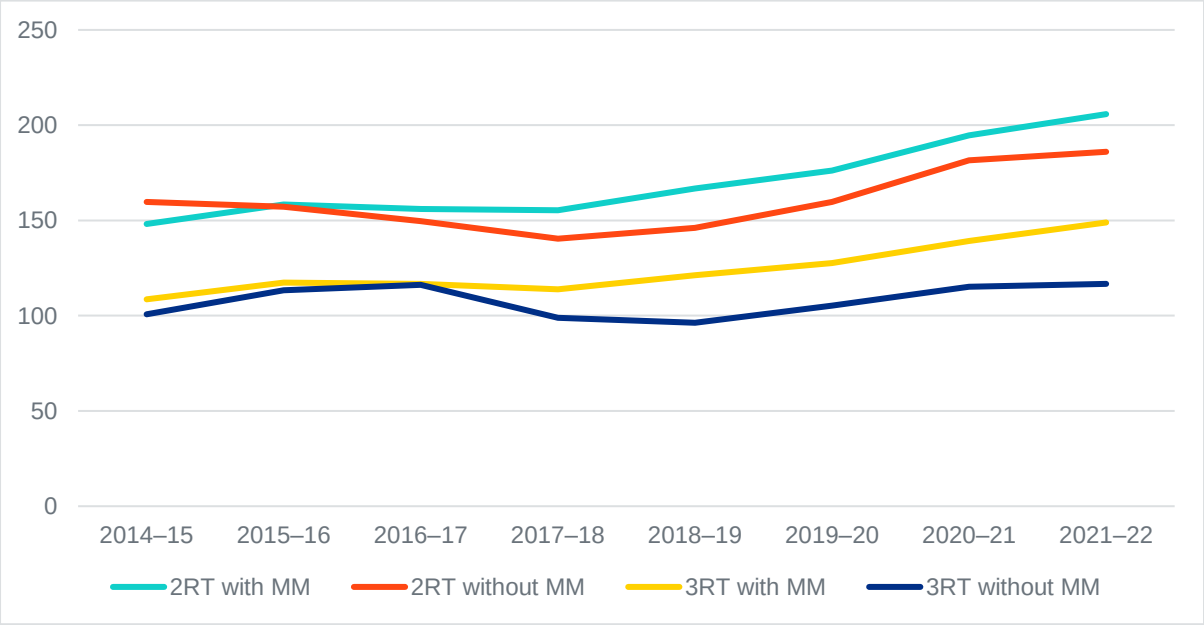
Figure 6. Heavy vehicle cost base with and without MaxMan ($m)



	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
CB with MM	2,861.6	2,974.9	2,911.9	2,863.4	3,058.6	3,274.7	3,713.6	3,817.2
CB without MM	2,846.3	2,956.6	2,896.0	2,848.6	3,044.0	3,260.2	3,706.1	3,811.8

Note: CB is cost base; MM is MaxMan

Figure 7. Allocated costs, with and without MaxMan for double and triple road trains ($m)



Note: MM is MaxMan; 2RT is double road train; 3RT is triple road train

The NTC has considered the advantages and disadvantages of retaining MaxMan in the model for future use. Reasons in favour of retaining MaxMan include:

- The module already exists in the PAYGO model and has been part of PAYGO for some time, so there is a need for sufficient evidence to depart from the status quo.
- Road trains arguably have a more distinct use of roads relative to most other heavy vehicles.

The NTC has also identified several reasons, both pragmatic and data/process-related, in favour of removing MaxMan from the calculation of the heavy vehicle cost base under PAYGO, as summarised in Table 14.

Table 14. Reasons to potentially remove MaxMan from PAYGO

Pragmatic	Data/process
▪ Would reduce (arguably unnecessary) complexity in the PAYGO model. ▪ Removing MaxMan would potentially simplify any future annual adjustment process. ▪ MaxMan does not directly affect registration charges for road trains, since the cost allocation process only determines the floor for total charges paid by a vehicle class to avoid cross-subsidisation. MaxMan will only have an effect on registration charges if the floor for total charges is binding. ▪ As of the last determination, registration charges for the articulated segment of the heavy vehicle fleet have been set to reflect the modularity of the fleet. MaxMan reflects a past era for charges where different charges were set for vehicle components to charge road trains and the corresponding B-double and B-triple combinations different amounts. Under the current modular charging approach, MaxMan will not have any effect on charges. ▪ Adjustments are immaterial compared with the overall heavy vehicle cost base. ▪ The original rationale for MaxMan was to give a discount to road trains to reflect the lower quality of roads that they may use. It is not achieving this objective, given it results in higher costs being attributable. In any case, it is unclear whether the original rationale is still relevant and, if so, whether a complex modelling treatment is the best way of achieving this objective. ▪ Road trains are the only vehicle classes treated separately in this way. No adjustment is made for any other vehicle classes, even though there may be restrictions preventing use or operators' choices not to use certain vehicle combinations in certain areas.	▪ The usage data from the SMVU underpinning the MaxMan calculations is unreliable, given that it relies on the data at sub-jurisdictional, vehicle class level in many cases. A large percentage of the data from the SMVU at this level has an RSE between 25 per cent and 50 per cent ('should be used with caution') or over 50 per cent ('too unreliable for general use'). This arguably casts doubt on any findings from MaxMan. ▪ The 'sub-set' of the network assumed to be used by road trains and included in the MaxMan calculations is arguably not entirely accurate, since road trains are allowed to travel in north-west Victoria and A-doubles are allowed to access the Port of Brisbane. ▪ The treatment of SMVU data is inconsistent for road trains in the MaxMan calculations relative to other heavy vehicle classes. It only uses a single (latest available) year of SMVU data, whereas other vehicles use a seven-year EMA. (In principle this could be addressed by using an EMA for MaxMan, but this would add even more complexity to the model.)

4.8.3 Recommendation

Based on the reasons outlined in Table 14 and following early consultation, the NTC recommends removing MaxMan from the PAYGO model. The modelling presented in the following chapters of this C-RIS does not use MaxMan.

Question 9: Do you agree with the NTC's proposal to remove MaxMan from the PAYGO model? Why or why not?

4.9 RUC leakages

4.9.1 Issues

The heavy vehicle charges calculated by the NTC under the PAYGO system are designed to achieve cost recovery. That is, the charges in the PAYGO model are set to recover the heavy vehicle cost base, given the registered heavy vehicle and heavy trailer fleet, and the estimated quantity of fuel used by heavy vehicles.[16] Changes to any of the cost base, vehicle population or fuel use requires changes in the level of heavy vehicle charges to preserve cost recovery.

The best data source for estimating fuel usage is the SMVU. However, a potentially substantial amount of fuel has become exempt from paying the RUC on the basis that the fuel was used to power auxiliary equipment and for off-road use, rather than 'for travelling' on a public road as specified in the *Fuel Tax Act 2006*. Examples of auxiliary equipment use on which the RUC is not payable include:

- concrete transport vehicles with rotating mixer drums
- refrigerated vehicles
- waste management collection vehicles
- vehicles with specialised equipment, such as elevated work platforms, loader cranes or drilling equipment
- long-haul vehicles with sleeper cabins.

These 'exemptions' or 'leakages' from paying RUC reduce the amount of revenue collected through the RUC, all else remaining constant. That is, the amount of fuel that is actually subject to the RUC is likely to be less than what is estimated from using the SMVU, which simply records total fuel used.

This workstream investigates this issue in more detail. One challenge in attempting to adjust for these 'leakages' is a lack of reliable data, meaning that there must be some assumptions or estimates used – this is discussed in more detail in section 4.9.2. In summary:

- The RUC aims to recover a proportion of the heavy vehicle cost base through a charge on each litre of fuel that is used by heavy vehicles for travelling on a public road.
- Over the past few years, certain uses of fuel by heavy vehicles have been exempted from paying the RUC on the basis that the fuel is not being used for travelling on a public road. As a result of these exemptions, the amount of RUC being recovered is less than intended when setting charges under the PAYGO model.

4.9.2 Analysis

The categories of auxiliary fuel use exempted from paying the RUC have increased since the original decision by the Administrative Appeals Tribunal of Australia to allow an exemption for refrigerated trailers in August 2012 (Administrative Appeals Tribunal of Australia, 2012). The Australian Taxation Office (ATO) released practical compliance guidelines in September 2016 (subsequently updated in October 2019) to outline the types

[16] In practice there is some inherent inaccuracy in the cost recovery process, given the lag between the availability of usage data and the period for which charges are being set in the PAYGO system as outlined in section 2.2.8. In addition, the degree of accuracy of the fuel estimate in the SMVU is unclear, but it remains the best available method of calculating the amount of RUC revenue in Australia.

of heavy vehicles or trailers with auxiliary equipment that may claim an exemption from paying RUC, as well as 'fair and reasonable' percentages of total fuel use not subject to the RUC for the various types of auxiliary equipment (ATO, 2019). In addition, claims for off-road use fuel tax credit exemptions, independent of auxiliary equipment use, have become more widespread.

The NTC's estimate of the total amount of RUC revenue collected is calculated by multiplying fuel usage data from the SMVU by the RUC rate (in cents per litre). The SMVU form asks the following question relating to fuel: 'What was the total amount of fuel consumed by this vehicle during the four-month period 1 July 2019 to 31 October 2019?' (ABS, 2019).[17] Although there could be alternative interpretations, the NTC considers that this question would typically be answered by survey respondents as the total amount of fuel used, including fuel used for any auxiliary equipment. If this is the case, the estimated fuel consumption data specified in the SMVU may overstate the actual fuel that is subject to the RUC and, as a result, may overstate the actual amount of RUC revenue that is currently being collected.

The total annual value of fuel tax exemptions for off-road and auxiliary equipment use cannot be accurately estimated by the ATO both in terms of the exemption rates used by individual claimants or the extent to which heavy vehicle operators make claims at all for off-road and auxiliary equipment use.

The ATO estimates some 112,000 businesses claiming fuel tax credits are operating heavy vehicles on road. This is an indicative estimate only. In an independent research report prepared for the Australian Trucking Association and NatRoad, Deloitte Access Economics recently estimated there were 146,862 businesses operating trucks in Australia, comprising 55,936 hire and reward operators and 90,926 ancillary operators. Based on these figures, at least 34,800 businesses operating trucks (24 per cent of all trucking businesses) are not claiming fuel tax credits at all. In reality, the figure would likely be higher than 24 per cent because the ATO estimate would include businesses operating buses.

These businesses could be expected to be outside the hire and reward industry and could be expected to be small. Many of the trucks would be pre-1996, since we also know from the ATO data that many operators of pre-1996 vehicles choose not to claim fuel tax credits because of the need to meet the pre-1996 environmental criteria to claim fuel tax credits.

On the other hand, it is known that the large hire and reward trucking companies claim fuel tax exemption rates for off-road and auxiliary equipment use that are well above the ATO's 'fair and reasonable' rates if they have invested in obtaining engine diagnostic proof to justify higher fuel consumption rates.

NTC modelling assuming all heavy vehicles claim for off-road and auxiliary equipment use at the ATO's 'fair and reasonable' rates indicate that the reduction of fuel tax (RUC) revenue would be around $90 million per annum compared with the PAYGO estimate of annual RUC revenue of $1.9 billion. If this is adjusted for the 24 per cent of trucking businesses that are estimated to not claim for off-road and auxiliary equipment use then the aggregate reduction falls to $68 million, if travel by these businesses is similar to those who claim the rebate.

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17 **https://www.abs.gov.au/websitedbs/d3310114.nsf/4a256353001af3ed4b2562bb00121564/5dff3ab82130e7e0ca257c070010f3b8/$FILE/SMVU_Survey_Guide_2019-20.pdf**. The time period in the text is adjusted as relevant for the survey period.

Most of these businesses are small and in the non-hire and reward industry, where average travel rates are lower than in the hire and reward industry (based on anecdotal evidence), but estimates of what share of overall fuel use these businesses account for is at best speculative.

One option to address this issue would be to adjust the fuel consumption figure that is used in the PAYGO model to set the RUC rate. This option is summarised in Table 15.

Table 15. Potential approaches for determining the RUC rate

Current approach	Alternative approach
$RUC\ rate = \frac{TR_{RUC}}{FU_{SMVU}}$	$RUC\ rate = \frac{TR_{RUC}}{FU_{on-road\ travelling}}$

Where:

$RUC\ rate$ is the RUC rate, in dollars per litre

TR_{RUC} is the target revenue to be raised from RUC, in dollars

FU_{SMVU} is the fuel usage data from the SMVU, in litres

$FU_{on-road\ travelling}$ is fuel usage data reflecting only fuel that is used for on-road travelling (i.e. excluding fuel used for auxiliary equipment), in litres.

Setting the RUC rate on the basis of the alternative approach would ensure the intended amount of revenue (TR_{RUC}) is collected, since the denominator used to set the RUC rate is also the total amount of fuel that is actually subject to the RUC. The primary challenge in implementing this approach is the quality of data. This is for the following, non-exhaustive, list of reasons:

- Although the SMVU is the best, and only, source of data available for estimating the total amount of fuel consumed and distances travelled by various types of heavy vehicles, the data becomes increasingly unreliable at greater levels of disaggregation.
- The types of auxiliary equipment subject to RUC exemptions may evolve over time, meaning any such calculations may need to be updated on a regular basis.
- The 'fair and reasonable' percentages that the ATO allows for each type of auxiliary equipment may change over time.
- Use of the ATO's 'fair and reasonable' percentages is not mandatory for operators, and it is not clear what proportion of claimants use their own methodology instead of relying on the 'fair and reasonable' percentages.
  - For example, an operator could conduct its own testing and may find that its refrigeration unit uses 20 per cent of the total amount of fuel, rather than the 10 per cent 'fair and reasonable' percentage quoted by the ATO. If based on test results or some other approved methodology, this would be permitted by the ATO. However, it would also mean that the denominator on the right-hand side would not reflect the actual amount of fuel subject to the RUC (if the RUC rate was calculated by assuming everyone uses the 'fair and reasonable' percentages). As a result, the total RUC revenue collected would be lower than intended.
- The availability of the necessary registration data to conduct these calculations varies across jurisdictions. Registration data is needed at a finer level of detail than the NTC's typical quarterly registration data collection, in order to calculate how many concrete trucks, rubbish trucks, refrigerated trailers, etc. are operating. Assumptions may therefore be required if the relevant data is not available for any jurisdictions.

As a result, any amended RUC rate that was calculated based only on information available from the SMVU and from jurisdictions' registration databases would be likely subject to some degree of inaccuracy. Other potential options to try to resolve this issue are:

- seek detailed data on auxiliary equipment fuel use from operators (potentially based on a sample of some of the largest operators)
- change the wording of the Fuel Tax Act to make all fuel used on public roads subject to RUC (even if used for auxiliary equipment)
- switch to an alternative variable charging mechanism for heavy vehicles, such as a form of distance-based charging.

4.9.3 Approaches and advantages and disadvantages for RUC leakages

The approaches and associated advantages and disadvantages we have identified in our preliminary analysis are outlined in Table 16.

Table 16. Assessment of potential approaches for treating RUC leakages

Approach	Advantages	Disadvantages
1. Status quo (retain fuel consumption estimate from SMVU for calculating the RUC rate).	▪ Simple approach, which does not require any additional estimates or assumptions. ▪ Operators who do not currently benefit from the RUC exemptions are not impacted negatively by any potential policy change that could occur under the other options.	▪ RUC revenue collected fails to achieve the cost recovery intended under PAYGO because the amount of fuel subject to the RUC is lower than the amount assumed for modelling purposes.
2. Use best estimate of RUC exemptions/ leakages – based on jurisdictions' detailed registration data and the SMVU – to recalculate RUC rate based on the fuel that is actually subject to RUC. This would likely involve a conservative approach using ATO 'fair and reasonable' standard exemption rates.	▪ The amount of RUC revenue recovered would be closer to the intended target than under the status quo. ▪ Using the ATO 'fair and reasonable' exemption rates is a conservative estimate, which would reduce the risk of over-recovering the heavy vehicle cost base.	▪ Data availability to calculate fuel used by auxiliary equipment is imperfect (as outlined in the previous section). There could be some risk of inaccuracies being introduced because of poor-quality data or the need to use assumptions. ▪ Adopting this option would likely mean a rise in the general RUC rate, particularly affecting the large number of operators who do not use auxiliary equipment and benefit from the exemptions.
3. Seek detailed data on auxiliary equipment fuel use from operators (potentially based on a sample of some of the largest operators).	▪ This option would potentially significantly improve the accuracy of the estimated amount of fuel subject to RUC exemptions (relative to option 2).	▪ The data would either need to be provided by operators on a voluntary basis, or included in a possible alternative to the SMVU (as explored in section 4.5). ▪ The NTC cannot compel operators to provide information, and there is

Approach	Advantages	Disadvantages
		limited (or no) incentive for operators to provide the relevant data because it would result in an increase to the general RUC rate. ▪ The structure of the trucking industry – with a large number of small operators – means that it would be extremely difficult to collect data from all operators. It is not clear how large a sample of operators would need to provide data to be deemed sufficiently representative of the entire industry.
4. Change the wording of the Fuel Tax Act to make all fuel used on public roads subject to RUC (even if used for auxiliary equipment).	▪ Could achieve cost recovery without the need to source data from operators or make assumptions.	▪ Outside the scope of this determination. ▪ Vehicles using fuel to power auxiliary equipment would arguably cross-subsidise other vehicle operators.

4.9.4 Recommendation

The NTC recommends implementing approach 2 in Table 16. This would use a conservative approach to produce an estimate of RUC exemptions using the ATO's 'fair and reasonable' fuel tax rate exemption rates. The estimate would be based on jurisdictions' detailed registration data and the SMVU – to recalculate the RUC rate based on the fuel that is actually subject to RUC.

At present, we estimate that this could reduce the estimated fuel used that is subject to RUC by approximately 4.8 per cent, implying that the RUC rate would need to increase by a similar percentage, or approximately 1.2 cents per litre to recover the required revenue.

Question 10: Do you agree that the NTC should adjust the estimated fuel consumption used to set the RUC rate to take into account RUC exemptions for auxiliary fuel use based on the ATO's 'fair and reasonable' fuel tax exemption rates (approach 2 in Table 16)? Why or why not?

4.10 Unsealed road travel discounts

4.10.1 Issues

Discounts for unsealed road travel by road trains were introduced into the PAYGO model in 2005 in response to industry feedback that road trains in particular did a considerable share of their annual travel on unsealed roads. The PAYGO model assumes that all the road network is sealed in the application of its cost allocators, which is particularly relevant to the ESA-km cost allocator. The results of industry surveys in 2005 found that on average 30 per cent of double road train travel was on unsealed roads and 35 per cent of triple road train travel was on unsealed roads. In 2012 this discount was also applied to B-triples when the NTC modelled B-triples separately for the first time. The issue is whether the application of this discount is still appropriate and, if so, whether an updated industry survey on unsealed road travel is required.

4.10.2 Background

In 2005 a number of stakeholders argued that applying the ESA-km cost allocator was not relevant for unsealed road travel and that VKT was a fairer allocator because unsealed roads were affected more by climate and the number of wheel passes.

In response, the NTC requested survey-based evidence on the share of road travel on unsealed roads. Several industry associations provided responses – the major responses were from the Australian Road Train Association, the Australian Livestock Transport Association, the Australian Trucking Association branches in the Northern Territory and Queensland, and the Western Australian transport forum.

A weighted average analysis of these survey responses relative to SMVU road train travel estimates resulted in an average unsealed travel share of 30 per cent for double road trains and 35 per cent for triple road trains.

4.10.3 How the discount is applied

The unsealed discount is applied just to the ESA-km allocated cost to obtain an adjusted allocated cost overall. The discounted ESA-km element is then redistributed by VKT across the rest of the heavy vehicle and light vehicle fleets, with the vast majority going to the light vehicle fleet.

4.10.4 Impacts with or without MaxMan

The unsealed road travel discounts result in a heavy vehicle cost base that is around $62 million (or 1.6 per cent) lower than would otherwise be the case under the current PAYGO model with MaxMan applied. If MaxMan is no longer applied, as recommended in this C-RIS, it results in a heavy vehicle cost base that is around $54 million lower than otherwise would apply.

In both scenarios, whether MaxMan is used or not, the attributable costs for B-triples and road trains are 14–17 per cent lower than would otherwise apply. Measuring the impact on heavy vehicle registration charges for B-triples and road trains is less certain due to the broader impacts of charge setting within the PAYGO model.[18] However, the heavy vehicle industry clearly benefits overall from a lower cost base than otherwise would be the case.

4.10.5 Recommendation

The unsealed travel discount has not been reviewed since its inception in 2005. It does address a legitimate issue concerning application of the ESA-km cost allocator and the PAYGO model assumption that all the network can be treated as being sealed. We propose to conduct a review of this discount based on a new survey of industry in time for application to the final decision RIS.

[18] The PAYGO model has a cross-subsidy check to ensure each vehicle class recovers at least its attributable costs through the charges paid (registration and RUC). However, beyond this cross-subsidy check – and an overall check that the charges paid by all heavy vehicles recover revenue equivalent to the heavy vehicle cost base – the PAYGO model does not automatically calculate/adjust charges for individual vehicle classes based on the results of the cost allocation process.

Question 11: Do you agree that the NTC needs to update the percentages used for unsealed road travel discounts in the PAYGO model? Why or why not?

4.11 Community service obligation discount

4.11.1 Issue

At the same time that the issue of unsealed road travel by road trains was being addressed in 2005, the issue of community service obligations (CSOs) also arose. Industry argued that the cost base for heavy vehicles should be adjusted to take account of CSO-related expenditure. This mainly affected the road train industry servicing remote settlements. Industry suggested that a separate CSO discount should apply to remote areas because road expenditure is often not warranted by traffic levels but is necessary to support these communities.

The CSO discount rate was based on responses from relevant state and territory transport agency officers that provide the annual expenditure returns. Accurate estimates were not possible, but approximate estimates of 2 per cent to 7 per cent were provided for the share of arterial road expenditure that could be considered CSO-related. The NTC adopted a rate of 5 per cent for both double and triple road trains. The issue is whether this discount – which has not been reviewed since its inception in 2005 – should be retained and, if yes, whether it should be reviewed with updated estimates.

4.11.2 Analysis and impacts

In the PAYGO model the CSO discount is taken off the adjusted attributable allocated cost for road trains after the unsealed travel discount has first been applied. The cost is then reallocated on a VKT basis to the rest of the heavy and light vehicle fleets, with the light vehicle fleet again absorbing the vast majority.

The application of the CSO discount on its own (i.e. independent of the unsealed travel discount) results in a heavy vehicle cost base that is $14 million lower than would otherwise be the case if MaxMan was used, or only $12 million lower if MaxMan is not applied.

Overall, the combined impact of the unsealed road travel discount and the CSO discount is to lower the heavy vehicle cost base by about 2 per cent compared with what it otherwise would be.

4.11.3 Recommendation

The main issue with the CSO discount has always been the ability to measure the CSO component of road expenditure because road authorities have difficulty isolating and judging whether road expenditure meets the CSO criteria. Given the small impact it has on the cost base and the degree of uncertainty in its measurement, the NTC proposes that this discount be discontinued.

Question 12: Do you agree that the CSO discount should be discontinued in the PAYGO model? Why or why not?

4.12 Heavy vehicle concessions

Heavy vehicle concessions refer to the discounts offered by state and territory governments to some recipients such as charity organisations.

The general purpose of heavy vehicle concessions is to alleviate the impact of registration charges for particular operators who are considered to be facing special circumstances such as primary producers, not-for-profit operators or operators requiring more trailers than usual.

Because the financial impact of concessions is borne by the jurisdictions that offer them, concessions have been treated as a matter for states and territories to decide individually in previous determinations. Concessions are not reflected in estimated revenue figures calculated using the PAYGO model.

During consultation, the general consensus was that this approach should continue for the current determination and, therefore, heavy vehicle concessions are not a feature of this determination.

Question 13: Do you agree that this determination should not consider heavy vehicle concessions?

4.13 Electric heavy vehicles

4.13.1 Issues

Electric vehicles are an issue for any system that is based primarily on road-related fuel charges for excise revenue such as the RUC that applies in Australia to heavy vehicles. At present the electric-powered heavy vehicle fleet in Australia is insignificant but is forecast to grow substantially off a very small base.

The PAYGO model does not currently cater for electric vehicles because the RUC assumes that all heavy vehicles use liquid fuels – almost 99 per cent of all heavy vehicles use is diesel fuel (most of the rest is compressed natural gas used in buses). The SMVU includes VKT from the couple of electric heavy vehicles it picked up in its last survey but does not record any fuel use. Do we need to adjust the PAYGO model to enable the impact of electric heavy vehicles to be measured in future and how should we do this?

4.13.2 The current electric heavy vehicle fleet

The NTC has attempted to measure the current electric heavy vehicle fleet in Australia with mixed success. Part of the issue appears to be the extent to which electric vehicles are being separately identified and reported by registration authorities.

For jurisdictions that do report data on electric heavy vehicles, there are two types: those that are solely electric powered, and those that are hybrids with mixed diesel fuel and electric power capabilities (as shown in Table 17).

Table 17. Electric heavy vehicles reported to date

Jurisdiction	Electric only	Hybrid	Total electric and hybrid	Total heavy vehicle fleet – all types
NSW	11 rigid trucks 11 buses	80 trucks 2 prime movers	104 all types	142,878
WA	3 rigid trucks 1 prime mover 1 special vehicle	1 rigid truck 2 prime movers 11 special vehicles	19 all types	85,752
VIC	3 buses	22 trucks	25 all types	137,506
NT	2 special vehicles	1 rigid truck	3 all types	7,023
ACT	2 buses		2 all types	2,586
Qld			None listed	114,963
SA			Not recorded yet but will be in future	39,734
Tas			No response (may not be identified)	14,298
Total			**153**	**543,740**

Based on the table above there are currently only 153 heavy vehicles that are solely electric or hybrid-powered. This represents just 0.03 per cent of the national heavy vehicle fleet. The travel of such a small component of the heavy vehicle fleet would be insignificant and would have no impact on the heavy vehicle cost base.

We do know that electric heavy vehicles will become more important as time goes by, and the NTC is aware of international truck and prime mover manufacturers investing in electric heavy vehicles.

4.13.3 Recommendation

Given the electric heavy vehicle fleet is currently insignificant, it is proposed that no adjustments be made to the PAYGO model for the 2021 determination.

The NTC is also aware that no adjustments have been made to the 2020 SMVU (soon to be released) to measure the number of electric heavy vehicles or their road use.

It is recommended that all jurisdictions in future provide regular reports on electric heavy vehicles by type and report it to the NTC. This will provide a much better basis to evaluate the impact of these vehicles for post-2021 HVRR.

Question 14: Do you agree with the NTC's recommendation to disregard electric heavy vehicles for the purposes of this determination? Why or why not?

Question 15: Do you agree that the NTC should collect data on alternative fuel vehicles to monitor whether their number becomes sufficiently large to warrant further action?

4.14 Recovery of regulatory costs

4.14.1 Background

When the NHVR was established, the intergovernmental agreement stipulated that the ongoing cost of operating the regulator would be recovered from heavy vehicle operators through a new regulatory component of registration charges.

This applies only to heavy vehicles registered in participating states and territories. Registration charges applying in Western Australia and the Northern Territory are set independently from the PAYGO model and reflect regulatory costs of those jurisdictions.

The approach for setting the regulatory component of registration charges was first set as part of the 2014 determination. However, a separate regulatory component of registration charges was first collected in 2016–17.

As part of this determination, we have reviewed the current approach to ensure it meets the following key objectives of ensuring that:

- the regulatory component of registration charges continues to provide the NHVR with enough revenue to fund its approved budget
- the costs of operating the NHVR are allocated between different heavy vehicle types on a reasonable basis.

4.14.2 Current approach

The current approach was developed as part of the 2014 determination. Under this approach, regulatory components of registration charges are set for each individual truck and trailer type as follows:

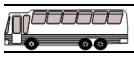
- 25 per cent of the total budget is allocated on a fixed, per vehicle basis. The intention is to reflect a relationship between the NHVR's costs and the overall size of the heavy vehicle fleet.
- 45 per cent of the total budget is allocated on the basis of AGM for this particular vehicle type, representing the concept that the overall risk imposed by heavy vehicles increases with weight.

- 30 per cent of the total budget is allocated on the basis of VKT for each vehicle type, representing the concept that those vehicle types making greater use of the road network should pay a greater proportion of the NHVR's costs.
- Each trailer is charged a fixed charge ($55 in 2020–21), recognising the modular nature of the vehicle fleet where trailers can be part of a range of different vehicle types.

The percentages above were not set based on a quantitative analysis of cost drivers. They were primarily chosen to achieve a reasonable progression of total registration charges across different types of heavy vehicles.

Table 18 shows the roads and regulatory components of registration charges applying to common heavy vehicle types in 2020–21.

Table 18. Roads and regulatory components of registration charges in 2020–21

Vehicle type	Mass rating for charging	Roads component ($)	Regulatory component ($)	Total registration charge ($)
	Up to 12.0 t	412	195	607
	Over 12.0 t	720	255	975
	Up to 42.5 t	1,944	341	2,285
	Up to 16.5 t	720	230	950
	Over 16.5 t	817	325	1,142
	Up to 42.5 t	2,653	416	3,069
	Over 42.5 t	10,742	702	11,444
	Over 42.5 t	11,354	704	12,058
	Up to 20.0 t	720	245	965
	Over 20.0 t	817	346	1,163
	Up to 12.0 t	309	204	513
	Over 12.0 t	309	334	643
		2,260	414	2,674
		5,767	458	6,225
		13,739	1,020	14,759
		13,739	1,076	14,815
		15,398	1,186	16,584

Since 2016–17, regulatory components of registration charges have been adjusted by scaling up or down to reflect changes in the NHVR budget and the size and composition of the heavy vehicle fleet.

4.14.3 Issues

The current approach has been successful in providing the NHVR with enough revenue to cover its approved budget. Arguably, the process of scaling regulatory charges up or down to reflect changes in the NHVR's budget or the vehicle fleet have also worked.

The process of asking ministers to approve both the NHVR's budget and, subsequently, the resulting regulatory charges, has proven to be relatively onerous. It could be desirable to develop a process that would automatically adjust regulatory charges to recover the approved NHVR budget.

Also, given updated usage data, it would also be desirable to consider whether the level of regulatory charges for each vehicle type should be reset.

4.14.4 Options

There are three options for setting regulatory charges in future years:

1. Retain the current regulatory charges but scale up or down to reflect changes in the NHVR's budget.

2. Reset the regulatory charges using the existing methodology with updated information on weight (AGM) and distance travelled (VKT) and the registered heavy vehicle fleet.

3. Develop a new, alternative approach to setting regulatory charges.

In addition, there are two possible approaches to adjusting regulatory charges each year to ensure the NHVR's approved budget continues to be recovered:

1. Continue with the current approach of ministers approving the regulatory charges each year.

2. Implement an automatic indexation mechanism that would scale the regulatory charges up or down each year to reflect changes in the NHVR's budget and changes in the heavy vehicle fleet.

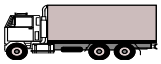
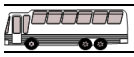
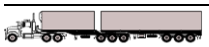
4.14.5 Assessment

The key consideration when deciding how to set regulatory charges for future years is whether there is enough trust that the current approach is working appropriately. While there is no empirical research of cost drivers underpinning the allocation percentages, the regulatory charges have successfully recovered the cost of operating the NHVR. From this perspective, the NTC considers there is limited benefit in developing a completely new methodology. This view also reflects that regulatory charges are only a relatively small part of total heavy vehicle charges and the impact of any change is likely to be minimal.

Table 19 shows the regulatory charges that would apply under the first two options on the basis of the NHVR's approved budget for 2021–22 and currently available usage data. It is important to note that this is an approximation only to illustrate the outcome under the first two options.

Table 19. Recalculated regulatory components of registration charges

Vehicle type	Mass rating for charging	Current regulatory component scaled ($)	Re-calculated regulatory component ($)	Change ($)	Change (%)
	Up to 12.0 t	195	200	5	3
	Over 12.0 t	254	260	6	2

Vehicle type	Mass rating for charging	Current regulatory component scaled ($)	Re-calculated regulatory component ($)	Change ($)	Change (%)
	Up to 42.5 t	340	336	−4	−1
	Up to 16.5 t	229	248	19	8
	Over 16.5 t	324	331	7	2
	Up to 42.5 t	415	402	−13	−3
	Over 42.5 t	701	701	0	0
	Over 42.5 t	703	703	0	0
	Up to 20.0 t	244	278	34	14
	Over 20.0 t	345	371	26	8
	Up to 12.0 t	204	197	−7	−3
	Over 12.0 t	333	355	22	7
		413	404	−9	−2
		457	442	−15	−3
		1,018	984	−34	−3
		1,074	1,040	−34	−3
		1,184	1,150	−34	−3

Given all other aspects of the PAYGO model are being updated to reflect the latest expenditure and usage data, we consider that it would be inconsistent not to update the calculation of regulatory charges at the same time. Therefore, the NTC recommends the second option outlined in section 4.14.4 – to reset the regulatory charges using updated information.

The current approach for periodically resetting regulatory charges involves ministers making regular decisions to reset regulatory charges. This process is cumbersome and administratively inefficient. The NTC recommends that regulatory charges be automatically adjusted each year to reflect the approved NHVR budget by scaling the initial set of regulatory charges up or down. This will avoid unnecessary administrative effort. Ministers will retain complete control over regulatory charges through approving the NHVR's budget. This can be achieved through changes to the model law.

4.14.6 Recommendations

We recommend that:

1. Regulatory charges for 2022–23 be reset using the existing methodology and the latest available information on weight (AGM), distance travelled (VKT) and the registered heavy vehicle fleet.

2. That regulatory charges for subsequent years be automatically adjusted by scaling the 2022–23 regulatory charges up or down to recover the NHVR's approved budget.

3. That the model law should be updated to include processes and formulae necessary to implement the automatic update of regulatory charges.

Question 16: Do you agree with the NTC's recommendation to recalculate the regulatory component of registration charges using the existing methodology and updated data? Why or why not?

Question 17: Do you agree that the regulatory component of registration charges should be adjusted from year to year to reflect the approved NHVR budget using an automatic adjustment provision in the Heavy Vehicle Charges Model Law?

5 Determination options

5.1 Options for consideration

The options for this determination were derived by combining all the recommended changes outlined in chapter 4 with the three key options for cost allocation explored in section 4.7.3.

The main reason for this approach is that, as explored in section 4.7.5, none of the three options for cost allocation is clearly and objectively superior to any other.

Therefore, this determination will evaluate a choice between the status quo and three alternative options, based mainly on the likely impact on heavy vehicle operators and governments (Table 20).

Table 20. Key determination options

	Detailed analysis and recommendations	Status quo	Option A	Option B	Option C
Updated treatment of innovative funding and financing mechanisms	Section 4.4	X	✓	✓	✓
Removal of MaxMan module	Section 4.8	X	✓	✓	✓
Adjustment for RUC leakages	Section 4.9	X	✓	✓	✓
Updated ESA values	Section 0	X	✓	✓	✓
Continued unsealed road travel discount with reviewed parameters	Section 4.10	X	✓	✓	✓
CSO discount removed	Section 4.11	X	✓	✓	✓
Future adjustments to take account of electric heavy vehicles	Section 4.13	X	✓	✓	✓
Updated regulatory component of heavy vehicle registration charges to recover heavy vehicle regulatory costs	Section 4.14	X	✓	✓	✓
Cost allocation approach	Section 4.7	Current	Current	Modified current	VIC DTF/ DOT

5.2 Comparison of determination options

5.2.1 Data

The final recommendations of this determination will recommend heavy vehicle charges to apply in 2022–23, based on the latest data available at the time. This will include road expenditure data and the number of registered heavy vehicles for 2020–21.

At the time of writing this C-RIS, the latest available data is as shown in Table 21.

Table 21. Latest available expenditure, usage and fleet data

Data	Source/year
State and territory road expenditure data	2019–20 as reported to the NTC by states and territories
Local government road expenditure data	2018–19 as reported by the ABS in government finance statistics
Road usage data, fuel usage data	2020 ABS SMVU
Vehicle numbers	State and territory registration databases, quarterly, averaged for 2019–20 financial year

5.2.2 Basis for comparison

When the final recommendations are presented to governments, the determination options for heavy vehicle charges to apply in 2022–23 will be compared with the charges that have been applied in 2021–22.

Because we do not have up-to-date road expenditure data, we will be calculating the heavy vehicle cost base using the latest available data as outlined in Table 21. It is therefore important to be aware that all calculations and figures relating to the three determination options presented in this report are illustrative only.

The actual outcomes under each of the options will depend heavily on future changes in government road expenditure for 2020–21 and the actual number of heavy vehicles registered by states and territories in 2020–21.

We will update all calculations and numbers for the decision RIS using the correct data, which is expected to be available by then.

5.2.3 Heavy vehicle cost base and implications for full cost recovery

Table 22 contains the allocated heavy vehicle cost base under the status quo and the three cost allocation options, based on the latest available usage and expenditure data.

Table 22. Allocated heavy vehicle cost bases

	Status quo for 2020–21 heavy vehicle charges	Option A	Option B	Option C
Total road expenditure for allocation, 7-year EMA ($m)	17,233	17,233	17,233	17,233
Heavy vehicle cost base ($m)	3,878	3,734	4,018	4,402
Percentage of total expenditure allocated to heavy vehicles (%)	22.5	21.7	23.3	25.5

Note: Numbers in the status quo (2020–21) column use existing model settings from prior to the determination (e.g. applying MaxMan) but use updated usage data from the 2020 SMVU. This serves as a basis for comparison for options A, B and C.

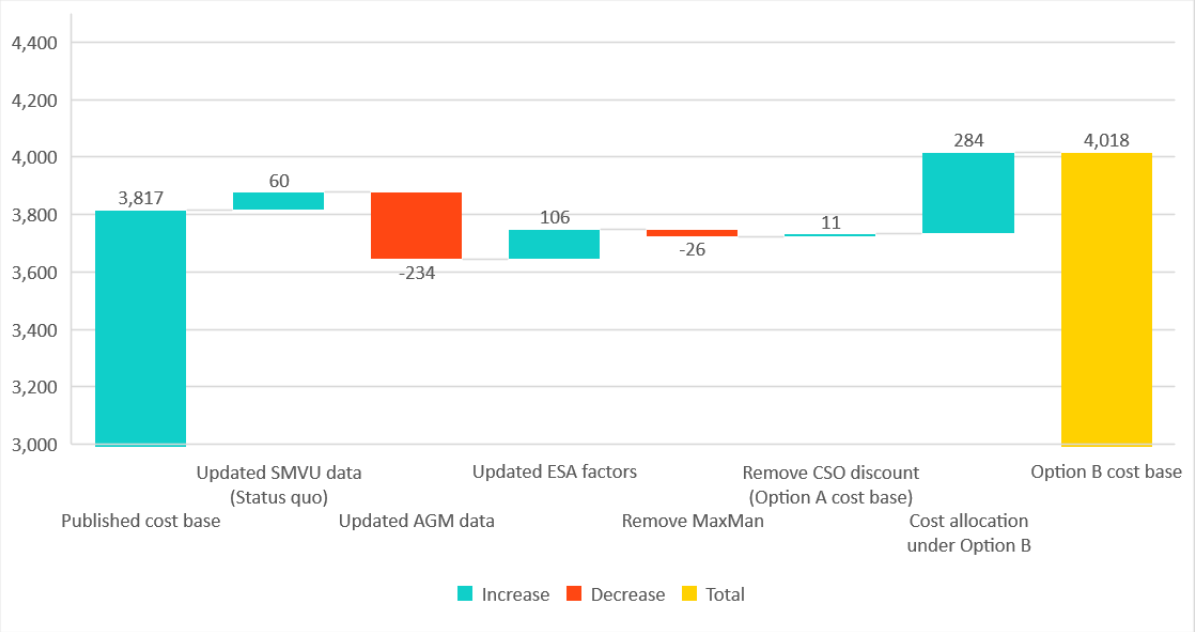
The status quo uses updated usage data from the 2020 SMVU but otherwise leaves the PAYGO model's settings unchanged from the previous determination. This change of usage data sees a $60 million increase in the heavy vehicle cost base relative to the $3.817 billion cost base number published in the consultation paper on 2021–22 heavy vehicle charges (NTC, 2021).

Options A, B and C each have a different cost allocation approach, as well as making various changes to model settings in line with the recommendations in chapter 4. The impact of these changes on the heavy vehicle cost base is shown in Figure 8, with an endpoint of the cost allocation option B cost base.

The cost base under cost allocation option A ($3.734 billion) is lower than the published cost base for the 2021–22 charges consultation paper, primarily due to the incorporation of AGM values for light vehicles (which more than offsets the increases that occur under various other changes). However, the cost allocation approach under option B adds $284 million to the heavy vehicle cost, meaning that, overall, the cost base under this option has increased relative to the status quo. Note that each impact in Figure 8 has been calculated sequentially, in the order shown when moving from left to right.[19]

[19] The impacts calculated would be different if calculated in a different order. For example, the impact of a revised cost allocation approach depends in part on the SMVU data (which determines the kilometre data for each of the cost allocation parameters) and on revisions to AGM and ESA factors.

Figure 8. Impact on heavy vehicle cost base from changes considered in this RIS ($m)



Using the VIC DTF/DOT cost allocation matrix increases the cost base by a further $384 million to a total of $4.402 billion under the option C cost base.

5.3 Assessment of determination options

5.3.1 Economic considerations

As outlined in section 4.7.5, all three options are likely to fall within the wide range for achieving economic efficiency that lies between recovering a minimum of incremental cost and a maximum of standalone cost.

From this perspective, there is no clearly superior option. However, the options would potentially have significantly different financial and economic impacts for governments and industry. The choice between determination options must therefore be based on an assessment of the overall impact of the option.

The identified heavy vehicle cost bases are $3.73 billion for option A, $4.02 billion for option B and $4.40 billion for option C. Given that the cost base under all options is significantly above the revenue currently provided by heavy vehicle charges, it is unlikely that full cost recovery of the heavy vehicle cost base could be achieved immediately in 2022–23 under any of the three options.

Therefore, the short-term implications of any change in cost allocation approach are likely to be limited from an economic perspective.

5.3.2 Timing and Heavy Vehicle Road Reform

This determination is being undertaken while governments consider a suite of more wide-ranging reforms under the HVRR project. Under this reform it is likely that the entire process of setting heavy vehicle charges – including expenditure measurement, cost allocation and recovery of road costs over time – will be subject to change. There are a wide range of policy decisions, including how to allocate costs, which will need to be made as part of this

reform. The reform will need to seek a balance between achieving productivity gains and managing the impact on heavy vehicle operators.

This determination under the PAYGO system may well be the last of its kind. It will need to provide a stable and well-reasoned platform on which future reform can be implemented.

There is a question whether a significant departure from the current cost allocators should be contemplated as part of this determination, or if such a significant change would best be considered as part of a wider range of significant changes under HVRR.

There are arguments supporting either proposition. On the one hand, if it is likely that a new cost allocation approach similar to option 2 or option 3 will be part of road reform, changing the cost allocators now may make implementation of HVRR easier. On the other hand, if a different approach is adopted as part of HVRR, any change implemented as part of this determination may then need to be reversed with the introduction of HVRR. The other advantage of introducing change as part of HVRR is that some or all of the effect could be mitigated through a decision on the level of the opening asset base of the FLCB.

5.3.3 Other issues

The report by HoustonKemp (2017) identified that road cost and use data generally suffers from shortcomings, which pose a challenge for evaluating the causal relationship between heavy vehicle road use and road costs. These challenges frequently lead to conflicting evidence and a general lack of consensus on fundamental elements on the relationships between heavy vehicle road use and road cost. It also found that new research was insufficient, in and of itself, to support a departure from the current cost allocators. This indicates that we can have some degree of confidence that the current cost allocators in option 1 and the modified current cost allocators in option 2 are reasonable approaches, albeit with recognised shortcomings.

The VIC DTF/DOT approach (ARRB, 2017a; ARRB, 2019) is an engineering-based approach using pavement deterioration models that link pavement deterioration to the millions of ESAs that pass over a particular pavement over time for key cost allocation parameters. There are some important features of this approach:

- The primary research focuses on load-related wear and construction and maintenance costs.
- The research is based on Victorian data only to date – it is uncertain whether the recommended cost allocators would be representative of the national road network.

5.3.4 Basis for decision

Based on the analysis presented above, we believe there is no clearly superior cost allocation approach from an economic perspective. Therefore, the choice of cost allocation approach needs to be made by seeking the appropriate trade-off between the following factors:

1. Resulting revenue gap and practical implications – changing the cost allocation approach will increase the heavy vehicle cost base compared with the current approach. Given the current gap between heavy vehicle charges revenue and the heavy vehicle cost base, changing the cost allocation matrix may only have a symbolic practical effect if full cost recovery cannot be achieved immediately.

2. Confidence in robustness of options – each of the options has strengths and weaknesses, and is based on a range of assumptions. The choice between the

options needs to consider the degree of confidence in the research, assumptions and judgements and possible information gaps inherent in each approach.

3. Timing and HVRR – governments are developing options for HVRR that will replace the current PAYGO system over time. Is now the appropriate time to implement significant changes to the cost allocation approach, or should this be considered as part of HVRR?

We are seeking the views of stakeholders on which cost allocation approach represents the appropriate approach for this determination.

5.4 Recommendations

Based on the assessment in section 5.3, we recommend that the cost allocation options, each combined with the recommended technical changes outlined in section 4, should form the three broad options for this determination.

Question 18: Do you agree that the three options outlined should be considered as the options to be assessed for this determination?

Question 19: If not, what other option(s) should be considered?

Question 20: Which cost allocation option is the best option to calculate the heavy vehicle cost base for this determination? What are the reasons for your preference?

6 Implementation options

6.1 Implementation objectives

In designing an implementation pathway for the determination, the overall objective is to achieve full cost recovery over time while complying with the pricing principles.

The pricing principles are:

> 'National heavy vehicle road use prices should promote optimal use of infrastructure, vehicles and transport modes.
>
> This is subject to the following:
>
> - full recovery of allocated infrastructure costs while minimising both the over and under recovery from any class of vehicle
> - cost-effectiveness of pricing instruments
> - transparency
> - the need to balance administrative simplicity, efficiency and equity (e.g. impact on regional and remote communities/access)
> - the need to have regard to other pricing applications such as light vehicle charges, tolling and congestion.'

Following the Productivity Commission's inquiry into road and rail infrastructure pricing in 2006, the ATC provided further direction to the NTC:

> *ATC direct the NTC, in developing its determination, to apply principles and methods that ensure the delivery of full cost recovery in aggregate, further develop indexation adjustment arrangements to ensure the ongoing delivery of full expenditure recovery in aggregate and remove cross subsidisation across different heavy vehicle classes, recognising that transition to any new arrangement may require a phased approach (ATC, 2007).*

Whether the over- and under-recovery of any class of vehicle is being minimised has been interpreted as a requirement that the average total heavy vehicle charges paid by the average vehicle in a class should exceed the average allocated cost for this vehicle type.

The PAYGO model uses a constraint check table to indicate whether this is being achieved. Under the current structure of heavy vehicle charges, there are a number of vehicle types where the charges revenue paid is lower than the allocated cost. Avoiding cross subsidies between different vehicle classes would therefore require the relative size of registration charges between different vehicle classes to change.

6.2 Historical approach to implementing determinations

Historically, a specific set of heavy vehicle charges would be implemented in the financial year following ministers' approval of the determination. An annual adjustment process would then apply between determinations to ensure heavy vehicle charges revenue kept up with changes in government expenditure.

The annual adjustment initially applied only to registration charges. Over time, this led to an increasing proportion of heavy vehicle charges revenue being recovered through registration charges, whereas the proportion recovered through RUC reduced over time. To avoid this occurring, ministers agreed as part of the 2007 determination that annual adjustments would apply to registration charges and to RUC.

The annual adjustment was calculated and applied automatically, based on a formula outlined in the Heavy Vehicle Charges Model Law.

Under normal circumstances, this would be the most obvious approach to implementing the heavy vehicle charges approved by ministers as part of this determination.

6.3 Direct implementation may not be feasible

The cost bases for all options, as shown in Table 22, exceed the revenue from current heavy vehicle charges by a range of between 8.2 per cent and 27.6 per cent.[20]

It may not be possible to implement the determination directly because:

- ITMM has historically been reluctant to approve large increases in heavy vehicle charges.
- The economic consequences of a significant increase in heavy vehicle charges may be more severe than usual in the uncertain economic climate post COVID-19.
- Heavy vehicle operators may not be able to pass on significant increases in heavy vehicle charges to their customers, particularly with the relatively short lead time inherent in a direct implementation approach.

On the other hand, full cost recovery over time is one of the most important principles underpinning PAYGO. Therefore, alternative implementation options should at least be able to achieve some progress towards full cost recovery, even if this is not achieved immediately.

6.4 Multi-year price periods

Setting charges for multiple years would allow the transition to full cost recovery to begin at a measured pace in a way that recognises the cost recovery principle underpinning PAYGO while also recognising that moving to full cost recovery immediately would impose an unreasonable burden on heavy vehicle operators.

Agreeing a multi-year price path would also have the potential to reduce administrative and compliance costs for governments and industry.

Recent experience with the need to revisit heavy vehicle charges each year shows this is distracting to both governments and industry and consumes significant administrative resources. These costs could be avoided, at least in part, with a defined multi-year price path.

[20] Estimated revenue from 2021–22 charges is $3.45 billion (ignoring the estimated revenue loss due to RUC leakages). The cost base under option A is $3.73 billion, while under option C it is $4.40 billion. These figures will change for the decision RIS as new expenditure and vehicle fleet data becomes available for the purposes of calculating the 2022–23 cost base for charging purposes.

A defined price path may offer additional advantages in that it would provide industry with certainty about the heavy vehicle charges that would apply in the medium term, allowing vehicle operators to make better pricing decisions and reflect them in contracts.

One of the key questions is: How long should any multi-year price path be?

6.4.1 Specifying the multi-year pricing period

There are trade-offs in deciding on the length of a multi-year pricing period, and the rate of increase to apply:

- Determinations occur approximately every five to seven years. This timeframe is the practical upper limit of a multi-year pricing period.
- It is possible that HVRR will be implemented in the medium term. Shorter pricing periods are more likely to support smooth reform implementation.
- Shorter pricing periods provide less certainty, whereas longer periods provide greater certainty for both industry and governments.
- Longer pricing periods involve a higher risk that the heavy vehicle cost base and the revenue from heavy vehicle charges drift apart, increasing the potential for over- or under-recovery to increase over the pricing period.
- Any percentage increase set below the long-run growth in the heavy vehicle cost base is likely to result in the gap between the heavy vehicle cost base and heavy vehicle charges revenue growing over time rather than reducing.
- The year-on-year growth in the heavy vehicle cost base is highly variable and difficult to forecast.

Any multi-year price path must be set with these considerations in mind. We recommend exploring options for a three-year price path as the best compromise between providing certainty and reducing the risk of the gap between the heavy vehicle cost base and heavy vehicle charges revenue widening significantly during the price period.

Under this approach, ITMM would set prices for three years as part of its decision on the determination. The NTC would continue to collect data and provide an annual report to ITMM comparing the actual cost base with the revenue from heavy vehicle charges in each year of the pricing period. At the end of the pricing period, the NTC would provide a report on outcomes and recommendations for setting prices for the next three-year period.

The heavy vehicle charges set under this methodology could be replaced at any time with charges set under a new methodology introduced as part of HVRR.

6.5 Implementation options evaluated

As part of this determination, we are assessing two implementation approaches. We have quantified the financial implications using cost base option B, but the implementation options could be pursued under all cost base options:

- direct implementation in 2022–23 with automatic annual adjustments to ensure full recovery of the identified heavy vehicle cost base in subsequent years
- three-year price path with a fixed percentage increase each year. Any percentage increase could be applied under this implementation option. To be able to explore the financial implications tangible examples are presented:
    - example 1: increases of 3.5 per cent per annum over the three years

- example 2: increases of 6 per cent per annum over the three years.

The direct implementation option represents the status quo. The increases of 3.5 per cent shown in example 1 of the three-year fixed price path option are intended to reflect the actual average annual growth rate in the heavy vehicle cost base from 2012–13 to 2021–22. The 6 per cent yearly increase in example 2 of the three-year fixed price path option would see charges increase above the recent growth rate in an attempt to move closer to full cost recovery over time.

For the direct implementation option, the NTC has retained the existing RUC revenue to registration revenue ratio from 2021–22 of 56.6 per cent RUC revenue and 43.4 per cent registration revenue (from the roads component of registration charges). That is, the RUC rate is calculated as the rate needed to recover 56.6 per cent of total revenue from fuel used by heavy vehicles (where total fuel used by heavy vehicles has been reduced by 4.8 per cent to reflect estimated RUC leakages).

Registration charges under the direct implementation option are set to recover 43.4 per cent of total revenue and to maintain existing charge relativities between different types of vehicles and trailers where possible. However, registration charges for some types of powered units need to increase significantly to meet the calculated attributable costs for the relevant vehicle class and therefore avoid cross-subsidisation between vehicle classes.[21] Where increases to registration charges are necessary to avoid cross-subsidisation, they have been kept as low as possible while still satisfying the constraints check. Nonetheless, the necessary increases to registration charges to avoid cross-subsidisation are, in some cases, very large, which is primarily due to the revised ESAs, along with changes in usage data from the SMVU.

Both examples of the three-year fixed price path specify fixed percentage increases in overall heavy vehicle charges. However, in calculating the charges to apply under these implementation options, the NTC has had regard to the pricing principle relating to cross-subsidisation. This is done by allowing for differential rates of increase in the charges for different types of powered units and trailers while maintaining the same overall revenue as would be achieved from a uniform 3.5 per cent (under example 1) or 6 per cent (under example 2) charge increase applied to all powered units and trailers. That is, certain charges increase faster (5 per cent under example 1; and 7.5 per cent under example 2) than the specified figure for the implementation option to help reduce the degree of cross-subsidisation (while still retaining some pragmatism about the rate of increase in charges that can be implemented for those vehicle classes). Charges for other types of vehicle and trailer increase by less than the specified figure (around 3.2 per cent under example 1; and around 5.7 per cent under example 2). Overall, the amount of revenue collected nationally is the same as if a uniform 3.5 per cent or 6 per cent increase had been applied under the two examples of the three-year fixed price path.[22]

[21] In a very small number of cases (primarily affecting short combination trucks), charges have also been increased to maintain the relativities logic in the charging schedule (e.g. type 2 trucks should cost more than type 1), even though they would not otherwise have been in breach of the cross-subsidisation pricing principle.

[22] While the amount of revenue collected nationally is the same under a uniform or differential increase, there would be differences in the revenue collected by an individual jurisdiction because the mix of the fleet registered in each jurisdiction will affect relative outcomes.

6.6 Assessment of implementation options

6.6.1 Financial and fiscal implications

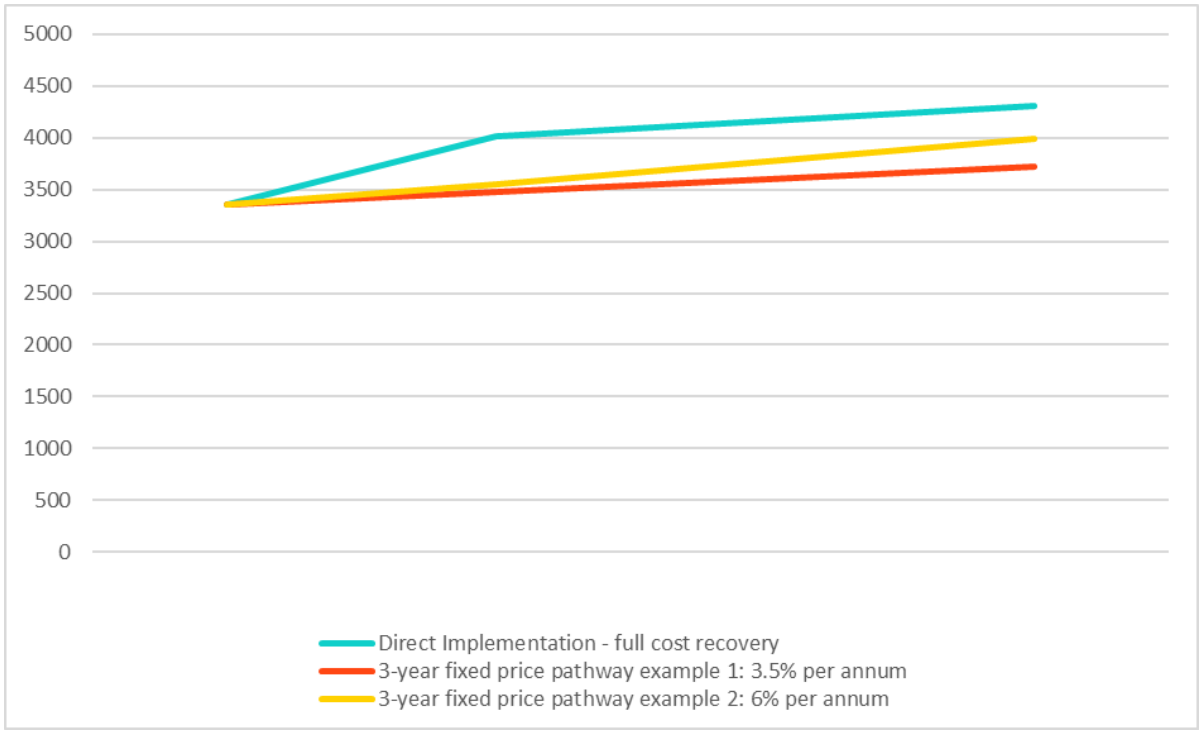
Financial and fiscal outcomes will differ under each implementation option, and for each example.

To illustrate the outcomes, we have assumed there is a substantial gap between the heavy vehicle cost base and revenue at the starting point, as would occur under cost allocation option B – modified current. After then, we assume the heavy vehicle cost base would increase by 3.5 per cent each in years 1, 2 and 3. This reflects the average increase in the heavy vehicle cost base (averaged using the existing seven-year exponential moving average with an alpha of 0.5). We then compare the charges outcomes under the three implementation options against the estimated heavy vehicle cost base.

It is important to note that this representation is illustrative only. Annual changes in heavy vehicle expenditure are typically volatile and unpredictable. Also, the vehicle fleet and fuel consumption typically grow year to year, which would increase revenue further from the levels shown in Figure 9.

The estimates of RUC revenue shown in this section reflect the revised estimate of heavy vehicle fuel consumption that is subject to the RUC, based on the analysis of RUC leakages in section 4.9. As a result, the estimate of fuel used by heavy vehicles has been reduced by 4.8 per cent. Under the direct implementation option, this reduction of fuel subject to the RUC is factored into the calculation of the RUC rate (to ensure 56.6 per cent of total revenue from heavy vehicles is sourced from the RUC). By contrast, for the two examples of the three-year fixed price implementation pathway, the RUC leakages are simply reflected in lower estimated revenue due to the lower volume of fuel that is subject to the RUC.

Figure 9. Projected financial implications for heavy vehicle charge revenue ($m)



Under the direct implementation option, heavy vehicle charge revenue would need to increase by around 16.5 per cent (relative to estimated revenue collected in 2021–22, and ignoring RUC leakages) in year 1 to fully eliminate the existing under-recovery.[23] However, this overall figure masks significant variation because the RUC rate would increase by around 22 per cent (in part to compensate for RUC leakages),[24] while registration charges would in some cases rise by several hundred per cent. Further automatic annual adjustments would follow in years 2 and 3 (assumed to be 3.5 per cent for illustration purposes) to reflect the growth in the heavy vehicle cost base. This implementation option would achieve full cost recovery in all three years.

Under example 1 of the three-year fixed price path, heavy vehicle charges would increase by an average of 3.5 per cent in each of the three years (with registration charges increasing by 5 per cent for some types of powered units and by around 3.2 per cent for trailers and other types of powered units). The gap between the estimated heavy vehicle cost base and heavy vehicle charges revenue would remain broadly steady if expenditure were to grow at a similar rate.

Under example 2 of the three-year fixed price path, heavy vehicle charges would increase by an average of 6 per cent in each of the three years (with registration charges increasing by 7.5 per cent for some types of powered units and by around 5.7 per cent for trailers and other types of powered units). The gap between the estimated heavy vehicle cost base and heavy vehicle charges would gradually narrow over time if expenditure grows at a lower rate (assumed for illustration purposes to be 3.5 per cent). This is a simple reflection that the yearly increase under this option is set above the assumed growth in the heavy vehicle cost base.

Table 23 shows the estimated revenue from the roads component of registration charges that would be received by each state and territory under cost base option B, which uses the modified cost allocation matrix (as recommended by HoustonKemp) and the direct implementation option.

Table 23. Estimated revenue from roads component of registration charges and RUC – direct implementation of option B ($m)

Direct implementation	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Cwlth	Total
Year 1	414.9	443.7	406.6	136.6	277.7	35.8	23.0	5.6	2,274.3	4,018.2
Year 2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Year 3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[23] The cost base under option B is $4.02 billion, while estimated revenue collected from heavy vehicle charges in 2021–22 is $3.45 billion. Taking into account the revenue lost through RUC leakages reduces the estimated revenue collected from heavy vehicle charges in 2021-22 to $3.36b.

[24] In part due to factoring in RUC leakages.

Direct implementation	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Cwlth	Total
Total over pricing period	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Tables 24 and 25 show estimated revenues from the roads component of registration charges and the RUC under implementation options 1 and 2. For modelling purposes, the heavy vehicle and trailer fleet and fuel use have been assumed to be constant throughout the modelling period; in practice, outcomes will differ due to changes in the fleet and fuel use over time.

Table 24. Estimated revenue from roads component of registration charges and RUC – three-year fixed price path example 1: 3.5 per cent per annum ($m)

Option 1: 3.5% per annum	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Cwlth	Total
Year 1	357.1	396.6	366.3	123.0	250.9	30.4	20.6	3.8	1,932.7	3,481.4
Year 2	370.1	410.3	379.1	127.3	259.4	31.5	21.3	4.0	2,000.4	3,603.3
Year 3	383.6	424.6	392.2	131.6	268.3	32.6	22.0	4.2	2,070.4	3,729.4
Total over pricing period	1,110.7	1,231.5	1,137.6	381.9	778.5	94.4	63.9	12.0	6,003.5	10,814.1

Table 25. Estimated revenue from roads component of registration charges and RUC – three-year fixed price path example 2: 6 per cent per annum ($m)

Option 2: 6% per annum	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Cwlth	Total
Year 1	365.7	406.1	375.2	126.0	256.9	31.1	21.1	3.9	1,979.4	3,565.5
Year 2	388.2	430.4	397.6	133.5	272.1	33.0	22.3	4.2	2,098.2	3,779.5
Year 3	412.0	456.1	421.3	141.4	288.2	35.0	23.7	4.5	2,224.1	4,006.2
Total over pricing period	1,165.9	1,292.7	1,194.1	400.9	817.2	99.1	67.1	12.6	6,301.7	11,351.2

Table 26 shows the estimated revenue from the regulatory component of registration charges, assuming the NHVR's budget, registration charges and the heavy vehicle and trailer fleet remain constant throughout the three years.

Table 26. Estimated revenue from regulatory component of registration charges ($m)

Regulatory component	NSW	Vic	Qld	SA	WA	Tas	NT	ACT	Cwlth	Total
Year 1	48.7	48.9	43.3	14.9	0.0	4.5	0.0	0.8	N/A	161.1
Year 2	48.7	48.9	43.3	14.9	0.0	4.5	0.0	0.8	N/A	161.1
Year 3	48.7	48.9	43.3	14.9	0.0	4.5	0.0	0.8	N/A	161.1
Total over pricing period	146.0	146.8	129.9	44.7	0.0	13.6	0.0	2.4	0.0	483.3

6.6.2 Impact on industry

Road user charge

Table 27 shows the estimated RUC in cents per litre of diesel fuel that would apply over the first three years of this determination under the three implementation options. The RUC rate is significantly higher under the direct implementation option than it is currently, due to both the higher cost base and the need to increase the RUC rate to make up for the shortfall in revenue arising from RUC leakages. Under the other two implementation options, the RUC rate is simply increased by the specified percentage with no adjustment for RUC leakages. (However, the estimates of RUC revenue in Table 24 and 25 reflect the lower amount of fuel estimated to be subject to RUC.)

Table 27. Road user charge under current cost allocation option for each implementation option (cents per litre)

	Year 1	Year 2	Year 3
Direct implementation	32.2	N/A	N/A
Three-year fixed price path example 1: 3.5% per annum	27.4	28.3	29.3
Three-year fixed price path example 2: 6% per annum	28.0	29.7	31.5

Registration charges for common vehicle types (including roads and regulatory components)

The following tables show the estimated registration charges (including both roads and regulatory components) that would apply under the three implementation options over the three years following the determination. Under the direct implementation option, charges for the second and third year are not unknown because they depend on future expenditure and usage data.

For simplicity, it is assumed that the regulatory component of registration charges would remain constant at 2022–23 levels.

Table 28. Registration charges for common vehicle types: direct implementation

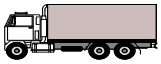
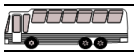
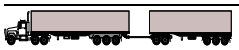
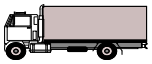
Vehicle type	Mass rating for charging	Current (2021–22)	Year 1	Year 2	Year 3
	Up to 12.0 t	617	627	N/A	N/A
	Over 12.0 t	993	1,804	N/A	N/A
	Up to 42.5 t	2,334	3,150	N/A	N/A
	Up to 16.5 t	968	1,792	N/A	N/A
	Over 16.5 t	1,162	2,084	N/A	N/A
	Up to 42.5 t	3,135	4,060	N/A	N/A
	Over 42.5 t	11,713	13,143	N/A	N/A
	Over 42.5 t	12,342	13,780	N/A	N/A
	Up to 20.0 t	983	1,822	N/A	N/A
	Over 20.0 t	1,183	2,124	N/A	N/A
	Up to 12.0 t	521	517	N/A	N/A
	Over 12.0 t	651	2,606	N/A	N/A
		2,731	7,615	N/A	N/A
		6,369	6,420	N/A	N/A
		15,102	15,225	N/A	N/A
		15,158	15,281	N/A	N/A
		16,969	17,110	N/A	N/A

Table 29. Registration charges for common vehicle types: three-year fixed price path example 1: 3.5 per cent per annum

Vehicle type	Mass rating for charging	Current (2021–22)	Year 1	Year 2	Year 3
	Up to 12.0 t	617	636	649	664
	Over 12.0 t	993	1,035	1,074	1,114
	Up to 42.5 t	2,334	2,405	2,486	2,568
	Up to 16.5 t	968	1,023	1,062	1,102
	Over 16.5 t	1,162	1,210	1,254	1,300
	Up to 42.5 t	3,135	3,222	3,329	3,438
	Over 42.5 t	11,713	12,227	12,769	13,336
	Over 42.5 t	12,342	12,876	13,439	14,027
	Up to 20.0 t	983	1,053	1,092	1,132
	Over 20.0 t	1,183	1,250	1,294	1,340
	Up to 12.0 t	521	524	534	545
	Over 12.0 t	651	688	704	722

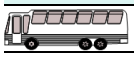
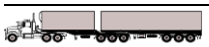
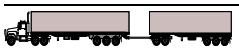
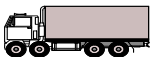
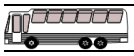
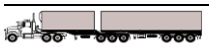
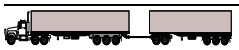
Vehicle type	Mass rating for charging	Current (2021–22)	Year 1	Year 2	Year 3
		2,731	2,836	2,958	3,086
		6,369	6,541	6,732	6,930
		15,102	15,513	15,969	16,442
		15,158	15,569	16,025	16,498
		16,969	17,434	17,944	18,474

Table 30. Registration charges for common vehicle types: three-year fixed price path example 2: 6 per cent per annum

Vehicle type	Mass rating for charging	Current (2021–22)	Year 1	Year 2	Year 3
	Up to 12.0 t	617	646	671	698
	Over 12.0 t	993	1,053	1,113	1,177
	Up to 42.5 t	2,334	2,455	2,589	2,733
	Up to 16.5 t	968	1,041	1,101	1,165
	Over 16.5 t	1,162	1,231	1,299	1,371
	Up to 42.5 t	3,135	3,291	3,470	3,662
	Over 42.5 t	11,713	12,503	13,350	14,261
	Over 42.5 t	12,342	13,168	14,052	15,003
	Up to 20.0 t	983	1,071	1,131	1,195
	Over 20.0 t	1,183	1,271	1,339	1,411
	Up to 12.0 t	521	532	551	571
	Over 12.0 t	651	695	721	748
		2,731	2,894	3,081	3,282
		6,369	6,688	7,042	7,416
		15,102	15,864	16,707	17,597
		15,158	15,920	16,763	17,653
		16,969	17,827	18,772	19,770

Schedules of estimated registration charges for the full range of vehicle types and components are outlined in Appendix B.

6.6.3 Heavy vehicle operating costs

The operating costs for heavy vehicles included in the model are registration, RUC, insurance, maintenance, tyres, fuel, capital, labour, administration and sundry costs related to running a business. Many of these costs will not be affected by the proposed implementation options. The main impacts will be on RUC and registration. However, both RUC and registration represent a minor proportion of overall costs, as depicted in Table 31 and Figure 10. Table 31 shows examples of seven vehicle classes and the proportion of cost represented by RUC and registration based on 2020 costs.

Table 31. Charges relative to operating costs for selected heavy vehicles

Vehicle type	Registration	RUC	Total charges	Total costs	Registration/ total costs	Charges/ total costs
Rigid truck 2-axle 4.5 to 7.0 t	$607	$1,835	$2,442	$144,324	0.4%	1.7%
Rigid truck 3-axle 18 t and over	$1,142	$4,378	$5,520	$185,333	0.6%	3.0%
Truck and trailer over 42.5 t	$6,492	$9,184	$15,676	$309,891	2.1%	5.1%
6-axle articulated truck	$6,225	$26,212	$32,437	$484,362	1.3%	6.7%
9-axle B-double	$14,472	$37,256	$51,728	$631,934	2.3%	8.2%
Double road train	$14,815	$42,043	$56,858	$769,601	1.9%	7.4%
Triple road train	$16,584	$52,017	$68,601	$911,797	1.8%	7.5%

Figure 10. Changes in operating costs from 2013 to 2020

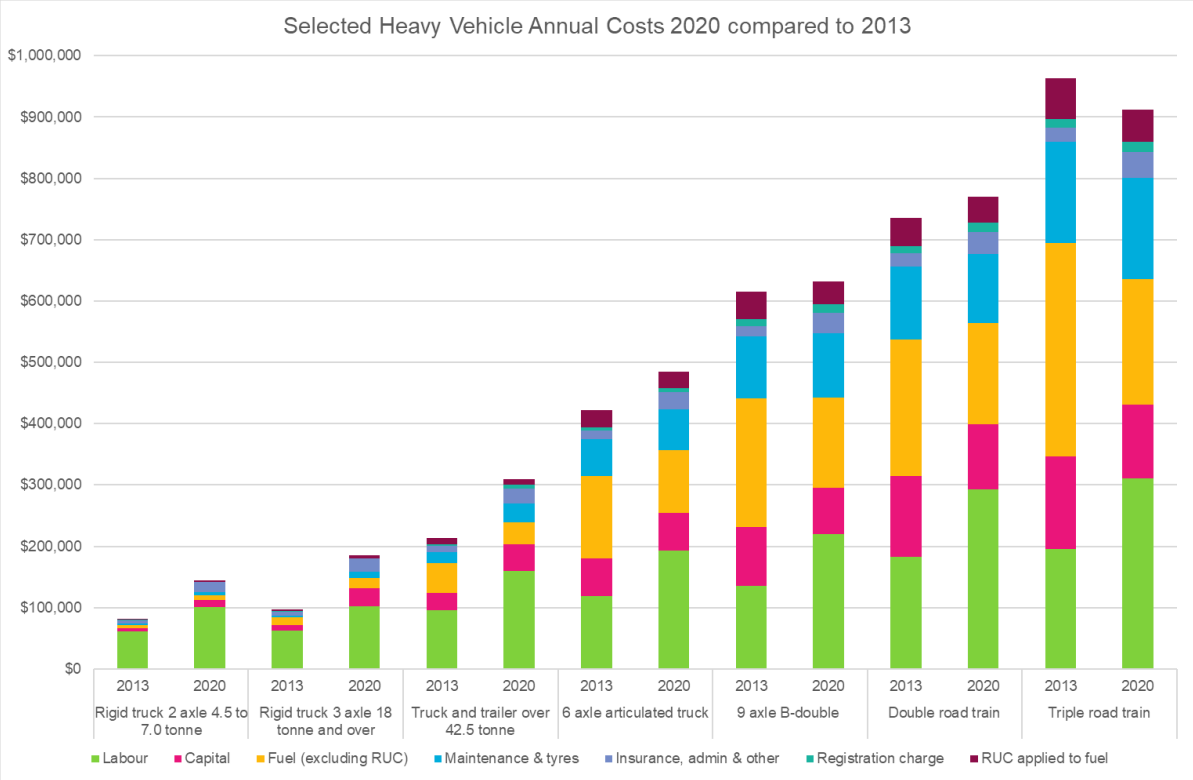


Figure 10 illustrates that operating costs have changed since 2013, in some cases significantly. Key observations from the review of the operating cost model were:

- Labour costs have increased significantly because it reflects the most recent award and includes costs previously not considered in the previous model.
- Fuel costs have decreased because the pump price for diesel excluding fuel excise has declined.
- Vehicle and capital costs have remained largely the same as the increase in market prices and inclusion of stamp duty have been largely offset by lower financing rates.
- The tyre/maintenance costs have increased significantly for some vehicle types (e.g. rigid vehicles and buses) to reflect costings in the Australian Transport Assessment and Planning guidelines and stakeholder feedback.
- Other costs have increased to cover costs previously not considered in the model – for example, compliance training, parking and tolls and the introduction of new technology such as electronic work diaries.

From the information above, we can conclude that a modest change in heavy vehicle charges would have a relatively modest impact on overall heavy vehicle operating costs. For example, for a 9-axle B-double, where current heavy vehicle charges make up 8.2 per cent of total operating costs, a 3.5 per cent increase in heavy vehicle charges would be likely to increase total operating costs by less than 0.3 per cent.

There are important limitations to the above analysis in that it relates to the average vehicle in a particular heavy vehicle class. Individual vehicles, particularly those operating in rural and remote areas, are likely to experience higher operating costs due to the wear and tear caused by the poorer quality of roads (e.g. unsealed) that these vehicles travel on.

6.6.4 Overall assessment of implementation options

The pricing principles (see section 2.1.1 for full details) include the principle of fully recovering infrastructure costs while minimising both the over- and under-recovery from any class of vehicle. They also require us to consider administrative simplicity, efficiency and equity (e.g. impact on regional and remote communities/access).

Starting from the point where, currently, heavy vehicle charges revenue is below the identified heavy vehicle cost base, it is unlikely that any option that would permanently recover less than the identified cost base would comply with the principle of full cost recovery.

On the other hand, the need to consider efficiency and equity means that options that impose an undue burden on vehicle operators, such as large year-on-year changes, are likely to fail to comply with the efficiency and equity principles.

Overall, our initial interpretation of the combined pricing principles is that they would favour an implementation path that achieves some progress in closing the gap between the identified heavy vehicle cost base and heavy vehicle charges revenue while, at the same time, keeping yearly increases to heavy vehicle charges within reasonable bounds.

The direct implementation approach would immediately achieve full cost recovery. However, it would also require a significant increase in heavy vehicle charge revenue in the region of 16.5 per cent in the first year (relative to revenue in 2021–22). While fully achieving cost recovery principles, it would fall short on equity because of the likely severe impact on industry and, in particular, regional and remote communities.

Example 1 of the three-year fixed price path implementation approach (3.5 per cent increase per annum) would minimise the impact on industry and makes some progress towards increasing heavy vehicle charges in line with the recent average yearly growth in the heavy vehicle cost base. While it is unlikely to fully comply with the cost recovery mandate provided by the pricing principles, it scores highly in terms of considering the impact on industry and regional and remote communities.

Example 2 of the three-year fixed price path implementation approach 2 (6 per cent increase per annum) would make more rapid progress in closing the gap between the heavy vehicle cost base and heavy vehicle charges venue over time. It would score more highly on achieving cost recovery implementation option 1 but lower than the direct implementation approach. The impact on industry of 6 per cent year-on-year increases in charges could still be severe, and it therefore scores lower than option 1 in terms of paying regard to equity concerns.

Overall, the trade-off between cost recovery and equity considerations is at least partially subjective. We are seeking the views on which of the three options represents the best compromise and would therefore be preferred overall. Our assessment of the options is subject to consideration of further information that will emerge during the public consultation phase.

Question 21: Has the NTC identified the right implementation options? If not, what other options should be considered?

Question 22: Do you agree with the NTC's initial assessment of the implementation options and examples against the combined pricing principles? If not, how would your assessment differ?

Question 23: Do you have any views or comments on the likely implications of each of the implementation options and examples on industry or governments?

Question 24: Which implementation option do you prefer? Why do you believe it strikes the best balance in furthering the pricing principles?

7 Call for submissions and next steps

This C-RIS contains a range of recommendations relating to technical improvements for the PAYGO model, the structure of determination options for consideration and implementation options.

These represent the NTC's initial assessment of the features, advantages and disadvantages of the technical improvements, options and implementation pathways considered.

The overall purpose of this C-RIS is to outline these in a way that allows interested parties to understand, assess and comment through a public consultation.

7.1 Timing of public consultation process

This C-RIS was published on 29 June 2021.

The consultation period will run to 24 August 2021.

This C-RIS, and additional information, can be found on the NTC's website.

7.2 How to make a submission

Submissions will be accepted until 5.00 pm on 24 August 2021

- online at www.ntc.gov.au or
- by mail to: Heavy Vehicle Charges Determination
  National Transport Commission
  Level 3/600 Bourke Street
  Melbourne VIC 3000

7.3 Next steps

Following the end of the consultation period, we will analyse the information we receive and formulate recommendations for a decision RIS. The decision RIS will make recommendations to transport ministers at the Infrastructure and Transport Ministers' Meeting (ITMM) in November 2021 for a new determination to apply for heavy vehicle charges applying from 2022–23. Following the meeting, Ministers will consult further on any proposed increase, in line with the Fuel Tax Act 2006.

ITMM will then consider any submissions received on the preferred option/s and make a final decision on registration charges and RUC to apply from 2022–23 onwards.

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Glossary

Term	Definition
AGM	Average Gross Mass
Capital costs	Capital costs are fixed, one-time expenses incurred on the purchase of land, buildings, construction, and equipment used in the production and maintenance of roads. From an operator perspective, capital costs are the one-time costs of purchasing a heavy vehicle and investment in the infrastructure associated with running a heavy vehicle operation.
Community service obligation	In relation to roads, community service obligation expenditure relates to road expenditure undertaken with the primary aim of providing a minimum level of service to a community which may not be justified solely on the basis of the amount of traffic using the road. An example could be to maintain a road to a minimum standard to provide access to remote communities.
Cost allocators	What aspects of road construction and maintenance costs are allocated to heavy vehicle use of the roads for cost recovery
Cost allocation	The process of allocating road construction and maintenance costs to different types of vehicles using a cost allocation matrix and usage data
ESA	Equivalent Standard Axle. ESA-km is a key cost allocator in the PAYGO model which is particularly significant for heavy vehicles. ESA values are a measure of the road wear caused by vehicles.
Expenditure categories	Road expenditure data is collected in different expenditure categories. Expenditure categories group similar types of expenditure together so that they can be allocated consistently to different vehicle types.
GCM	Gross Combination Mass. The gross vehicle mass (GVM) and gross combination mass (GCM) data sets are used to assess the distribution of GVM/GCM by vehicle type compared to average values used in the PAYGO model.
GTK	Gross tonne-kilometers.
GVM	Gross Vehicle Mass. Heavy vehicles charges apply to all vehicles with a Gross Vehicle Mass (GVM) of above 4.5 tonnes.
Heavy vehicle charges	The charges paid by heavy vehicle operators. These consist of a yearly registration charge and a road user charge (RUC) on each litre of diesel fuel.
Heavy vehicle road reform	Australian governments are working together to deliver heavy vehicle road reform. This is expected to replace PAYGO and aims to link the needs of heavy vehicle users with the level of service they receive, the charges they pay and the investment of those charges back into road services.

MAXMAN	MAtriX MANipulation is software that is used for the calculation of reductions in cost allocation to road trains to reflect their limited operating area. .
NEVDIS	National Exchange of Vehicle and Driver Information System. NEVDIS is owned by Austroads. It exchanges information about vehicles and driver licenses across state borders.
PAYGO	Pay-as-you-go (PAYGO). The funding model used to calculate the heavy vehicle cost base and to set heavy vehicle charges.
PPP	Public Private Partnerships. A joint funding partnership between government and the private sector, often in relation to construction.
Regulatory costs	The cost of operating the National Heavy Vehicle Regulator, as reflected in the budget approved by ITMM. .
RUC	The road user charge (RUC) is paid by heavy vehicle oeprators on each litre of diesel used for travelling on public roads. .
SMVU	The Survey of Motor Vehicle Use conducted by the Australian Bureau of Statistics. It is the primary source of data for PAYGO.
Unsealed roads	An unsealed road is a road that has been formed and constructed but is not sealed with a bitumen surface.
Usage data	Refers to the data on usage of the roads by heavy vehicles that informs the PAYGO model. This data is collected through the SMVU.
VKT	Vehicle Kilometers Travelled is a unit of measure which describes the distance travelled by heavy vehicles.
WIM	Weigh-in-motion (WIM). A WIM station weighs vehicles while they are in motion.

Appendix A Enlarged figures

Figure 4. Heavy vehicle cost base and estimated revenue ($m)

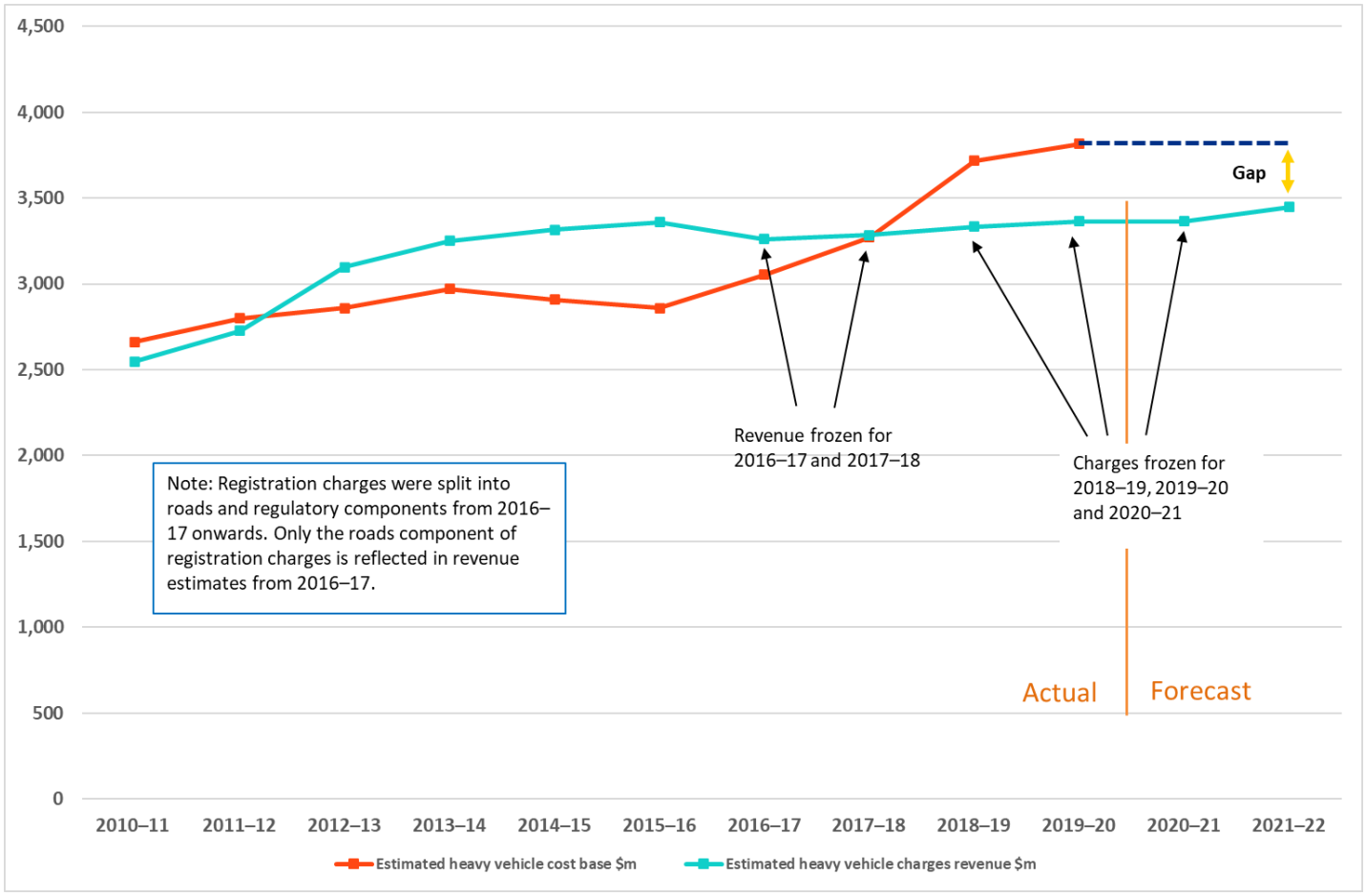


Figure 5. Estimated heavy vehicle cost bases under different cost allocators

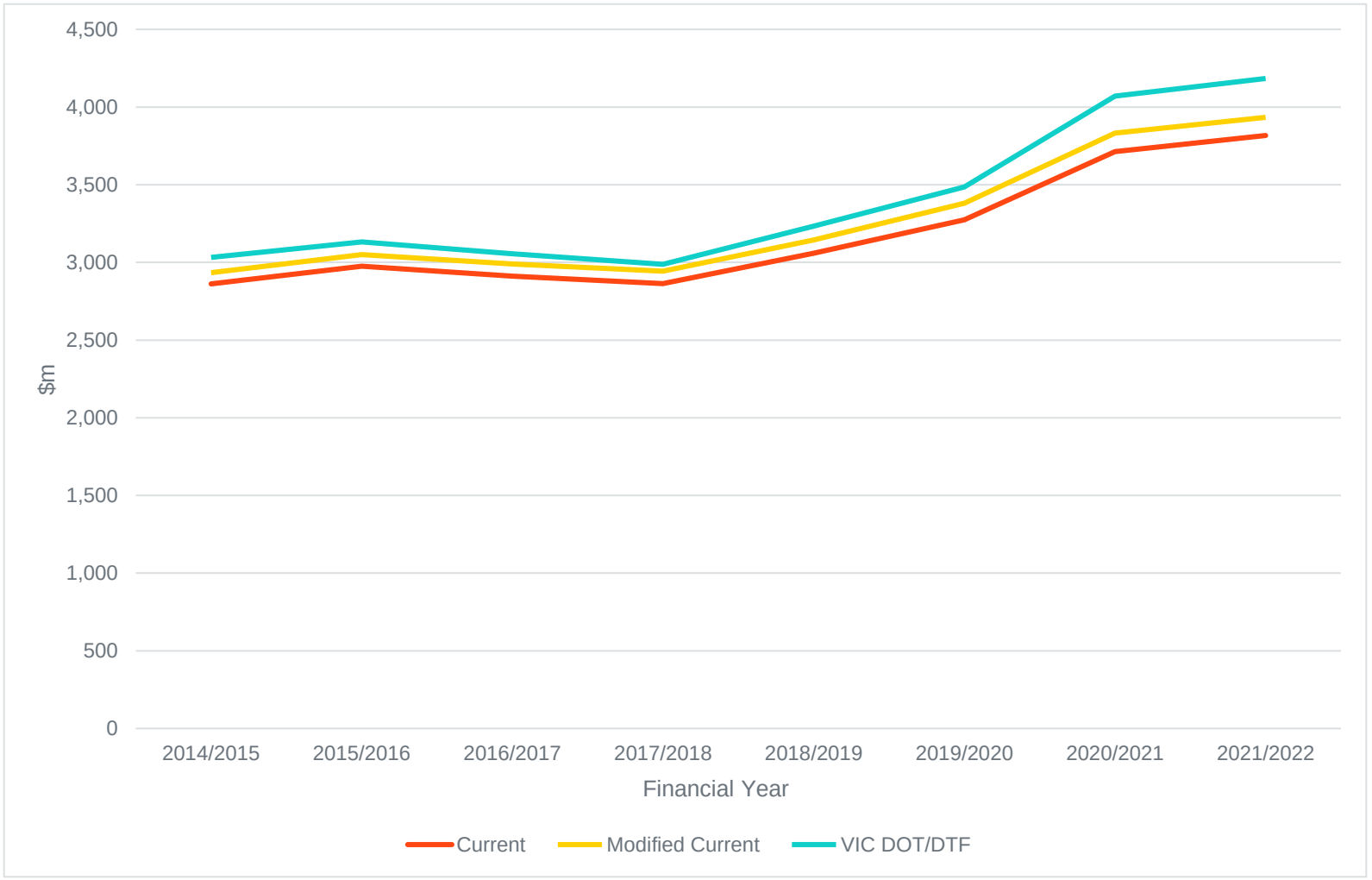
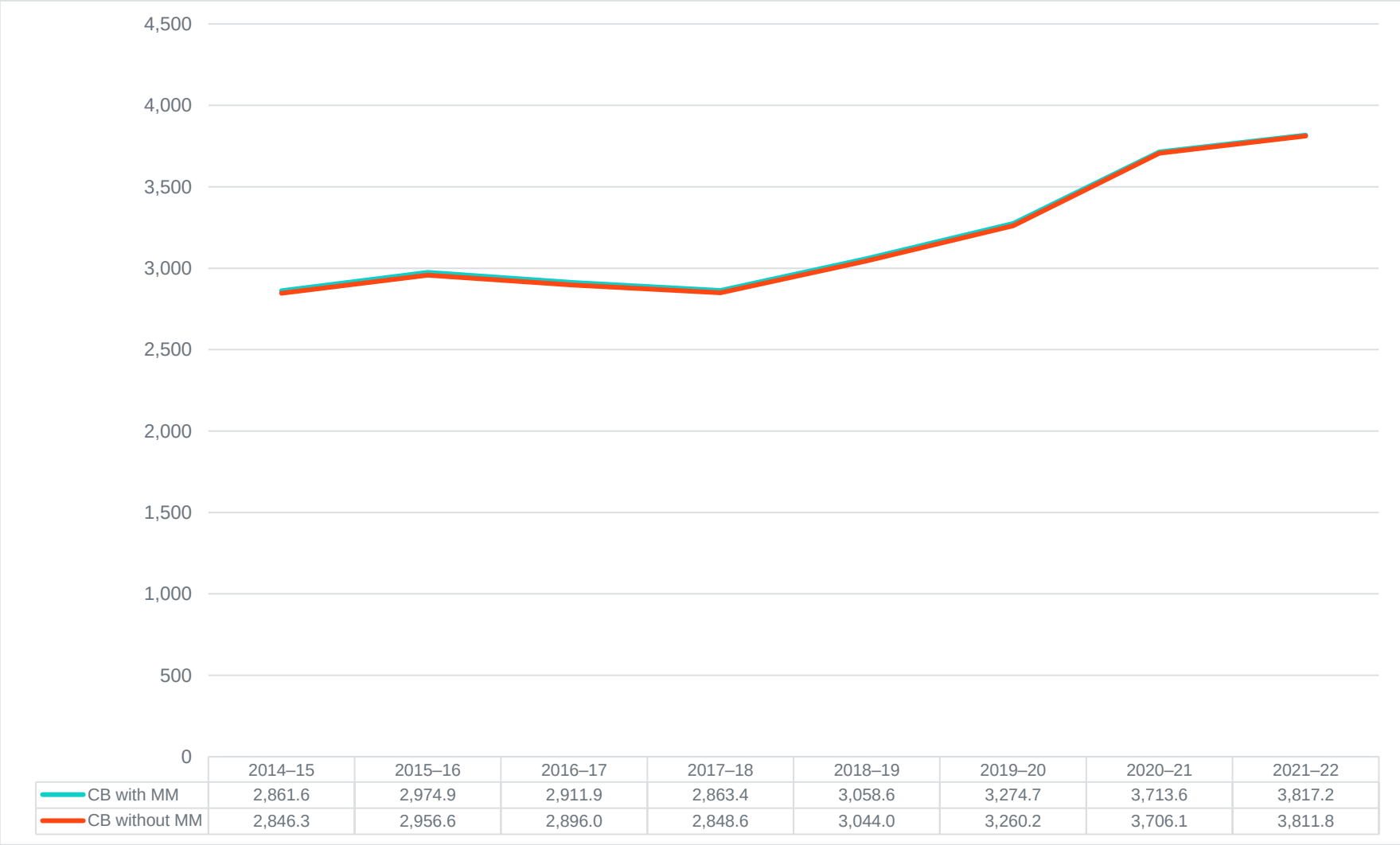


Figure 6. Heavy vehicle cost base with and without MaxMan ($m)



	2014–15	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22
CB with MM	2,861.6	2,974.9	2,911.9	2,863.4	3,058.6	3,274.7	3,713.6	3,817.2
CB without MM	2,846.3	2,956.6	2,896.0	2,848.6	3,044.0	3,260.2	3,706.1	3,811.8

Figure 7. Allocated costs, with and without MaxMan for double and triple road trains ($m)

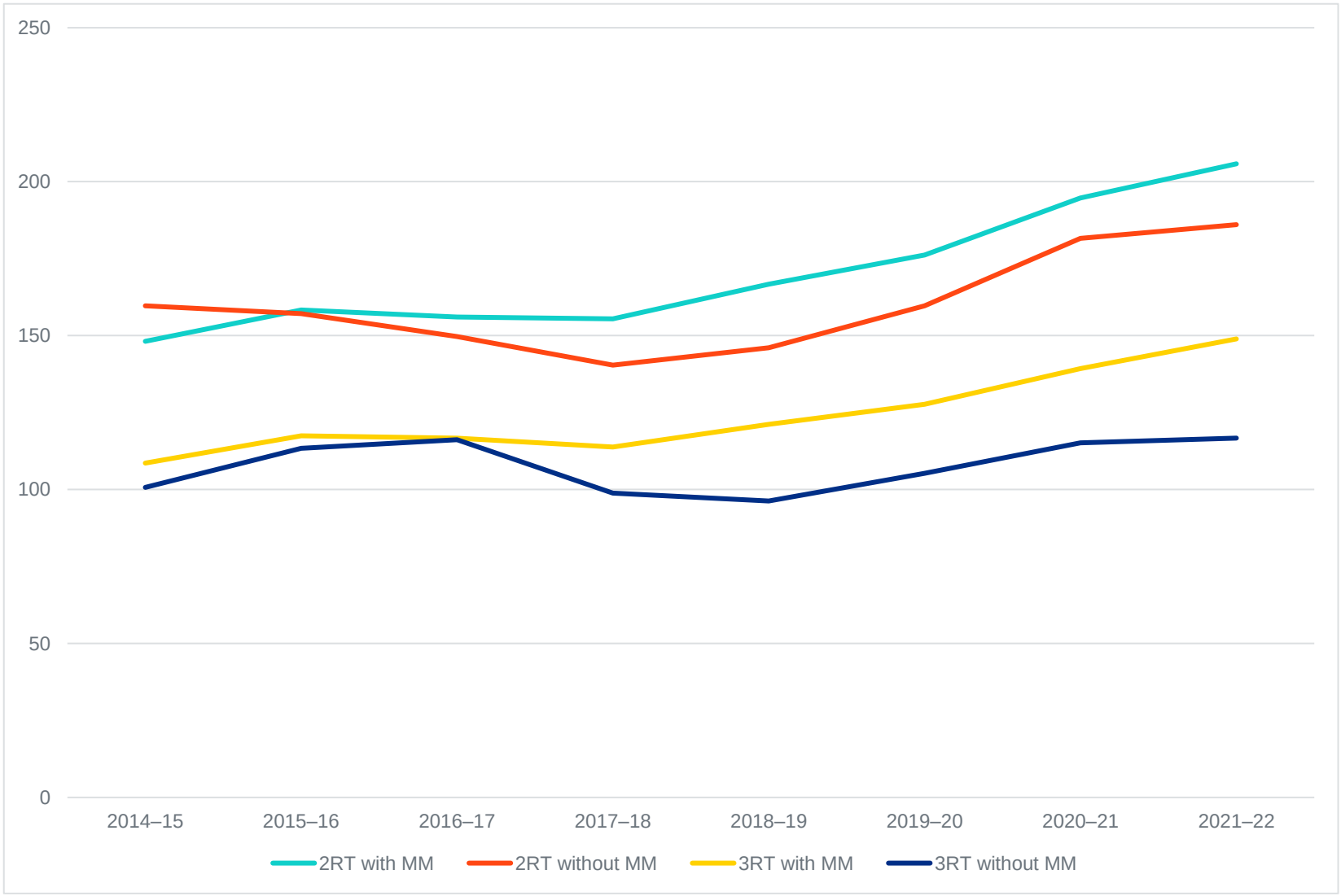


Figure 8. Impact on heavy vehicle cost base from changes considered in this RIS ($m)

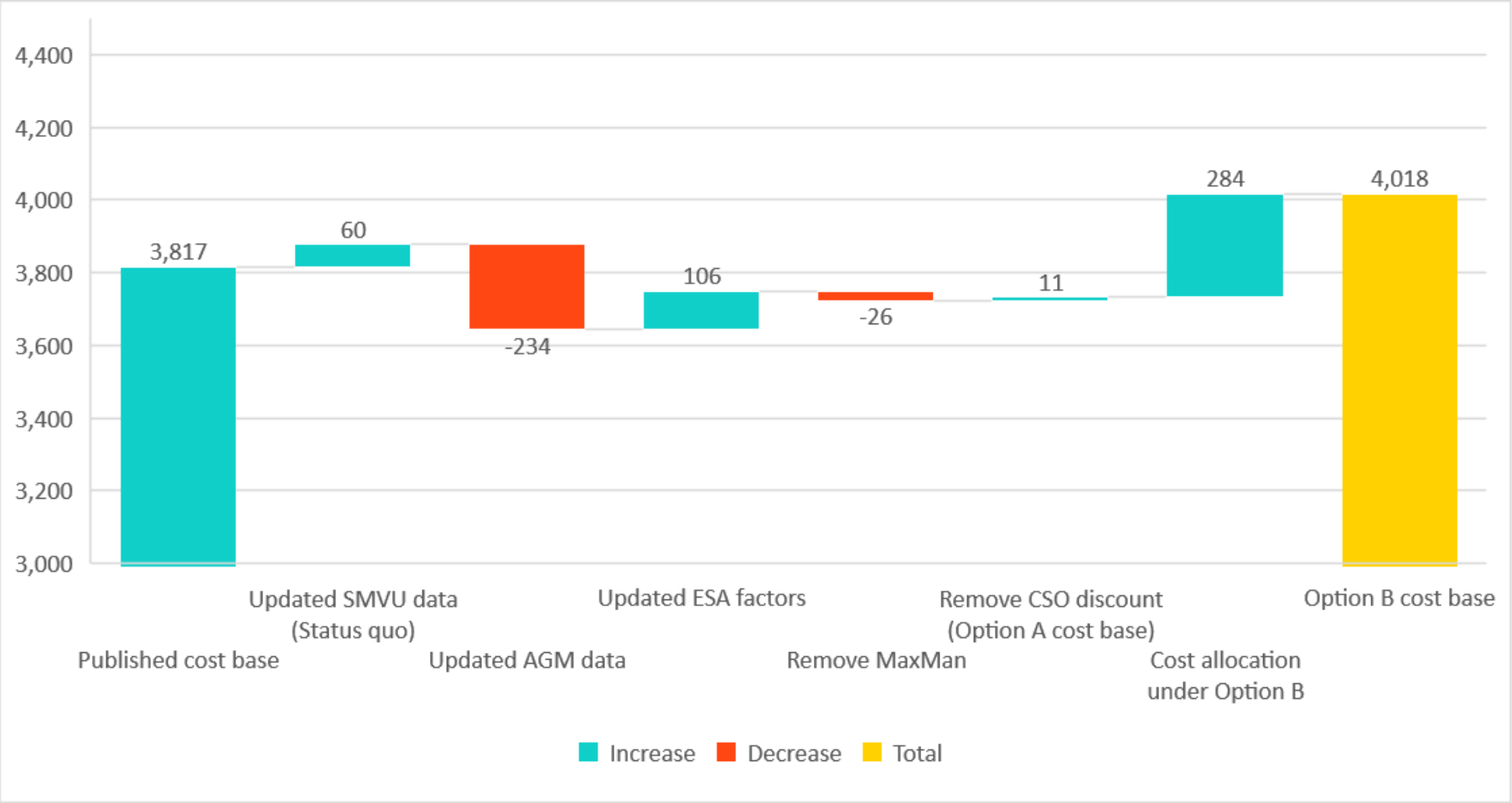


Figure 9. Projected financial implications for heavy vehicle charge revenue ($m)

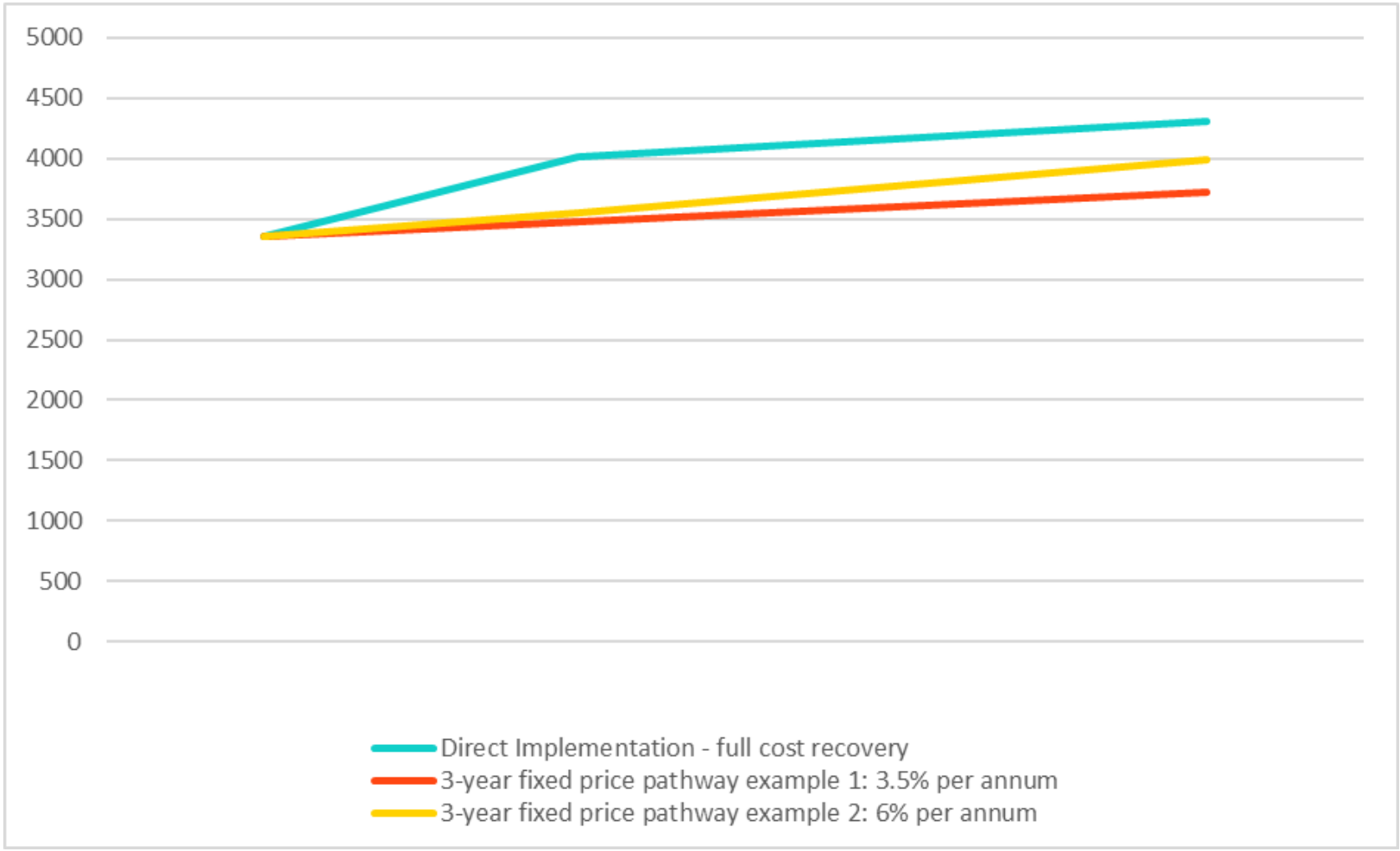
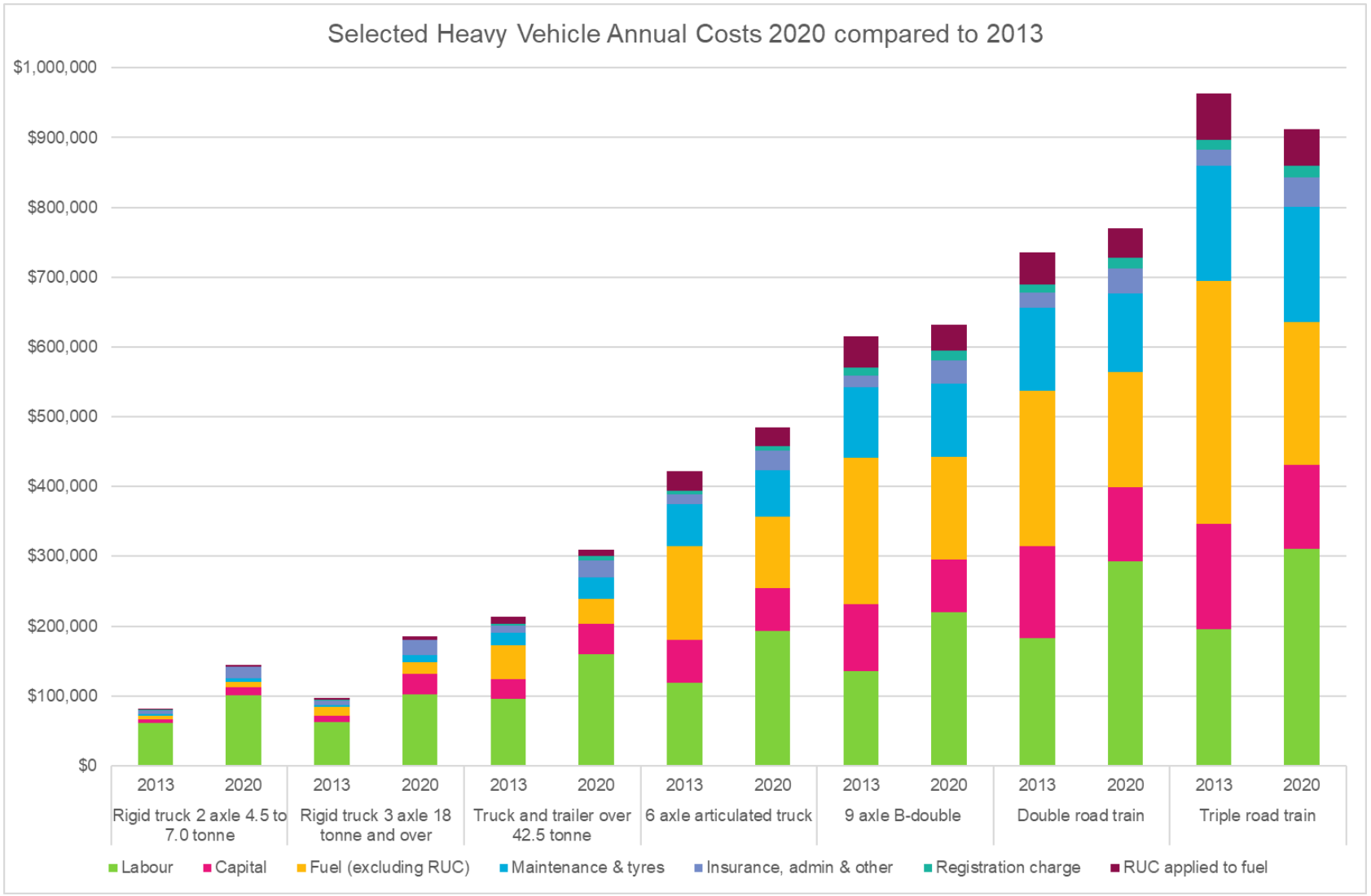


Figure 10. Changes in operating costs from 2013 to 2020



Appendix B Charging schedules

The following pages of this appendix contain the charging schedules for the roads component of registration charges under the different implementation options, as well as the charging schedule for the regulatory component of registration charges.

Table 32. Charging schedule for roads component of registration charges under direction implementation of option B, 2022–23

1 July 2022 – 30 June 2023				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	427	1,544	1,544	1,544
Truck (type 2)	1,544	1,753	1,753	1,753
Short combination truck	1,544	1,753	1,757	1,757
Medium combination truck	10,537	10,537	11,380	11,380
Long combination truck	14,566	14,566	14,566	14,566
Prime movers				
Short combination prime mover	746	4,259	4,578	4,578
Multi-combination prime mover	10,803	10,803	11,883	11,883
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	635	635	635	635
Dog trailer	635	635	635	635
Semitrailer	635	807	573	430
B-double lead trailer and B-triple lead and middle trailers	635	807	573	430
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	320			
Bus (type 2)	2,251	7,211	7,211	
Articulated bus		2,251	2,251	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	311			
Special purpose vehicle (type O)	Calculated using the formula: 389 + (389 × number of axles over 2)			

Table 33. Charging schedule for roads component of registration charges under example 1 of the three-year fixed price implementation pathway, 2022–23

1 July 2022 – 30 June 2023				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	436	775	775	775
Truck (type 2)	775	879	879	879
Short combination truck	775	879	1,792	1,792
Medium combination truck	9,585	9,585	10,352	10,352
Long combination truck	13,251	13,251	13,251	13,251
Prime movers				
Short combination prime mover	761	4,344	4,670	4,670
Multi-combination prime mover	11,019	11,019	12,121	12,121
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	647	647	647	647
Dog trailer	647	647	647	647
Semitrailer	647	823	585	439
B-double lead trailer and B-triple lead and middle trailers	647	823	585	439
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	327			
Bus (type 2)	333	2,432	2,432	
Articulated bus		333	333	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	317			
Special purpose vehicle (type O)	Calculated using the formula: 397 + (397 × number of axles over 2)			

Table 34. Charging schedule for roads component of registration charges under example 1 of the three-year fixed price implementation pathway, 2023–24

1 July 2023 – 30 June 2024				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	449	814	814	814
Truck (type 2)	814	923	923	923
Short combination truck	814	923	1,849	1,849
Medium combination truck	10,064	10,064	10,870	10,870
Long combination truck	13,913	13,913	13,913	13,913
Prime movers				
Short combination prime mover	785	4,481	4,817	4,817
Multi-combination prime mover	11,367	11,367	12,504	12,504
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	668	668	668	668
Dog trailer	668	668	668	668
Semitrailer	668	849	603	453
B-double lead trailer and B-triple lead and middle trailers	668	849	603	453
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	337			
Bus (type 2)	349	2,554	2,554	
Articulated bus		349	349	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	327			
Special purpose vehicle (type O)	Calculated using the formula: 409 + (409 × number of axles over 2)			

Table 35. Charging schedule for roads component of registration charges under example 1 of the three-year fixed price implementation pathway, 2024–25

1 July 2024 – 30 June 2025				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	464	854	854	854
Truck (type 2)	854	969	969	969
Short combination truck	854	969	1,907	1,907
Medium combination truck	10,568	10,568	11,414	11,414
Long combination truck	14,609	14,609	14,609	14,609
Prime movers				
Short combination prime mover	810	4,622	4,969	4,969
Multi-combination prime mover	11,726	11,726	12,898	12,898
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	689	689	689	689
Dog trailer	689	689	689	689
Semitrailer	689	875	622	467
B-double lead trailer and B-triple lead and middle trailers	689	875	622	467
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	348			
Bus (type 2)	367	2,682	2,682	
Articulated bus		367	367	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	338			
Special purpose vehicle (type O)	Calculated using the formula: 422 + (422 × number of axles over 2)			

Table 36. Charging schedule for roads component of registration charges under example 2 of the three-year fixed price implementation pathway, 2022–23

1 July 2022 – 30 June 2023				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	446	793	793	793
Truck (type 2)	793	900	900	900
Short combination truck	793	900	1,836	1,836
Medium combination truck	9,813	9,813	10,599	10,599
Long combination truck	13,566	13,566	13,566	13,566
Prime movers				
Short combination prime mover	780	4,449	4,783	4,783
Multi-combination prime mover	11,286	11,286	12,415	12,415
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	663	663	663	663
Dog trailer	663	663	663	663
Semitrailer	663	843	599	449
B-double lead trailer and B-triple lead and middle trailers	663	843	599	449
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	335			
Bus (type 2)	340	2,490	2,490	
Articulated bus		340	340	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	325			
Special purpose vehicle (type O)	Calculated using the formula: 406 + (406 × number of axles over 2)			

Table 37. Charging schedule for roads component of registration charges under example 2 of the three-year fixed price implementation pathway, 2023–24

1 July 2023 – 30 June 2024				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	471	853	853	853
Truck (type 2)	853	968	968	968
Short combination truck	853	968	1,940	1,940
Medium combination truck	10,549	10,549	11,394	11,394
Long combination truck	14,584	14,584	14,584	14,584
Prime movers				
Short combination prime mover	824	4,701	5,053	5,053
Multi-combination prime mover	11,925	11,925	13,117	13,117
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	700	700	700	700
Dog trailer	700	700	700	700
Semitrailer	700	890	633	475
B-double lead trailer and B-triple lead and middle trailers	700	890	633	475
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	354			
Bus (type 2)	366	2,677	2,677	
Articulated bus		366	366	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	343			
Special purpose vehicle (type O)	Calculated using the formula: 429 + (429 × number of axles over 2)			

Table 38. Charging schedule for roads component of registration charges under example 2 of the three-year fixed price implementation pathway, 2024–25

1 July 2024 – 30 June 2025				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	498	917	917	917
Truck (type 2)	917	1,040	1,040	1,040
Short combination truck	917	1,040	2,049	2,049
Medium combination truck	11,340	11,340	12,248	12,248
Long combination truck	15,678	15,678	15,678	15,678
Prime movers				
Short combination prime mover	870	4,967	5,339	5,339
Multi-combination prime mover	12,599	12,599	13,859	13,859
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	740	740	740	740
Dog trailer	740	740	740	740
Semitrailer	740	941	669	502
B-double lead trailer and B-triple lead and middle trailers	740	941	669	502
Converter dolly or low loader dolly	0	0	0	0
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	374			
Bus (type 2)	393	2,878	2,878	
Articulated bus		393	393	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	363			
Special purpose vehicle (type O)	Calculated using the formula: 453 + (453 × number of axles over 2)			

Table 39. Charging schedule for regulatory component of registration charges

1 July 2022 – 30 June 2023				
DIVISION 1 – LOAD CARRYING VEHICLES ($)				
Vehicle type	**2-axle**	**3-axle**	**4-axle**	**5-axle**
Trucks				
Truck (type 1)	200	248	278	278
Truck (type 2)	260	331	371	371
Short combination truck	280	348	388	388
Medium combination truck	647	647	700	700
Long combination truck	895	895	895	895
Prime movers				
Short combination prime mover	388	388	388	388
Multi-combination prime mover	876	876	964	964
DIVISION 2 – LOAD CARRYING TRAILERS ($)				
Axle group type (per axle charge ($))	**Single**	**Tandem axle group**	**Tri-axle group**	**Quad-axle group & above**
Trailer type				
Pig trailer	55	28	18	14
Dog trailer	55	28	18	14
Semitrailer	55	28	18	14
B-double lead trailer and B-triple lead and middle trailers	55	28	18	14
Converter dolly or low loader dolly	55	28	18	14
DIVISION 3 – BUSES ($)				
Bus type	**2-axle**	**3-axle**	**4-axle**	
Bus (type 1)	197			
Bus (type 2)	355	404	404	
Articulated bus		400	400	
DIVISION 4 – SPECIAL PURPOSE VEHICLES ($)				
Special purpose vehicle (type P)	0			
Special purpose vehicle (type T)	200			
Special purpose vehicle (type O)	200			

Appendix C Proposed treatments for innovative funding and financing

Table 40 outlines the NTC's proposed treatments of certain types of innovative funding and financing, and the rationale for the chosen methods, based on the principles discussed in section 4.4.4. The types of innovative funding and financing included in the table are not intended to be an exhaustive list but have been included in the consultation regulation impact statement to provide an indication of how common types of innovative funding and financing may be treated.

However, it is impossible to predict all possible future road funding and financing approaches and their specific circumstances so each instance may require assessment on a case-by-case basis. In addition, we recognise that possible future developments – for example, a move to independent pricing or economic regulation, or funding reform – may necessitate a reconsideration of the principles and proposed treatments.

Table 40. Proposed treatments of selected innovative funding and financing

Theme	Proposed treatment	Rationale
Revenue		
Revenue received by governments from toll road users or beneficiaries	Any identifiable revenue received by governments from users/beneficiaries of a project – that is, toll revenue or revenue raised through value capture (e.g. betterment levies) – should be offset against the model's cost base.	Heavy vehicle pricing is based on the principle of cost recovery (as outlined in the list of principles) so that charges are set that aim to minimise both under- and over-recovery. Failure to offset revenues received from other sources against the model's cost base would mean the costs were recovered twice (i.e. over-recovery) – once through direct revenue from users/beneficiaries and once through the broader road charging system. The implication of this treatment is that all such revenues are being raised for cost recovery purposes, without any of the revenue being attributed to addressing externalities.
Revenue received by governments more than any government contributions	Relating to the proposed treatment above, identifiable toll or value capture revenue received by governments for a project should continue to offset the cost base even if it exceeds the amount contributed by the government towards the project (in nominal terms or present value terms).	Any excess toll or value capture revenue (beyond the government's contribution to the relevant PPP or toll road) received by the government should continue to be deducted from the cost base since road users are contributing to the government's road funding generally, albeit through a different mechanism than road user and registration charges. (This treatment is consistent with the first and third proposed principles.) While this means some cross-subsidisation may occur from users of tolled roads (where governments receive some/all toll revenue generated) to users of other roads, this is no different from what occurs presently with de facto cross-subsidisation between roads under the current charging system. This proposed treatment would need to be revisited if road charging reform occurs, with location-based charging and revenue being allocated to achieve cost recovery at a more disaggregated level (e.g. by road or road category).
Roads where revenue from tolls or value capture fully funds the road	PPP projects where user charges (i.e. toll revenue or value capture) fully fund the road should not have any expenditure added to the cost base on transfer of the asset to the government at the end of the concession.	Users/beneficiaries have already fully funded the road. If added to the cost base, these costs would be recovered for a second time from road users through road charges. This treatment is consistent with the first proposed principle (cost recovery).
Funds raised through asset recycling	Funds raised by governments through asset recycling programs should, in general, not be deducted from the cost base unless the funds come from the privatisation of road assets, with the intention for these funds to be reinvested into roads.	Revenues from asset recycling of non-road assets are a general source of government revenue, and the funds may go into consolidated revenue. In principle, there is no reason for funds raised from privatisation of assets to necessarily go into funding roads, as opposed to other forms of infrastructure. Also, unlike the case of value capture, the revenues are not being raised from direct beneficiaries of the project. However, if both the funding source (privatisation) and intended destination of the funds are roads, the funds raised from asset recycling should be deducted from the cost base.

Theme	Proposed treatment	Rationale
Expenditure		
Government loans to private sector participant(s) [1]	Government loans to a private sector participant in a PPP that are intended to be repaid (with interest) should not be recovered through the cost base if the arrangement is broadly commercial.	If the government makes a loan, rather than providing a grant/subsidy, the government will receive interest payments from the private sector participant. If the interest rate received by the government is as high as the government's interest rate for borrowing (which is expected to occur in general), along with a return of the principal, the government would be no worse off by making the loan arrangements.[25] Therefore, the loan's costs should not be charged to road users. This treatment is consistent with the first and second proposed principles.
Government loans to private sector participant(s) [2]	Government loans to a private sector participant in a PPP where loan arrangements are not broadly commercial or there is a default by the private sector should be considered as government costs or revenues (as relevant).	In the event of default by the private sector participant, or governments lending to the private sector at an interest rate below the government's cost of borrowing, the NTC considers these net costs should be recovered from road users.[26] Similarly, if the government were to lend to the private sector participant(s) at an interest rate significantly above its cost of borrowing and any administration costs (i.e. if it made a profit from its lending) then this net profit should be deducted from the cost base that is recovered from road users. Treating any under- or over-recovery achieved through lending to the private sector for a PPP will require the magnitude of the loss/profit to the government to be identifiable and for data to be provided. This treatment is consistent with the first and second proposed principles.
Payments by government recognising a road infrastructure asset's value	If the government has specifically made a payment to the private sector participant at the start or end of the concession that recognises the value of a road asset (e.g. a subsidy or a payment in lieu of the asset value unrecovered through other revenue sources) on transfer, this payment should be recovered from road users.	The government's payments imply that user charges have not fully paid for the costs of the road during the period of the concession. The government's payment is in effect making up the shortfall in revenue (albeit potentially from an ex-ante perspective at the time when the contract was signed). Payments made by the government to cover this shortfall should be recovered from road users. This treatment is consistent with the first and second proposed principles.

[25] In practice, there may be an opportunity cost if the borrowed money could have been put to a use with a higher benefit–cost ratio than making the loan to the private sector participant. However, the government would be no worse off in financial terms so long as the principal is repaid, along with an interest rate at least as high as the government's cost of borrowing.

[26] From a modelling perspective, this could be treated by calculating the net present value of the concession and entering that into the model as expenditure once, or potentially calculating the difference annually between government borrowing costs and interest payments received.

Theme	Proposed treatment	Rationale
Gifted assets	Gifted assets that are built by other parties at no cost to the government (e.g. roads built by developers and subsequently transferred to the government) should not be added to the cost base. However, any future costs incurred by a government on maintenance or renewal are relevant and should be recovered from road users through expenditure in the model.	These costs have already been paid for from other sources (e.g. through costs of a new estate). Subsequent operating/maintenance/renewal/upgrade/expansion costs borne by government should be recovered from road users because these are government costs that are not funded from elsewhere. This treatment is consistent with the first proposed principle (cost recovery).
Recurring government payments to the private sector participant(s)	Recurring payments made by the government to the private sector entity (e.g. availability payments, shadow tolls, payments for minimum demand guarantees) should be recovered through the model each year as they are incurred.	Recurring costs such as availability payments represent a genuine cost to government from undertaking the PPP under the agreed structure, as opposed to constructing/maintaining the road under a more 'traditional' project structure. If the government receives toll or value capture revenue in return, this revenue should be deducted from the model's cost base (in accordance with the principles and proposed treatments above). This treatment is consistent with the first and second proposed principles.
Early termination of a public–private partnership	In the event of early termination of a PPP (including contract buy-outs), costs incurred by government (less any revenues received) should be included in the model and recovered through road charges.	Early termination of a PPP may occur for several reasons, including (but not limited to) default by the private sector participant(s), force majeure or a discretionary choice made by a government. These are legitimate costs incurred by government and should be recovered through road charges, less any revenue received by the relevant government (e.g. payments from the private sector participant(s) or insurance payouts). This treatment is consistent with the first and second proposed principles.

Appendix D How the PAYGO model works

Overview

The National Transport Commission's responsibilities

The National Transport Commission (NTC) has ongoing responsibilities for recommending heavy vehicle charges to the Infrastructure and Transport Ministers' Meeting (ITMM). These charges are intended to apply nationally and are set to fully recover the share of road construction and maintenance costs that can be allocated to heavy vehicles.

Charges that apply to heavy vehicles

All heavy vehicles in Australia are charged an annual registration fee and a road user charge (RUC) levied on each litre of diesel fuel. These charges are determined according to a charging framework known as the pay-as-you-go (PAYGO) methodology. The primary objective of PAYGO is to deliver a nationally consistent set of heavy vehicle charges that efficiently recover the cost of providing and maintaining the road network.

Heavy vehicle charges recover the capital and operational costs of building and maintaining the Australian road network allocated to heavy vehicles. These charges consist of:

- the RUC levied on fuel used by heavy vehicles, administered and collected by the Australian Government
- registration charges for heavy vehicles administered and collected by state and territory governments.

Legislative framework

In relation to the RUC, the *Fuel Tax Act 2006* requires that the Commonwealth Minister for Transport determines the amount of RUC paid by heavy vehicle operators. The Fuel Tax Act obliges the minister to consult before increasing the RUC. This must be in the form of public consultation for at least 60 days on a document that contains the proposed increased rate of RUC and any information that was relied on in determining the proposed increased rate.

The Fuel Tax Act then requires the minister to consider any comments received (within the period specified by the transport minister) from the public in relation to the proposed increased rate.

In relation to the registration charge, the *National Transport Commission Act 2003* and the *Intergovernmental Agreement on Regulatory and Operational Reform in Road, Rail and Intermodal Transport* provide the authority for the NTC to recommend registration charges for heavy vehicles to ITMM.

ITMM periodically determines the process to calculate charges that are to be applied to heavy vehicles. The process, known as a determination, combines the requirements of developing the RUC and the registration charges into a single consistent process that also calculates the amount that charges must be adjusted each year to maintain cost recovery, known as PAYGO.

Section 52 of the National Transport Commission Act provides that the Governor-General may make regulations, not inconsistent with the Act, prescribing all matters required or

permitted by the Act to be prescribed or necessary or convenient to be prescribed for carrying out or giving effect to the Act.

The Heavy Vehicle Charges Model Law contains the schedules of heavy vehicle registration charges agreed by ITMM. The model law also describes the methodology for calculating an annual adjustment for charges in subsequent years. The charges have legislative force once the model law is adopted by states and territories.

Original PAYGO objectives

PAYGO was originally set up to provide a nationally consistent approach to heavy vehicle charges. Before PAYGO, individual state and territory governments would set their own charges. The basis for these charges varied significantly. In some states, charges varied with the gross mass of vehicles, while in others they were based on tare mass or on a combination of vehicle characteristics (including engine bore diameter).

Despite all operators having access to all roads in Australia, an operator's competitive position often depended on their garaging address rather than on the underlying efficiency of the business.

The first national heavy vehicle charges aimed to apply, for the first time, uniform charges to the same vehicle type regardless of the jurisdiction in which it was registered.

The brief given to the then National Road Transport Commission (NRTC) under the Heavy Vehicle Agreement defined five charging principles that required the NRTC to set charges:

- to fully recover distributed road costs while minimising over-recovery from any vehicle class, thereby achieving full recovery of all road costs
- adopting a common methodology
- to determine and collect charges in a way that achieves a reasonable balance between administrative simplicity, efficiency and equity in the charging structure
- to improve pricing, leading to a better allocation of resources, with investment decisions on equipment and infrastructure being based on more relevant demand signals
- to minimise the incentive for operators to 'shop around' for lower charges and undermine the integrity of the national charging system.

The pricing principles

Predecessors of ITMM have set pricing principles for the NTC in making its recommendations to ministers. These pricing principles are discussed in section 2.1.1.

How PAYGO works

Each year, jurisdictions provide the NTC with a completed road expenditure template that covers all road construction and maintenance costs (light and heavy vehicles). A cost base is then established with the heavy vehicle portion recovered via heavy vehicle charges. Figure 11 provides an overview of the existing PAYGO system.

Figure 11. Overview of the current PAYGO system

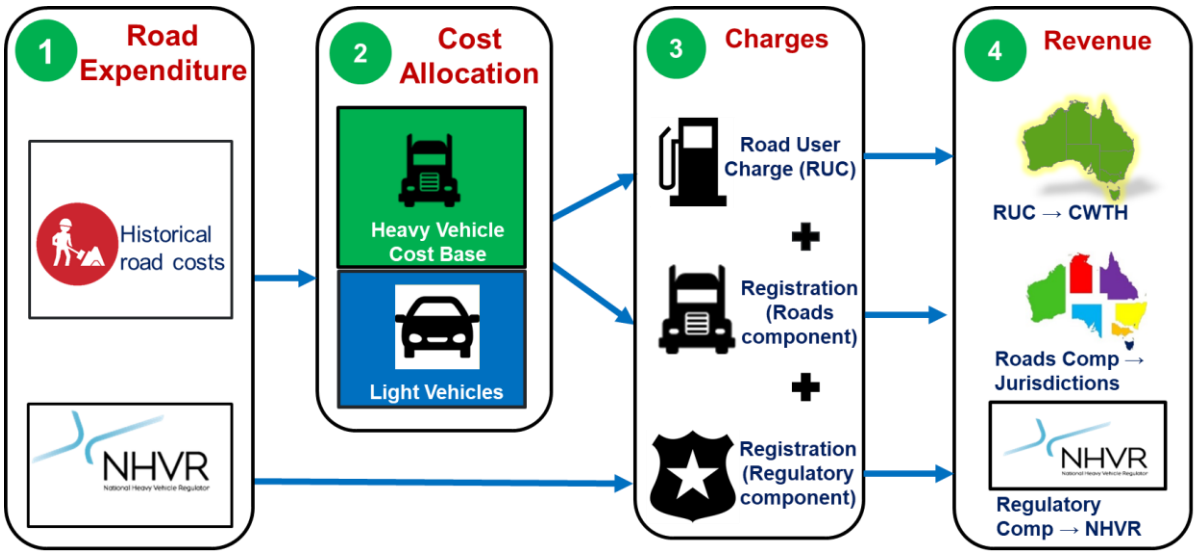
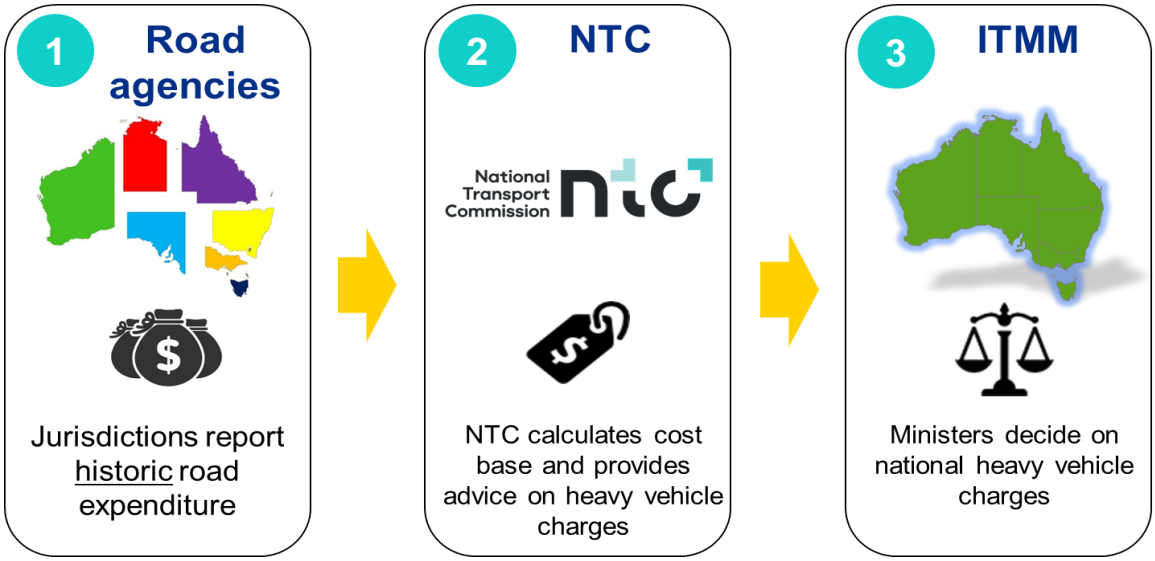


Figure 12 illustrates how the NTC processes this information and makes recommendations to ITMM. The NTC's charge recommendations are non-binding.

Figure 12. Overview of existing PAYGO regulatory process



Calculating the cost base

Under PAYGO, both capital and operating expenditure are recovered in the year they are incurred (subject to averaging).

The cost base is calculated by taking a seven-year average of the historical financial costs of providing roads.[27] The system was designed to recover the financial cost of roads on the assumption that the financial cost was a reasonable approximation of the economic cost.

[27] An exponential moving average is currently used to apply greater weights to the most recent years.

The key difference between financial and economic costs is that under a financial cost recovery approach, capital costs are recovered in the period in which the expenditure takes place. Under economic cost recovery, capital costs are depreciated and recovered over the life of the asset.

The assumption that the financial cost is equal to the economic cost was based on the following criteria being met:

- the network is neither expanding nor contracting, nor is the pavement or bridge condition changing significantly
- network-wide expenditure does not fluctuate markedly over time
- traffic growth is relatively steady.

Over the past decade, these conditions have tended not to hold, and the cost base and charges have been quite volatile.

The PAYGO model's cross-subsidy check and its limitations

The PAYGO model has a built-in module to check there are no cross-subsidies, in order to comply with the pricing principles. It involves checking whether the 'average vehicle' in a vehicle class pays enough in charges (both registration and RUC[28]) such that they contribute an amount greater than or equal to the average attributable costs for each vehicle in that vehicle class. Attributable costs are those that can be directly associated with heavy vehicles based on the four cost allocators in the cost allocation matrix.[29]

In addition to each vehicle class recovering at least its attributable costs, the pricing principles also require that heavy vehicles in aggregate recover their share of common (or non-attributable) costs, such that overall the charges paid by the entire heavy vehicle fleet recover the heavy vehicle cost base (and therefore heavy vehicles are not being subsidised by other sources, such as light vehicles or governments).

The current charge-setting framework relies on two components for recovering road-related costs: registration charges and the RUC.[30] This gives limited ability to adjust the charges paid by a particular vehicle class given that:

- all heavy vehicles pay the same rate of RUC (in cents per litre)
- particularly among the articulated fleet, modularity means that a particular vehicle component may appear in a range of different vehicle classes.[31]

Due to these points, some vehicle combinations may pay total charges only slightly above their attributable costs, meaning that although they are not being cross-subsidised, they are making a relatively small contribution towards common costs. By contrast, other heavy vehicle classes will pay charges significantly higher than their attributable costs, meaning

[28] Based on the average distance and fuel consumption in that vehicle class.

[29] VKT, PCU-km, AGM-km and ESA-km.

[30] The regulatory component of registration charges is ignored for the purposes of this cross-subsidy check because this is a separate process designed to recover the National Heavy Vehicle Regulator's budget from vehicles registered in participating jurisdictions.

[31] For example, a three-axle semi-trailer could potentially fit in several of the PAYGO model's single-combination vehicle classes (5-, 6- and 7-axle rigs) as well as B-doubles, B-triples, double road trains and triple road trains.

they are making a greater contribution towards recovering the heavy vehicle industry's share of common costs.

In summary, different vehicle classes will make relatively high or low contributions towards recovering the share of overall common costs assigned to heavy vehicles under the PAYGO model's cross-subsidy check. However, this is largely unavoidable (given the modularity of the fleet and the limited ability to adjust charges for individual vehicle classes as a result) and is not a problem in regard to the pricing principles (as cross-subsidies between heavy vehicle classes have been avoided and overall cost recovery is achieved from heavy vehicles). In the future, under alternative charge setting mechanisms being considered under Heavy Vehicle Road Reform, it may be possible to consider alternative charge-setting approaches that achieve a more equitable sharing of common costs across different heavy vehicle classes if this is considered desirable.

Appendix E Impact analysis tool

The Excel impact analysis tool is available for download from the NTC website.

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