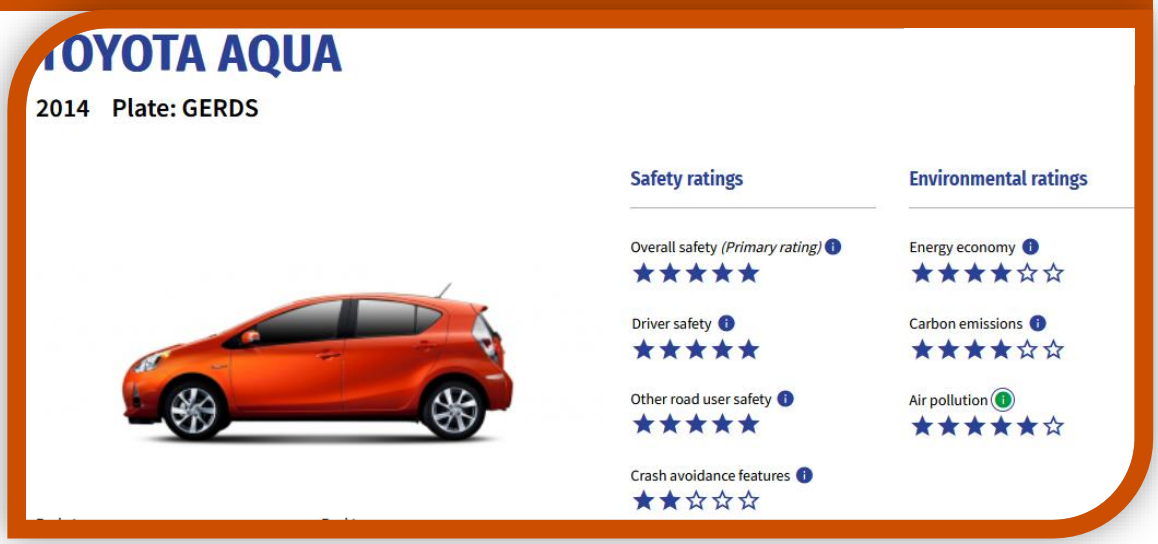
Rightcar air pollution rating system: 2026 review



Prepared for

NZ Transport Agency Waka Kotahi

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emission: impossible ltd

Suite 2-1A, 93 Dominion Rd
Mt Eden, Auckland 1024
+64 9 631 5127
www.emissionimpossible.co.nz

Report details:

Authors: Jayne Metcalfe, Gerda Kuschel

Organisation: Emission Impossible Ltd

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1	30 April 2026	Jayne Metcalfe Director & Senior Technical Specialist	Gerda Kuschel Director & Senior Technical Specialist	Draft report for client review

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Executive summary

The Rightcar website[1] is administered by NZ Transport Agency Waka Kotahi (NZTA) and is linked to the motor vehicle register. The website provides information to help consumers choose the safest, cleanest, most efficient vehicle they can afford. Rightcar utilises a rating system for vehicle safety and environmental performance, with the best performing vehicles assigned up to 6 stars in each category.

For environmental performance, vehicles are rated on fuel economy, carbon emissions and air pollution.

This report provides a review of the Rightcar air pollution star ratings, which was updated in 2023 (Kuschel and Metcalfe 2023). The 2023 methodology established a six-star rating for light vehicles based on estimated real-world emission factors from the Vehicle Emissions Prediction Model (VEPM) version 6.3 and health damage costs derived from the Health and Air Pollution in New Zealand 2016 study (HAPINZ 3.0). The full methodology is described in Kuschel and Metcalfe (2023).

We have reviewed the ratings based on:

- VEPM 7.2, which incorporates updated European emission factors and revised non-exhaust particulate matter ($PM_{2.5}$) factors including road surface wear.
- Updated health damage costs sourced from a 2025 study of indoor combustion health effects and costs (Metcalfe *et al* 2025), using urban New Zealand values consistent with the approach in the 2023 methodology.

Based on the latest emission factors and social costs, we recommend the following 'minimum change' approach:

- Increase ratings for Euro 6d diesel cars and SUVs from 3 stars to 4 stars, supported by updated real-world emission factors now available in VEPM 7.2.
- Retain all other 2023 ratings.

We note that updated non-exhaust emission factors in VEPM 7.2 are significantly higher than in VEPM 6.3, largely due to the inclusion of road surface wear. This increases the estimated social cost for all vehicle categories, with the largest proportional effect on low-exhaust emission vehicles (hybrids, plug-in hybrids and electric vehicles). We recommend that further work be undertaken to refine non-exhaust emission factors before using them as a basis for changing star ratings. Under the updated assessment, the estimated social cost of non-exhaust emissions from an electric light commercial vehicle (LCV) is higher than the total estimated social cost (exhaust and non-exhaust) from a plug-in hybrid car. This further underscores the need to refine non-exhaust emission factors before using them as a basis for rating changes.

A comprehensive update of the air pollution ratings system is not within the current scope of work. However, based on the findings of this review, we recommend investigating two issues to help inform future updates:

1. Introduce half-star granularity, which would allow greater differentiation within star categories (for example, distinguishing newer-technology hybrid vehicles from older hybrid vehicles)

[1] https://rightcar.govt.nz/

2. Refine non-exhaust $PM_{2.5}$ emission factors from VEPM and carefully consider the implications of changes to these factors before using non-exhaust emissions as a basis for changing ratings, particularly for LCVs.

The updated ratings are shown in Table S1.

Table S1: Updated air pollution star ratings assigned to the indicated exhaust emissions standard. Note that Euro 6d diesel car (shown in red underline) is the only rating that has changed compared to 2023.

Vehicle type	Rating (stars)	Petrol emission standard		Diesel emission standard		Other
		NZ new	Jap used	NZ new	Jap used	
Car and SUV	0	Pre-Euro 1		Euro 3 & earlier	Jap 2004 & earlier	
	1	Euro 1		Euro 4 & Euro 5	Jap 2005 to 2018	
	2	Euro 2 & Euro 3	Jap 2002 & earlier			
	3	Euro 4	Jap 2005 & 2005d			
	4	Euro 5 to *Euro 7*	Jap 2009 & 2018	Euro 6d, *Euro 7*		
	5	Hybrid/PHEV	Hybrid/PHEV			
	6					**EV**
Van and ute	0	Euro 1 & earlier		Euro 5 & earlier	Jap 2018 & earlier	
	1					
	2	Euro 2 & Euro 3	Jap 2002 & earlier	Euro 6d		
	3	Euro 4	Jap 2005 & 2005d	*Euro 7*		
	4	Euro 5 to *Euro 7*	Jap 2009 to 2018			
	5	Hybrid/PHEV	Hybrid/PHEV			
	6					EV

EV = electric vehicle, PHEV = plug-in hybrid vehicle, SUV = sports utility vehicle (e.g. 4WD)

Note: Euro 7 rating are shown in *italics* as they are indicative and have only been included for completeness.

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Glossary

EV	electric vehicle
EMEP/EEA	European Monitoring and Evaluation Programme / European Environment Agency
g	gram, a unit of mass
HAPINZ	Health and Air Pollution in New Zealand, a study of the air pollution impacts and associated social costs
km	kilometre
LCV	light commercial vehicle, a commercial vehicle with a gross vehicle mass < 3.5 tonnes
light duty vehicle	a vehicle with a gross vehicle mass < 3.5 tonnes
NO_X	oxides of nitrogen
NZTA	NZ Transport Agency Waka Kotahi
PHEV	plug-in hybrid electric vehicle
PM	particulate matter, a harmful air pollutant
$PM_{2.5}$	particulate matter smaller than 2.5 µm in diameter
SUV	sports utility vehicle
VEPM	Vehicle Emissions Prediction Model, developed by NZ Transport Agency Waka Kotahi to predict air emissions and fuel consumption for the New Zealand fleet
VKT	vehicle kilometres travelled

1.0 Introduction

1.1 Purpose and scope of study

The Rightcar website[2] provides information to help consumers choose vehicles with lower safety and environmental impacts. For environmental performance, vehicles are rated on fuel economy, carbon emissions and air pollution, with the best-performing vehicles assigned up to 6 stars.

In 2023, an updated air pollution star rating methodology was developed to better represent the real-world health impacts of vehicle emissions (Kuschel and Metcalfe 2023). The methodology uses estimated real-world emission factors from VEPM and damage costs derived from HAPINZ 3.0 (Kuschel *et al* 2022) to rank vehicles by their air pollution health cost per kilometre. Emission Impossible Ltd has been engaged by NZ Transport Agency to update these ratings to reflect the latest version of VEPM and current damage cost estimates.

This report describes the changes from the 2023 methodology and presents the recommended updated air pollution star ratings. The full methodology is described in Kuschel and Metcalfe (2023) and is not repeated here.

A comprehensive update of the air pollution ratings system is not within the current scope of work. However, recommendations are made based on the outcomes of this review to help inform future updates.

1.2 Report structure

The report is structured as follows:

- Section 2 describes the methodology followed to review the air pollution star ratings
- Section 3 describes the results of the review.
- Section 4 describes further work that is recommended to inform a more comprehensive review of air pollution ratings in future

This report is supported by an accompanying Excel workbook containing all calculations and assumptions.

[2] https://rightcar.govt.nz/

2.0 Methodology

The overall methodology is the same as described in Kuschel and Metcalfe (2023) with updated emission factors and damage costs.

2.1 Emission factors

Updated emission factors were generated from VEPM 7.2 (Metcalfe and Peeters 2026), which incorporates updated European emission factors and revised non-exhaust particulate matter ($PM_{2.5}$) factors including road surface wear.

Consistent with Kuschel and Metcalfe (2023), emission factors were generated from VEPM 7.2 using an average speed of 50 km/hour with no consideration of degradation effects. Default values were used for all other settings in VEPM.

2.2 Damage costs

Table 1 shows the updated unit damage costs for $PM_{2.5}$ and NO_X emissions. These are sourced from a 2025 study of indoor combustion health effects and costs (Metcalfe *et al* 2025).[3] Urban New Zealand values were used consistent with the approach in Kuschel and Metcalfe (2023).

Table 1: New Zealand urban damage costs in 2025$/tonne

Pollutant	Costs in NZ$/tonne
$PM_{2.5}$	$2,093,295
NO_X	$1,700,386

Source: Metcalfe *et al* 2025

In this report, we applied the costs shown in Table 1 to per kilometre emission rates for different vehicle types to assess the resulting social costs.

The calculations are provided in an excel spreadsheet (RightCar_AP_rating_2026). The spreadsheet structure has been updated to be consistent with VEPM 7.2 tables and outputs[4].

[3] During the 2025 indoor study, we found an error in Treasury CBAx model which reports the official damage costs. At time of writing, the CBAx values do not currently reflect those shown in Table 1. Treasury has been advised, and a revision is pending. We used the correct values in our latest Rightcar analyses.

[4] VEPM 7.2 has changed to a database structure. Previous ratings (Kuschel and Metcalfe 2023) were based on VEPM 6.3 which was a spreadsheet model.

3.0 Results

3.1 Updated social costs per km

Updated social costs per km are provided in the accompanying spreadsheet. In general terms, the 2026 vehicle rankings and groupings into star ratings are comparable to the 2023 results. This section briefly outlines the effects of updated damage costs, exhaust emission factors and non-exhaust emission factors.

3.1.1 Damage costs

The updated damage costs are approximately 3.4 times higher than the 2023 values for both $PM_{2.5}$ and NO_X.[5] Because the ratio is similar for both pollutants, the relative ranking of vehicle categories is largely preserved.

3.1.2 Exhaust emission factors

VEPM is based on European exhaust emission factors, which are regularly updated to incorporate the results of real-world emission testing. Exhaust emission factors in VEPM 7.2 are generally similar to VEPM 6.3, except for those for Euro 6d/e diesel vehicles. Emission factors for these vehicles have improved in VEPM 7.2 compared with VEPM 6.3 as real world test results have become available. The implications for star ratings are discussed in Section 3.2.

3.1.3 Non-exhaust emissions

Exhaust emissions from modern vehicles have reduced substantially over recent years, whereas non-exhaust emissions are generally unchanged. As a result, non-exhaust emissions are becoming more relatively more important.

Recent research undertaken for NZ Transport Agency (Davy 2026) suggests that non-exhaust emissions now contribute around 37% of motor vehicle $PM_{2.5}$ in New Zealand.

Non-exhaust emission factors are significantly different in VEPM 7.2 compared to VEPM 6.3, with key developments being:

- VEPM now differentiates brake and tyre wear factors by hybrid, plug-in hybrid, electric and internal combustion engine cars.
- VEPM now includes road wear factors.
- The source emission factor document (EMEP/EEA 2025) now provides different brake and tyre wear factors for different light duty vehicle size categories (e.g. small, medium and large diesel car/SUV). These factors are incorporated into VEPM 7.2, but VEPM outputs only one average factor for all vehicles in a given category (e.g. diesel car/SUV). This means, for example, that diesel car brake and tyre wear factors are now higher than petrol car factors because the average diesel car in the NZ fleet is bigger (heavier) than the average petrol car.

[5] As a result of the considerable increase in the official Value of Statistical Life, following a review published by NZ Transport Agency in 2023. https://www.nzta.govt.nz/assets/resources/research/reports/698/698-monetised-benefits-and-costs-manual-mbcm-parameter-values.pdf

As a result of these changes, non-exhaust emission factors are much higher in VEPM 7.2 compared to VEPM 6.3 as shown in Table 2.

Table 2: VEPM 7.2 non-exhaust $PM_{2.5}$ emission factors at 50 km/hour versus those in VEPM 6.3

Vehicle category	Fuel type	VEPM 7.2 non-exhaust $PM_{2.5}$ (mg/km)	VEPM 6.3 non-exhaust $PM_{2.5}$ (mg/km)
Car and SUV	Petrol	16.59	~9.91
Car and SUV	Diesel	18.32	~9.91
Car and SUV	Petrol hybrid	15.80	~9.91
Car and SUV	Petrol PHEV	14.79	~9.91
Car and SUV	Battery electric	13.15	~9.91
Van and ute	All fuel types[1]	24.29	~15.57

[1] VEPM 7.2 applies a single non-exhaust $PM_{2.5}$ factor to all LCV fuel types. This is a known limitation discussed further in Section 4.2.

The increase in non-exhaust emission factors has raised total social costs for all vehicle categories relative to the 2023 assessment, with the largest proportional effect on low-exhaust emission vehicles such as hybrids and battery electric vehicles. This change has affected some vehicle rankings, but the vehicle groupings and resulting star ratings are generally unchanged. The notable exception is battery electric LCVs which now have a higher estimated social cost per km compared to plug-in hybrid cars.

Further work is recommended before changing any star ratings based on non-exhaust emission factors. This is discussed in Section 4.

3.2 Assigning star ratings

A comprehensive update of the air pollution ratings was outside our current scope of work so we undertook a targeted review based on:

- Updated relative social costs ($/km)
- An overall 'minimum change' approach – recognising that a more comprehensive update will be scheduled at a later stage
- The recommendation (from Section 3.1.3) that star ratings should not be changed based on non-exhaust emissions.

On this basis, we recommend the following:

- Euro 6d diesel cars and SUVs: increase the 3- to a 4-star rating, supported by updated real-world emission factors now available in VEPM 7.2. **However, this change is optional.** Although emission factors have improved for these vehicles, the social costs of Euro 6d diesel cars and SUVs still sit at the boundary of the 3- and 4-star categories so could be assigned to either, as shown in Figure 1.
- Euro 6d LCVs: emission factors have improved but no change to the current whole-star rating is recommended at this stage. These vehicles have an estimated social cost of $0.277/km, which sits in the mid-range of the 2-star category. Under a half-star rating scheme (discussed in Section 4.2), these vehicles could be distinguished from higher cost 2-star vehicles.

- Battery electric LCVs: retain a 6-star rating even though the social costs of non-exhaust emissions from an LCV are higher than the social costs of total emissions from a plug-in hybrid car. Further work is recommended before changing any star ratings based on non-exhaust emission factors. This is because non-exhaust emission factors are still evolving in VEPM 7.2 and additional refinement is needed before they can be considered sufficiently robust to justify any ratings changes (see Section 4.1).
- All other categories: retain the 2023 ratings.

The complete updated star ratings are presented in Table S1 in the Executive Summary.

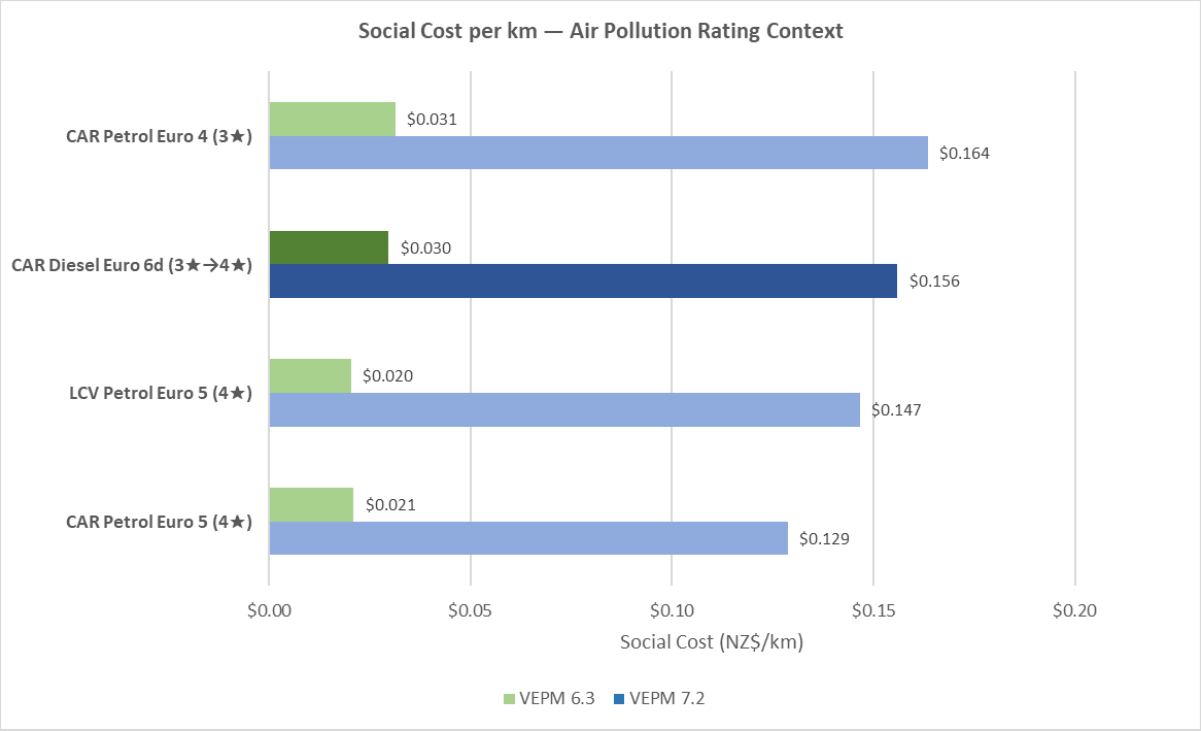

Figure 1: Estimated social costs per km for vehicle categories near the 3/4-star boundary using VEPM 7.2 vs VEPM 6.3. We recommend that car diesel Euro 6d moves from 3 stars to 4 stars under the updated assessment.

Figure 2 illustrates the updated social costs and star ratings for key vehicle categories, showing the considerable spread in social costs per km across different vehicle types.

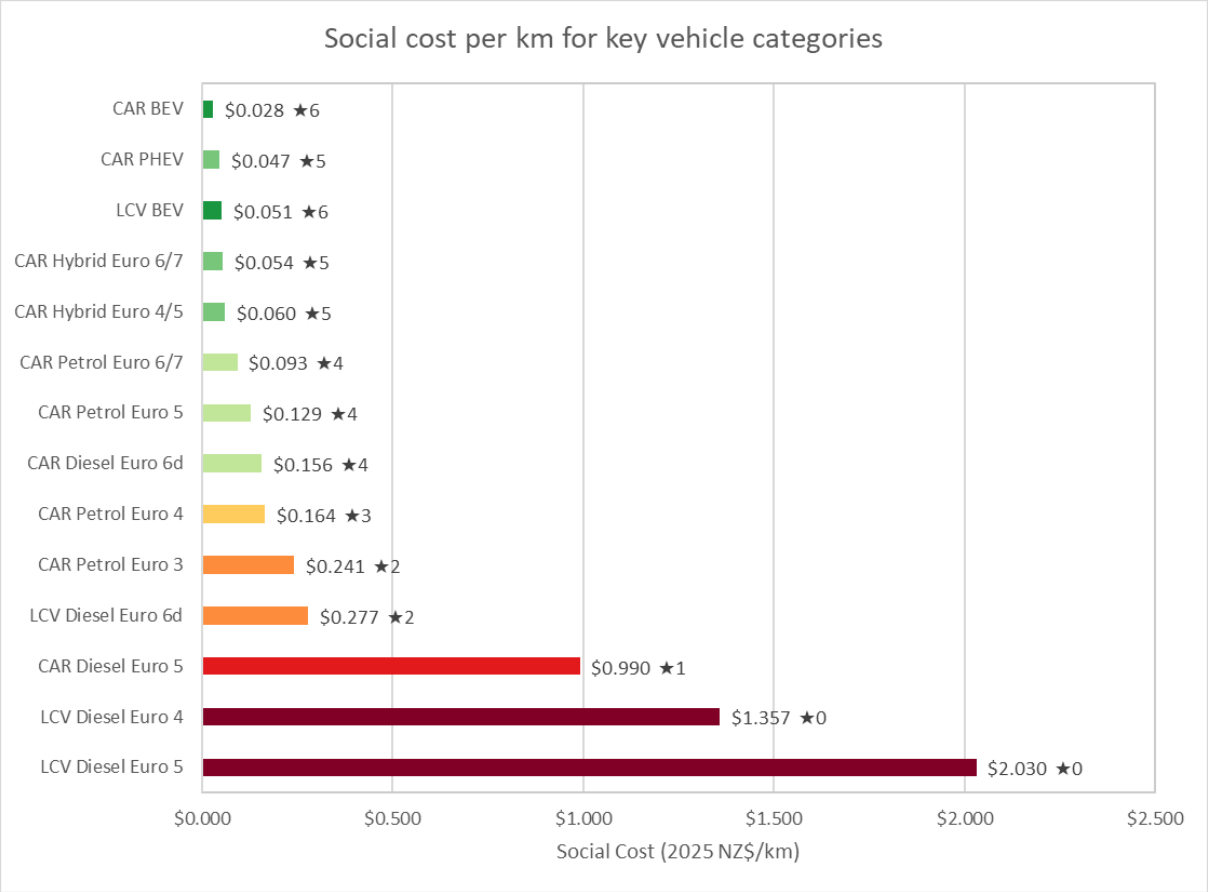

Figure 2: Estimated social costs per km (2025 NZ$/km) and star ratings for key vehicle categories.

Figure 3 indicates the proportion of the light fleet travel which would be assigned each star rating, based on estimated vehicle kilometres travelled in 2026 for each category in VEPM 7.2[6]. This is compared to the same information for vehicles travelled in 2022 based on the current star ratings.

The comparison shows that:

- More than 45% of vehicles sit in the high rating 4-, 5- and 6-star categories in 2026. The proportion of vehicles in these categories has increased since 2022 (at only 29%) due to modernisation of the fleet and increased adoption of hybrid, plug-in hybrid and electric vehicles.
- The proportion of zero rated vehicles has not changed significantly between 2022 and 2026 (holding steady at 21%). This category is dominated by Euro 4 and Euro 5 diesel LCVs (utes and vans)[7].

[6] The proportion of *vehicle kilometres travelled* assigned to each vehicle category is not the same as the proportion of *vehicles* in each category because newer vehicles tend to travel further.

[7] Euro 4 and Euro 5 diesel LCVs account for 82.5% of VKT in the 0-star category.

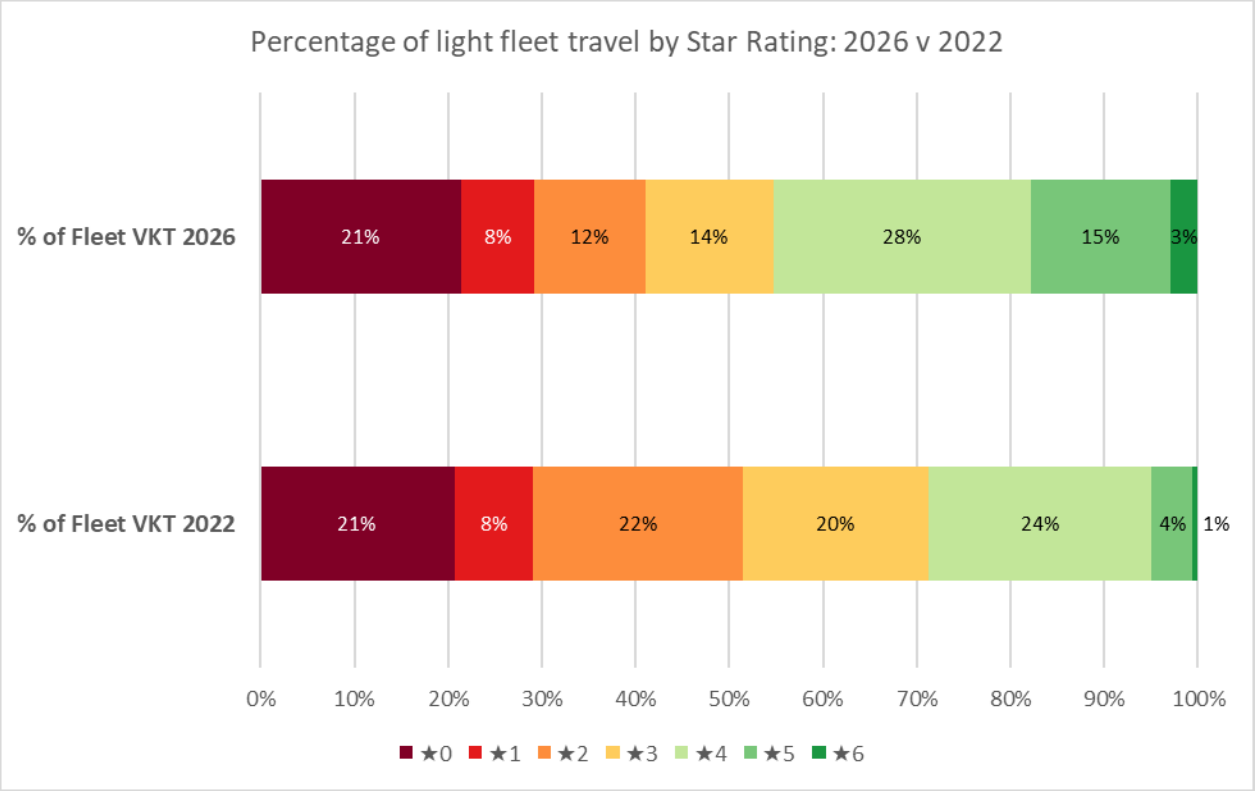

Figure 3: Estimated percentage of light fleet travel by vehicles in each star category assuming the updated star ratings and the VEPM 7.2 fleet in 2026 compared with estimated percentage of light fleet travel by vehicles in each star category based on Kuschel and Metcalfe 2023 (using VEPM 6.3 emission factors and 2022 fleet).

Note that Figure 3 in Kuschel and Metcalfe (2023) contained an error in the fleet VKT distribution, which has been corrected in this analysis.

4.0 Recommendations

This section describes recommendations for further work to inform a more comprehensive review of air pollution ratings in future.

4.1 Refinement of non-exhaust emission factors

Non-exhaust emissions, from brake, tyre and road surface wear, now constitute a significant share of total social cost, particularly for low-exhaust emission vehicles. As a result, the treatment of non-exhaust emissions has an increasing influence on relative rankings.

The source emission factors used in VEPM for non-exhaust emissions (EMEP/EEA 2025) differentiate between different size passenger cars and LCVs, but VEPM currently provides one factor. Vehicle mass is a key driver of brake, tyre and road wear: heavier vehicles generate more wear particles. A large SUV may have similar mass characteristics to a small LCV, suggesting that non-exhaust emission factors should ideally account for vehicle size sub-categories within both the car and LCV groups.

We therefore recommend that:

- VEPM be updated to provide different non-exhaust emission factors for different car sizes.
- Non-exhaust emission factors for LCV sub-categories (by vehicle size and fuel type) be investigated and incorporated into VEPM if feasible. If it is not feasible to change VEPM categories, alternatives such as scaling factors or passenger car equivalents for the Rightcar ratings could be considered.

We recommend undertaking this work before considering any change to star ratings based on non-exhaust emission factors.

The VEPM 7.2 technical report (Metcalfe and Peeters 2026) notes that further work has been recommended to develop guidance or appropriate re-suspended road dust factors for VEPM users. This work is also relevant to any consideration of change to star ratings based on non-exhaust emission factors.

4.2 Introduce half-star ratings

The 2023 methodology acknowledged the possibility of introducing half-star ratings to provide greater granularity. We recommend that half-star ratings be considered for a future update.

Half-star ratings would allow greater differentiation. For example, under a half-star scheme:

- Euro 6/7 hybrid cars could be rated at 5.5 stars, distinguishing them from older-technology Euro 4/5 hybrids at 5 stars.
- Euro 6/7 petrol cars could be rated at 4.5 stars, with Euro 5 petrol cars remaining at 4 stars.
- LCV diesel Euro 6d/7 vehicles could move from 2 to 2.5 stars under a half-star scheme, more accurately reflecting their much lower social cost compared to other 2-star vehicles such as older petrol LCVs.

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