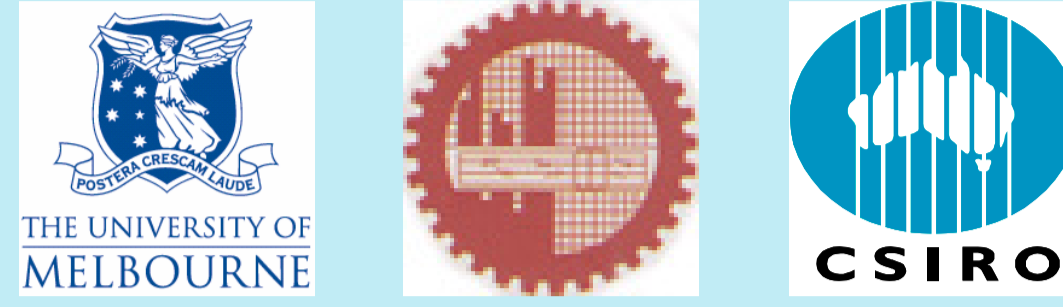


MODELING EXHAUST EMISSIONS FROM AUSTRALIAN ROAD TRANSPORT UP TO 2025

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1. Introduction

Road transport responsible for 12.9% of Australian GHG emissions

Motor vehicles' contribution to local air pollution also significant: 35%, 78% and 62% of HC, CO and NO_x emissions in four major cities

This study forecasts the emissions of criteria air pollutants, HC, CO, NO_x and PM₁₀ and greenhouse gases CO₂, CH₄ and N₂O till 2025

2. The Model

Bottom up approach, for different types of vehicles

Three different modules: **travel activities module**, **fuel module**, and **emission module** (see figure)

Age and mix and stock of vehicles

Growth trend and vehicle stock during from historical data since 1948

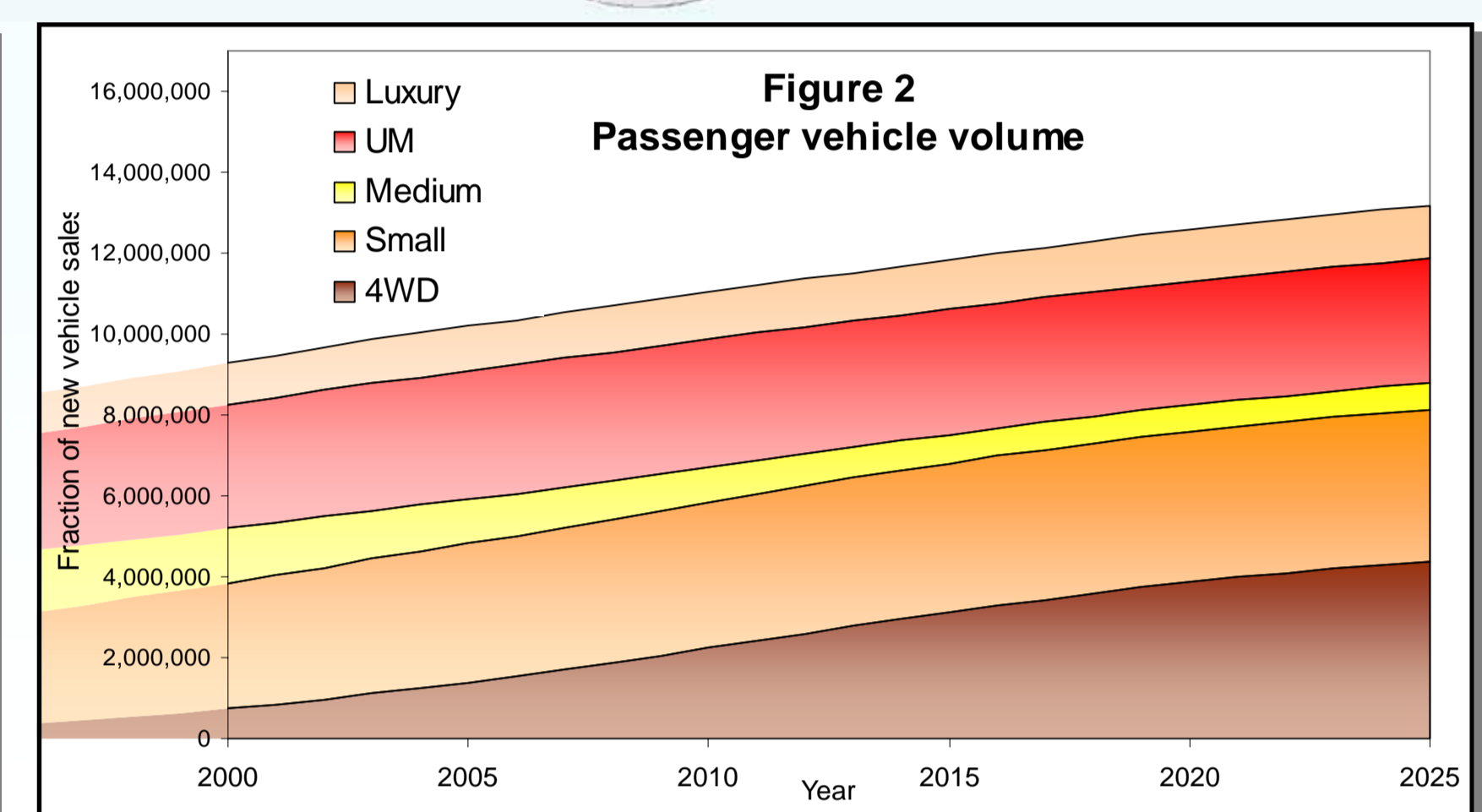
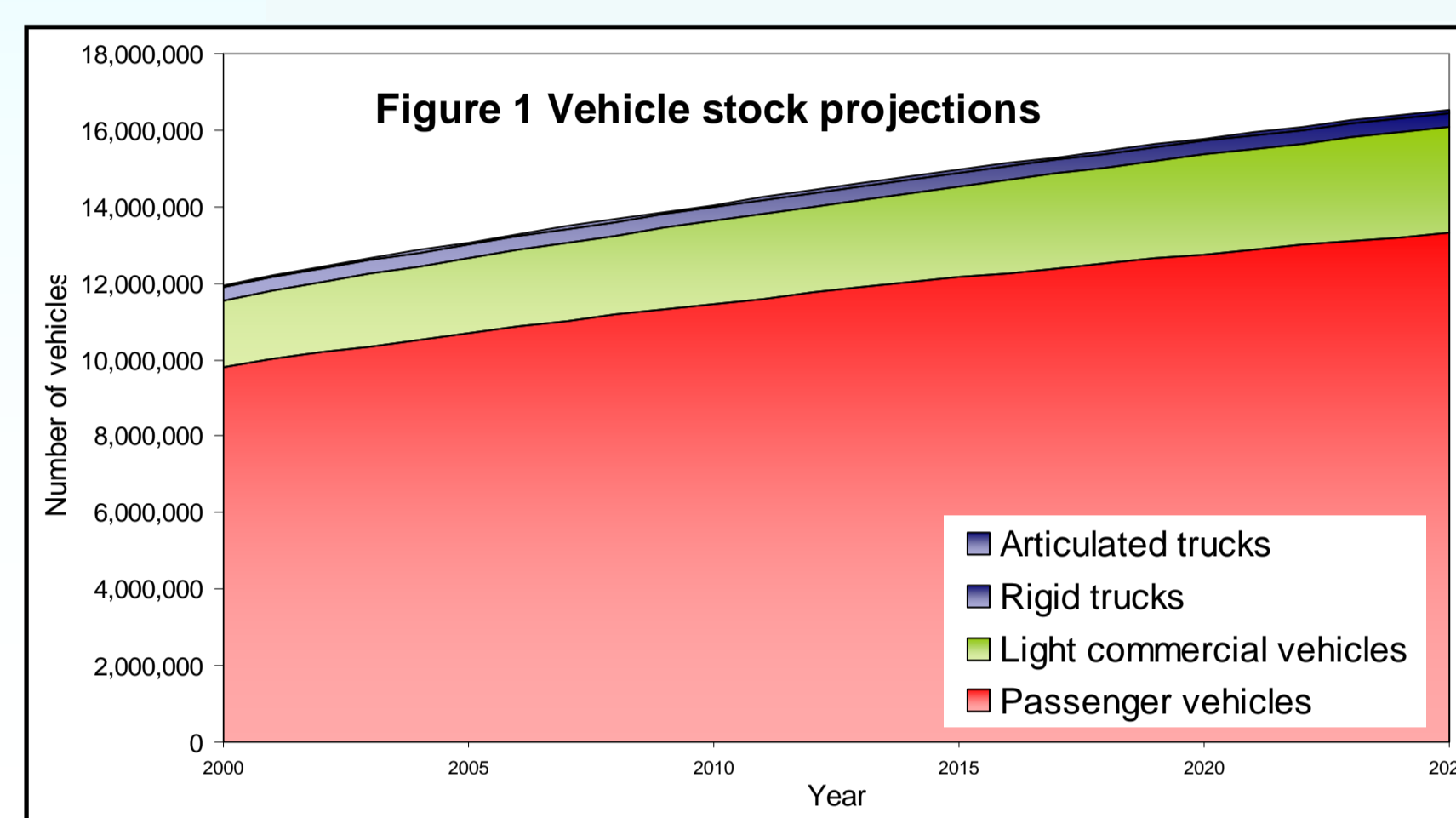
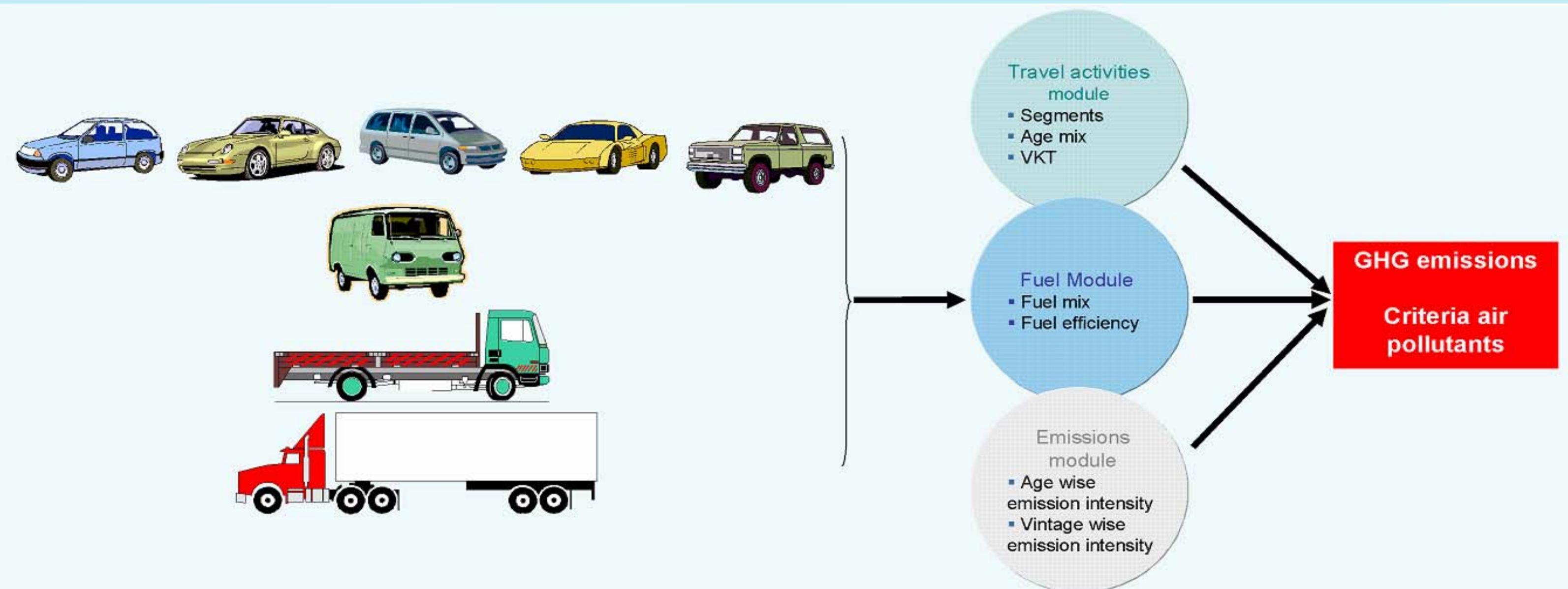
- passenger vehicles and rigid trucks: S curve
- light commercial vehicles: Linear
- articulated trucks: Linear with slightly tapered end to account for productivity growth

Survival function for the vehicles derived from timeseries data

Vehicle stock + New vehicle sales data + Survival functions = Vehicle stock with age wise distribution at the beginning of the modelling period, i.e. 2000.

SUV's and other vehicle types within passenger vehicle segment

4WD vehicle sales assumed current growth to persist till 2010, luxury maintains 10% of the passenger vehicle stock, others make up the rest



Age wise VKT

Age wise VKT for different types of vehicles - from available data-bases

Average VKT for **passenger**, **light commercial**, and **rigid trucks** — small changes in the near future.

Average VKT for **articulated trucks** have been ever-increasing; a linear increase of 1% per year has been assumed

Fuels

Passenger vehicles — Mostly petrol, 4WDs diesel, some LPG

Light commercial vehicles - Diesel (38%), petrol (42%) and LPG (20%);

Articulated trucks and rigid trucks - Diesel

Penetration of CNG and other alternative fuels not considered

Fuel consumption

National Average Fuel Consumption (NAFC) target 6.7 l/100 km by 2010 modelled for **passenger vehicles**, with a factor for on-road performance

Light commercial vehicles and **trucks** - improvements in fuel efficiency due to innovations assumed to be balanced by increased payloads.

Emission factors

Emission intensities of local pollutants - derived from literature

Future emissions of **passenger vehicles** - assumed that new vehicles emit 50% of the standard and deteriorate to 90% of the standard at the specified 80,000 km odometer reading.

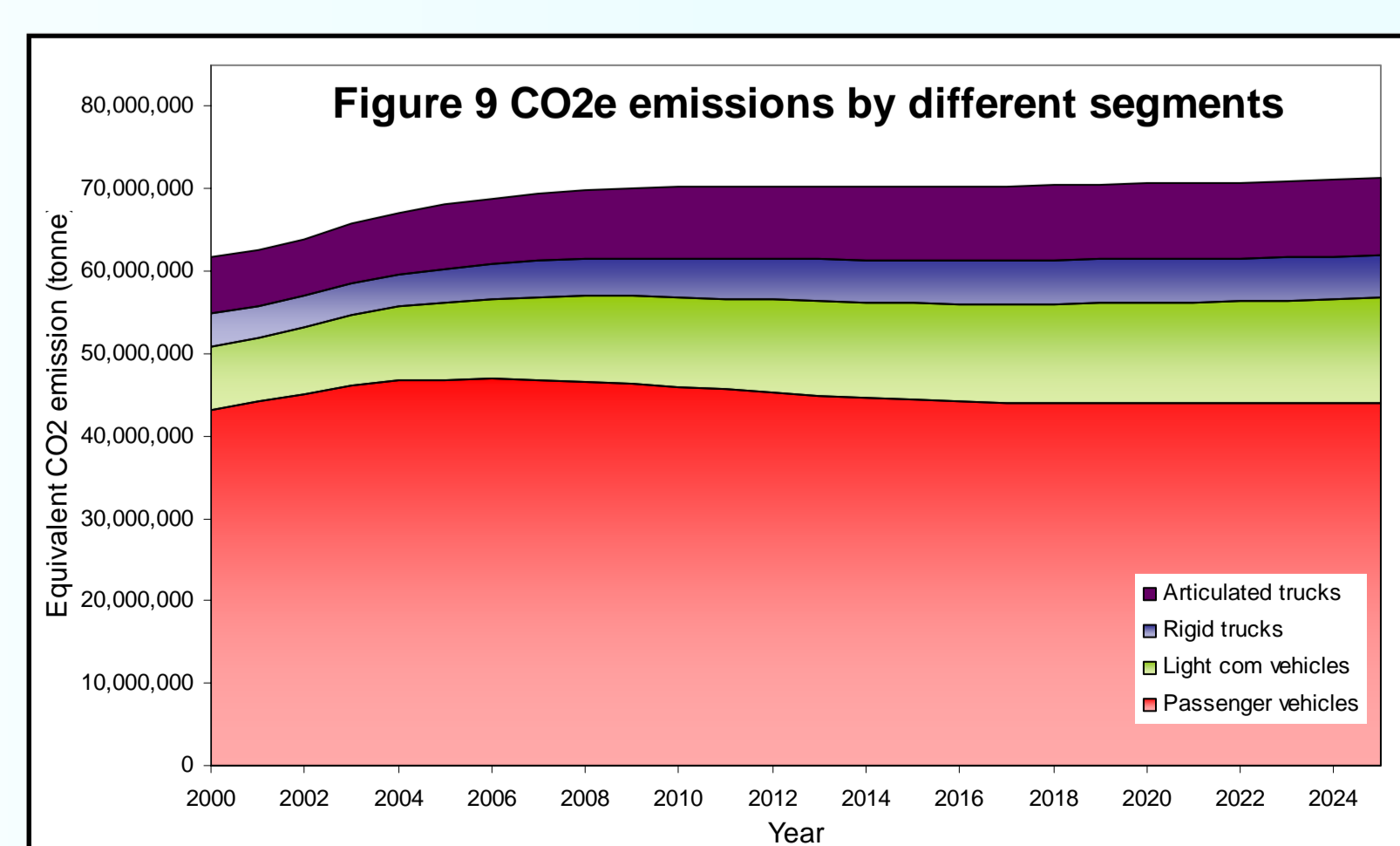
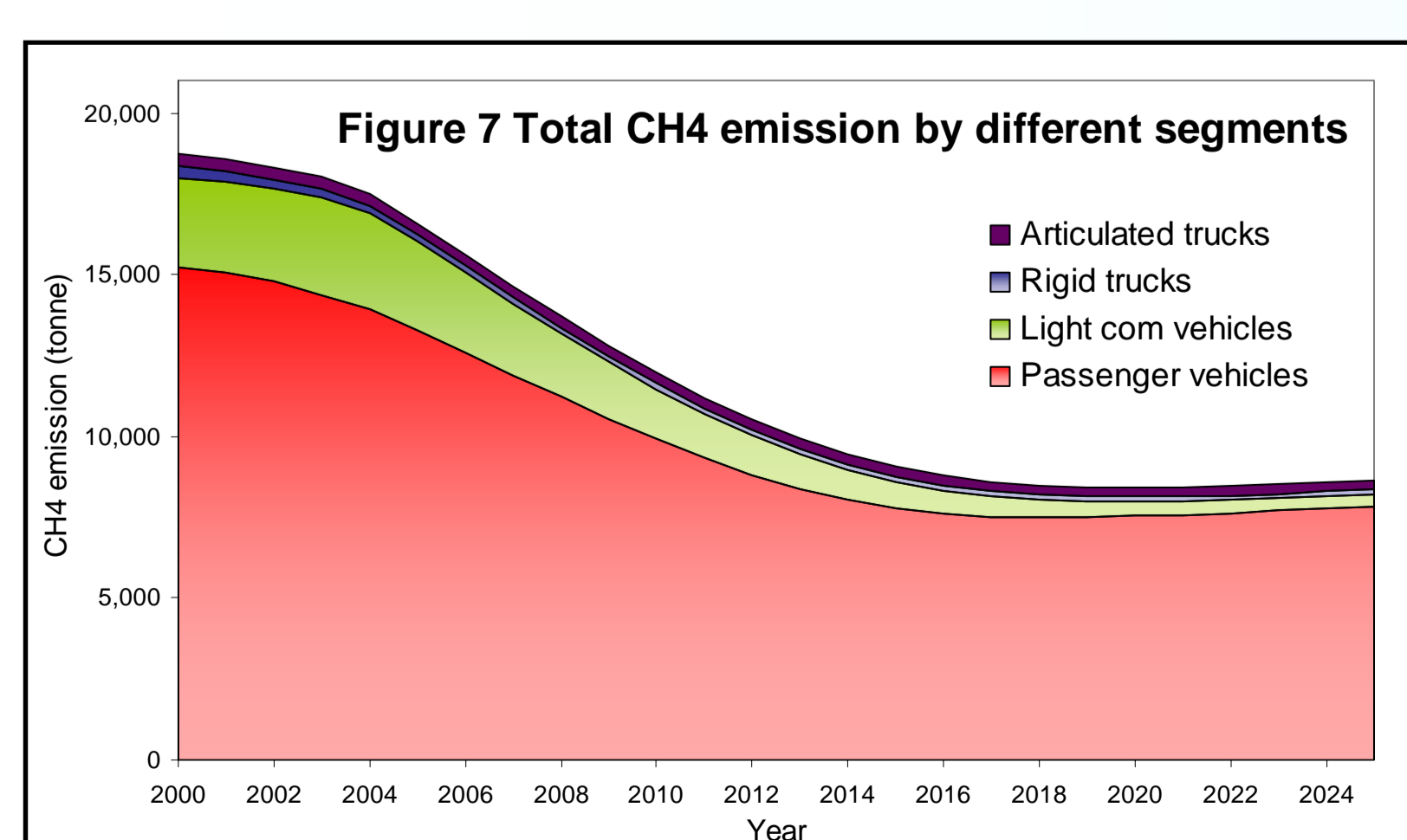
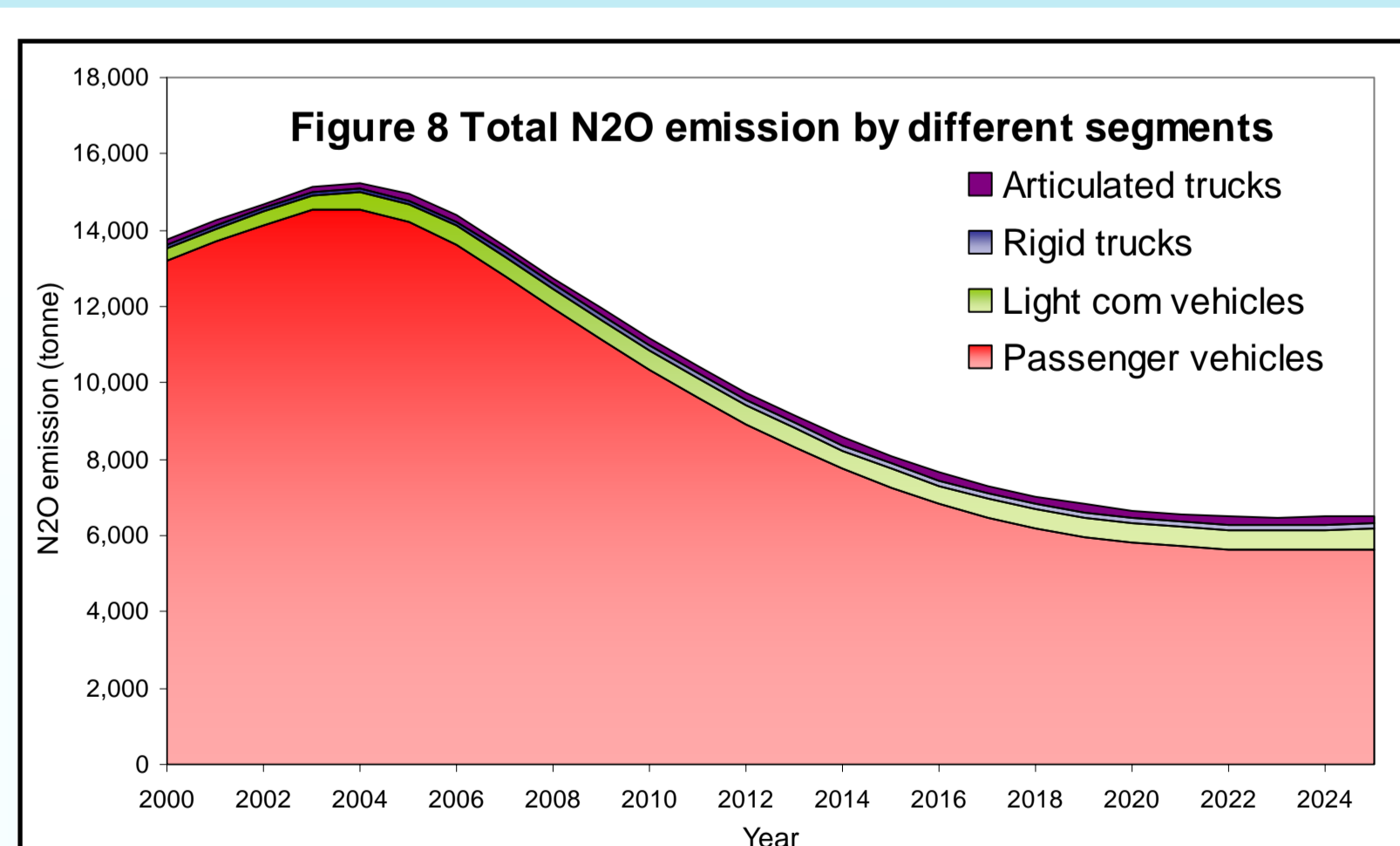
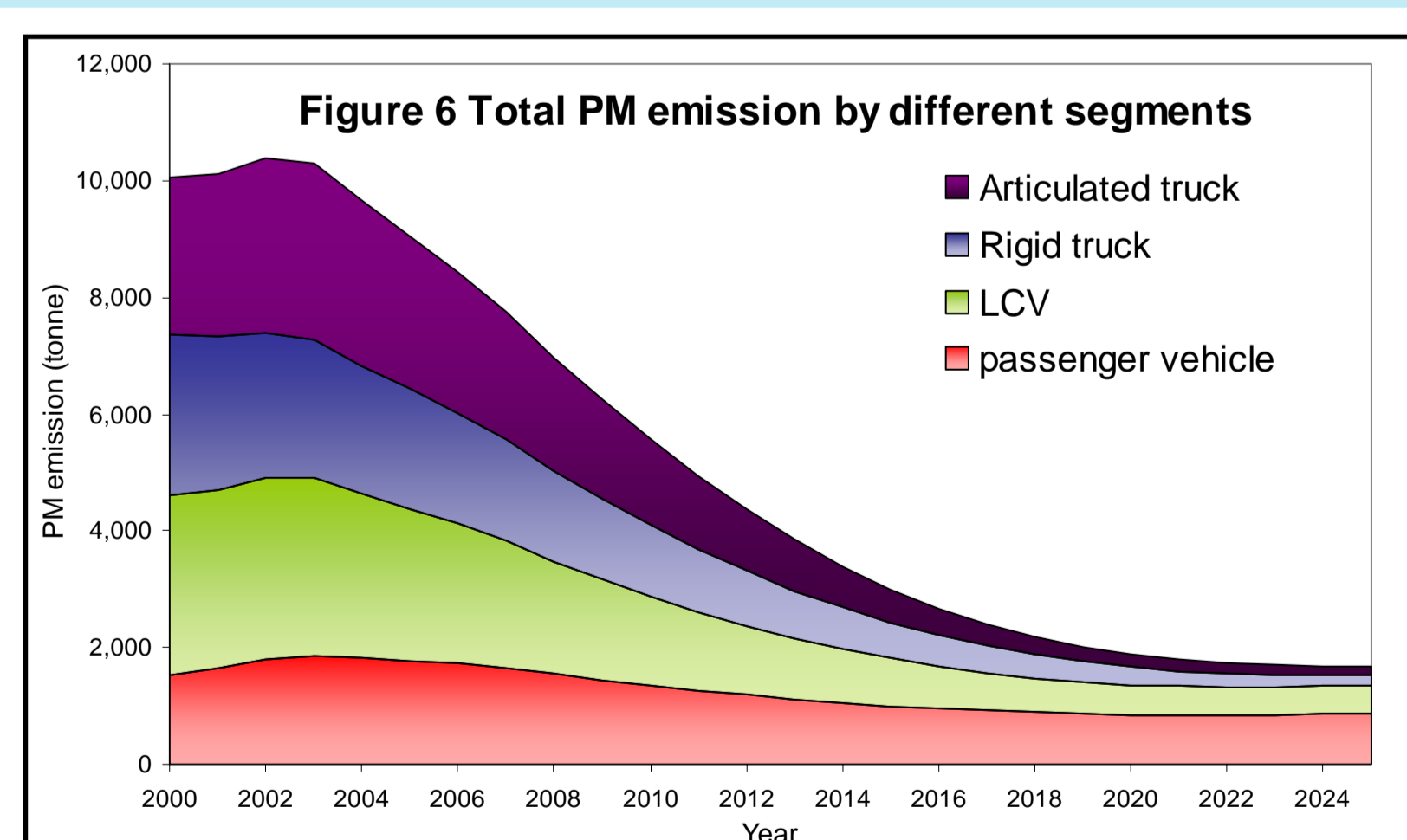
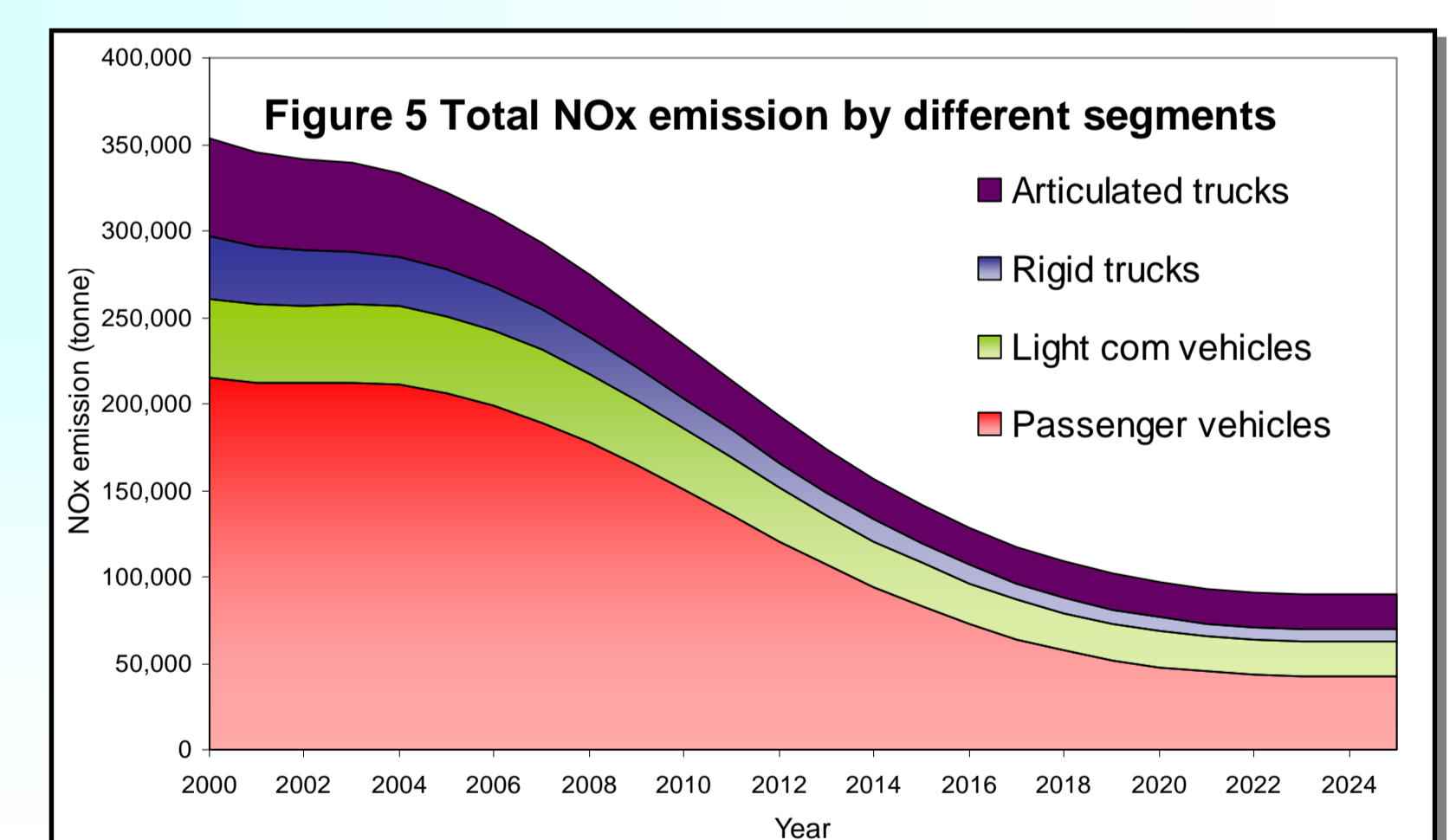
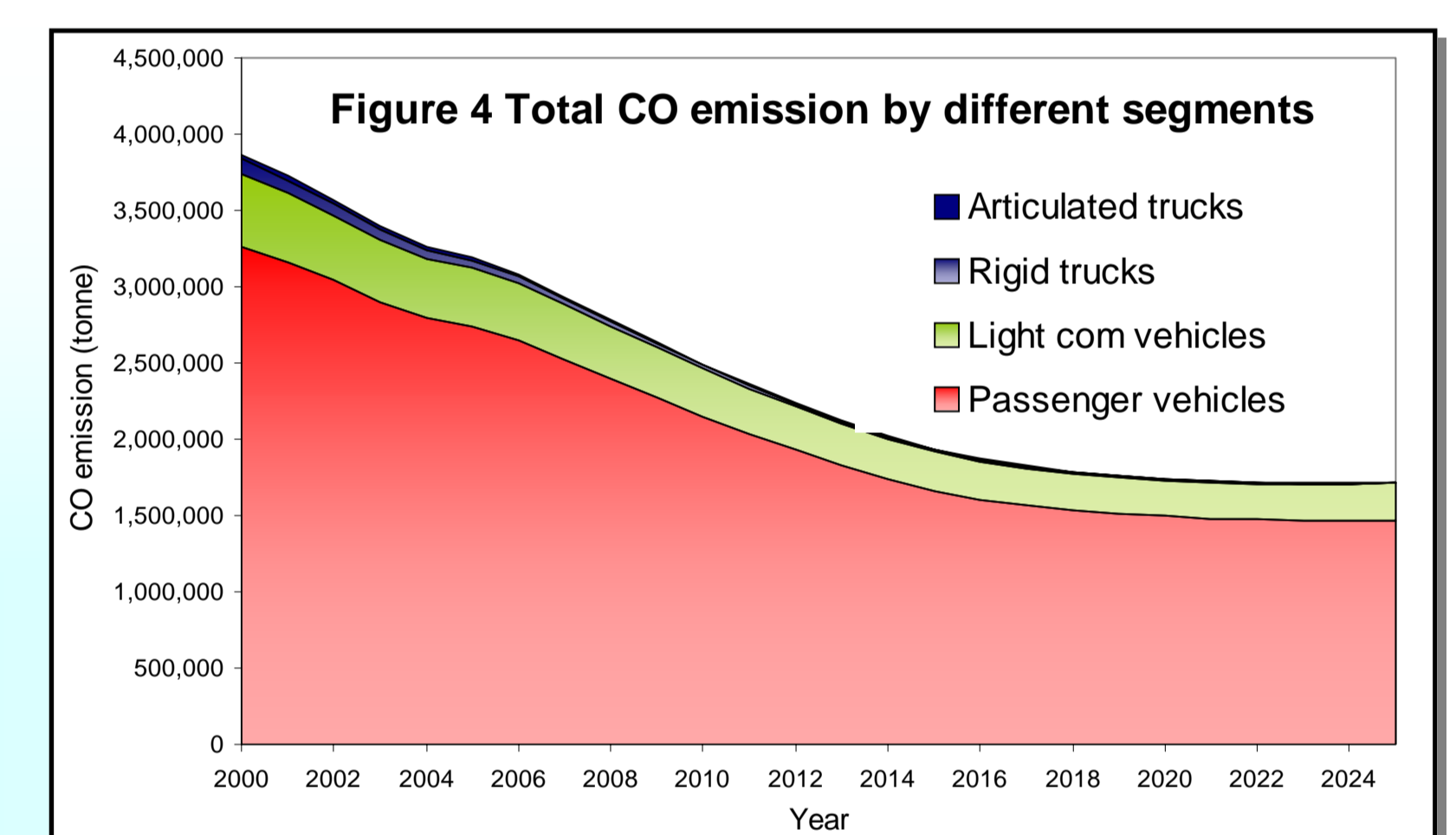
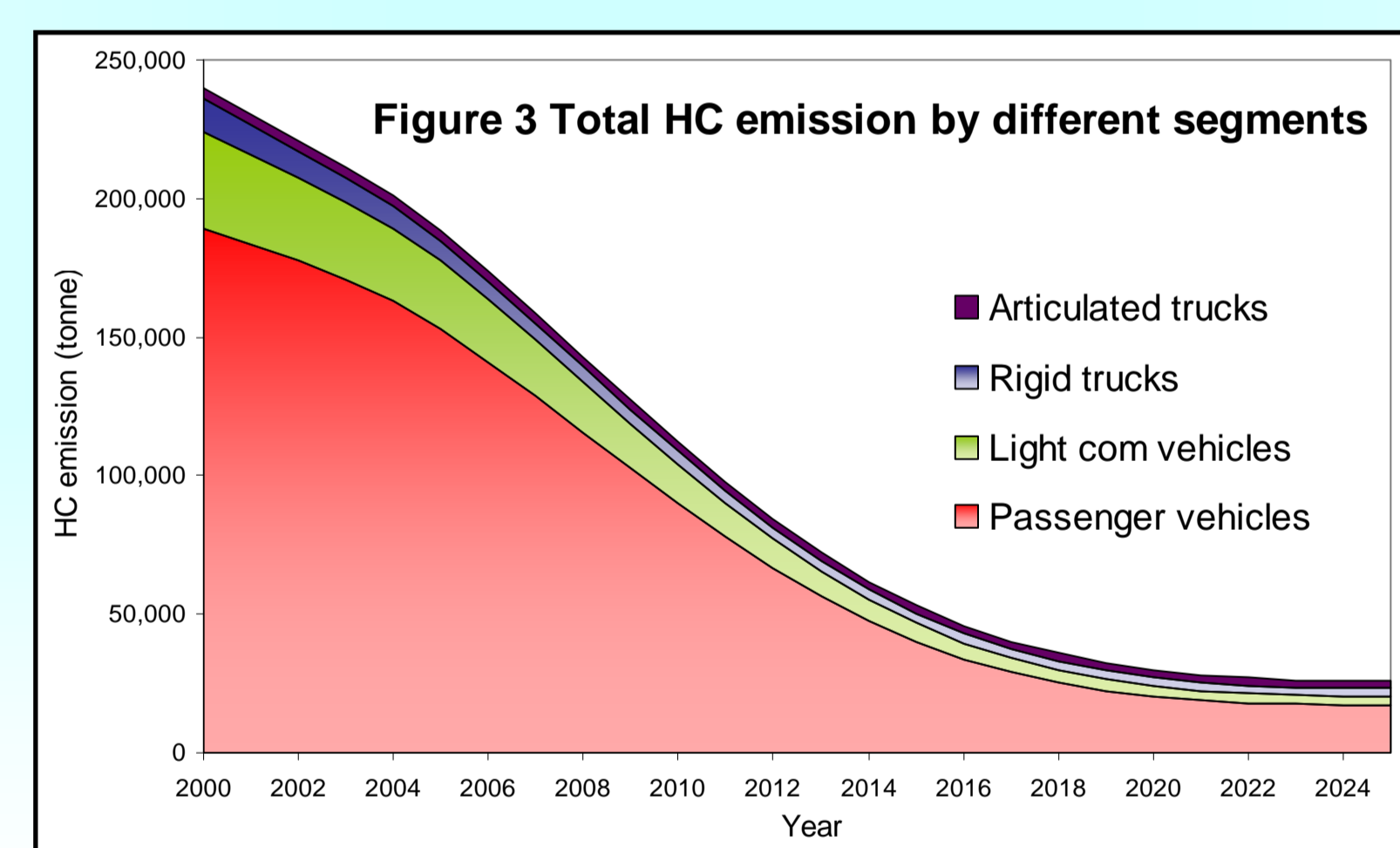
Australian Urban Cycle conversion factors used to simulate real driving

For **commercial vehicles** MOBILE 6 factors used with new ADRs effects. No deterioration in emissions performance in the diesel-fuelled vehicles.

N₂O and CH₄ varies proportionally to NO_x and HC respectively, but that proportion would increase as NO_x and HC emissions decrease

Expected outcome of the proposed new emission standards to be implemented in Australia till 2007.

3. Results



4. Conclusion

Criteria air pollutants - emissions will decrease significantly (around 70%) as a result of more stringent regulations.

GHG - expected to increase initially, then **stabilize**. CH₄ and N₂O emissions would decrease significantly (> 50%). Contribution of CH₄ and N₂O to GHG would decline from 7.5% in 2000 to 3% in 2025.

CO₂ emissions from **passenger vehicles** expected to be in balance with the increased vehicle volume.

For commercial vehicles, the CO₂ emission is projected to be increasing. CO₂ emission could decrease if the fuel economy for **commercial vehicles** can be reduced by the same amount as passenger vehicles.

Petrol continues to be the dominant contributor to emissions from the **passenger vehicles**, diesel to have dominant share in commercial vehicles.

Within the **passenger vehicles**, the 4WD stock is expected to increase at the expense of other passenger vehicles. This translates into increasing emissions and increased share of GHG and air pollutant emissions.

Impact category	Passenger vehicles		Commercial vehicles	
	2000 (%)	2025 (%)	2000 (%)	2025 (%)
HC	80	64	20	36
CO	84	78	16	22
NO _x	60	35	40	65
PM ₁₀	15	30	85	70
CH ₄	81	91	19	9
N ₂ O	96	87	4	13
CO ₂	68	61	32	39
GHG	70	62	30	38