KPMG

Accelerating local electric vehicle uptake where it matters

How Australia can lead the way by responding to local preferences in car model ownership and travel behaviour

KPMG.com.au

Contents

1 Introduction

As of 2021, almost one fifth of Australia's carbon emissions came from transportation-related activities. Consequently, electric vehicles (EVs) represent a key pillar in the push towards decarbonisation and governments across Australia are enacting measures to increase the adoption of EVs. When used in combination with renewable energy, EVs will be critical in helping reduce Australia's carbon footprint.

In this paper, we investigate expected EV uptake in Sydney, Melbourne and Brisbane at a local suburb level. The impact of EVs will depend in large part on the personal preferences and choices people make when owning and using a car. Major Australian cities have a large urban footprint and how people use their car differs between the inner city and outer suburbs.

While a range of state-level EV targets have been set with New South Wales, Victoria and Queensland setting a target of 50% of new car sales by 2030, localised adoption at a postcode level and its drivers is not well understood.

KPMG has developed our Electric Vehicle Insights and Analytics Platform (EVIAP) that tracks EV volumes at a postcode level. The EVIAP provides a snapshot of the latest developments in EVs and anticipates future EV fleet shares based on the observed trends and major technology and policy commitments.

Using insights derived from the EVIAP, we highlight:

- the disparity in internal combustion engine (ICE) passenger car fleet ages between the inner city and outer suburbs
- the growing inequality in EV uptake across our major cities
- the challenges in balancing emissions pricing and affordability of EVs

This report aims to contribute to the discussion of EV policy implementation going forward by raising awareness of the potential shortfalls and spatial inequalities present in some of the current policy frameworks.

.

2 The current state

In Sydney, Melbourne and Brisbane there are clear trends regarding passenger car registrations and commuting patterns, including:

- As we move from the city centres to the outer suburbs, people prefer larger, more spacious cars.
- We tend to see cars that are older in the outer suburbs and relatively newer cars in the inner city.
- Not surprisingly, commuting travel time and distance travelled increase with distance from city centres.

2.1 Most common registered car models in 2021

As of 2021, the 20 most common passenger car models accounted for over a third of all vehicles in Australia. The five most common models of registered cars in Australia are the Holden Commodore, Toyota Hilux, Toyota Corolla, Toyota Landcruiser and Mazda 3. The preference for these vehicles differs from suburb to suburb; however, it tends to coincide with an area's vicinity to a major employment centre, such as the CBD. Some key trends include:

- Relatively small cars (Volkswagen Golf and Toyota Corolla) dominate the inner city.
- Larger models such as the Holden Commodore, Toyota Hilux and Toyota Land Cruisers dominate the outer suburbs.

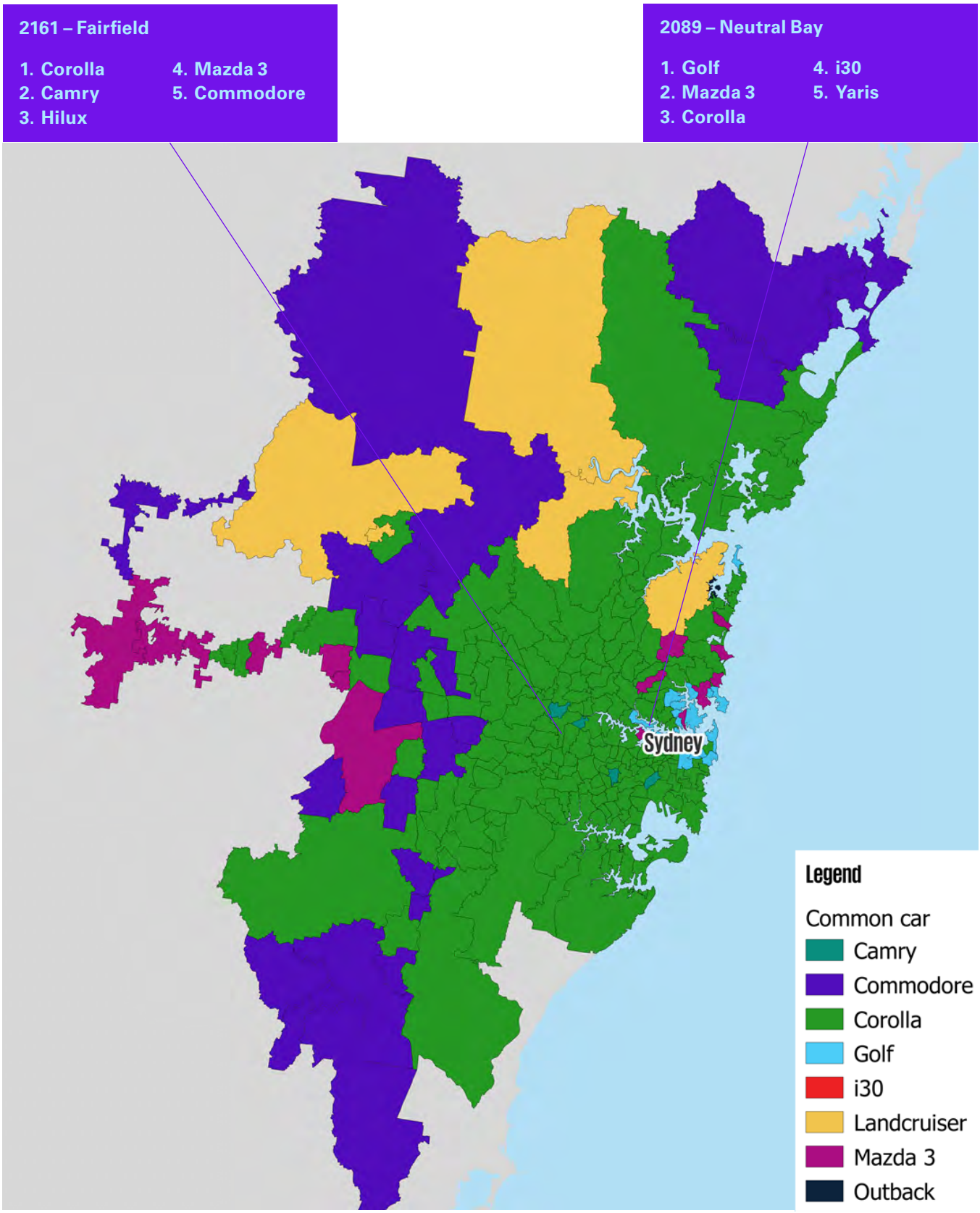
While specifics differ, this pattern can be observed in all three metropolitan areas. The contrast is:

- Most notable in metropolitan Melbourne, the inner-city postcodes prefer the Toyota Corolla, Toyota Camry and Mazda 3, whereas inner-city Sydney and Brisbane prefer the Volkswagen Golf and Toyota Corolla.
- Outer suburbs were consistent across the three cities, wherein the Holden Commodore and Toyota Landcruiser were the preferred vehicles.

These results are striking, especially as the Holden Commodore has not been in production since late 2017. This yields several implications surrounding future efforts to electrify the fleet.

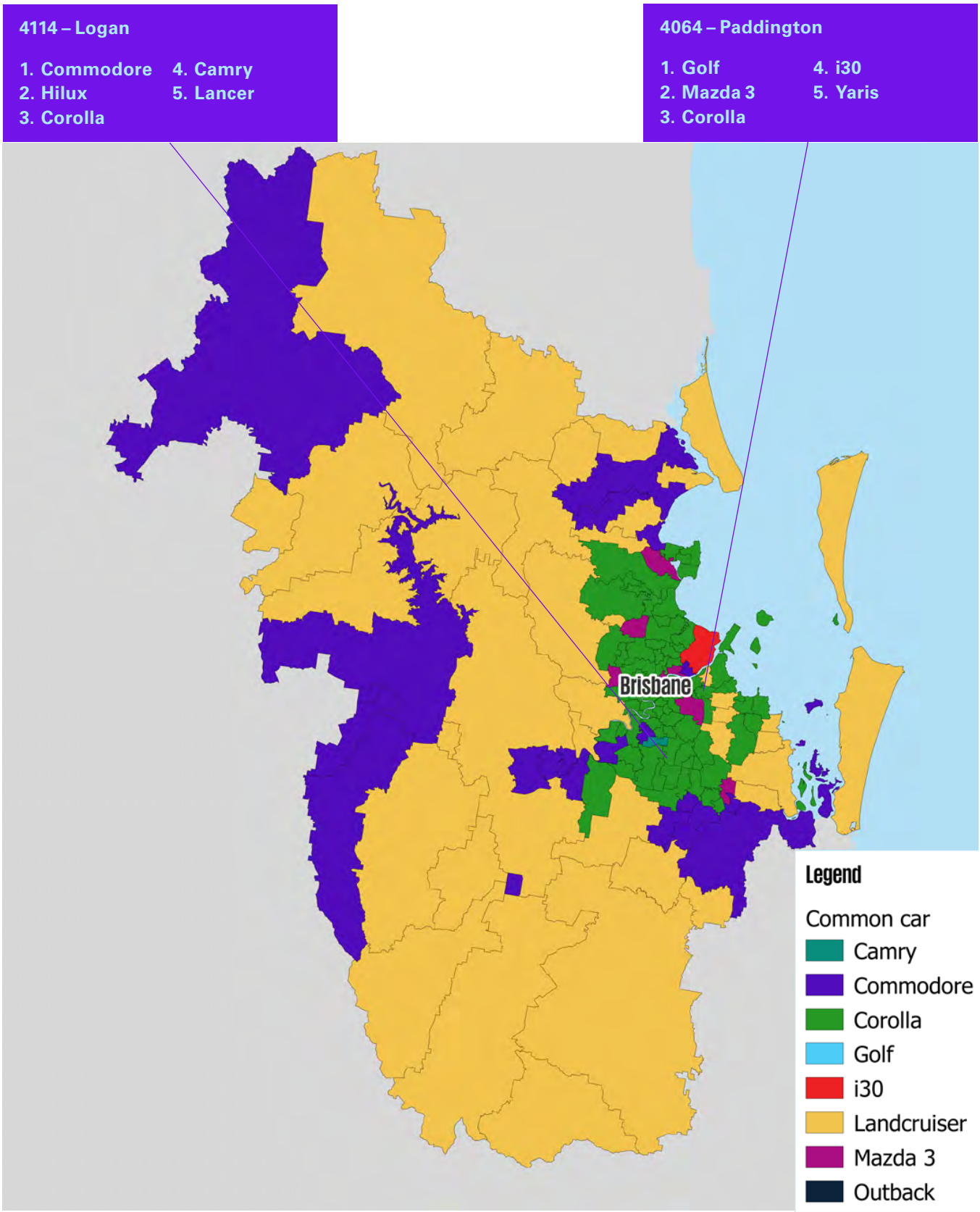
Currently there is a lack of suitable choice in Australia for larger vehicles like the Toyota Hilux and Toyota Landcruiser and the suitability of EVs for off-road travel will likely impede the speed of future EV uptake.

Figure 2-1 A Most common registered passenger car models by postcode 2021



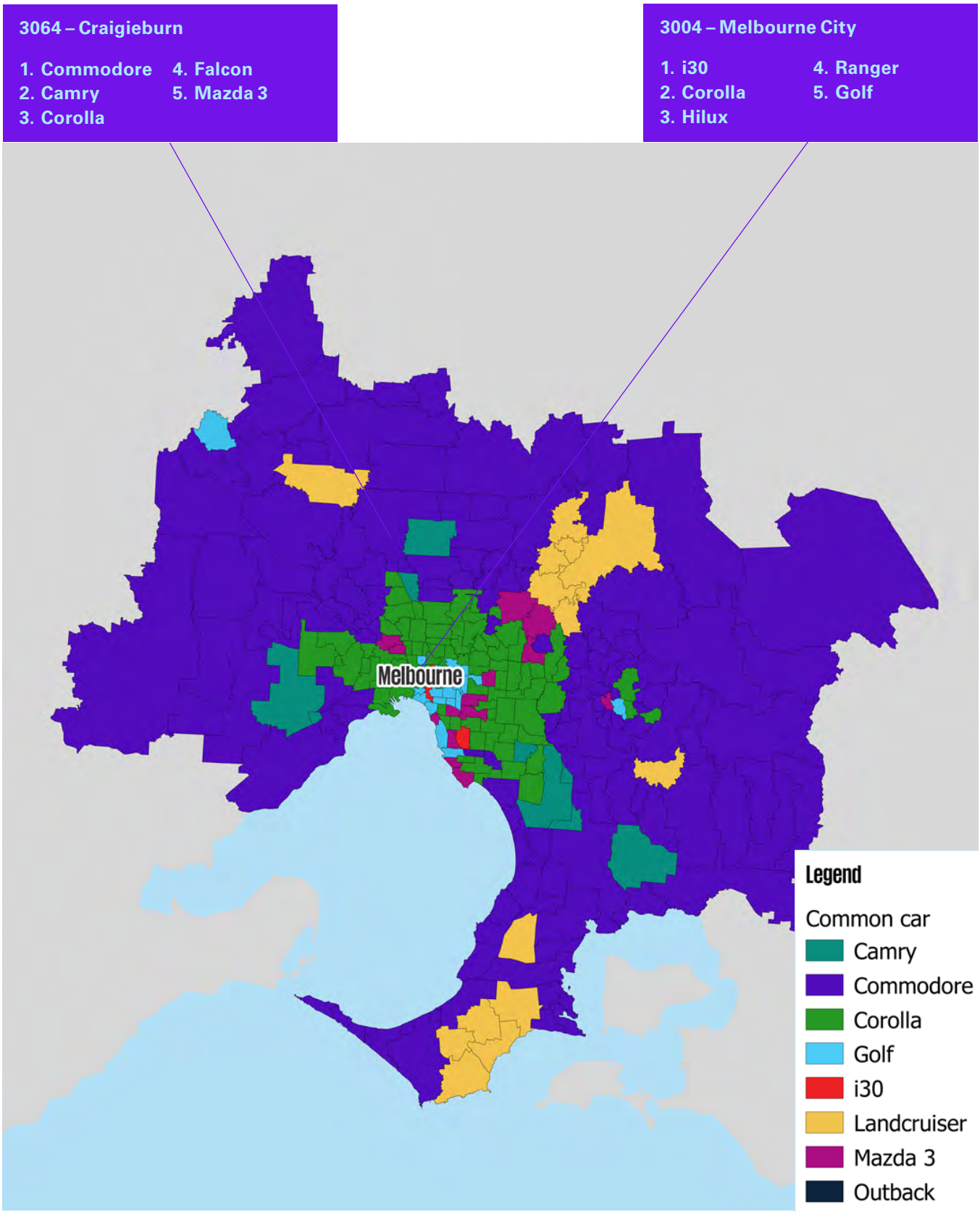
Source: KPMG analysis of ABS data

Figure 2-1 B Most common registered passenger car models by postcode 2021



Source: KPMG analysis of ABS data

Figure 2-1 C Most common registered passenger car models by postcode 2021



Source: KPMG analysis of ABS data

2.2 The ageing car fleet in outer suburbs

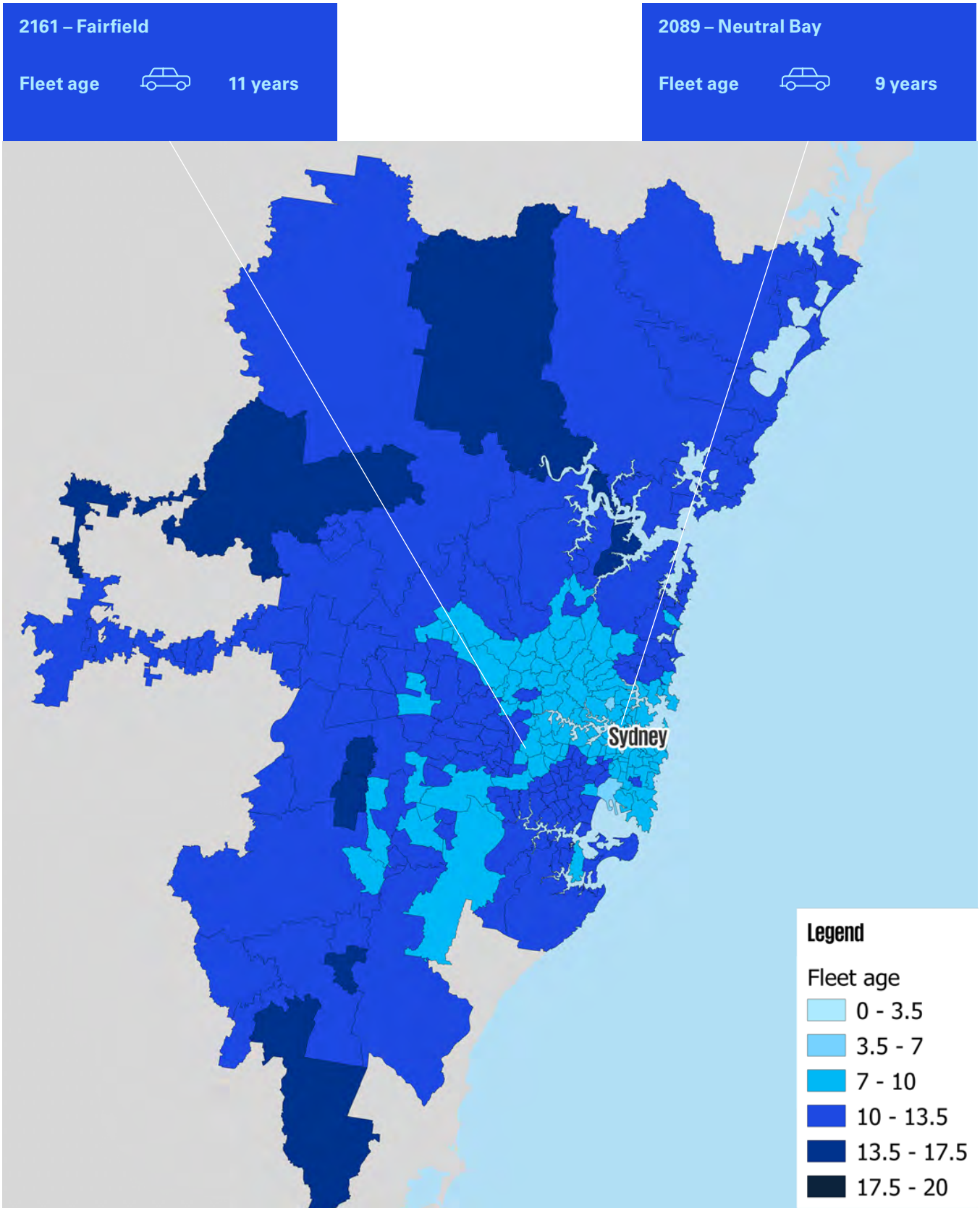
The average age of the car fleet is like tree rings forming out from the city centre. An analysis of average car ages reveals an inverse relationship between car age and distance to major employment centres.

This suggests that suburbs farther from major employment centres are, on average, more likely to be populated more by older cars. The maps below show this relationship across all three major cities.

It is most clearly exhibited within metropolitan Brisbane, where many inner-city postcodes have an average age below eight years, with household vehicles replaced on a more frequent basis. Conversely, postcodes on the fringes of each metropolitan area exhibit average car ages in excess of 12 years.

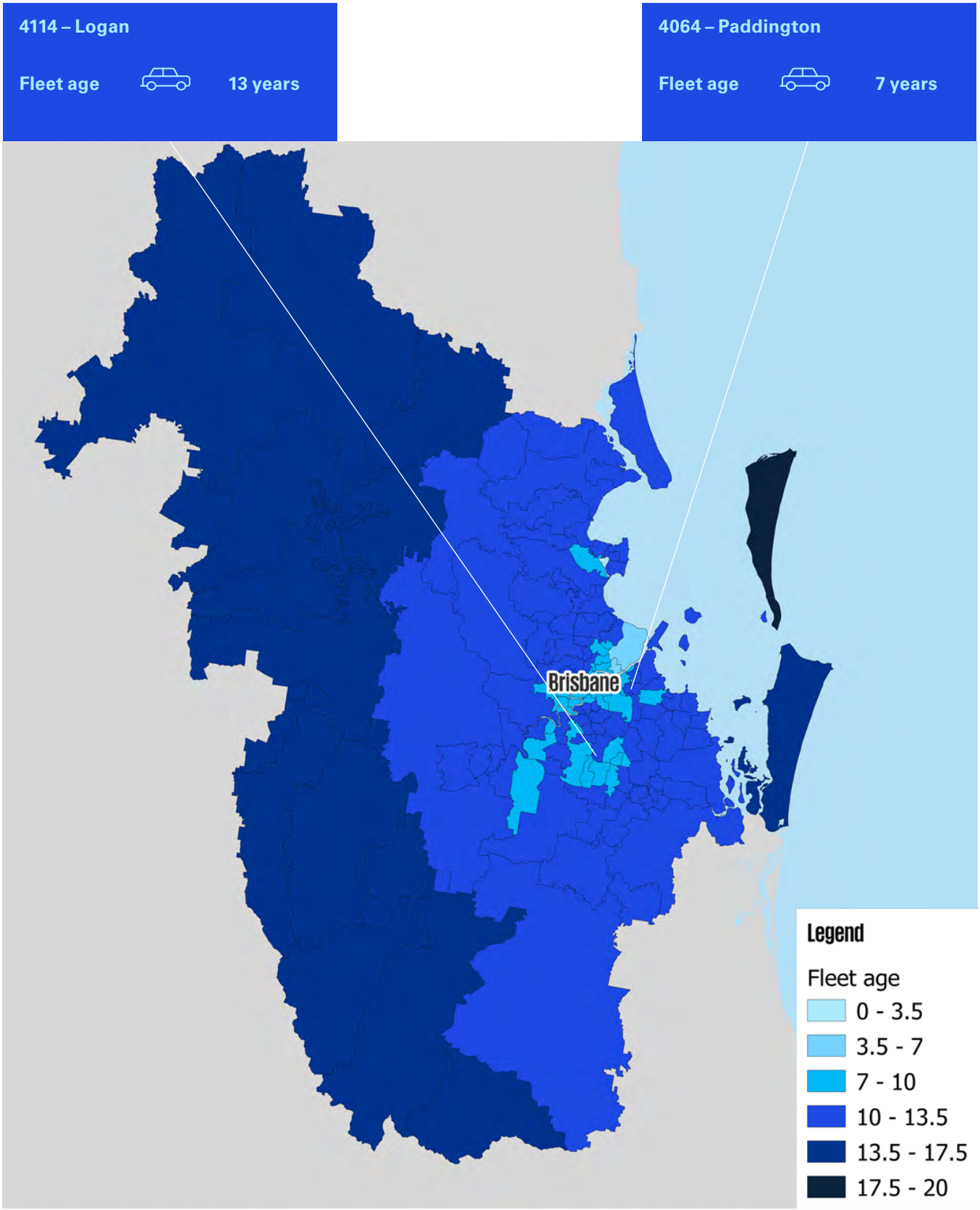
These characteristics highlight the challenges of future EV rollouts across cities and states. More time and targeted incentivisation will be needed for the postcodes with older fleets to replace their existing (conventional) cars.

Figure 2-2 A Average passenger car fleet age by postcode 2021



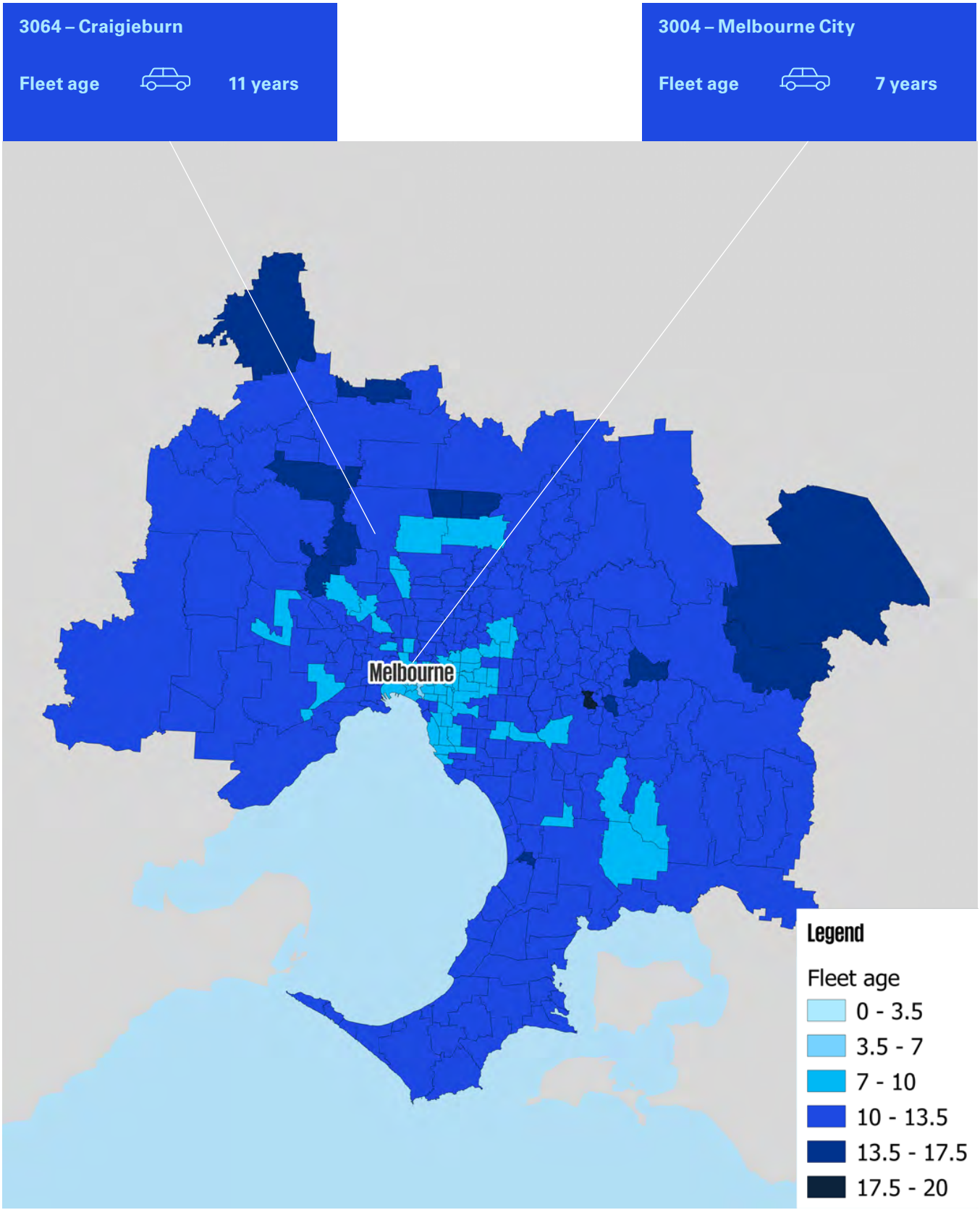
Source: KPMG analysis of ABS data

Figure 2-2 B Average passenger car fleet age by postcode 2021



Source: KPMG analysis of ABS data

Figure 2-2 C Average passenger car fleet age by postcode 2021



Source: KPMG analysis of ABS data

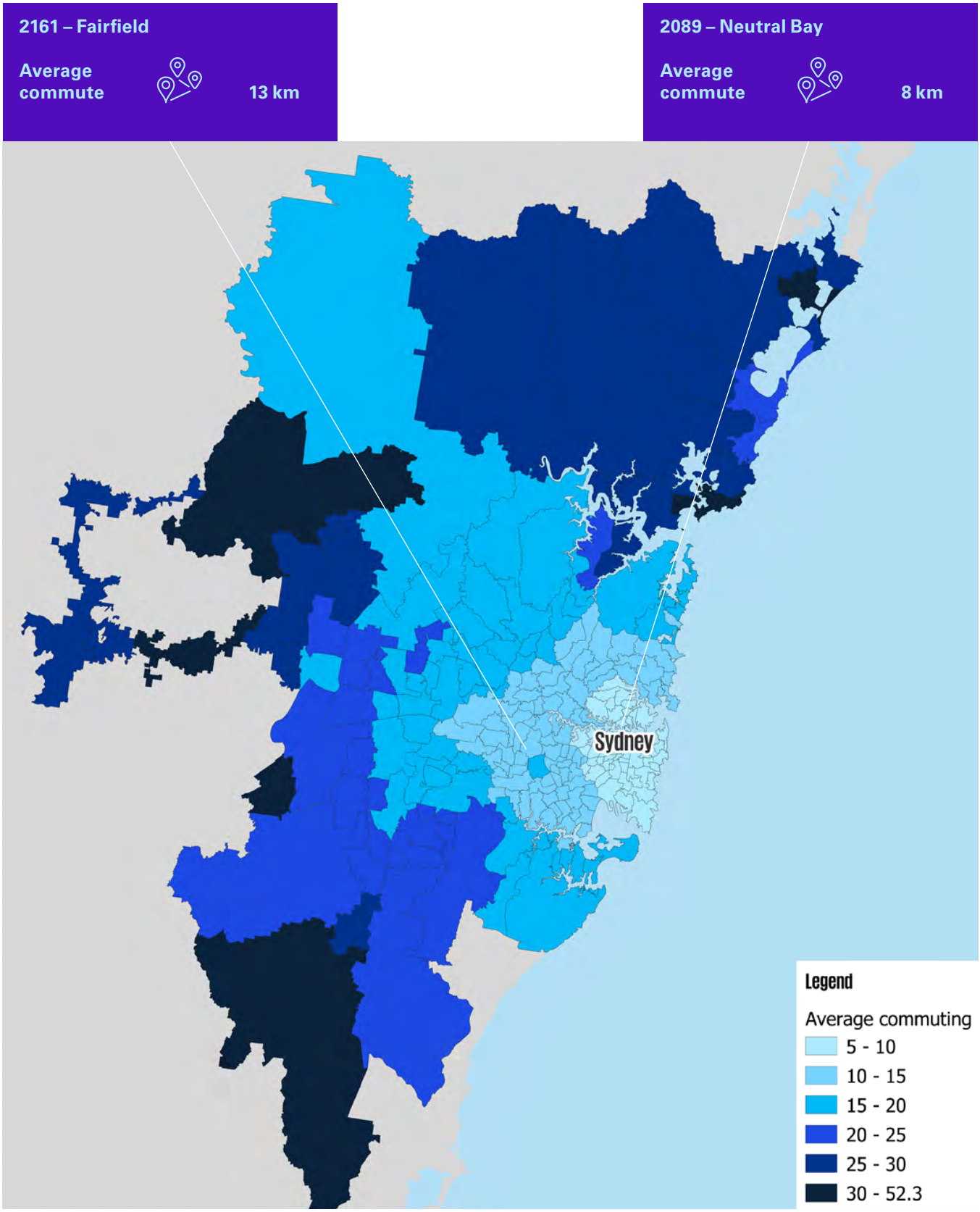
2.3 Old cars are driven farther

We have demonstrated that areas farther from the CBD tend to be populated by larger and older ICE vehicles. The average local commuting distance recorded by the ABS Census represents a readily available and nationally consistent indicator of how far we travel from home to work. Commuting accounts for about one third of all personal motor vehicle traffic across Australia's metropolitan areas; therefore, it is an important indicator of local household travel patterns.

The average commuting distances for each postcode are presented on the maps below. They show:

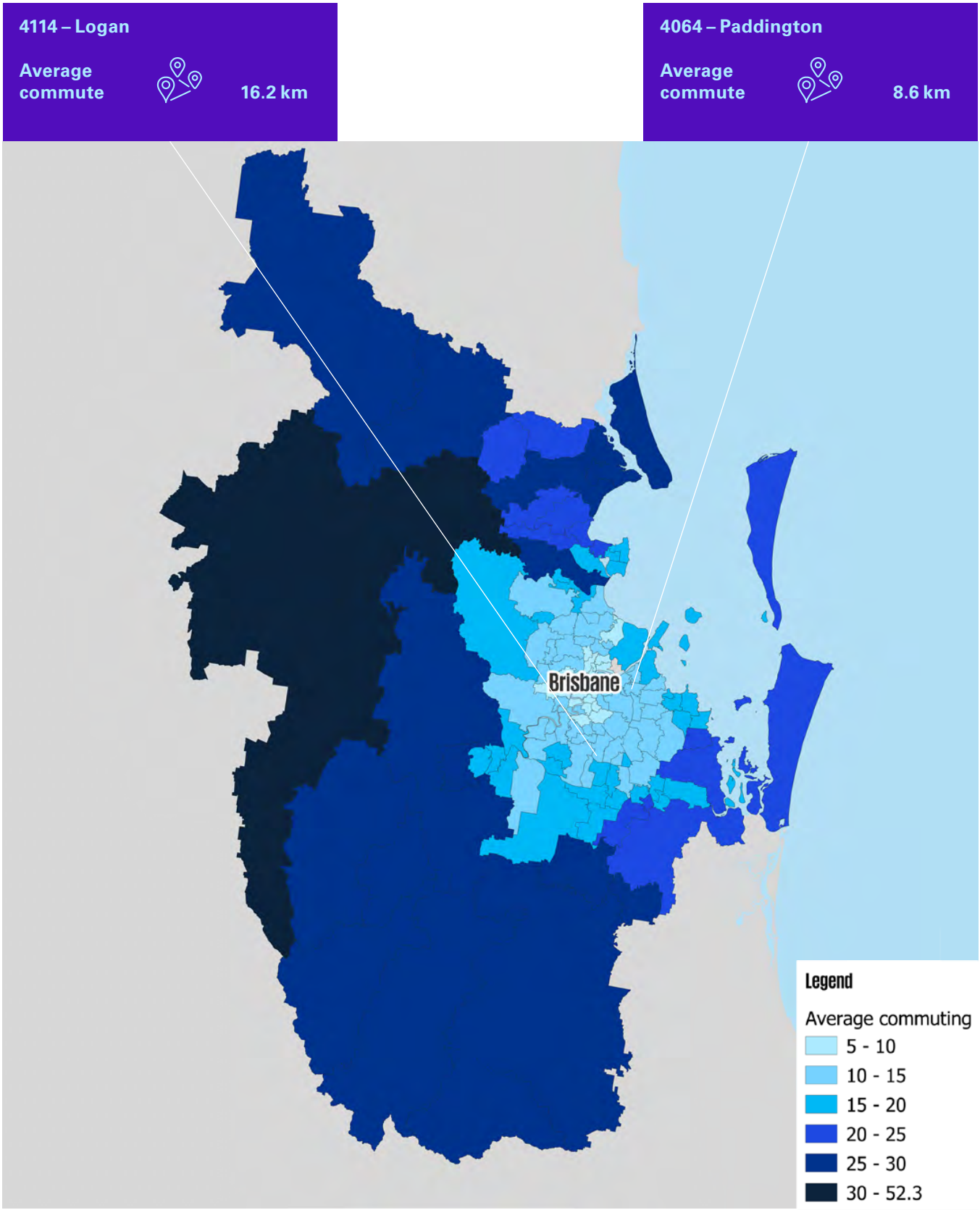
- Commuting distance increases with distance from the CBD and – where they exist – other major employment centres.
- The average commuting distance is larger in areas with older cars.
- This relationship is most pronounced in Greater Melbourne between the inner and outer-city suburbs.

Figure 2-3 A Commuting distance by postcode 2021



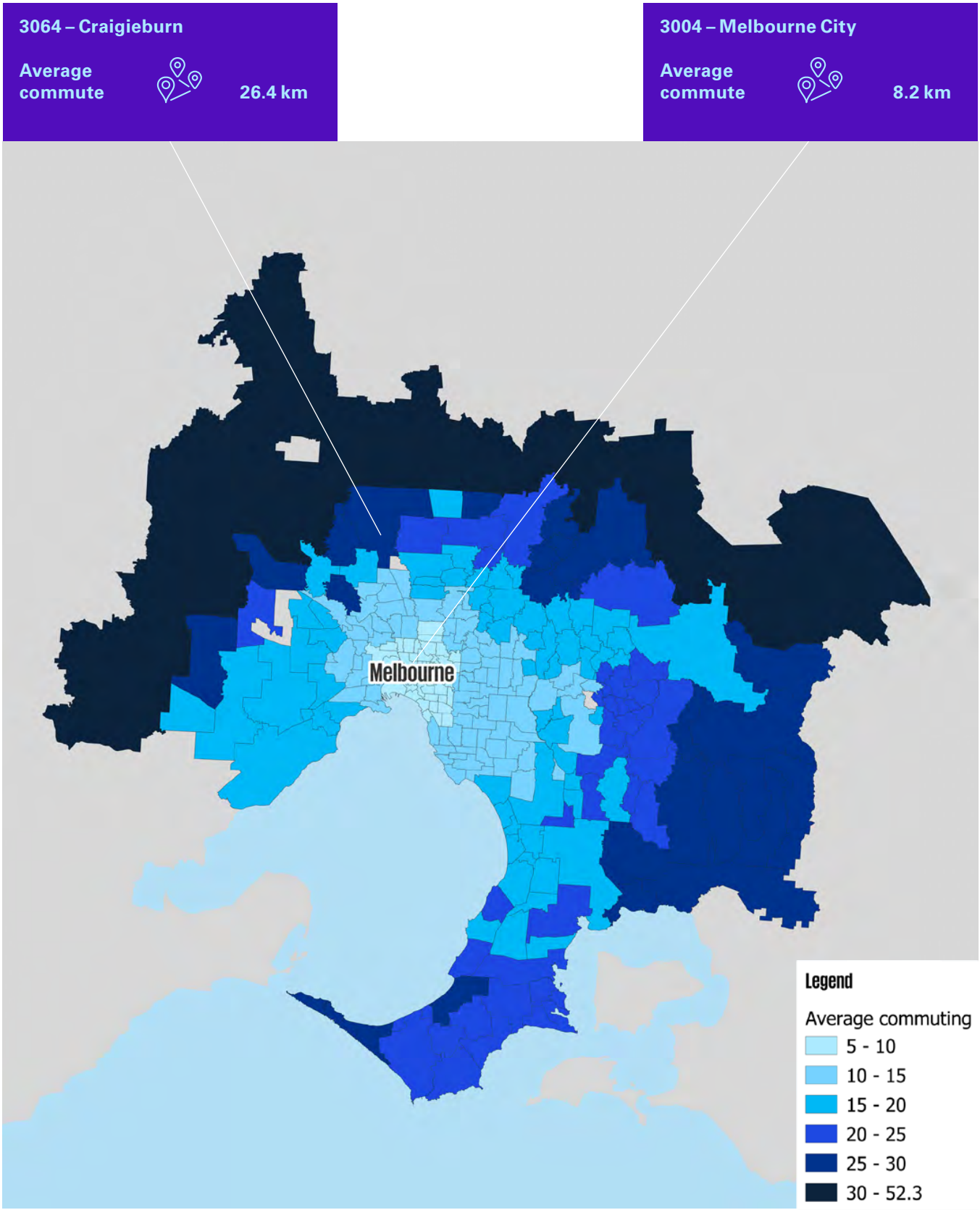
Source: KPMG analysis of ABS data

Figure 2-3 B Commuting distance by postcode 2021



Source: KPMG analysis of ABS data

Figure 2-3 C Commuting distance by postcode 2021



Source: KPMG analysis of ABS data

2.4 Vehicle emission standards in Australia

Ranging from less than five to almost 20 years old, the local average car fleet age varies substantially across the three cities. Over this period, conventional engine technology has advanced as new emission standards have been adopted internationally.

The Euro emission standards are a set of internationally recognised emission standards aimed at improving air quality and fuel efficiency from transportation-related activities. These standards currently range from Euro 1 to Euro 6, whereby:

- Euro 1 (1992): universal fitting of catalytic converters
- Euro 3 (2001): introduced nitrogen oxide limits for diesel engines
- Euro 5 (2011): imposed a limit for particle emissions in all new diesel cars
- Euro 6 (2014): expanded limits for nitrogen oxide and hydrocarbon emissions, including hybrid cars

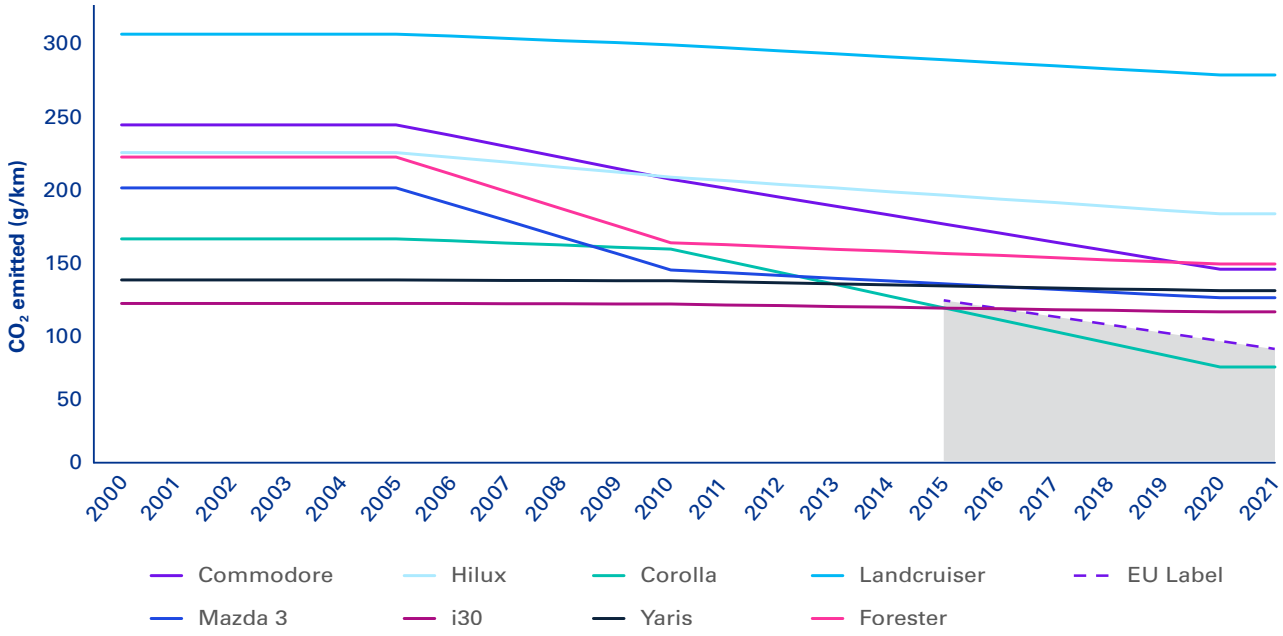
This has resulted in newer vehicles available across the market that are more efficient and cleaner.

Almost 80 percent of the international car market has adopted Euro 6 standards since 2014, including India, Mexico and China.

The current minimum standard for new light vehicles in Australia is ADR 79/04 (Australian Design Rule 79/04), which is based on the Euro 5 standards. Recent considerations by the Federal government to legislate a transition from Euro 5 to Euro 6 in Australia would greatly assist Australia's effort to further decarbonise the transport sector. The adoption of tighter vehicle emission standards in Australia is a key lever that will incentivise car manufacturers to supply more efficient vehicles and EVs into the Australian market.

The figure below tracks CO2 emissions per kilometre across eight of Australia's most common registered car models. Most models show a modest decline in average CO2 emissions over time, with decreases most pronounced in small and mid-sized cars. The chart also shows that European Union (EU) regulations and targets for CO2 emissions across the new passenger vehicle fleet of 130g/km in 2015 (set in 2009) and the 2021 target of 95g/km (set in 2014).

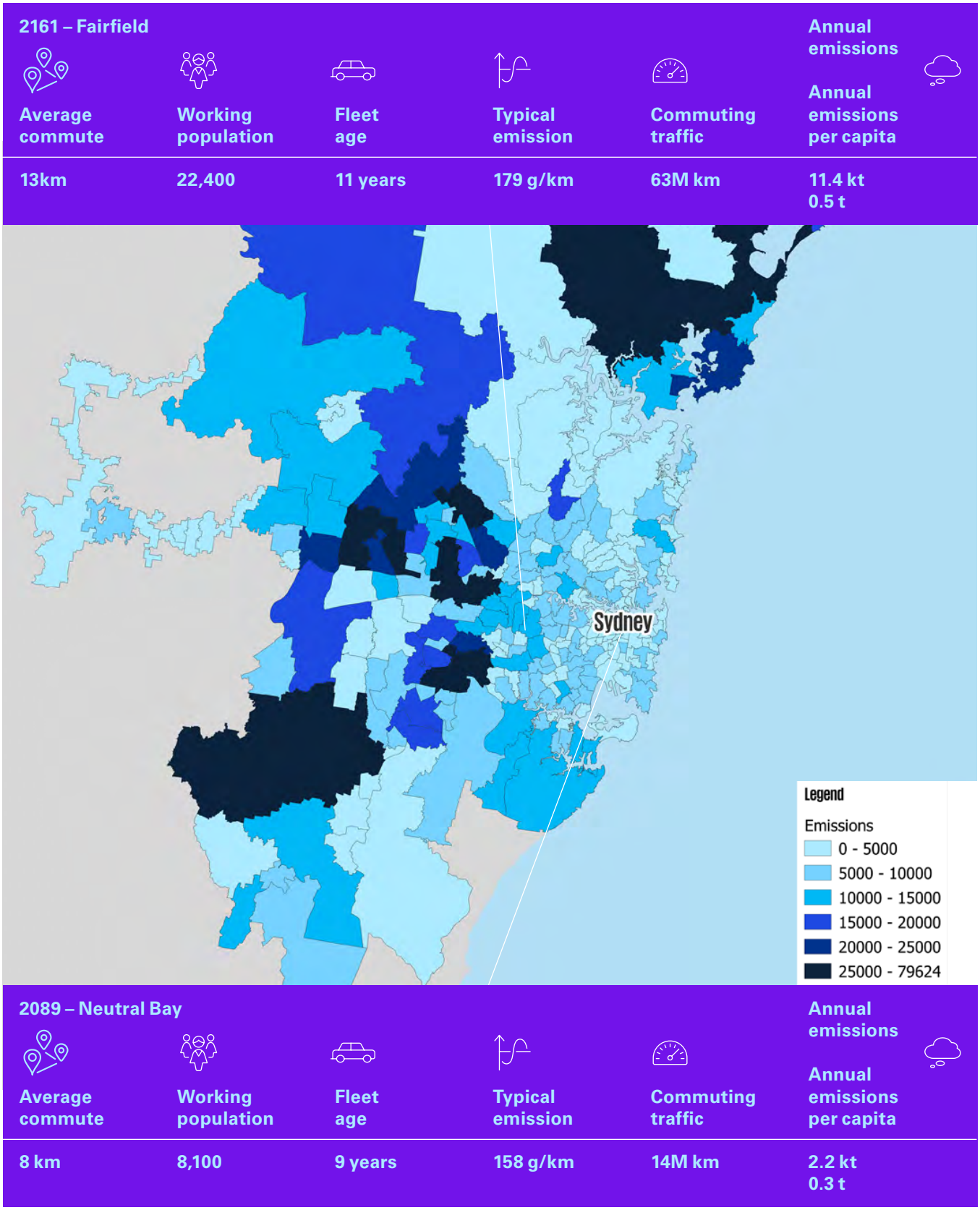
Figure 2-4 Passenger vehicles emissions (2005 to 2020) and EU targets for new passenger vehicles



2.5 Local emissions' illustrative benchmarks

The current fleet composition and household commuting patterns suggest that car type, vehicle age and commuting distance vary significantly across urban areas and clear trends emerge when these characteristics are considered for individual postcodes. This means vehicle emissions will increasingly be a local matter and subject to an area's unique fleet features and commuting trends. Figures 3.2 below illustrates this trend where we observe emissions intensifying as we travel further from the inner city.

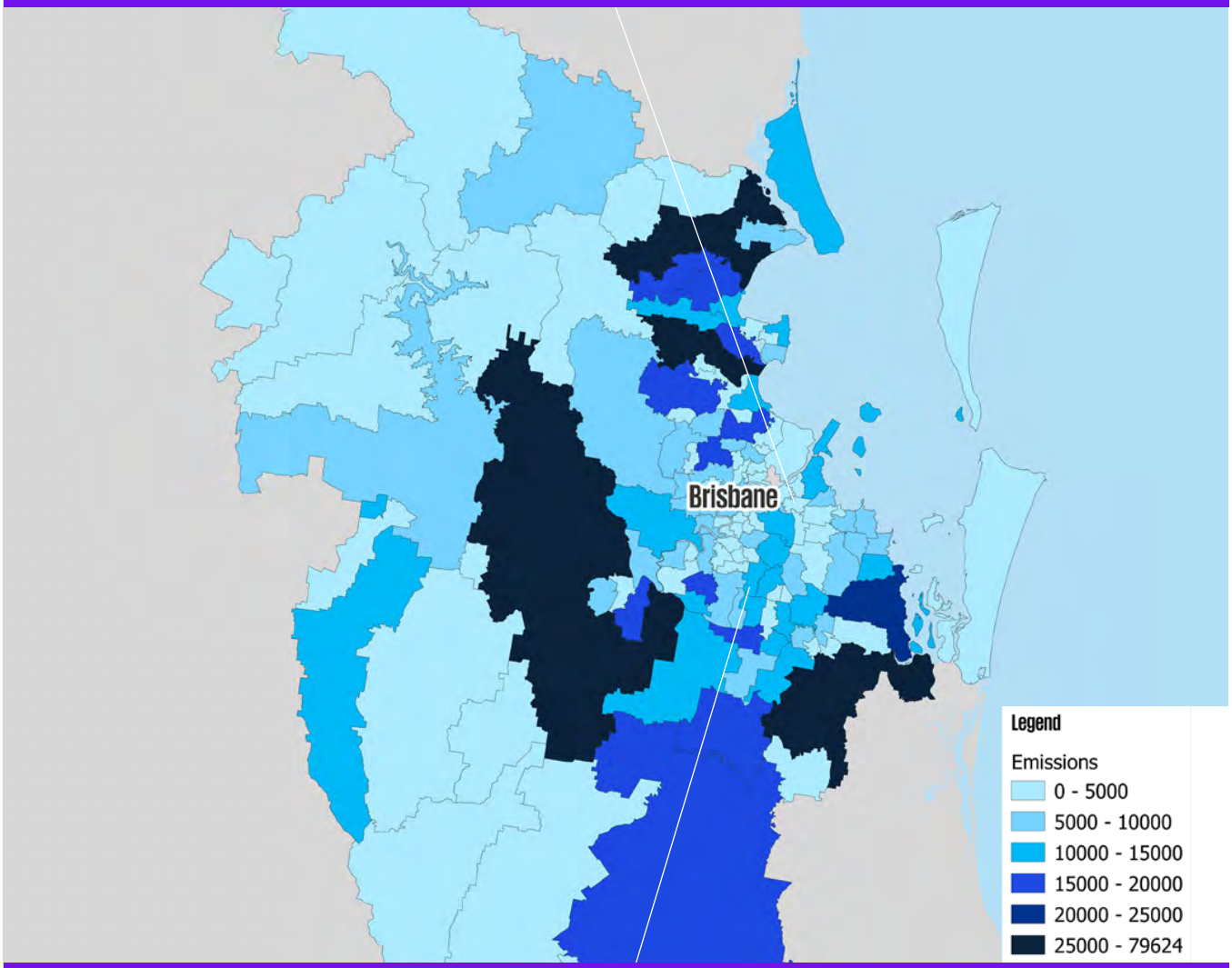
Figure 2-5 A Illustrative emission benchmarks by postcode from commuting in 2021



Source: KPMG analysis of ABS data

Figure 2-5 B Illustrative emission benchmarks by postcode from commuting in 2021

4064 – Paddington					
Average commute	Working population	Fleet age	Typical emission	Commuting traffic	Annual emissions Annual emissions per capita
8.6 km	6,400	7 years	158 g/km	12M km	1.8 kt 0.3 t

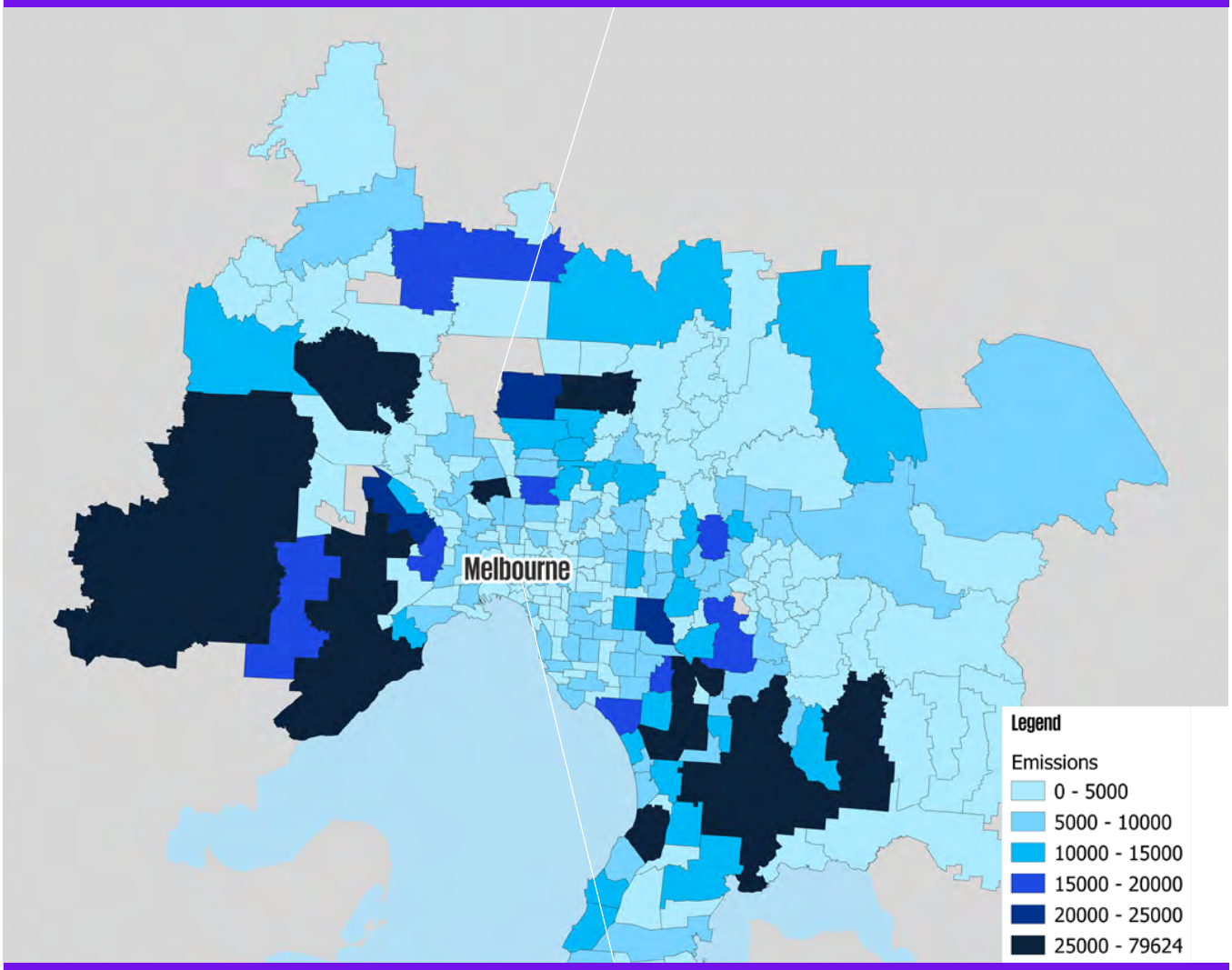


4114 – Logan					
Average commute	Working population	Fleet age	Typical emission	Commuting traffic	Annual emissions Annual emissions per capita
16.2 km	18,918	13 years	199 g/km	66M km	13.1 kt 0.7 t

Source: KPMG analysis of ABS data

Figure 2-5 C Illustrative emission benchmarks by postcode from commuting in 2021

3064 – Craigieburn					
Average commute	Working population	Fleet age	Typical emission	Commuting traffic	Annual emissions Annual emissions per capita
26.4 km	77,605	11 years	181 g/km	439M km	79.6 kt 1.0 t



3004 – Melbourne City					
Average commute	Working population	Fleet age	Typical emission	Commuting traffic	Annual emissions Annual emissions per capita
8.2 km	9,300	7 years	185 g/km	16M km	3 kt 0.3 t

Source: KPMG analysis of ABS data

3

EV uptake to 2031

While all State governments have embraced EVs as the future of personal vehicles, concrete information and projections are somewhat limited. The available State-level projections are useful in understanding certain implications and requirements in an aggregated context. However, as EV uptake is a personal choice that depends on personal conditions and preferences, prevailing market patterns and trends can only be understood at a more granular level.

3.1 KPMG's EV Insights and Analytics Platform

KPMG has developed our Electric Vehicle Insights and Analytics Platform (EVIAP). THE EVIAP is capable of tracking EV technology, socio-economic trends and policy efficacy at a local level in our major cities.

Our model estimates annualised EV registrations specific to each postcode in Sydney, Melbourne and Brisbane. The model reflects the socio-economic characteristics of each postcode as well as the state of the technology at a given point of time. These results are further combined with generalised commuting patterns and vehicle replacement rates (derived from the fleet age), allowing us to determine fleet share proportions.

Several key local socio-economic characteristics that are central to our forecast include the types of dwellings (as a proxy for EV charging at home), incomes and education levels. The technology parameters included in the model cover EV range, EV model availability and EV price.

Key outputs of our model include:

- number of new EV registrations at a postcode level
- proportion of the vehicle fleet that are EVs at a postcode level
- commuting patterns at a postcode level
- changes in fuel consumption at a postcode level
- increases in electricity demand at a postcode level
- reductions in CO_2 emissions at a postcode level.

3.2 Expected EV uptake

EV uptake is set to continuously accelerate over the coming decade. To forecast future EV uptake for in our major cities, we have undertaken extensive market research and sought global insights to develop the following future assumptions for EVs in Australia:

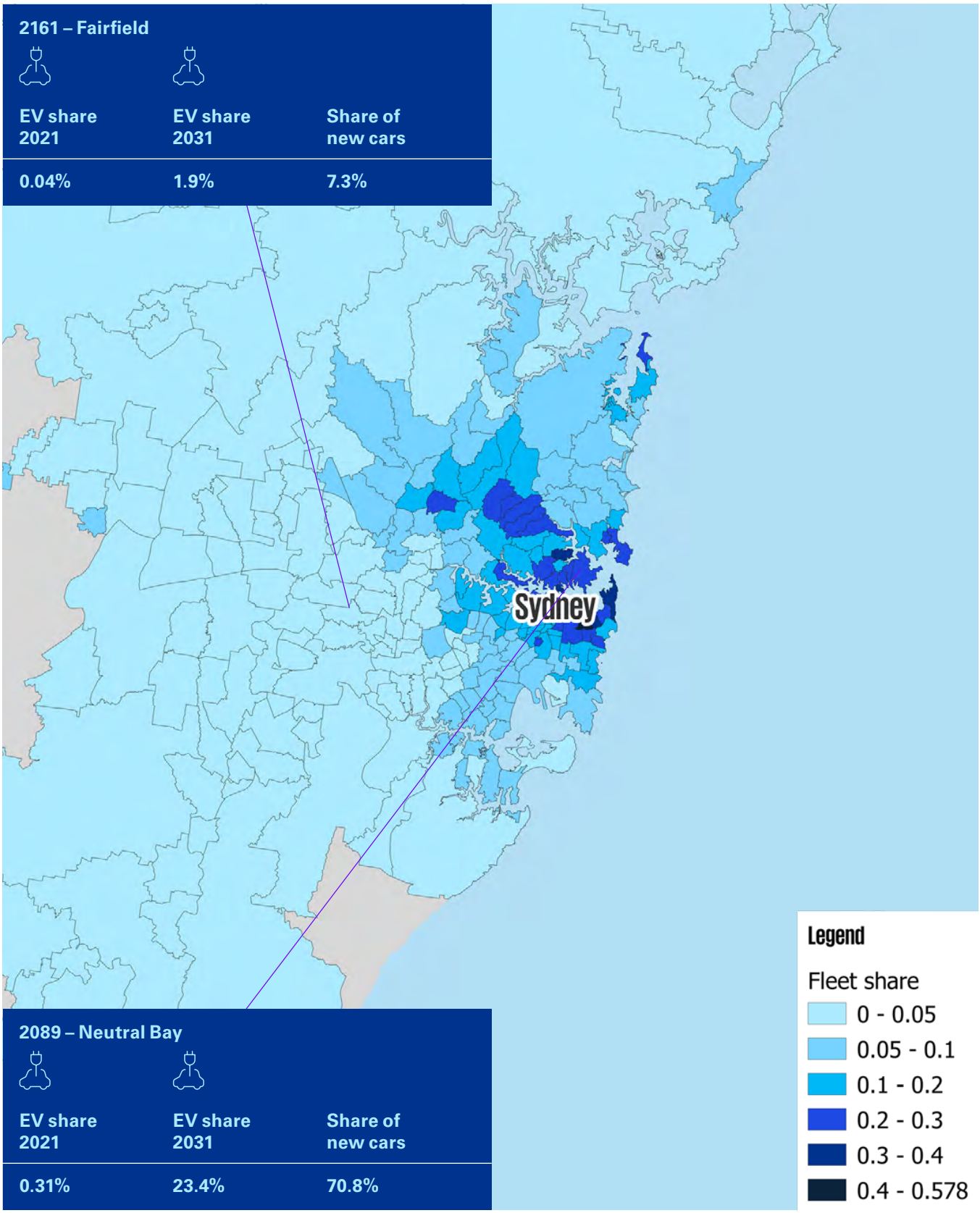
- Average range in 2031: 480km range on average for an EV (up from currently 340km on average)
- Available models in 2031: 55 different EV models (up from currently eight and similar to available conventional car models)
- Average purchase price differential in 2031: $0 price differential and price parity is reached (down from currently ~$30,000 difference in price)

The figure below provides a spatial overview of EV uptake in the major cities. Our modelling finds that the spatial distribution of EVs is starkly different across metropolitan areas. Across the three cities analysed, adoption rates are forecast to be lower in the outer suburbs relative to the inner city.

The results find that Sydney is expected to uptake EVs at a faster rate of the three cities. In Sydney it is estimated that EVs will make up around 11 percent of the total passenger fleet, 10 percent in Melbourne and six percent in Brisbane in 2031.

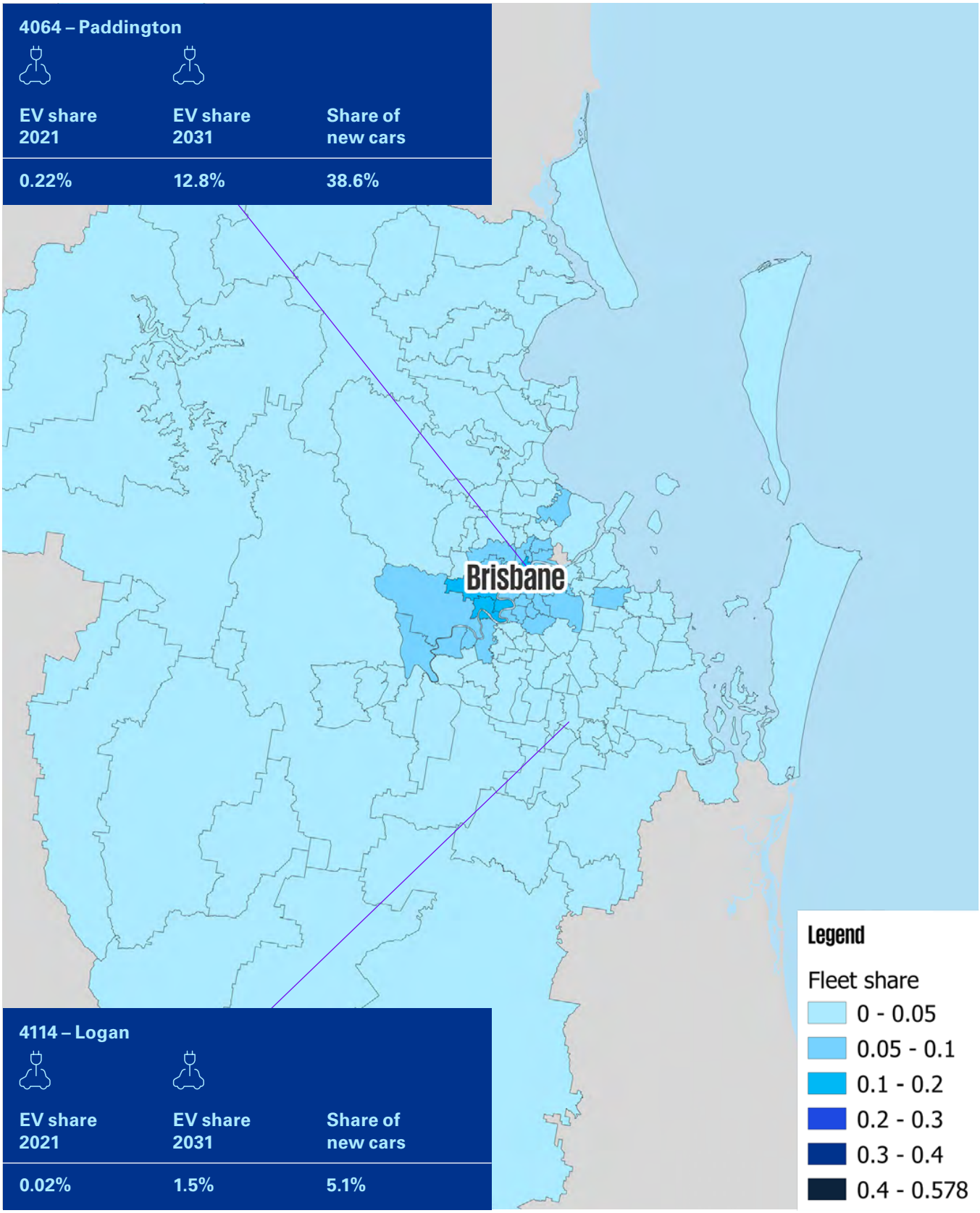
The inner-city suburbs of Sydney, Melbourne and Brisbane will see strong uptake of EVs. However, there are large parts of the outer suburbs where EV uptake is expected to be low. In these outer suburbs, the share of EVs as a proportion of the total passenger fleet may be around one or two percent.

Figure 3-1 A EV passenger car fleet shares 2031



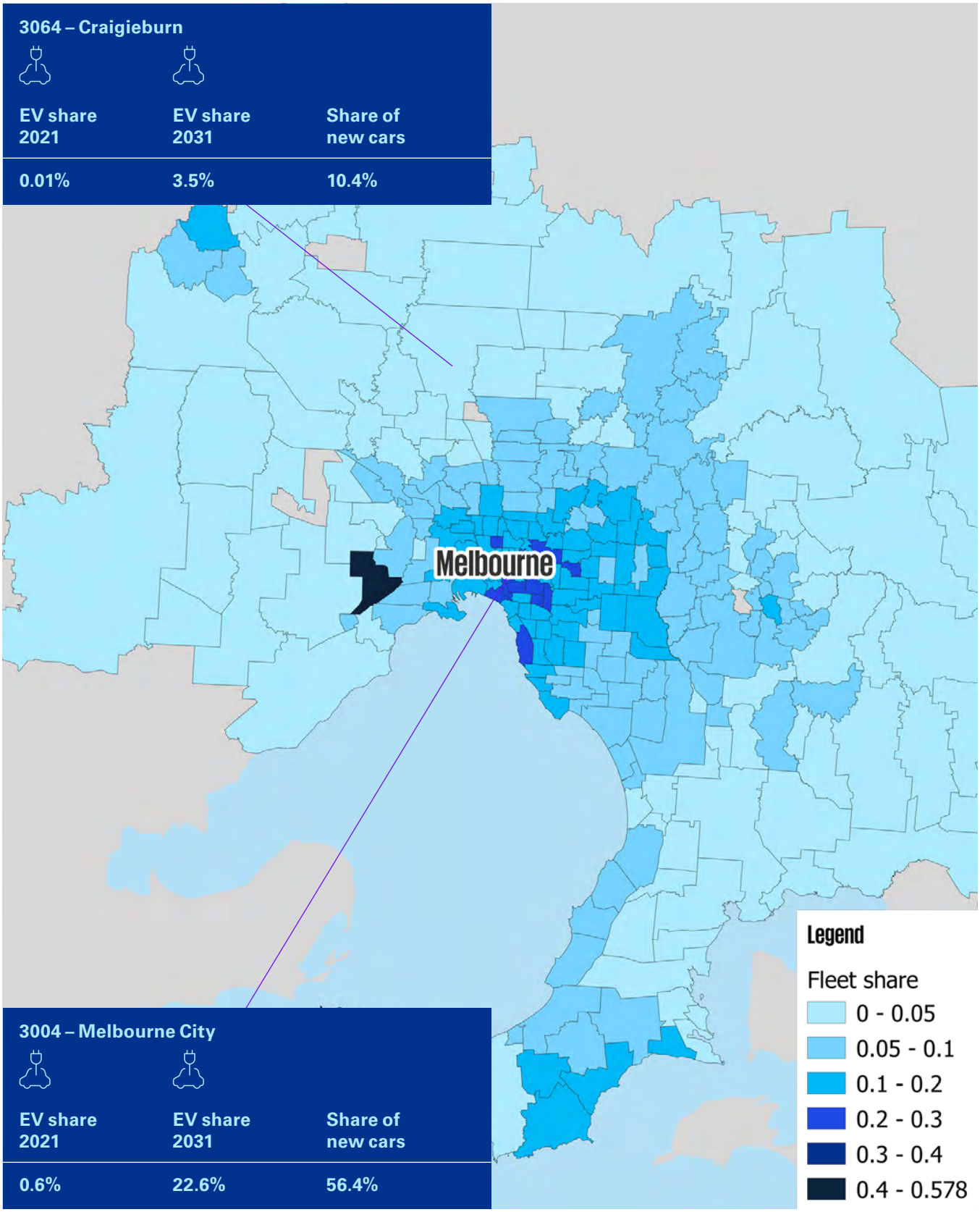
Source: KPMG analysis of ABS data

Figure 3-1 B EV passenger car fleet shares 2031



Source: KPMG analysis of ABS data

Figure 3-1 C EV passenger car fleet shares 2031



Source: KPMG analysis of ABS data

4 Emissions reduction potential

Emission target reductions are typically defined at both the national and state level in Australia. Through our work, we have found that more focus and attention is required at the local level with targeted policies to better address the differences across and within each of our major cities at a postcode level.

Using the KPMG Electric Vehicle Insights and Analytics Platform, we are able to forecast the likely reduction in CO2 from the uptake of EVs in each postcode based on typical commuting patterns.

We find that emissions reductions are a local matter and that replacing a conventional vehicle with an EV in one area will not result in the same benefit as one in another. Current EV uptake trends suggest that rates will be highest in areas in the inner city with relatively shorter commuting distances; the emissions reduction benefits in this area will not be a great as the outer suburbs. This is where policies can be targeted to increase EV uptake to meet our emission reduction targets.

4.1 Per vehicle emissions

If the current trends persist, emissions will be highest in areas with the slowest EV uptake. This will be a result of the current geographic distribution of cars across postcodes, where concentrations of older, emissions-intensive vehicles are clustered within outer suburban postcodes. In other words, replacing one conventional vehicle in an outer suburb could lead to much higher emissions reductions than replacing one in an inner city.

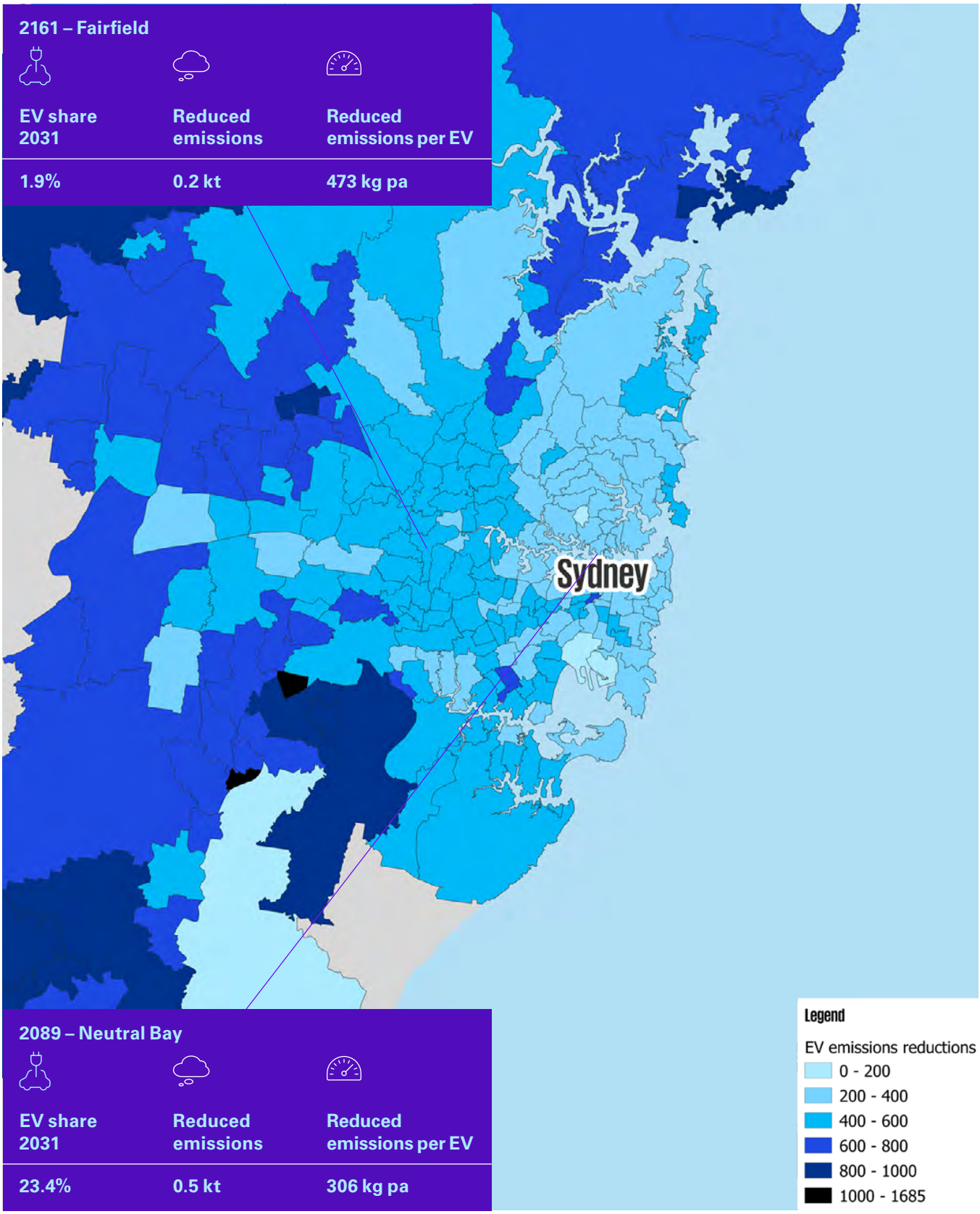
To ensure maximum effectiveness of EVs as a means of reducing carbon emissions, future policy should thus have a greater focus on incentivising EV adoption beyond inner-city households. Targeted decarbonisation effects in outer areas will yield greater emissions savings than market-driven adoption alone.

The maps below illustrate this effect and, for example, show that even though the share of EVs in the outer suburb of Craigieburn is expected to be significantly lower than in inner-city Melbourne, the emissions savings potential is significantly higher. In fact, Craigieburn is projected to have one of the lowest EV shares of all analysed areas, but its emissions savings potential is among the highest. While population size plays a role, the emissions per vehicle drive this pattern. Across the three cities and exemplary postcodes:

- The emissions savings potential per vehicle in Craigieburn is almost 10 times that of inner-city Melbourne
- Logan shows a value five times that of Paddington in Brisbane
- An EV in Fairfield could save more than 1.5 times the emissions as one in Neutral Bay in Sydney

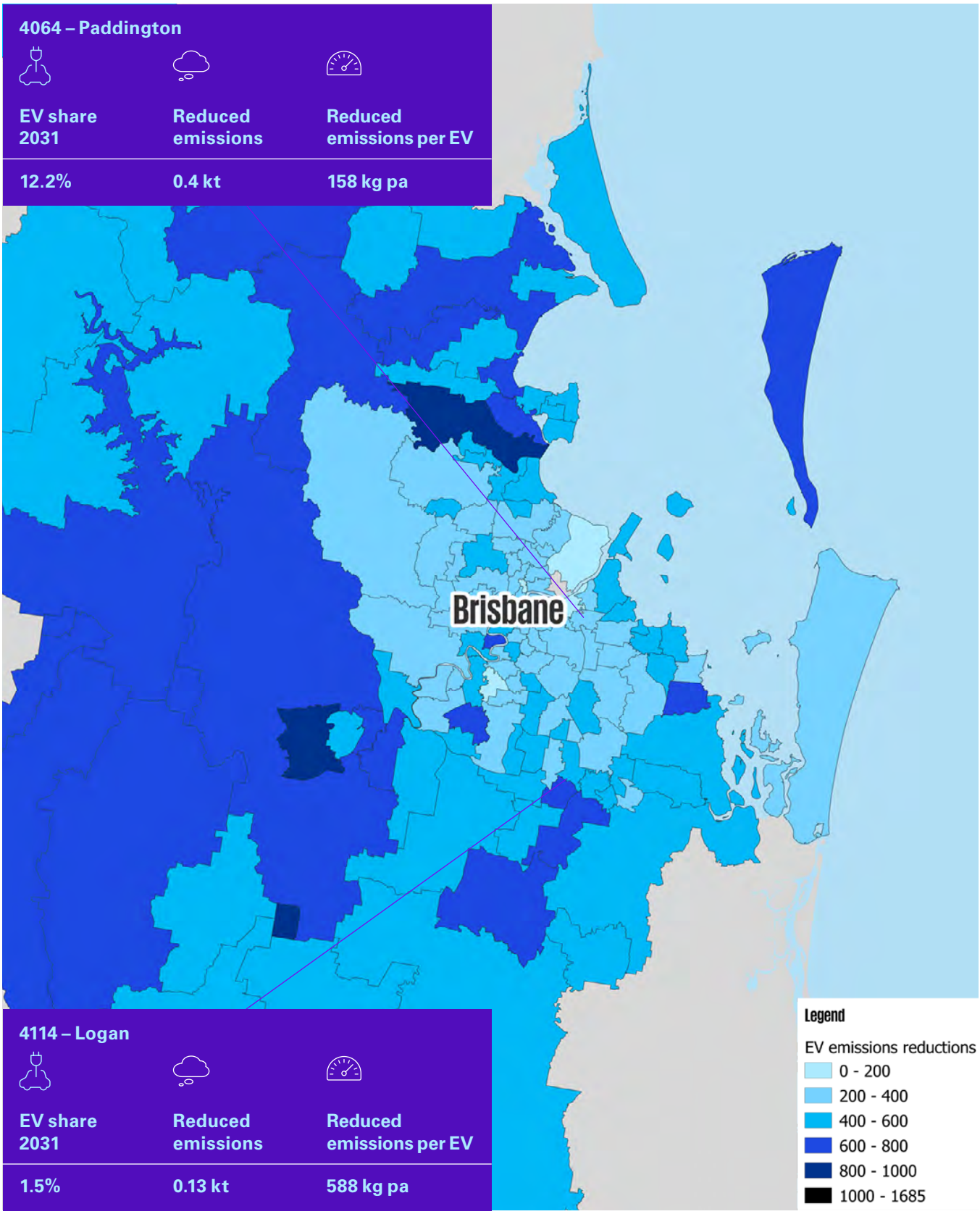
The maps show that this is a general trend where the per-EV emissions savings potential increases in the outer suburbs. This means that policies aimed at saving emissions through stimulating EV uptake are likely to be most effective if they target outer suburbs.

Figure 4-1 A EV emissions reduction potential from commuting



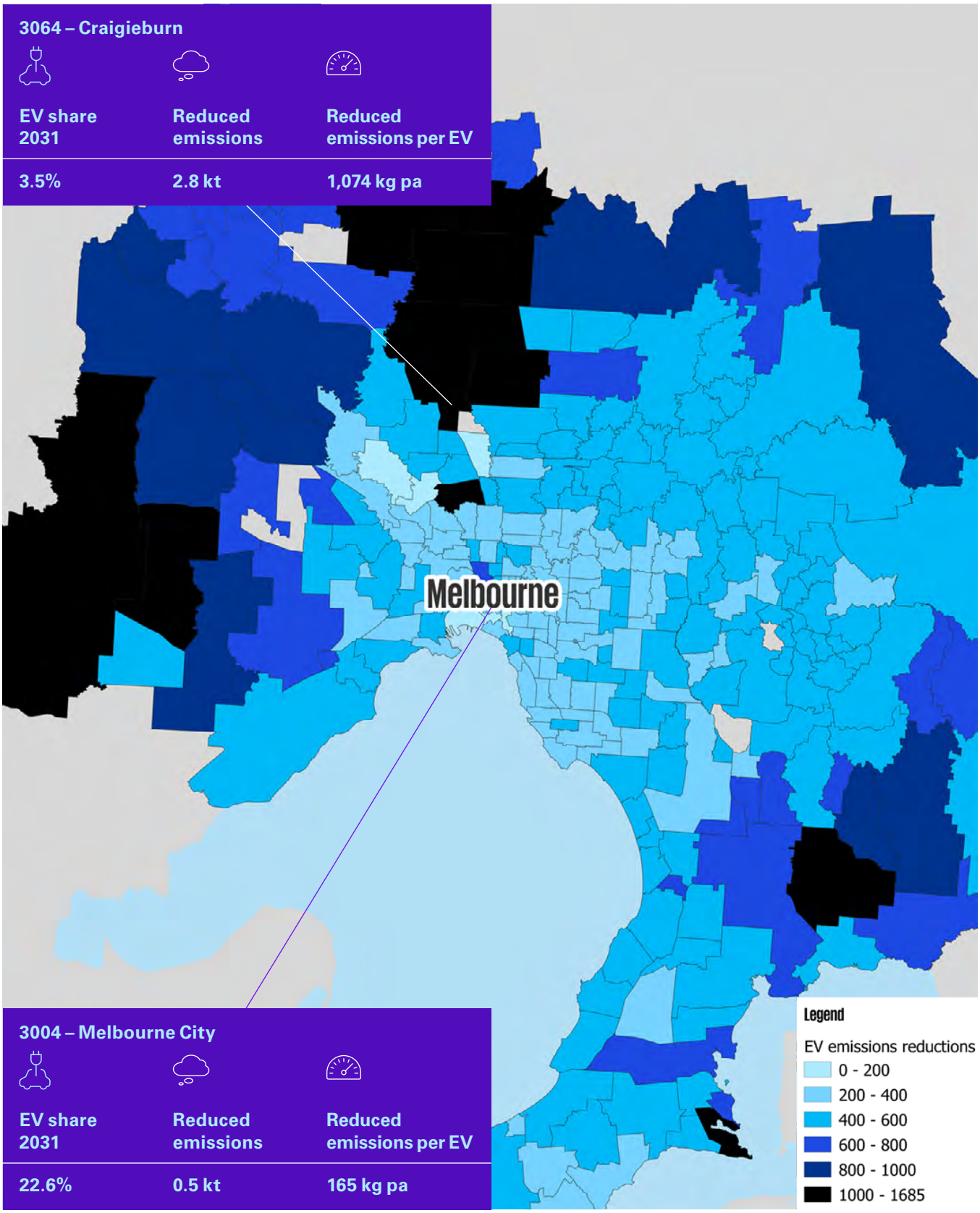
Source: KPMG analysis of ABS data

Figure 4-1 B EV emissions reduction potential from commuting



Source: KPMG analysis of ABS data

Figure 4-1 C EV emissions reduction potential from commuting



Source: KPMG analysis of ABS data

4.2 The risks of taxing emissions

In the three cities, areas with higher-emitting, aged cars often overlap with longer commutes. Based on our forecasts, these areas can also be expected to see the slowest EV uptake rates. The maps below overlay these forecasts with average income data. On these maps, blue areas indicate high incomes and high EV uptake coinciding, while pink areas show high income with a low EV uptake and teal areas the opposite.

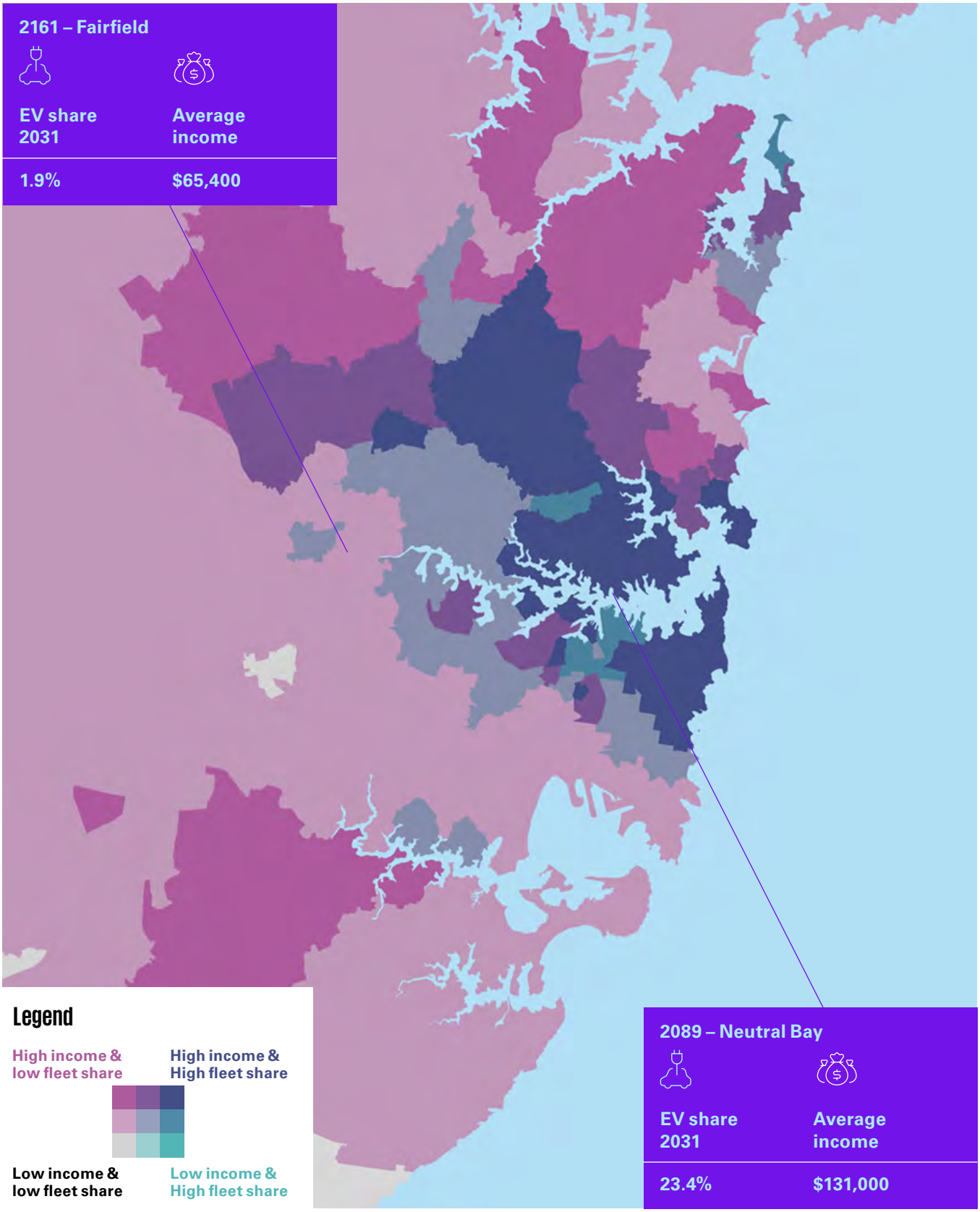
The maps show only very few darker pink areas and no teal areas suggesting a close relationship between incomes and the ability to replace a conventional with an electric vehicle. This observation has potential implications for policies aimed at accelerating EV uptake such as emission-based vehicle taxation or even the ban of selling new conventional cars.

For example, if they exceed lower income households' ability to pay, emission taxes could jeopardise car affordability for this group would result in socially undesirable outcomes such as:

- car ownership becoming unaffordable, negatively impacting earning ability
- low-income households being forced to revert to the marginal conventional vehicles (i.e. the lowest priced vehicles with maximum allowed emissions). This could even slow down emissions savings rather than accelerate them

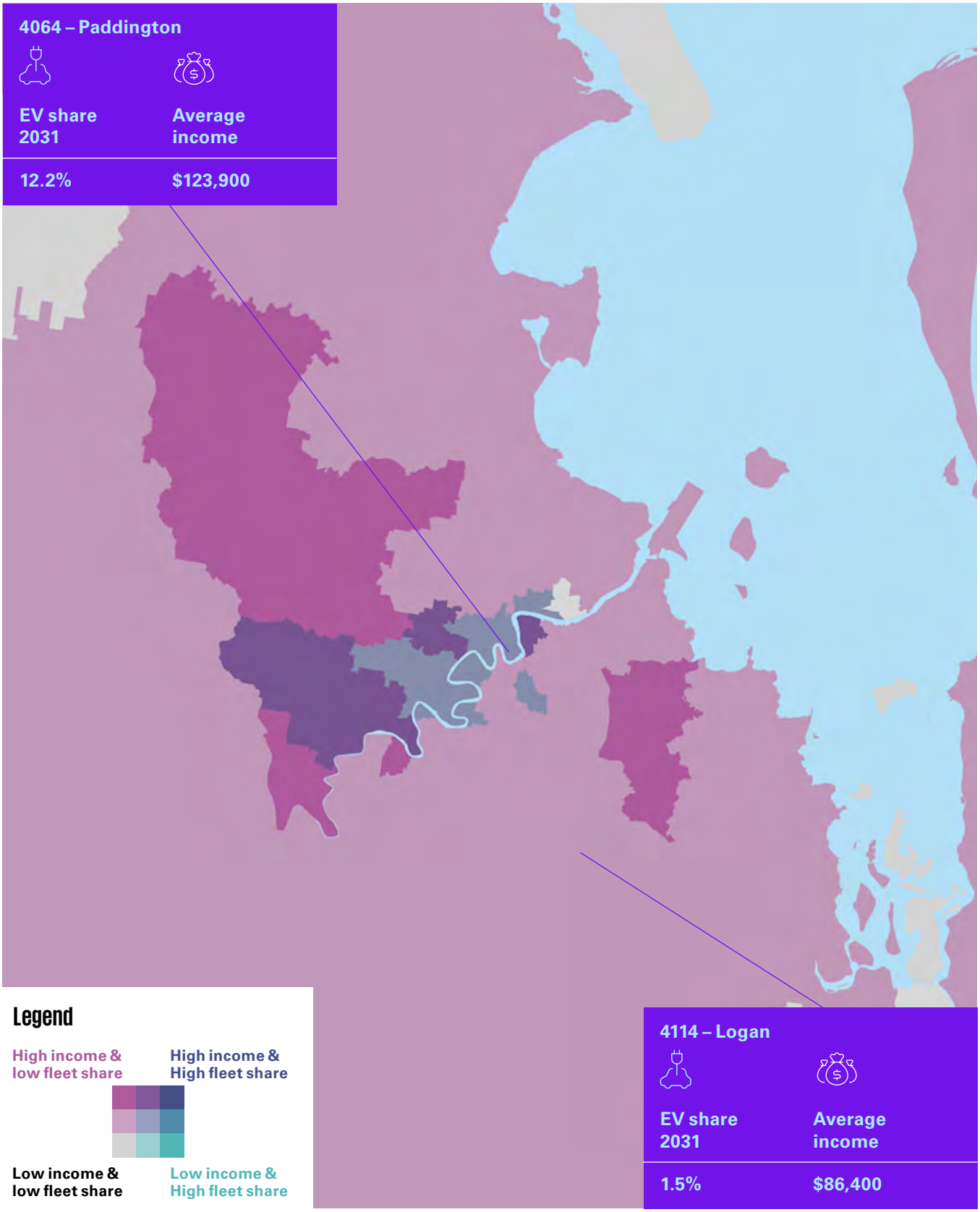
For policy makers, it will therefore be important to balance socio-economic characteristics that drive these vehicle choices and to craft policies that address our need to decarbonise the passenger vehicle fleet without creating unwanted adverse outcomes.

Figure 4-2 A Incomes vs. 2031 EV uptake



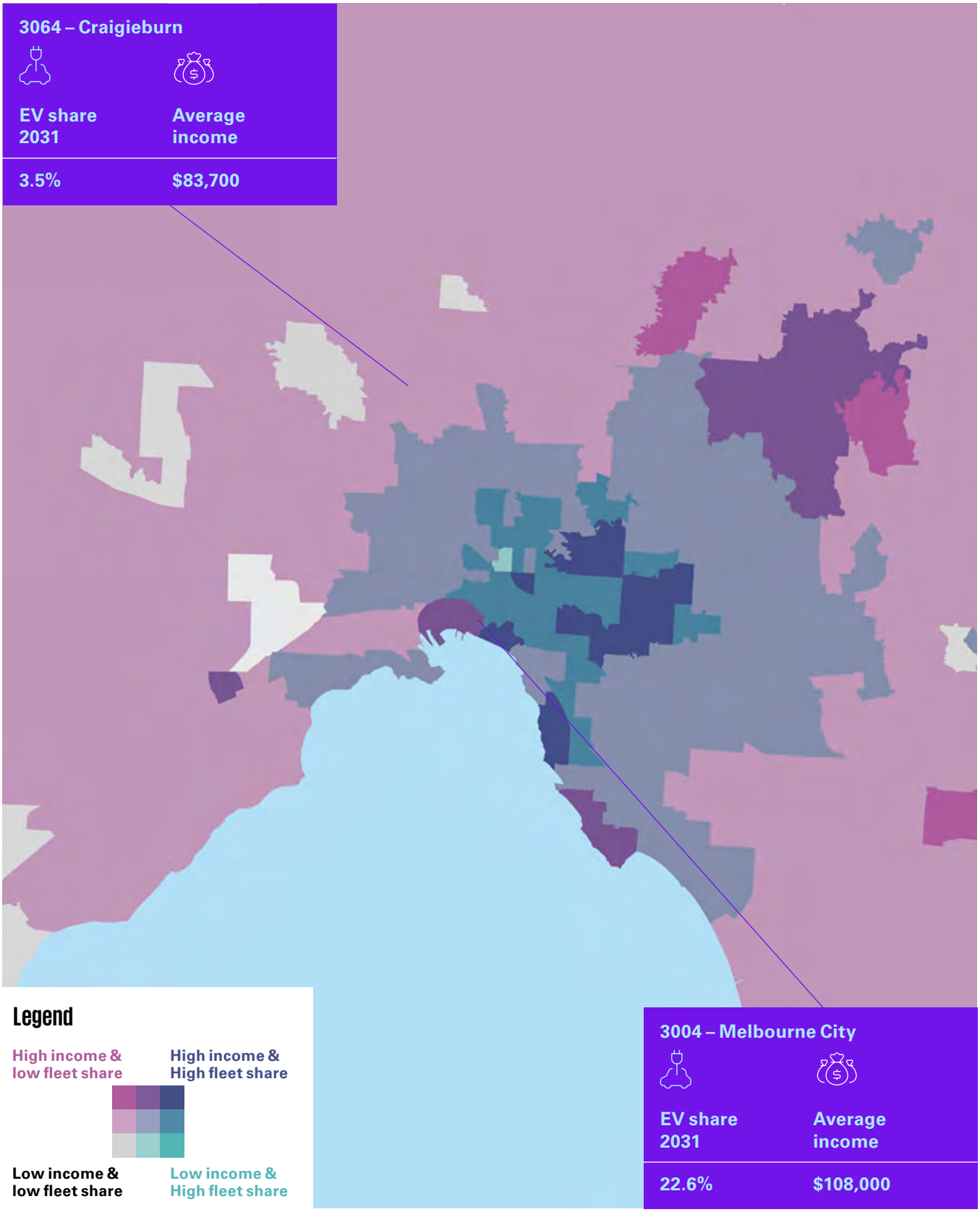
Source: KPMG analysis of ABS data

Figure 4-2 B Incomes vs. 2031 EV uptake



Source: KPMG analysis of ABS data

Figure 4-2 C Incomes vs. 2031 EV uptake



Source: KPMG analysis of ABS data

4.3 Accelerating local EV uptake where it matters

We have shown that if the current patterns and trends persist, EV uptake can be expected to be fastest in the inner city. This could put emission targets at risk as the car fleet in outer urban areas tends to be older, higher-emitting and travel farther. In these same areas, households could find it more difficult to react to EV uptake-promoting policies as their ability to replace their conventional cars can be limited.

A range of market interventions could address this dilemma and promote EV uptake acceleration where it matters while alleviating some of the financial pressures of replacing a conventional car. A package of initiatives could include:

- **Adequate supply of EVs**

  EV import campaigns could ensure that (new) EVs desired by the Australian market are available. Adopting the Euro 6 vehicle emissions standards will also send a signal to the market to offer lower emissions vehicles to Australia, including EVs. Accelerated government and private fleet conversions will play a further crucial role as they can help create a second-hand market relatively quickly due to their relatively short replacement cycles.

- **Affordable vehicles and model availability**

  Ongoing purchase incentives for lower priced vehicles and/or lower income households could help level the playing field and promote a more even uptake across metropolitan areas. We have also shown that in our major cities, there is a large proportion of the market that prefers larger vehicles such as the Holden Commodore, utility vehicles such as the Toyota Hilux and off-road such as the Toyota Landcruiser. Supporting the importation of vehicles that match driving preferences of each postcode will enable more choice for consumers.

- **Targeting long commutes**

  EV commuting could be subsidised to make it more attractive than commuting in a conventional car. European policies could be considered as a reference point for this concept. For example, commuters in Austria are granted a fixed (income) tax exemption which increases based on the distance to the workplace and with the absence of public transport alternatives. In such a model, each kilometre exceeding a commute above an initial pre-set distance could be made (income) tax deductable for EVs. This could be implemented in a similar way as the ATO's tax deduction for business-use vehicles.

By addressing issues identified at the postcode level and addressing them strategically with tailored policies, Australia will be able to transition to an EV fleet more effectively and realise its emission reduction goals.

The KPMG Electric Vehicle Insights and Analytics Platform

Electric vehicles are critical for Australia to meet its net zero emissions goals. The Federal and State Governments have set important targets for our transition and developed policies to support Australia's journey to decarbonise transport.

The KPMG EV Insights & Analytics Platform considers a wide array of data points to provide a more comprehensive understanding of current EV uptake trends and uses bespoke analytics to predict future uptake at a local level. With this information policy-makers and business can best decide how to tailor future policies and investments to make the most of the EV opportunity.

KPMG's Planning & Infrastructure Economics team, part of our Infrastructure, Assets & Places group, can help plan for our cities and regions for now and the future by helping develop and prioritise projects that address the immediate and long term requirements to generate sustainable benefits for the community.

Contact us

Ben Ellis
Partner
E: benellis@kpmg.com.au

Simon Sagerer
Associate Director
E: ssagerer@kpmg.com.au

Susannah Jefferys
Associate Director
E: sjefferys1@kpmg.com.au

Jason Baena-Tan
Consultant
E: jbaenatan@kpmg.com.au

KPMG.com.au

October 2022 962608286IAP