ARUP

Road mapping an equitable electric vehicle transition

Shaping Perth's net zero transport future

Electric vehicle (EV) uptake is critical for Australia to meet its net zero commitments.

Responsibility for the transition has fallen to the state governments, with each state and territory at different states of adoption.

Introduction

The city of Perth is in a unique position to learn from other cities and create an equitable transition to EVs – one that includes people from all backgrounds and demographics.

In collaboration with the University of Western Australia, we undertook extensive research to develop a roadmap to guide policy makers. We reviewed international best-practice policies from leading EV jurisdictions and shared this for Perth's unique needs and existing infrastructure landscape.

Taking a data-driven approach, we created a spatial roadmap with actions for policy makers that ensure the transition is equitable. Each action is linked spatially to an area of Perth considering the socioeconomic and geographic context and supported by a detailed literature review incorporating lessons learned for cities across the globe.

Data is a powerful tool to drive equitable policy outcomes. When combined with collaboration between industry, manufactures and government we can facilitate a net zero transport future that is inclusive and accessible to all.

Sinead Thompson
Environmental Engineer,
Arup

How policy drives EV uptake

Effective policy is essential for accelerating EV adoption, including tax incentives, fuel efficiency standards and establishing minimum compliance for EV-readiness in new construction.

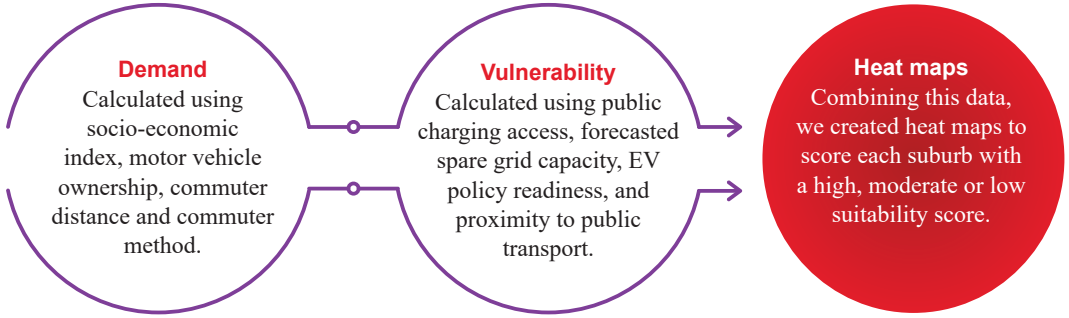
Currently, Australia is one of two developed countries in the world without fuel efficiency standards. From January 1, 2025, this will change with the new vehicle efficiency standard (NVES) set to commence. This standard is a valuable tool to encourage the phase out of internal combustion engine vehicles (ICEVs). By setting average targets, typically in carbon dioxide released per km, manufacturers are restricted in their ability to sell high-polluting ICEVs.

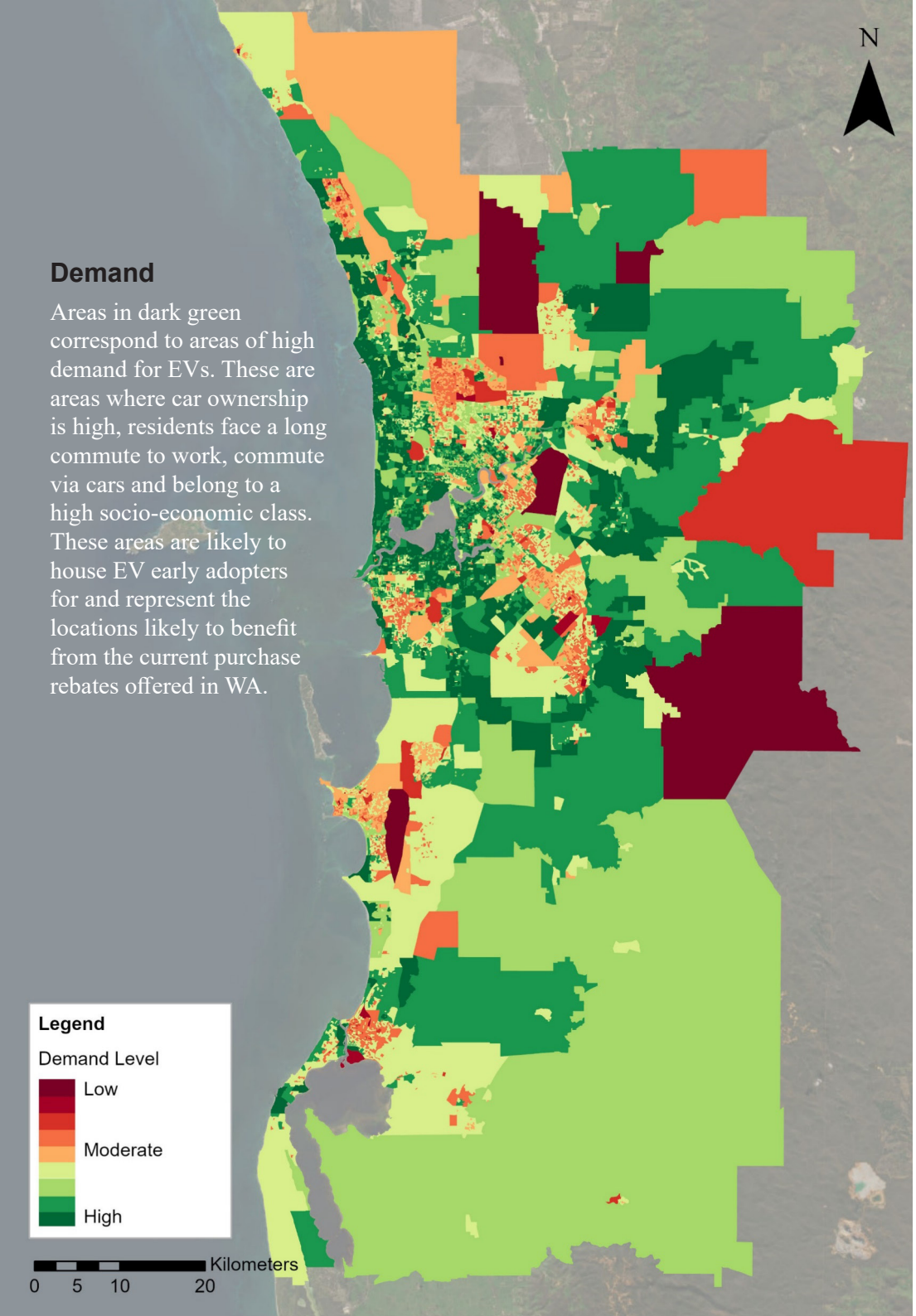
Construction codes can also accelerate adoption by mandating facilities for charging equipment in new buildings and public carparks. The Australian Government has recently made several changes to the National Construction Code. From October 2023, all new car parks must be fitted with electrical distribution boards dedicated to EV charging.

WA is making progress with the State Electric Vehicle Strategy and the Electric Vehicle Action Plan. While both strategies make important pledges to invest in large-scale infrastructure upgrades, update standards and develop the manufacturing industry they do not address equity barriers that inhibit EV uptake.

Spatial analysis and heat mapping

To develop a roadmap for an equitable transition, we first needed to understand the barriers and drivers of the transition in Perth. Using geographic information system (GIS) software, we undertook a spatial multi-criteria assessment to understand the vulnerability and demand for EV uptake in Perth.

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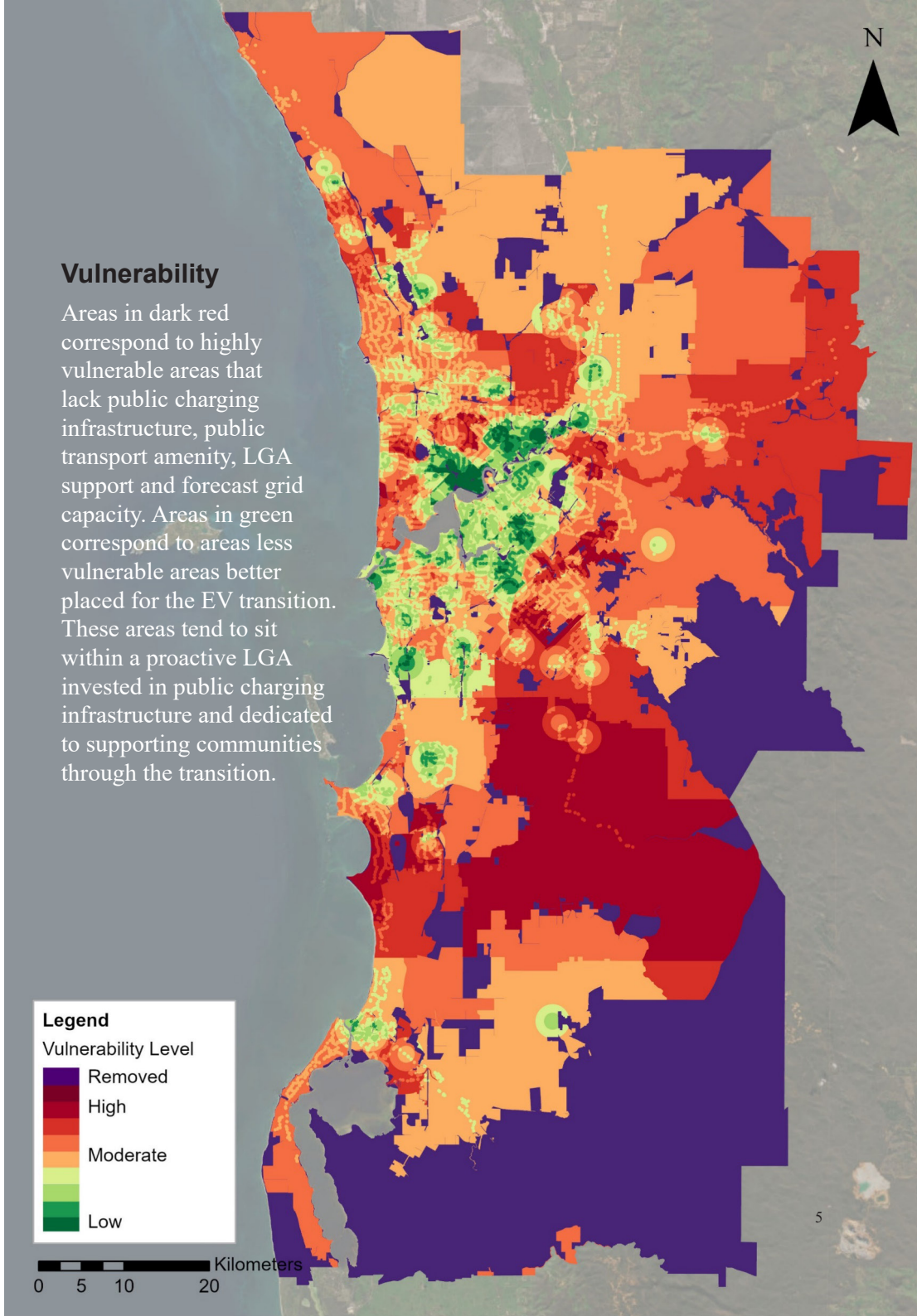
Demand
Areas in dark green correspond to areas of high demand for EVs. These are areas where car ownership is high, residents face a long commute to work, commute via cars and belong to a high socio-economic class. These areas are likely to house EV early adopters for and represent the locations likely to benefit from the current purchase rebates offered in WA.
Legend
Demand Level
Low
Moderate
High
Kilometers
0 5 10 20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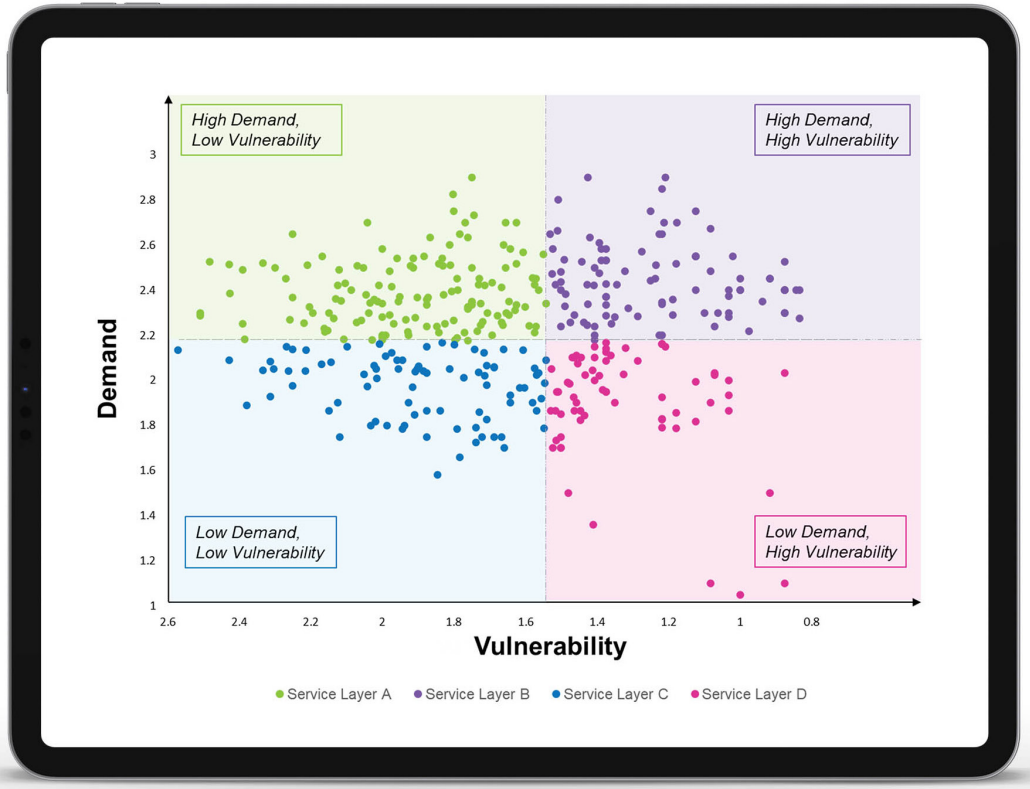
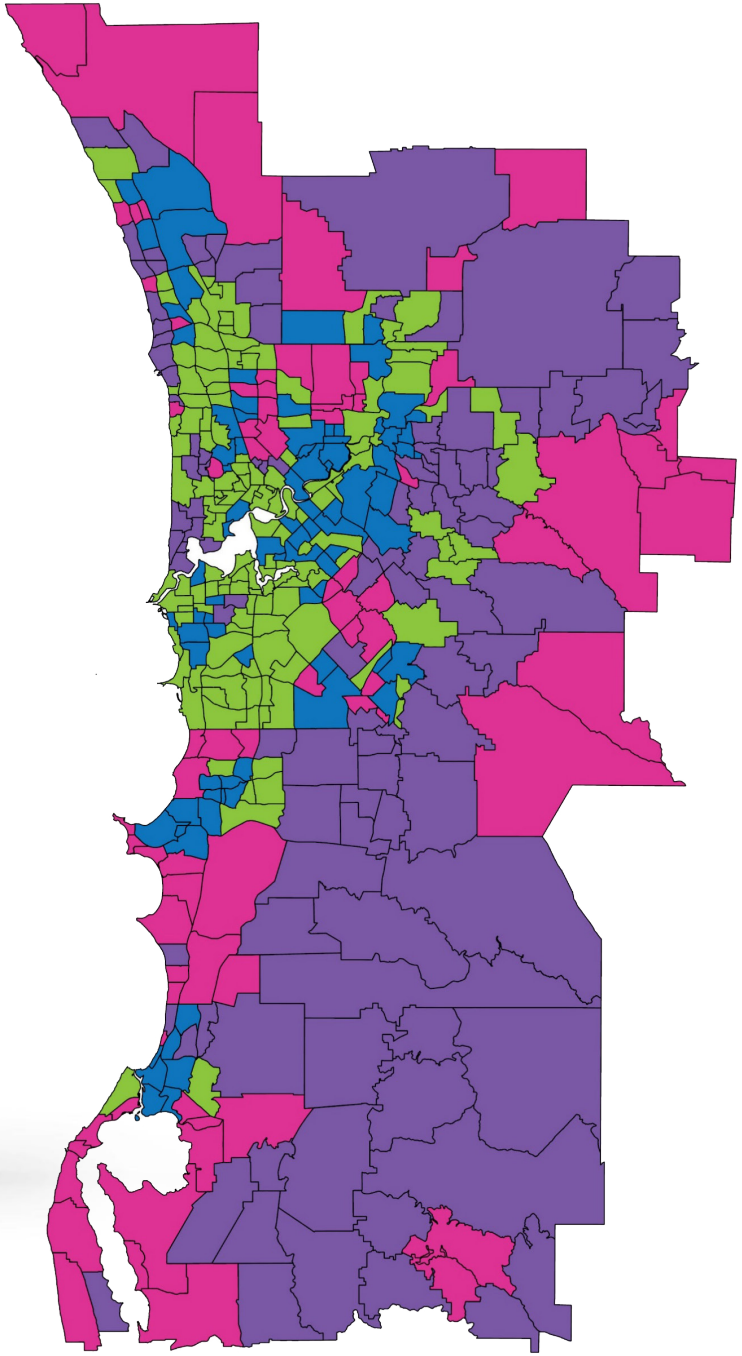
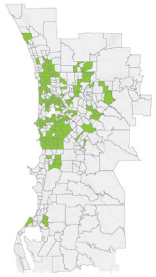
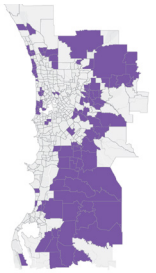
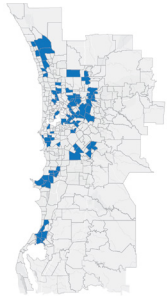
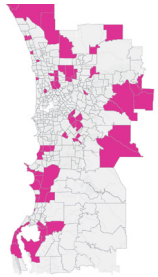
Vulnerability
Areas in dark red correspond to highly vulnerable areas that lack public charging infrastructure, public transport amenity, LGA support and forecast grid capacity. Areas in green correspond to areas less vulnerable areas better placed for the EV transition. These areas tend to sit within a proactive LGA invested in public charging infrastructure and dedicated to supporting communities through the transition.
Legend
Vulnerability Level
Removed
High
Moderate
Low
Kilometers
0 5 10 20

Four service layers – combining demand and vulnerability

To develop targeted policy that supports an equitable transition, demand and vulnerability must be considered together. We designed a framework dividing Perth into four service layers based on the interaction between demand and vulnerability.





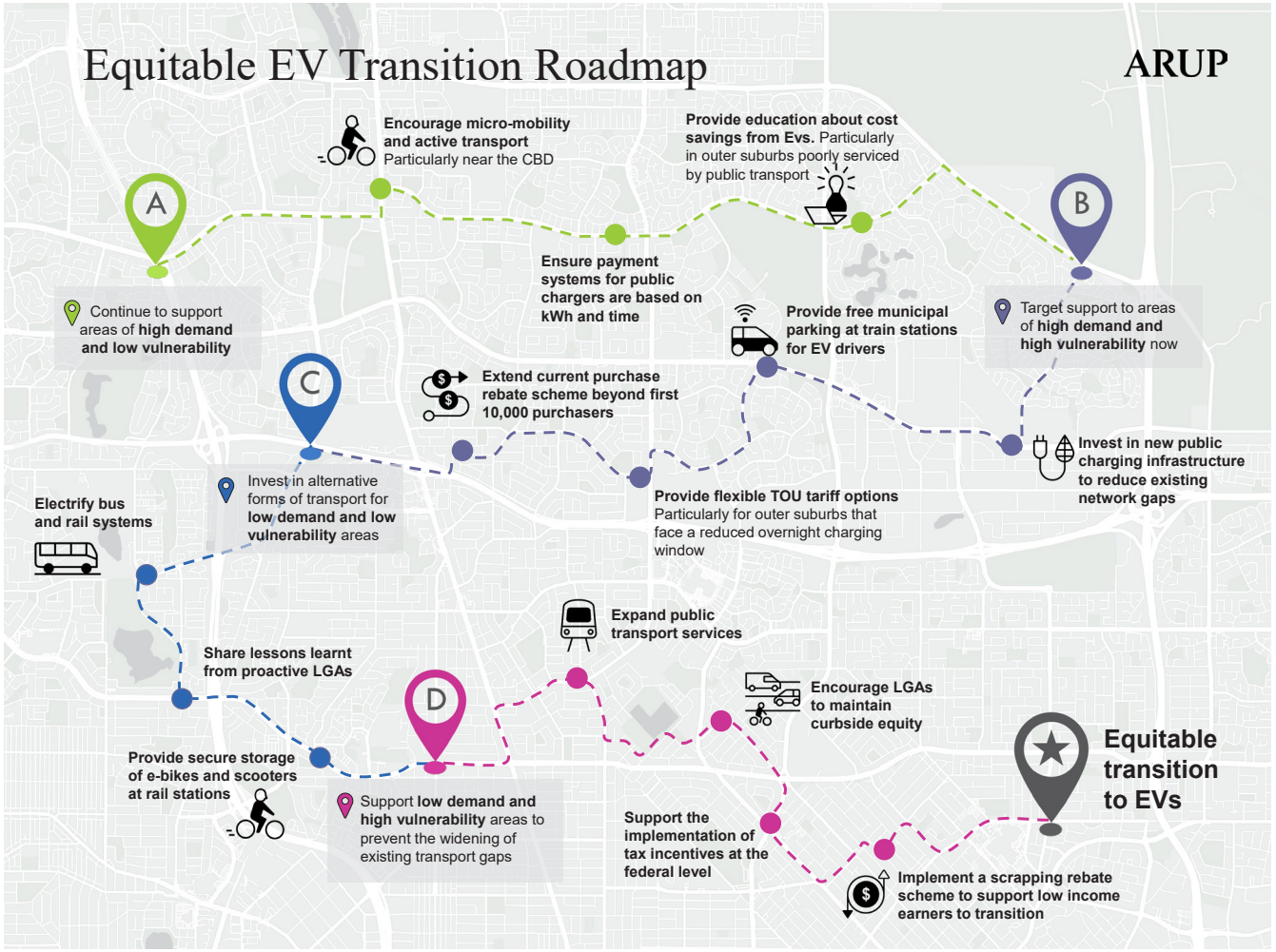
Service layer		Description	Key Policies / Interventions
A **High demand, low vulnerability**		Suburbs that are best placed for EV uptake and likely to harbor high demand for technology. Most of the suburbs are clustered within a 20km radius of the city CBD. These areas that existing public charging availability and are well serviced by public transport.	• Payment systems for public EV chargers should be priced based on a combination of kWh and time. • Free municipal parking at train stations to encourage mode shift and incentivise EV uptake. • Encourage micro-mobility and prioritise active transport, particularly in suburbs close to CBD. • Provide secure charging for e-bikes and e-rideables. • Provide education on the cost of EVs, particularly for suburbs in the hills area where rail options are lacking.
B **High demand, high vulnerability**		High-risk suburbs ill-suited for EV uptake will likely harbor high demand. Areas featured have limited access to public transport and high car dependence. Most suburbs are of low to moderate socio-economic standing, which combined with a lack of existing support from LGAs places these suburbs in the highest need of intervention.	• Investment in new public charging infrastructure. • Free municipal parking at train stations to encourage mode shift and incentivise EV uptake. • Education on the cost of EVs, particularly for suburbs in the hills area where rail options are lacking. • Provide flexible time-of-use options to ensure long commuters can still benefit from discounted charging windows. • Extend rebate scheme beyond first 10,000 vehicle purchases. • Provide a freeze or distance cap for road user charge to encourage long distance commuters to transition
C **Low demand, low vulnerability**		Areas well suited for EV uptake but are likely to have a lower demand than service layer A. Areas featured have low to moderate socio-economic status and showcase lower rates of motor vehicle ownership than the rest of Perth. Many are outside the walking catchment for existing public transport options, but still within reach for active transport options.	• Encourage micro-mobility and prioritise active transport, particularly in suburbs close to CBD. • Provide secure charging for e-bikes and e-rideables at Transperth facilities. • Free municipal parking at train stations to encourage mode shift and incentivise EV uptake. • Investigate peak loading management opportunities (supplier managed charging, time of use tariffs). • Ensure funding continues to upgrade public transport options to reduce dependence on passenger vehicles.
D **Low demand, high vulnerability**		Dominated by suburbs with low socio-economic status. Many of these suburbs are at risk of being left in 'transit poor' neighbourhoods and will require significant support mechanisms for public transport and EV access.	• Invest in public transport infrastructure as an alternative to personal car ownership. • Encourage LGAs to maintain curbside equity when rolling out EV policy. • Invest in new public charging infrastructure and ensure payment schemes are a combination of kWh and time. • Free municipal parking at train stations to encourage mode shift and incentivise EV uptake. • Education on the cost of EVs, particularly for suburbs in the hills area where rail options are lacking. • Investigate peak loading management opportunities (supplier managed charging, total cost of ownership tariffs) • Extend rebate scheme beyond first 10,000 vehicle purchases. • Support the implementation of tax incentives to reduce the cost of EVs.

Roadmap and actions

We synthesised each policy and intervention to create a final roadmap. To implement the roadmap, actions need to be assigned to key stakeholders who have the ability and interest to achieve them. To shape the next steps an action plan was developed to tie each policy to its relevant service layer, stakeholder, timeframe and effort required for implementation.

Through a review of international best practice and analysis of Perth's vulnerability and demand to the transition we created actions for government and industry to contribute to EV equity.

Each action is grouped by the service layer they will have the greatest impact towards. However, it is likely that their implementation will also see downstream benefits across other service layers.



Action	Stakeholders responsible	Timeframe	Effort
Encourage micro-mobility and prioritise active transport, particularly in suburbs close to CBD	State government / LGAs	Now	Moderate
Ensure payment systems for public EV chargers are based on a combination of kWh and time	Technology manufacturers	Now	High
Provide education on LCO of EVs, particularly to outer suburbs with poor public transport servicing	LGAs	Now	Low
Free municipal parking at train stations for EVs	PTA	Mid-term	Moderate
Invest in new public charging infrastructure to complete network gaps	State government / LGAs	Now	High
Provide flexible TOU options that account for reduced overnight charging window for outer suburbs	Synergy	Now	High
Expand current purchase rebate scheme beyond 10,000	State Government	Mid-term	Moderate
Ensure roll-out of new chargers are accessible to all by following the PAS1899:2022 standard or equivalent	Federal Government / Industry planners	Now	Moderate
Roll-out funding to support retrofitting and adherence to minimum compliance codes for new buildings	State Government	Now	High
Electrify public transport options	PTA	Long-term	High
Share lessons learnt from proactive LGAs	LGAs	Now	Low
Provide secure charging for e-bikes and e-rideables at rail stations	PTA	Now	Low
Expand and upgrade public transport options to reduce dependence on passenger vehicles	PTA	Long-term	High
Encourage LGAs to maintain curbside equity when rolling out EV policy	LGAs	Now	Low
Support the implementation of tax incentives to reduce the cost of EVs	State Government/ Federal Government	Now	High
Investigate peak loading opportunities (such as supplier managed charging, V2G DERs)	AEMO/Synergy/ Western Power	Now	High
Cap RUC increases to ensure late adopters are not disadvantaged	State Government	Mid-term	Moderate
Investigate scrapping rebate scheme to support late adopters to transition	State Government	Mid-term	High

Action groups

- High demand, low vulnerability
- High demand, high vulnerability
- Low demand, low vulnerability
- Low demand, high vulnerability

Timeframe

- Now (by 2028)
- Mid-term (by 2035)
- Long-term (by 2050)

Effort

- Low cost, easy to implement, small number of stakeholders required to achieve
- Moderate cost, requires cooperation with multiple stakeholders to implement
- High cost, requires dedicated long-term investment and cooperation with a high number of stakeholders

Using data to drive equitable transport outcomes

To achieve an equitable transition to EVs in Perth, there needs to be a unified effort from industry, government and manufacturers. The roadmap presented in this study shows how each stakeholder group can improve the equity of this transition and facilitate a net zero transport future that is inclusive and accessible to all.

Through analysing Perth's social context and infrastructure landscape using a spatial multi-criteria assessment, our research demonstrates how a data-driven approach to city planning can be used to improve equitable outcomes for strategic planning.

For more information contact:

Sinead Thompson
Environmental Engineer

t: +61 8 9327 8361
e: sinead.thompson@arup.com

Level 3 WS2, 143 St Georges Terrace
Perth WA 6000

arup.com