Transport and Infrastructure Net Zero Consultation Roadmap

Take the survey

Department of Climate Change, Energy, Environment and Water

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5 First name
Claire

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Gardner

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[redacted]

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[redacted]

9 Who are you answering on behalf of?

Organisation

10 Organisation name

Office of Kate Chaney MP

11 What best describes you or your organisation?

Government

12 What sector do you represent?

Other: "Community - Curtin federal electorate"

13 What state or territory do you live in?

Western Australia

14 Postcode

6014

15 What area best describes where you live?

City

16 1. Do you support the proposed guiding principles?

Yes

17 1.1 Please add details to your response.

Not answered

18 2. Do you support the use of the avoid-shift-improve framework as a tool to identify opportunities for abatement?

Yes

19 2.1 Please add details to your response.

Reducing the need to travel through better urban planning that makes cities and neighbourhoods more liveable and sustainable should be the foundation of urban transport decarbonisation. Mode shift to active and public transport and a reduction in car dependency must follow second. Cars and other light vehicles are the single biggest contributor to transport emissions, and this is far higher in Curtin than the national average. Active transport provides the greatest co-benefits to health, the environment, social wellbeing and local economies, and yet has previously received far less support from federal government.

20 3. Do you agree the development of a national policy framework for active and public transport will support emissions reduction?

Yes

21 3.1 Please add details to your response.

See attached submission.

22 4. What should be included in a national policy framework for active and public transport and how should it be developed?

See attached submission.

23 5. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the movement of people contributes to transport emissions reduction?

See attached submission.

24 6.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure that the movement of goods contributes to transport emissions reduction?

See attached submission.

25 6.2. How would these actions address the identified challenges and opportunities for emissions reduction in the movement of goods?

See attached submission.

26 7. Do you agree with the proposed net zero pathway for light road vehicles?

No

27 7.1 Please add details to your response.

We support a target of 100% zero emissions light vehicle sales by 2035 which the proposed pathway does not mention. Widespread adoption of bi-directional charging from 2040 also seems too late. This should be brought forward. See attached submission for further details.

28 8. The Australian Government is currently developing an Australian New Vehicle Efficiency Standard and has already begun to implement actions in the National Electric Vehicle Strategy.8.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce light vehicle emissions?

See attached submission.

29 8.2 How would these actions address the identified challenges and opportunities to reduce light vehicle emissions?

See attached submission.

30 9. Do you agree with the proposed net zero pathway for heavy road vehicles?

Not answered

31 9.1 Please add details to your response

See attached submission.

32 10. The proposed pathway for heavy road vehicles relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank

from 1 to 3, the order in which these should be prioritised for emissions reduction.

33 10.1 Please add details to your response. Why did you rank them in that order?

See attached submission.

34 11. What role should low carbon liquid fuels play in the heavy vehicle decarbonisation?

See attached submission.

35 12. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce heavy vehicle emissions?

See attached submission.

36 13. Do you agree with the proposed net zero pathway for rail?

Not answered

37 13.1 Please add details to your response.

See attached submission.

38 14. The proposed pathway for rail relies on a mix of battery electric, hydrogen fuel-cell and low carbon liquid fuels.Rank from 1 to 3, the order in which these should be prioritised for emissions reduction.

39 14.1 Please add details to your response. Why did you rank them in that order?

Not answered

40 15. What role should low carbon liquid fuels play in rail decarbonisation?

Not answered

41 16. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce rail emissions?

Not answered

42 16.1 How would these actions address the identified challenges and opportunities to reduce rail emissions?

Not answered

43 17. Do you agree with the proposed net zero pathway for maritime?

Not answered

44 17.1 Please add details to your response.

Not answered

45 18. The Australian Government is engaging in consultation as part of the development of the Maritime Emissions Reduction National Action Plan and those consultations will also inform the final Roadmap and Action Plan. 18.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce maritime emissions?

Not answered

46 18.2 How would these actions address the identified challenges and opportunities to reduce maritime emissions?

Not answered

47 19. Do you agree with the proposed net zero pathway for aviation?

Not answered

48 19.1 Please add details to your response.

Not answered

49 20. The Australian Government has already engaged in consultation on aviation decarbonisation through the development of the Aviation White Paper and those consultations will also inform final Roadmap and Action Plan.

Not answered

50 20.1 What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce aviation emissions?

Not answered

51 21. Do you agree with the proposed net zero pathway for transport infrastructure?

Not answered

52 21.1 Please add details to your response.

Not answered

53 22. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to reduce transport infrastructure emissions and ensure that transport infrastructure is ready for and enables low-emission transport modes?

Not answered

54 22.1 How would these actions address the identified challenges and opportunities to reduce transport infrastructure emissions?

Not answered

55 23. What additional actions by governments, communities, industry and other stakeholders need to be taken now and in the future to ensure the energy mix is ready to support transport emissions reduction?

Not answered

56 24. How should the use of low carbon liquid fuels (LCLFs) be prioritised across different transport modes over time to achieve maximum abatement?

Not answered

57 25. What are the best ways for the Australian Government to work collaboratively with industry, business, governments and communities to implement the proposed pathways?

Not answered

58 25.1 What are good domestic or international examples of partnership and collaboration on transport and transport infrastructure emissions reduction that could inform the final Roadmap and Action Plan?

Not answered

59 25.2 What opportunities can Government leverage to show leadership in Australia and internationally?

Not answered

60 26. What measures and metrics should be used to evaluate the final Transport and Infrastructure Net Zero Roadmap and Action Plan?

Not answered

61 26.1 What other data and evidence could governments use and how could this offer further insights on the pace, scale and location of transport emissions reduction pathways?

Not answered

62 27. Do you have any feedback on the proposed review process?

Not answered

63 28. Do you have any further feedback on the Consultation Roadmap and proposed pathways?

Not answered

64 28.1 Is there anything missing? Are the sections appropriately integrated? Is the Roadmap appropriately ambitious?

Not answered

65 29. Is there any further information or documentation that you wish to be considered with your submission?

Not answered

66 Would you like to upload a document?

Yes

67 Have you removed any identifying information from your submission?

Yes

68 Upload a submission

Curtin Community Submission_Active Transport in the Transport Net Zero Roadmap.pdf

69 Upload a submission

Not answered

70 Upload supporting file

Not answered

71 Upload supporting file

Not answered

Active Transport in the Transport and Infrastructure Net Zero Consultation Roadmap

Curtin Community Submission

Kate Chaney MP
Federal Member for Curtin

6 August 2024

Contents

Introduction

A new federal role in active transport

Reducing car dependency by increasing active transport (such as walking or cycling) is one of the fastest ways to reduce transport emissions. It also provides many other social, environmental and economic benefits to communities, including better physical and mental health, improved air quality, and reduced transport costs.

Unfortunately, active transport rates in Australia have declined considerably over the last decades, due in large part to our car-centric urban planning and limited and inconsistent funding for active transport infrastructure.

Whilst the federal government has historically provided little support to active transport, its responsibility for emissions reduction, public health and the provision of considerable funding to states for road, rail and other infrastructure, means there is an opening for the current Government to provide leadership, funding and coordination on active transport across Australia.

It is pleasing to see the Government's renewed interest in supporting active transport, which recalls the 2013 Ministerial Statement on Walking, Riding and Access to Public Transport, introduced by then-Minister for Infrastructure and Transport, the Hon Anthony Albanese MP. Recent policy announcements, including the new $100 million Active Transport Fund, the National Urban Policy and the National Health and Climate Strategy, and the inclusion of active transport in the Transport and Infrastructure Net Zero Consultation Roadmap, are all positive signs. However, there is still a large gap between high-level statements and the policy detail needed to make a difference on the ground.

About this submission

This Curtin Community Submission brings together findings and feedback from several community engagement processes, including our Curtin's Pathway to Net Zero report (Feb 2023-Feb 2024), and survey responses on active transport from parents, schools and local governments (May-June 2024). It also includes publicly available data about Perth's Long-Term Cycle Network, and research from the Australian Parliamentary Library about federal funding for active transport.

Curtin's Pathway to Net Zero is a community-driven report, launched earlier this year, that lays out a positive vision for a decarbonised society, the big changes we need to get there, and the social, environmental and economic co-benefits from climate solutions. More than fifty volunteers were involved in the project across five working groups which form the five key chapters of the report - electricity, buildings, transport, urban greening and waste. Each chapter identifies broad steps to net zero, and policy asks for local, state, and federal governments.

The Transport chapter is included in this submission to provide our community's vision for net zero urban transport – reducing car dependency and switching to zero emissions vehicles. It includes some high-level recommendations on some of the other transport modes covered by the Net Zero Roadmap, as well as the full list of transport policy asks.

We are on our way to achieving both of the report's top two priority Federal policy asks for transport, which were:

> 1. Legislate national fuel efficiency standards in line with a target of 100% zero emissions new light vehicles sales by 2035.
>
> 2. Deliver a national transport decarbonisation strategy which prioritises active and public transport in urban areas and improves mobility access for all people.

In May, we saw the introduction of the New Vehicle Efficiency Standard, which, whilst not as strong as the initial proposal, still puts us within an achievable distance of the 2035 target for 100% zero emissions new light vehicles. The inclusion of active transport in an early chapter of Transport and Infrastructure Net Zero Consultation Roadmap gives me hope that the final Roadmap may also keep active transport front and centre.

This submission outlines the Curtin experience of active transport, and the Federal policy priorities required to drive change:

1. To be used well, active transport infrastructure needs to make walking and cycling easier, safer and more convenient that driving.
2. Existing active transport infrastructure in Curtin is mixed – good in some places, poor in others.
3. The primary problem with existing active transport infrastructure is a lack of connectivity; paths that don't go from start to finish safely, but are fragmented, poorly connected to home or activity centres, and fail where they are most needed – crossing busy streets and intersections.
4. Federal government support is needed to:
    a. significantly increase funding;
    b. focus on expanding active transport infrastructure throughout the catchment of key activity centres, not just the immediate surrounds; and
    c. coordinate and integrate planning across relevant stakeholders.

On behalf of the Curtin community, I hope this submission strengthens the case for active transport in the National Transport and Infrastructure Net Zero Roadmap, for the benefit of Curtin and other communities across Australia as we head down the path to net zero.

Kate Chaney MP
Federal Member for Curtin

Summary of Recommendations

Curtin's Pathway to Net Zero recommendations

1. Deliver a National Transport Net Zero Roadmap which prioritises active transport in urban areas and improves mobility access for all people.
2. Introduce national targets for increased active transport use.
3. Increase federal funding for active transport.
4. Develop a National Active Transport Framework that recognises and values the health, social, economic and environmental co-benefits of active travel to communities across Australia.
5. Integrate active travel with sustainable, liveable urban planning that reduces travel needs and distances.
6. Support efforts to reduce car dependency by stopping the expansion of roads in already-congested urban areas.
7. Support best practice active transport infrastructure that makes walking and cycling safe, easy and convenient.
8. Prioritise active transport infrastructure around key locations and activity centres, such as school and shops, covering the catchment not just immediate surrounds.
9. Support the uptake of e-bikes, e-scooters and other electric micromobility.
10. Improve integration of public and active transport networks.
11. Set targets to increase public transport use.
12. Increase funding for public transport infrastructure.
13. Support the development of mid-tier transit in key urban centres.
14. Electrify Australia's public transport by 2035.
15. Legislate a target of 100% ZEV new light vehicles sales by 2035.
16. Develop a nationally consistent road user charge scheme to address decreasing revenue from petrol tax excise.
17. Remove the luxury car tax, import duties, and stamp duty on EVs until EVs reach price parity with fossil fuel vehicles.
18. Bring forward the upgrade of noxious vehicle emissions standards to Euro 6 by 2025 and work towards Euro 7 by 2030.
19. To decarbonise freight, prioritise mode shift from road to rail, accompanied by electrification of heavy vehicles.
20. Increase the truck width limit in Australia from 2.5m to 2.6m to allow zero-emissions heavy vehicles made for the EU or US to be used in Australia without expensive modifications

Active transport recommendations

21. Commit support and funding to the WA Government to fully implement Perth's long term cycle network.
22. Ensure the Roadmap and Active Transport Framework supports the development and implementation of comprehensive regional cycle networks that are well connected, focused around key locations, and make cycling safe, easy and convenient.
23. Develop a national metric for measuring and assessing safe active travel routes within school catchment areas and ensure that active travel data is available to schools, communities and councils.

24. Provide funding and resources to schools, communities and councils to help them improve their school precincts with a focus on safety and connectivity.
25. Prioritise funding towards school precincts in greatest need of active travel infrastructure.
26. Support local governments to collect active travel data and develop local active travel plans.
27. Significantly increase active transport funding available to local governments for staffing, resources, programs and infrastructure.
28. Coordinate and facilitate collaboration on active transport between all levels of government, departments, sectors, and stakeholders, especially around key locations. Where appropriate, develop new planning frameworks for active transport to streamline these approval processes.
29. Ensure that community consultation is central to active transport precinct planning, to increase effectiveness, uptake and support for final implementation.
30. Increase the proportion of overall transport funding that is dedicated to active transport.
31. Require active transport infrastructure to be included in the scope of works for transport funding.
32. Require a percentage of funding in all transport projects to go towards active transport.
33. Provide dedicated funding for active transport networks and precincts around key activity centres.

Curtin's Pathway to Net Zero - Transport

The following pages are from the Transport Chapter of Curtin's Pathway to Net Zero Report and provide an overview of urban transport modes relevant to Curtin, including public transport, electric vehicles and freight, in addition to the active transport this submission focuses on. State and Local Government policy asks are included here, as the Net Zero Roadmap and future Federal policy may be able to support these actions. The key recommendations for this submission drawn from Curtin's Pathway to Net Zero can be summarised as follows.

Active transport recommendations

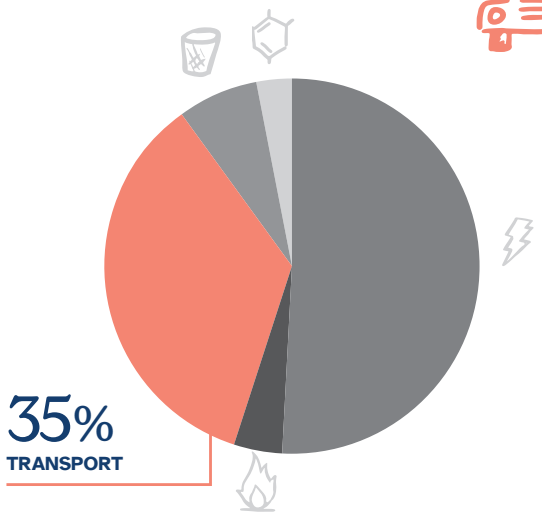
1. Deliver a National Transport Net Zero Roadmap which prioritises active transport in urban areas and improves mobility access for all people.
2. Introduce national targets for increased active transport use.
3. Increase federal funding for active transport.
4. Develop a National Active Transport Framework that recognises and values the health, social, economic and environmental co-benefits of active travel to communities across Australia.
5. Integrate active travel with sustainable, liveable urban planning that reduces travel needs and distances.
6. Support efforts to reduce car dependency by stopping the expansion of roads in already-congested urban areas.
7. Support best practice active transport infrastructure that makes walking and cycling safe, easy and convenient.
8. Prioritise active transport infrastructure around key locations and activity centres, with connectivity across the catchment, not just immediate surrounds.
9. Support the uptake of e-bikes, e-scooters and other electric micromobility.
10. Improve integration of public and active transport networks.

Other transport recommendations

11. Set targets to increase public transport use.
12. Increase funding for public transport infrastructure.
13. Support the development of mid-tier transit in key urban centres.
14. Electrify Australia's public transport by 2035.
15. Legislate a target of 100% ZEV new light vehicles sales by 2035.
16. Develop a nationally consistent road user charge scheme to address decreasing revenue from petrol tax excise.
17. Remove the luxury car tax, import duties, and stamp duty on EVs until EVs reach price parity with fossil fuel vehicles.
18. Bring forward the upgrade of noxious vehicle emissions standards to Euro 6 by 2025 and work towards Euro 7 by 2030.
19. To decarbonise freight, prioritise mode shift from road to rail, accompanied by electrification of heavy vehicles.
20. Increase the truck width limit in Australia from 2.5m to 2.6m to allow zero-emissions heavy vehicles made for the EU or US to be used in Australia without expensive modifications.

TRANSPORT

Transport makes up 35% of Curtin's emissions (760,000 t CO_2e), which mostly comes from cars.



Where do Curtin's transport emissions come from?

- 88% from light vehicles (including cars, 4WDs and utes),
- 10% from trucks and freight,
- 1% from buses and
- 1% from trains.

> **Reaching net zero transport means more walking, cycling and public transport use, as well as a national fleet (including cars, trucks, trains and buses) that is 100% zero emissions vehicles (ZEVs).**

Reduce car dependency

Australia is one of the most car-dependent countries in the world[1] because our cities were built to move cars first and people second.[2] Australia has more cars than people with driver's licences.[3] 81% of Australians drive to work[4] and walking and cycling to and from school has dropped from 75% to 25% over the last 40 years.[5]

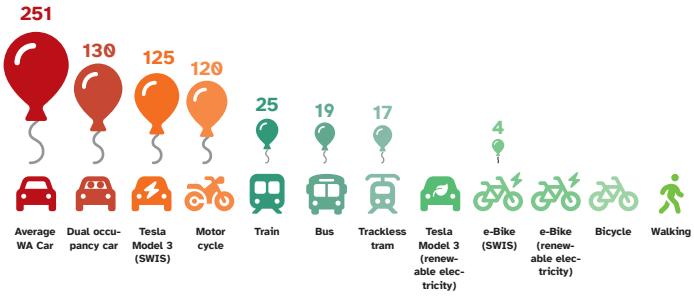
Reducing car dependency by making active and public transport easier, cheaper and safer is one of the fastest ways to reduce emissions.[6]

Transition to zero emissions vehicles

Zero emissions vehicles (ZEVs) include electric vehicles (EVs) that run only on batteries, fuel cell vehicles that use green hydrogen and internal combustion engines (ICEs) that run on sustainable biofuels.[8] Light vehicles (like cars and 4WDs) will be nearly all electric. Heavy vehicles, such as buses, trucks and trains, will be a mixture of EVs and ICEs running on sustainable fuels, depending on costs and innovation.[9]

Biofuels, such as ethanol or biodiesel, are plant or animal-based fuels that can be used in ICEs (with some or no modification) and are sustainable if they are made from agricultural or food waste.[10] Hydrogen fuel cells produce heat energy and water, so are emissions free to run. However, making hydrogen is very energy intensive and is only 'green' if powered by renewable electricity.[11]

GRAMS OF CO_2 PER PERSON KILOMETER TRAVELLED[7]



Co-benefits of decarbonising transport

HEALTH

Walking and cycling increase fitness, improving physical and mental health. Public transport use also increases walking. 75% of Australian adults don't do enough physical activity, significantly increasing the risk of many chronic health conditions.[12] Making active and public transport easier to use is one of the most cost-effective ways to improve population health.[13]

Reducing car dependency and switching to ZEVs also improves health and saves lives by reducing air pollution. Vehicle pollution may cause over 11,000 premature deaths and 19,000 hospitalisations in Australia each year.[14] Reduced car dependency also improves road safety.[15] Vehicle crashes cause about 1,200 deaths per year,[16] and almost 60,000 hospitalisations.[17]

SOCIAL CONNECTION

Urban planning designed for active and public transport improves mobility, access to amenities and livability for everyone. Cars take up much more space than other modes of transport, both on the road and in parking.[21] Reducing car dependency frees up prime real estate for other purposes,[22] supporting more mixed-use urban centres and allowing more people to live close to work and social opportunities.

COST OF LIVING

Better active and public transport services will make daily travel more affordable, especially for disadvantaged and low-income households.[18] On average, Australians spend over $20,000 per year per household on car running costs compared to $1000 on public transport.[19] EVs are cheaper to run and maintain than petrol cars, saving $1900 per year on average.[20]

NATURE

Sustainable urban planning reduces urban sprawl, protecting nature around our cities. Less air pollution makes the environment healthier for wildlife as well as people. Active transport routes can double as green corridors, increasing urban vegetation.

JOBS

Public and active transport supports local economies by providing the foot traffic local businesses need to thrive. The transition to ZEVs also provides a huge economic opportunity for WA, as we have large deposits of the minerals essential to batteries and electric motors.[23]

Jemima - YEAR 5

ANIMAL TESTING, CLIMATE CHANGE & LITTER

I have drawn a gas free car that had a mouth full of hearts which is made up of anti-rubbish goo (needs inventing). There are also happy trees, rabbits, and clouds about because there is no animal testing, climate change is gone and there is no litter because of my car.

Steps to achieving net zero transport

Reduce car dependency

1

Reduce the need to travel

The most fundamental way to reduce transport emissions is to reduce the need to travel far to meet our basic needs.

Integrated transport and land use planning puts amenities near people's homes, increases housing density at key locations and provides a range of effective and cheap transport options. The '15-minute city' is an urban planning idea that aims to place amenities within a 15 walk or cycle from your home.[24] Rapidly adopted by cities and local councils such as Paris, Barcelona, Portland and Melbourne,[25] this type of urban planning improves social equity and accessibility and supports local small businesses which rely on foot traffic and local custom.[26] Remote work and digital communications reduce travel needs.[27]

2

Stop expanding roads in congested urban areas

Contrary to popular belief, expanding roads actually increases traffic because of 'induced demand'.

New or wider roads encourage more people to drive, which quickly fill up, increasing traffic on all the connecting roads and making overall congestion worse, costing time and money.[28] Congestion in Australia's biggest cities was estimated to cost $10.6 billion in 2005. By 2025, this could be $30 billion per year. Transport planners recognise this problem[29] but our politics hasn't caught up. Most transport funding goes to road expansion.[30]

Case study: Cycling in Seville

Seville, Spain, built 80km of connected, easy-to-use, city-wide bike paths in two years (2006-2007).

Within a decade, bicycle use rose by more than 11 times.[36]

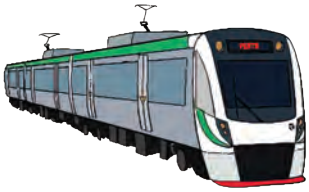
3

Increase active transport

Two thirds of Perth's daily car trips are less than 5km.[31] Our good weather and flat terrain mean these could easily be done by bike.

Induced demand also applies to active travel. Areas in Perth with separate cycle paths have cycling rates four to eight times higher than areas with poor cycling infrastructure.[32] Pedestrians and cyclists need right of way at intersections and priority road crossings; safe, separate lanes that form a well-connected network of paths, greenery for shading, and adequate end trip facilities.[33] Reducing speed limits to 30km/h on local residential streets will make walking and cycling safer and save lives.[34] Active transport should be prioritised around key locations, such as schools and local shops.

If we had the right infrastructure, electric bikes and scooters can help people go further and faster and significantly reduce car use.[35]



4

Increase public transport

Public transport is only 7% of Perth's travel use.[37] To increase this, we need better public transport infrastructure.

Mid-tier transit like light rail or trackless trams - more than a bus but less than a train – is the missing middle in Perth's public transport system. Mid-tier transit can be added to existing major roads, creating greater connection between trains and activity centres, and increasing local economic activity.[38]

Public transport needs to be frequent, convenient, and accessible to the broadest possible range of locations.[39] Services should run throughout the day and week, not just at peak times, and every 5 minutes on major routes. The network should be a well-connected and diverse web across the whole city, rather than just spokes radiating from the CBD. All forms of public and active transport should be integrated, with routes that top-and-tail, co-ordinated timetables, and bicycle facilities on public transport. Buses and trackless trams should have priority on roads to ensure public transport is faster than driving.[40]

Transition to zero emissions vehicles

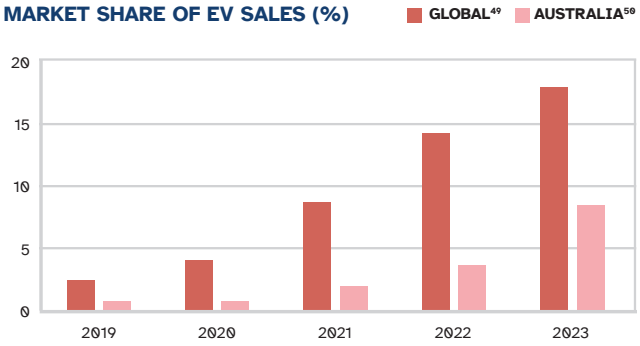
1

100% zero emissions light vehicle sales by 2035

Australia's vehicle snapshot:

- There are only ~109,000 EVs on the road[41] out of 21.2 million registered vehicles.[42]
- >90% of the national fleet are cars, 4WDs and other light vehicles.[43]
- The average vehicle has a lifetime of 20+ years.[44]
- Business and government fleet purchases make up about half of new vehicles sales in Australia.[45]

Switching the national fleet over to ZEVs will take time. To reach close to 100% ZEVs on the road by 2050, we need 50-75% of new sales to be ZEVs by 2030[46] and 100% by 2035.[47] Many countries, including the EU, UK, Canada and Japan have already made this commitment.[48]

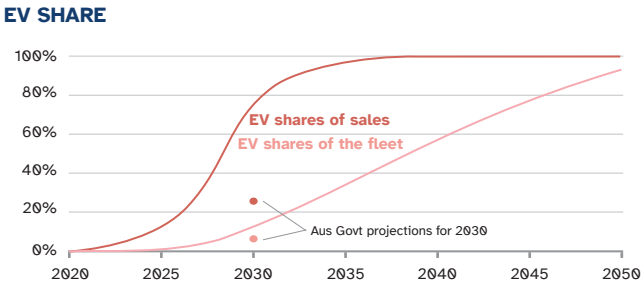


The biggest barrier to EV uptake in Australia is lack of supply. Demand is high, with many models selling out in hours.[51] We need strong policies to increase the number and variety of EVs available in Australia.[52] We also need to decrease emissions from existing ICEs, and any new ICEs sold in the next decade.[53] Emerging technologies, such as autonomous (driverless) vehicles, ridesharing and two- or three-seater micro EVs should be considered in EV strategies.[54]

Case study: EVs in Norway

In 2022, 88% of new cars sold in Norway were EVs.

Norway will meet its target of 100% ZEV sales by 2025 through a comprehensive range of policies, including EV subsidies and taxing petrol cars.[55]



2

Decarbonise public transport and freight

To decarbonise public transport, buses and trains should be electrified.

Shenzhen's (China) 16,000 bus fleet has been fully electric since 2018[56] - electric bus technology is already operational. Most urban rail is electric; Transperth's trains have been electric since the 1991[57] but the first four electric buses were only introduced in 2022.[58] New trackless trams will be electric.[59] Australia's public transport should be fully electrified by 2035.[60]

Net zero freight should prioritise shifting road to rail, as freight trains produce 75% less emissions than trucks, as well as reducing traffic congestion and improving road safety.[61] Urban trucks are expected to be mostly electric.[62] Regional trains and long-haul trucks may be a mix of electric, hydrogen and biofuels; these technologies are still be developed.[63] Green hydrogen and biofuels will be essential to net zero shipping and aviation and should be prioritised for those industries.[64]

3

Establish an integrated EV charging network

The electrification of our national vehicle fleet requires adequate charging infrastructure at home, at work and in public.[65]

In urban areas, distances between charging stations are less of an issue, but the charging load on our electricity networks will be significant and must be carefully managed.[66] Charging infrastructure should be available at daytime locations, such as office blocks and car parks, to maximise the use of cheap rooftop solar power. Bi-directional charging (V2G) allows EVs to discharge back to the grid or your home and serve as portable batteries. It will be a game-changer.[67]

TRANSPORT

What Federal Government can do

The Federal Government is responsible for regulation, safety and funding for roads and railways.

Current Federal policies include:

- A commitment to develop a national transport decarbonisation strategy.
- A commitment in the National EV strategy (2023) to a mandatory fuel efficiency standard (FES) on light vehicles by the end of 2023. There is no mention of an end date for the sale of new fossil fuel vehicles.
- A commitment to introduce the Euro 6 noxious emissions standards from 2025 for heavy vehicles and 2028 for light vehicles. The EU introduced Euro 6 in 2014 and will bring in Euro 7 by 2025.
- $500 million Driving the Nation Fund to support business fleet transition, green hydrogen for heavy vehicles and EV charging infrastructure.

Federal policy asks

Reduce car dependency

1. Deliver a national transport decarbonisation strategy which prioritises active and public transport in urban areas and improves mobility access for all people. The strategy should include targets for increased active and public transport use and provide increased funding for active and public transport.

Transition to 100% Zero Emission Vehicles (ZEV)

1. Legislate a target of 100% ZEV new light vehicles sales by 2035.
2. Legislate a national Fuel Efficiency Standard for light vehicles that meets international best practice.
3. Develop a nationally consistent road user charge scheme to address decreasing revenue from petrol tax excise.
4. Remove the luxury car tax, import duties, and stamp duty on EVs until EVs reach price parity with fossil fuel vehicles.
5. Bring forward the upgrade of noxious vehicle emissions standards to Euro 6 by 2025 and work towards Euro 7 by 2030.
6. Commit to 80% ZEV government fleet purchases by 2025, and 100% by 2030.
7. Develop a strategy to decarbonise freight with targets and timelines, and support for electric and/or sustainable fuel heavy vehicles.
8. Increase the truck width limit in Australia from 2.5m to 2.6m to allow zero-emissions heavy vehicles made for the EU or US to be used in Australia without expensive modifications.

What State Government can do

The State government is responsible for most aspects of transport, including transport planning, constructing, and maintaining state roads, setting and enforcing road rules and vehicle registration, public transport systems, and cycle and footpaths.

Current State policies include:

- The State EV strategy which includes rebates of $3,500 for the purchase of EVs under $70,000, and $23 million for a state-wide EV charging network, and $125 million to locally manufacture 130 electric buses.
- A commitment to develop a transport sector emissions reduction strategy by late 2023.

State policy asks

Reduce car dependency

1. Deliver a state transport decarbonisation strategy which prioritises active and public transport in urban areas and improves mobility access for all people. The strategy should include targets for increased active and public transport use, increased funding for active and public transport and be integrated with urban planning.
2. Develop a mid-tier transport network (e.g. trackless trams) for Perth.

Transition to 100% Zero Emission Vehicles (ZEV)

1. Set a state target of 100% ZEV light vehicle sales by 2035.
2. Develop a plan to reduce urban air pollution in WA.
3. Reform all vehicle pricing to support EV uptake, including a shift to emissions-based vehicle registration fees, and stamp duty exemptions for EVs.
4. Introduce a regular, mandatory smog test (such as the California Smog Test) to identify vehicles that produce excessive emissions and need repair.
5. Commit to 80% ZEV for all government fleet purchases by 2025, and 100% of purchases by 2030.
6. Electrify all public transport in urban areas by 2035 and rural public transport (e.g. school bus services) by 2040.
7. Coordinate the establishment of a state-wide EV charging network and ensure that buildings (including rental properties) and the electricity grid are EV-ready. Plan for future rollout of V2G charging.

TRANSPORT

What Local Governments can do

Local government is responsible for planning and maintaining residential roads, building bike paths and footpaths and managing some public car parking. Local Governments have been leading the development of a mid-tier transit network for Perth through the Mid-Tier Transport Consortium.

Local policy asks

1. Transition council fleet to 100% ZEVs, including waste trucks.
2. Increase active and public transport trips through connected, dense planning approaches and infrastructure that makes walking and cycling safer and easier.
3. Support development of a mid-tier transit network.
4. Review parking management to prioritise active and public transport use and reduce car dependency.
5. Provide or trial public hire of micro mobility, such as e-bikes and e-scooters.
6. Develop a plan to reduce local air pollution.
7. Install EV charging on council land (incl. street parking and car parks). Work with State government and businesses to rollout a local charging network.
8. Provide public education to support active and public transport use.

What is your Council doing so far?

ACTION TAKEN | SOME ACTION | NO KNOWN ACTION

	100% ZEV fleet	Active & public transport plan	Mid-tier transit	Parking management	E-micro mobility hire	Air pollution plan	EV charging	Public education
CAMBRIDGE	SOME	SOME	NO	NO	SOME	NO	SOME	ACTION
CLAREMONT	SOME	SOME	NO	NO	NO	NO	SOME	SOME
COTTESLOE	NO	SOME	NO	NO	ACTION	NO	SOME	NO
MOSMAN PARK	NO	NO	NO	SOME	NO	NO	SOME	SOME
NEDLANDS	SOME	SOME	ACTION	NO	ACTION	NO	SOME	NO
PEPPERMINT GROVE	NO	NO	NO	NO	NO	NO	SOME	NO
PERTH	SOME	ACTION	NO	SOME	ACTION	NO	SOME	SOME
STIRLING	SOME	SOME	ACTION	NO	ACTION	NO	SOME	ACTION
SUBIACO	SOME	SOME	ACTION	NO	NO	NO	SOME	ACTION

The road to nowhere? Connectivity in active transport infrastructure

Active transport infrastructure that makes walking and cycling easy, safe and convenient is a key factor in increasing rates of active transport use. Curtin's current cycling network is fragmented, incomplete, and does not prioritise connections to key locations, including schools, shops, train stations, and hospitals. The buffer zones around Curtin's primary schools reflect also display inconsistent pedestrian access and infrastructure, again reflecting a lack of focus on connectivity around key locations.

Perth's Long Term Cycle Network

WA's Long-term cycle network (LTCN) is an "aspirational blueprint" for continuous bicycle paths throughout WA to support cycling for all ages and abilities, and accommodate transport, recreational and commercial activities. The LTCN for the Perth and Peel region (metropolitan Perth) was developed by the WA government in collaboration with thirty-three local government authorities. The LTCN comprises primary, secondary, and local routes, with state and local governments responsible for the implementation of different routes. An image of the proposed LTCN across Curtin is on page 17. Only one of Curtin's nine local councils has not endorsed the LTCN (the City of Nedlands), although this does not seem to have greatly impacted LTCN implementation with the City.

The Perth and Peel LTCN is listed by Infrastructure Australia as a priority project still at the earliest stages. It notes that "Perth has one of the lowest rates of walking and cycling commuting trips in Australia. Each day there are an estimated 4.2 million private car trips in Perth, with 2.8 million of these trips being under 5km." This equates to two thirds of Perth's car trips being under 5km – a distance that should be easy to walk or cycle for most people. Combined with our excellent weather and generally flat terrain, there is considerable potential to increase active transport use in Perth if active transport infrastructure were improved.

Unfortunately, Infrastructure Australia also notes that

> *There is a lack of dedicated active transport connections that link key strategic centres in Perth. It is estimated that* ***only 41% of the 1,297km of identified Primary bike network, and 34% of the 1,564km of identified Secondary bike network are completed****. The remainder of these networks are either non-existing or require significant upgrades and replacement.*

The project is listed as an early-stage proposal that requires the proponent (WA Government) to next identify and analyse potential investment options. This suggests that there is no clear plan from the state government to fully implement the LTCN.

The interactive Perth and Peel LTCN Map allows users to see the planned network of primary, secondary and local routes, along with the current status of any particular section; non-existing, needing significant improvement, needing some improvement, or adequate. Exact figures for network completion within Curtin are not available, but the images on page 18 and 19 show clearly the gaps in implementation. Page 18 shows the current status of each part of the network, with many sections of network non-existing or needing

improvement. Page 19 shows the same map with all non-existing routes highlighted in yellow.

Non-existent routes fall generally into one of two categories; (1) whole sections, approximately one kilometre or longer and (2) short fragments between existing routes, only a few hundred metres long. It is particularly odd to see these latter fragments, as it shows the lack of commitment to connectivity in plan implementation. The distribution of adequate paths is also haphazard, showing no clear logic for why particular routes have been prioritised over others.

Also notable is the lack of connectivity around key activity centres, the places people are most likely to go on a regular basis, and that are often only a couple of kilometres from home. The maps on page 20 and 21 show current implementation overlaid with key locations including schools, shopping centres and train stations. Again, the full proposed LTCN will have paths coming close to most of these (although there is still room for improvement), but current implementation has not prioritised these locations.

Anecdotally, volunteers in the Curtin Pathway to Net Zero Transport working group are familiar with bike paths around Curtin that simply stop partway down a road, or at a busy intersection, leaving the cyclist no safe way to continue.

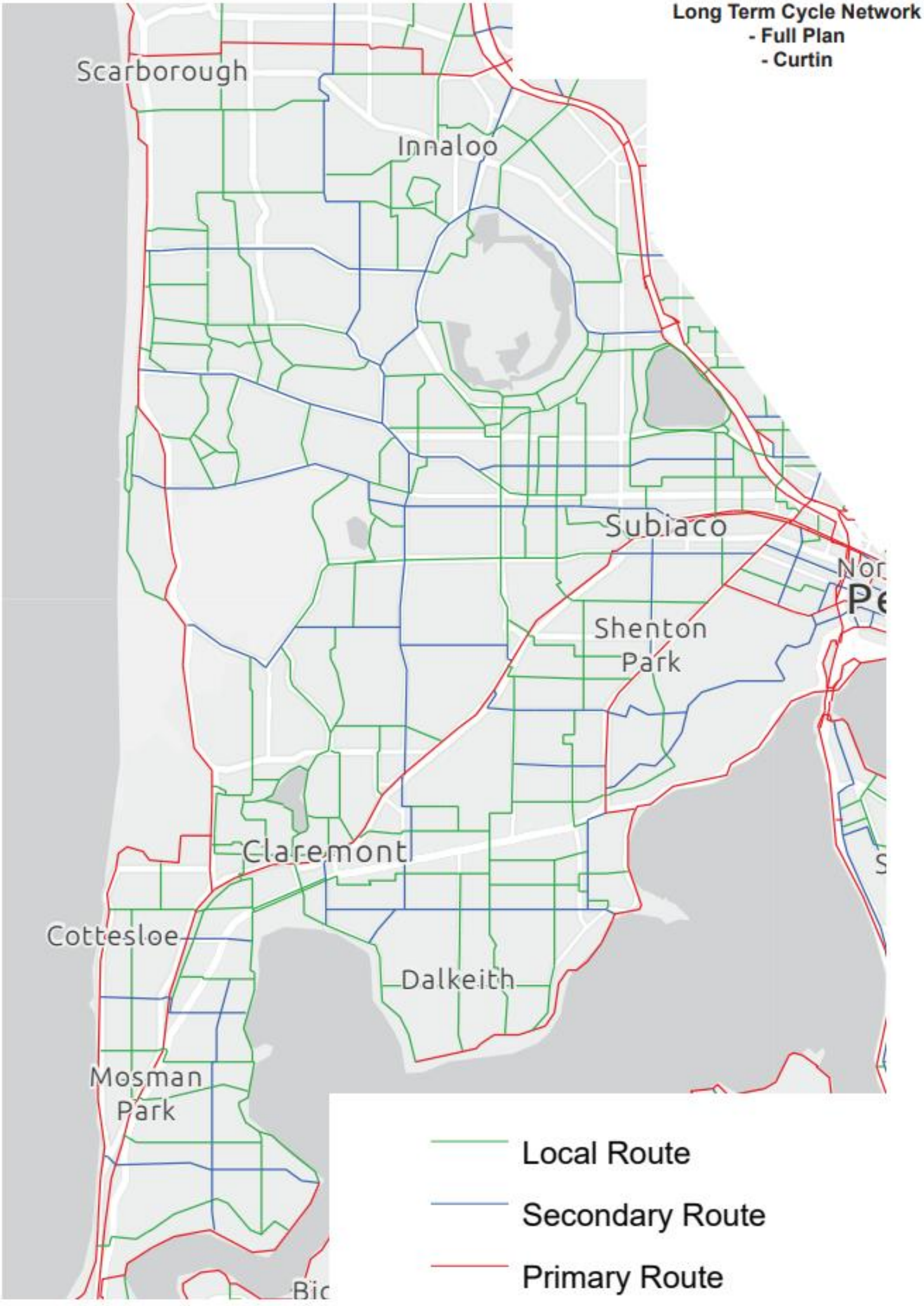
We would never build roads for cars that didn't go from start to finish. Yet, the rollout of Perth's cycling infrastructure seems to assume either that people who cycle do not travel from home to schools, shops or other key locations, or that they are willing to work really hard to do so, switching from cycle paths to busy roads to footpaths, crossing dangerous roads and intersections, and requiring excellent bicycle skills and navigational knowledge. Overall, Curtin's current bicycle network is not yet easy, convenient and safe to use.

The Net Zero Roadmap and future National Active Transport Framework must support the implementation of large, priority active transport plans such as the LTCN.

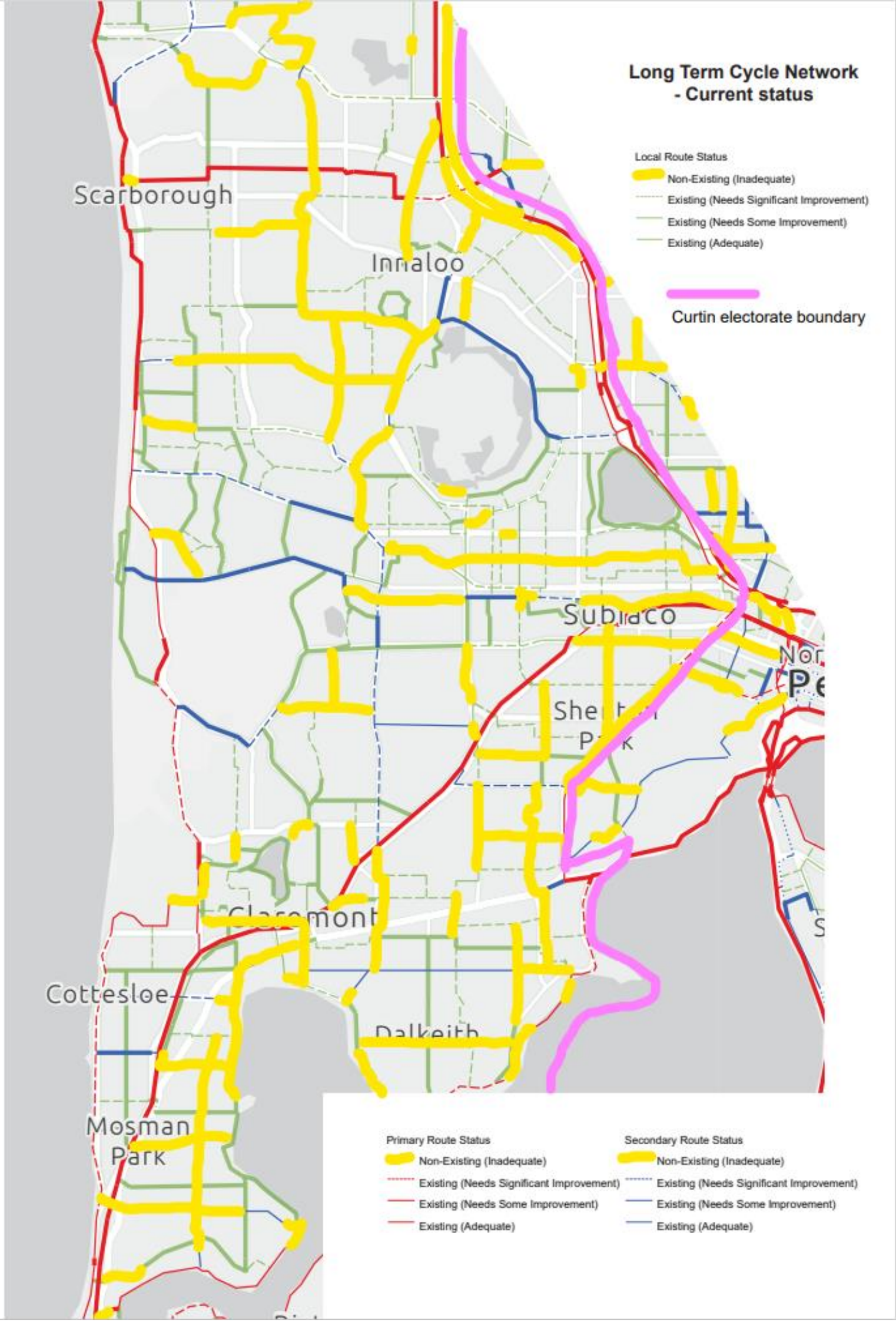
They must provide the funding, stakeholder coordination and policy guidelines to ensure that cycling networks are well connected, with complete paths going from residential areas to key activity centres, and prioritising safe and easy navigation through intersections, crossings and

Recommendations

21. Commit support and funding to the WA Government to fully implement Perth's long term cycle network.
22. The Roadmap and Active Transport Framework should support the development and implementation of comprehensive regional cycle networks that are well connected, focused around key locations, and make cycling safe, easy and convenient.


Long Term Cycle Network
- Full Plan
- Curtin
Scarborough
Innaloo
Subiaco
Shenton
Park
Claremont
Cottesloe
Dalkeith
Mosman
Park
Local Route
Secondary Route
Primary Route

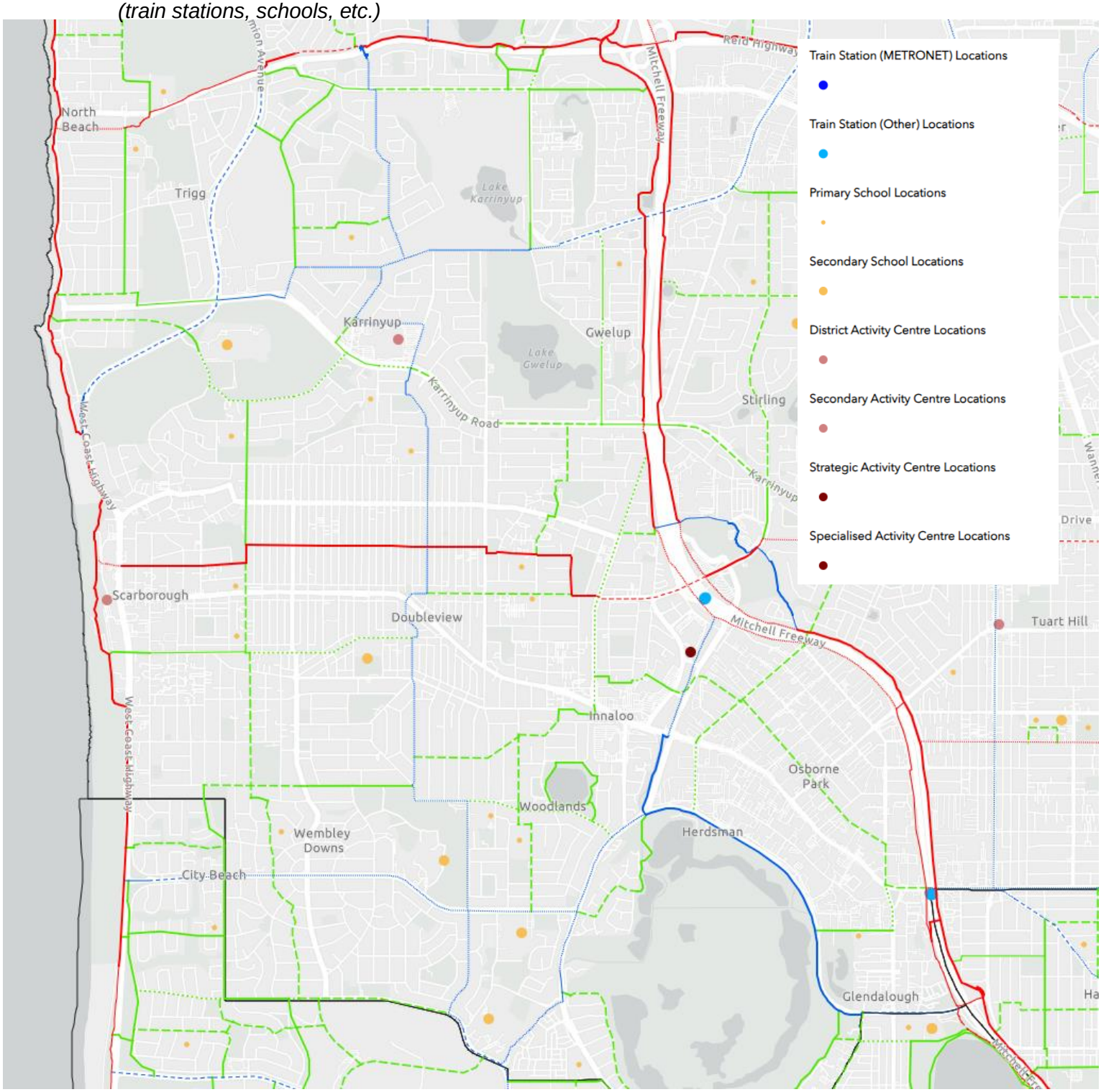

Long Term Cycle Network
- Current status
Local Route Status
Non-Existing (Inadequate)
Existing (Needs Significant Improvement)
Existing (Needs Some Improvement)
Existing (Adequate)
Scarborough
Innaloo
Subiaco
Shenton
Park
Claremont
Cottesloe
Dalkeith
Mosman
Park
Primary Route Status
Non-Existing (Inadequate)
Existing (Needs Significant Improvement)
Existing (Needs Some Improvement)
Existing (Adequate)
Secondary Route Status
Non-Existing (Inadequate)
Existing (Needs Significant Improvement)
Existing (Needs Some Improvement)
Existing (Adequate)


Long Term Cycle Network
- Current status
Local Route Status
Non-Existing (Inadequate)
Existing (Needs Significant Improvement)
Existing (Needs Some Improvement)
Existing (Adequate)
Curtin electorate boundary
Scarborough
Innaloo
Subiaco
Claremont
Cottesloe
Dalkeith
Mosman Park
Primary Route Status
Non-Existing (Inadequate)
Existing (Needs Significant Improvement)
Existing (Needs Some Improvement)
Existing (Adequate)
Secondary Route Status
Non-Existing (Inadequate)
Existing (Needs Significant Improvement)
Existing (Needs Some Improvement)
Existing (Adequate)

Long Term Cycle Network

Key locations and current status in Curtin's north

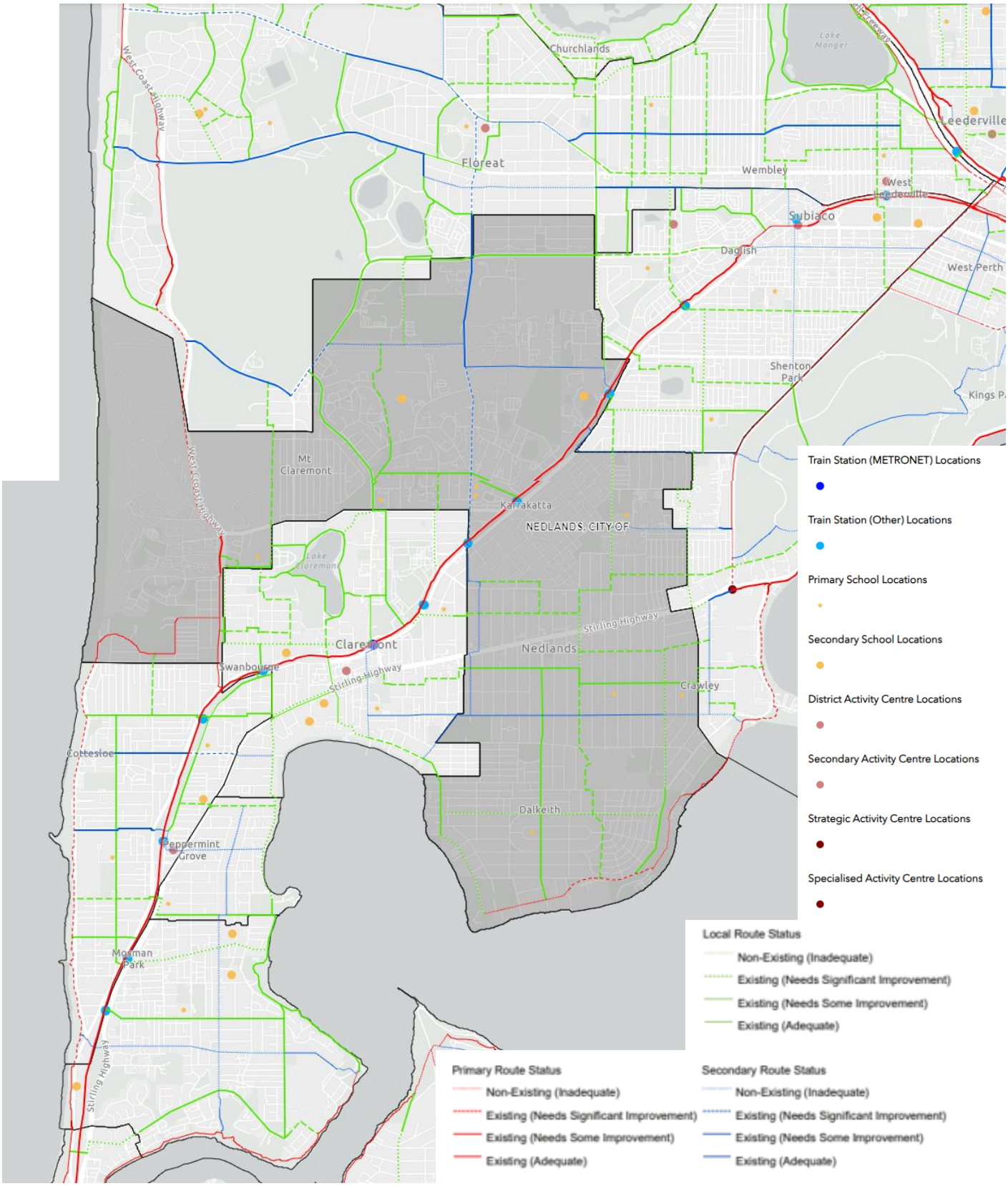
Current implementation of the LTCN does not prioritise connectivity with key activity centres (train stations, schools, etc.)



Long Term Cycle Network

Key locations and current status in Curtin's south

Current implementation of the LTCN does not prioritise connectivity with key activity centres (train stations, schools, etc.)



Safe school precincts

National rates of walking and cycling to school have declined from 75% to 25% over the last forty years. In Perth, this is as low as 20%. Schools, particularly primary schools, present a significant opportunity to increase active transport rates due to the frequency and short distances of travelling to school. Walking and cycling to school also improves health and wellbeing and can help children develop habits for life.

Taking advantage of National Walk Safely to School Day on Friday 10 May, volunteers from the Curtin Pathway to Net Zero Transport Working Group surveyed 305 parents at ten primary schools across Curtin about how and why their children usually travelled to school. This in-person survey was accompanied by a similar online survey for parents and school staff. The online parents survey received 84 responses, and the school staff survey was completed by 19 schools.

The parents' and school surveys were not intended to comprehensively record travel modes. Rather, the aim was to understand the motivations for and barriers against using active transport to get to school, with particular attention to pedestrian and cycling infrastructure around schools. Due to the busy nature of school drop offs, many parents only partially completed the in-person survey. Nonetheless, there were clear trends in the responses received.

Parental perspectives on active transport

A summary of parents' survey results is included in the following table. There were a mix of transport modes in the parents surveyed, although significantly more families walked on Walk to School Day itself. Some of the schools had their own Walk to School Day activities, others did not. Key findings show that being close and convenient was the single biggest motivation for walking and cycling to school, followed by exercise and health. Reasons for not walking or cycling were more mixed, with dropping kids on the way to work, distance, lack of safety and 'other' all prominent reasons. All of these responses show a perception that walking or cycling to school is not safe, convenient or easy. Increasing active travel will require a range of approaches, including behaviour change and public education, but lack of infrastructure is still important even if it was not the primary reason listed, as it can improve the safety, convenience and ease of active travel. It is worth asking whether parents who drop kids on the way to work would be happy to let them walk or ride independently if active travel infrastructure was improved.

Whilst 'lack of infrastructure' was less popular as a reason, the majority of respondents said the walking and cycling infrastructure around their school was inadequate and were able to name specific locations of concern, suggesting that infrastructure may be more of a factor than acknowledged in the previous question. Lastly, there was overwhelming support for increased government funding for active transport, with 86% of in person and 88% of online respondents saying yes.

Parents Survey Results						
1. How do your usually kids travel to school?						
	Walk	Cycle	Car	Other		
Walk to School Day	59%	15%	23%	3%		
In person	39%	16%	41%	4%		
Online	23%	24%	33%	21%		
2. If your kids usually walk or cycle, why?						
	Close and convenient	Exercise and health	Sustainability	Free	Independent travel	Other
In person	49%	26%	8%	5%	1%	11%
Online	31%	26%	13%	8%	16%	6%
3. If your kids don't usually walk or cycle, why not?						
	Unsafe	Lack of infrastructure	Too long/too far away	Too much to carry	On the way to work	Other
In person	10%	4%	29%	10%	19%	28%
Online	31%	6%	23%	2%	5%	32%
4. What is the walking and cycling infrastructure around your school like? Is it adequate?						
	It's good	It's OK	It's not good enough	*Note: 'It's OK' includes mixed responses that mentioned both good and bad infrastructure.*		
In person	33%	48%	19%			
Online	20%	35%	45%			
5. Do you support increased government funding for active transport?						
	Yes	No	Unsure			
In person	86%	6%	8%			
Online	88%	0%	12%			

Qualitative analysis of these responses show concern about footpaths, cycle paths, crossings and intersections, in the areas both immediately next to the school and further away. Significantly, only one or two dangerous locations needed to be present for respondents to mark the infrastructure as inadequate or needing improvement. Infrastructure was seen as inadequate by being:

1. Non-existent
    a. Some key streets and whole suburbs lack footpaths, so children must walk on the road.
    b. Some key streets and whole suburbs lack cycle paths, so parents and children must cycle on footpaths or on the road.
2. Disconnected or incomplete
    a. Footpaths that did not go all the way from home to school
    b. Cycle paths that did not go all the way from home to school. Several specific mentions of the Principle Shared Paths along the train line being excellent, but then not connecting into the suburb or to the school, reinforcing our analysis of Perth's LTCN.

c. Busy major roads near schools lacking pedestrian crossings or footbridges.
d. Busy intersections and roundabouts lacking safe crossings for pedestrians or cyclists.
e. Footbridges that lack ramps making them inaccessible to bikes, prams or wheelchair users.
f. Safe crossings on the streets immediately bordering the schools, but a lack of pedestrian crossings in the surrounding blocks.
g. 40 km/h school zones being too small.

3. Unsafe for children
    a. Footpaths that are too narrow or right next to the road
    b. Cycle paths not safe for kids to use, being too narrow, used by fast adults commuting or having cars parked over them.
    c. Pedestrian crossings near schools lacking safety wardens
    d. School zone speed limits not being adhered to.

Overall, the bulk of the concerns related to a specific road or intersection on the way to school being too dangerous to travel down or cross safely. As with the LTCN, the infrastructure is fragmented and does not connect all the way from home to school.

School perspectives on active transport

The school survey results largely echo the parent surveys, in the perception of inadequate active transport infrastructure and support for increased funding, although there was a range of responses demonstrating varying levels of engagement with active transport.

Significantly, most schools do not have any robust, regularly collected data about active travel to school. 58% of schools had no existing data at all, and many of those that did only collected it on ad hoc Walk to School Days and did not keep it. Just over half of schools had activities to encourage active travel, but most of these were one-off walk/ride to school days, not regular programs.

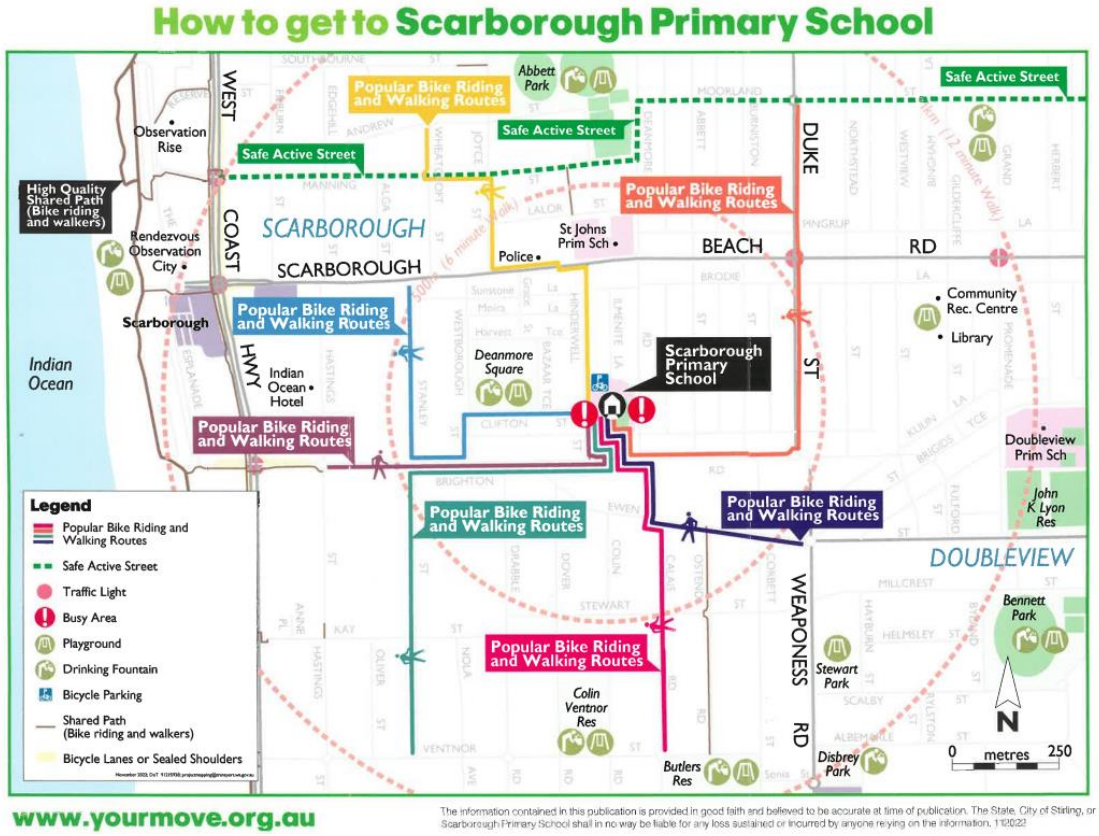
58% of schools recognised that increased active travel would reduce traffic congestion around the school, with some of the more engaged schools also seeing benefits to students' health and wellbeing, the environment and increased community and positive parent interactions.

79% of schools mentioned a lack of safety and suitable infrastructure (including inadequate paths or a lack of wardens) as a barrier to active travel. Time-poor parents who drop kids off on the way to work was second, with 37% of schools seeing this as a barrier. All other reasons were only suggested by one or two schools. The government support most sought after by schools to increase active travel was funding for infrastructure and wardens (79%) and behaviour change and education programs (58%). Schools see clearly a lack of pedestrian and cycling infrastructure as the primary barrier to increased active travel to school, with increased funding for said infrastructure the primary solution.

A case study of safe school precincts: Scarborough Primary School

Scarborough Primary School, a public school in the north of Curtin, has participated in the WA Government's 'Your Move' active transport program for five years, and increased walking, cycling and scooting to school from 35% to consistently around 65%in that time. Your Move is a behaviour change program incentivising students to travel differently through a rewards system. Although students can 'win' bike storage sheds for their school, the program does not directly provide improved pedestrian or cycling infrastructure outside the school boundaries. However, Scarborough PS has produced the following map showing good walking and cycling routes to school from all over the catchment, showing the importance of the whole school precinct to active travel adoption.

Developing a national framework or metric to measure, assess and implement safe school precincts would allow schools, communities, and local and state governments to holistically address the connectivity challenges identified in our parent and school surveys across the whole school catchment.



Recommendations

23. Develop a national metric for measuring and assessing safe active travel routes within school catchment areas and ensure that active travel data is available to schools, communities and councils.
24. Provide funding and resources to schools, communities and councils to help them improve their school precinct with a focus on safety and connectivity.
25. Prioritise funding towards school precincts in greatest need of active travel infrastructure.

Federal leadership on active transport

Increased funding has been clearly identified as the most needed federal government support for active transport in Curtin. The overwhelming majority of schools and parents surveyed supported increased funding for active transport. This is supported by survey responses from Curtin's councils, which identified a lack of funding and resources as the key barrier to increasing active transport locally.

Council perspectives on active transport

Eight out of the nine local government authorities (LGAs) in Curtin responded to the council survey, with perspectives provided by a range of positions, from Mayors and CEOs to Mangers and Officers.

As with schools, there is a considerable variation in the level of engagement with active transport between councils, due in part to the large difference in size between LGAs. Seven of the eight had some form of data about active travel use in the local government area, although only five of these were regular bike counts.

Likewise, some LGAs have adopted Strategic Active Travel or Bike Plans, whilst others' active travel efforts were more ad hoc. Only the smallest council had no current activities to support active travel. Councils' efforts were a mix of hard and soft support – from physical infrastructure improvements, such as new bike paths, Safe Active Streets, or safe crossings, to reduced speed limits, public education, events and community engagement.

Councils see the benefits of increased active travel for reducing congestion, increasing connectivity and improving community health and wellbeing, but face a range of barriers both in the community and within the councils themselves to making this happen. Seven of eight councils identified a lack of connectivity and integration in active transport infrastructure as a community barrier to active transport use, noting that the LTCN was incomplete, major roads and highways lacked safe crossings or underpasses, and some key activity centres did not have cycle paths. Other community barriers included social norms and habits that preference driving, safety concerns, car-centric urban planning and a lack of skills and knowledge about bike riding and available bike routes.

Seven of the eight councils identified a lack of funding and resourcing, as their primary barrier to increasing active travel. Several councils noted that the State Department of Transport had previously provided funding for TravelSmart Officers, but now councils lacked both the staff resourcing to work on active travel, and the funding to build new infrastructure. Other barriers to active travel included narrow streets, verges and existing street trees that left little space for bike paths, as well as community backlash to loss of street parking, although these were only listed by a couple of respondents for each.

The lack of funding provides clear challenges to long-term active travel plans for councils. One smaller council reported that its limited funding drove improvements that were largely piecemeal, and feasible in the short term rather than most strategic in the long term. Councils stated that new funding would be used to increase staff resources for active travel, perhaps through dedicated travel officers, develop bicycle plans or movement network studies where they did not yet exist, and allow the construction of new pedestrian and cycling infrastructure.

Other government support that councils would like include better data collection, public education and behaviour change campaigns, and support from, and coordination between, various state government departments and bodies. One council gave the example of a railway crossing that was desperately needed but would require the collaboration and approval of five separate organisational stakeholders, including multiple councils and state transport bodies (as the train line is parallel to a major highway and major cycle path of the LTCN). In essence, it wasn't moving ahead because the coordination was too difficult. This situation can hardly be unique.

Connecting active transport into activity centres such as schools, shops, universities and medical precincts will also necessitate the involvement of many stakeholders, including the community and private institutions as well as the whole gamut of government bodies. Active transport precincts that fail to adequately engage the community from the beginning will not only meet community backlash upon implementation but may not be effective in addressing community needs for safe, easy and convenient active transport networks.

Recommendations

26. Support local governments to collect active travel data and develop local active travel plans.
27. Significantly increase active transport funding available to local governments for staffing, resources, programs and infrastructure.
28. Coordinate and facilitate collaboration on active transport between all levels of government, departments, sectors, and stakeholders, especially around key locations. Where appropriate, develop new planning frameworks for active transport to streamline these approval processes.
29. Ensure that community consultation is central to active transport precinct planning, to increase effectiveness, uptake and support for final implementation.

Federal funding for active transport

The new $100 million National Active Transport Fund announced in May is a great first step, but is not enough to build adequate active transport infrastructure across Australia or see significant mode shift to active travel. Funding for active transport in Australia is generally estimated to be approximately 2% of transport funding overall. Previously, federal funding for active transport has either been as part of larger road or rail infrastructure projects (which presents challenges in identifying the active transport proportion), through road safety funding or through smaller community grants. It is worth noting that the former only happens if a project proponent decides to include active transport infrastructure as part of the broader proposal. There is no requirement to do so.

When placed in the context of federal funding for other modes of transport and previous active transport funding, $100 million appears quite insignificant. Statistics from BITRE show that, in 2020-21 alone, the Commonwealth Government provided $1.34 billion in road funding to WA. The state's total road expenditure in the same year (by all governments) was $4.2 billion; nationally it was $36.3 billion.

Some of the key existing federal funding sources for active transport include the Infrastructure Investment Program, which will deliver $120 billion worth of infrastructure over 10 years. Research provided by the Australian Parliamentary Library found that,

since 2013, only 15 projects which include active transport components have been funded, totalling $26 million. Only one of these projects is in WA. Since 2018, 316 federal grants, relating to walking and cycling paths have been approved, totalling $275 million. Only 23 of these, worth $5 million, went to WA, and none were in Curtin.

Road Safety funding can be allocated to vulnerable road users, including pedestrians and cyclists. The initial funding of $2 billion included 230 projects benefitting vulnerable road users, but the Department of Infrastructure and Transport did not provide the percentage of funding this represented, nor the overall number of projects. The re-designed Road Safety Program (2023-25) saw an additional $976.4 million of allocated funding. As of February 2024, about 24% of approved projects related to vulnerable road users, and totalled $48.19 million, which is about 5% of the funding available.

Recommendations

30. Increase the proportion of overall transport funding that is dedicated to active transport.
31. Require active transport infrastructure to be included in the scope of works for transport funding.
32. Require a percentage of funding in all transport projects to go towards active transport.
33. Provide dedicated funding for active transport networks and precincts around key activity centres.

Curtin's Pathway to Net Zero: References

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