



ON-DEMAND & SHARED MOBILITY ROADMAP



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DOCUMENT PURPOSE:

The purpose of this Roadmap is to describe the approach that Auckland Transport (AT) plans to take to shape Auckland's future transport network by expanding access to travel options such as bike share, e-scooter share, car share, on-demand shuttles, dynamic car-pooling and ride-hailing. AT recognises that these new travel options could help to connect people to existing public transport services and address the first and last leg gap – the distance between an individual's home or final destination and the nearest bus, rail or ferry service.

The intention of the Roadmap is to open the conversation with communities, operators and others that may be affected by the changes that on-demand and shared services might bring to Auckland's transport system. AT recognises that operators, communities and other stakeholders, for example developers or other government agencies, will need to be involved in the decision-making process and that any approach will need to be flexible in recognition of the pace of change and complexity of services on offer.

The Roadmap starts by describing the current situation in Auckland, introduces a set of principles to guide investments and decision-making, sets out how AT plans to engage with communities and operators, and concludes by describing what action AT plans to take over the coming years to achieve the Roadmap's aims.

Foreword

Recently, a journalist asked whether AT Local, would be Auckland Transport's Apollo 11 or our Icarus. AT Local is our on-demand, shared ride, first/last leg trial service in Devonport. It is provided through a technology platform that allows customers to book a trip from a point close to their home or business to the Devonport, Bayswater or Stanley Bay ferry terminals (and vice versa). The service is improving access across the Devonport peninsula and over 30,000 trips have been made on the service in the opening year.

Technology forecasters are predicting big shifts in technology and towards electric powered transport, as well as an exponential increase in focus on individual customers. Auckland Transport's response to these forecasts is contained in this document, the 'On-demand and shared mobility roadmap'.

This Roadmap sets out our approach to shaping Auckland's future transport network. We plan to do this by expanding access to travel options such as bike share, e-scooter share, car share, on-demand shuttles, dynamic car-pooling and ride-hailing. These services can help customers connect to our rapid or frequent public transport network, improve transport choices and reduce our reliance on the private car.

It includes principles to guide our decisions around our on-demand and shared-mobility future. It sets out how we will engage with communities and operators and describes what action we will take over the coming years to prepare Auckland's transport system for the future.

Auckland is not a region without its challenges. Rapid population growth, low density land-use and an historic under-investment in public transport has led to a high dependency on single occupancy car travel, high household travel costs, traffic congestion and a public transport network that has not kept up with growth. In addition, less than half of our population is within walking distance to a rapid or frequent public transport service.

On-demand and shared mobility is not a panacea, but it has its place and can help improve access to jobs and services. To do this we need to work with our communities and partner with operators to integrate new services with our existing network. If we do not take a pro-active approach, our roads, streets and paths could become more congested, we risk disruption to public

transport services, there could be poor safety outcomes, and communities may become confused about their travel options.

Technology-driven change from the private sector has been influencing transport options available to Aucklanders at a rapid pace in recent years. In addition to AT Local, we have:

- Supported several pilots for e-scooter share and bike share schemes; and
- Developed a car share policy

Moving forward, we plan to take a more active approach to bringing these newer modes into our transport system. We will do this in a way that complements our existing public transport network and makes life easier for travelling customers. In developing this Roadmap, we are formally acknowledging the key role we need to play in shaping and investing in Auckland's transport future and in keeping it safe, up-to-date, attractive and easy to use. On-demand and shared mobility modes offer our customers better travel options. It is driven by the need to encourage more people to choose transport that is active, space-efficient and cost-effective as our region continues to grow.

We recognise that providing or enabling new services is only part of the picture. To achieve a shift away from single-occupancy car use towards much greater use of active and shared transport we also need to adapt our infrastructure, develop engagement programmes that influence travel choices, and help customers to navigate both physical and digital transport systems. We'll also continue to work closely with other government agencies on regulatory changes, in planning the use of on-demand and shared transport services for events or in emergencies, and when making decisions about land use.

Exciting transformations lie ahead as we get Auckland's transport services ready for the future.

Shane Ellison
Chief Executive, Auckland Transport

Executive Summary

This Roadmap sets out the approach that Auckland Transport (AT) plans to take to shape Auckland's future transport network by expanding access to on-demand and shared travel options such as bike share, e-scooter share, car share, on-demand shuttles, dynamic car-pooling and ride-hailing. It discusses the challenges and makes clear AT's intention to work with communities to design and deliver schemes that work for them.

On-demand and shared modes are important because they can help to address the key challenges Aucklanders and AT have identified as barriers to the region becoming more liveable:

- Access to jobs and opportunities
- Safety risks
- Congestion
- Noise, poor air quality and other environmental impacts of transport.

AT is committed to developing this Roadmap in its Regional Public Transport Plan (RPTP) with the aim of using on-demand and shared services to:

- Provide a first/ last leg connection to the rapid and frequent transport network; only a little over 40% of Auckland's population is within walking distance of the rapid and frequent transit network;
- Supplement existing bus/train/ferry services; or
- Replace public transport routes where on-demand or shared services could provide better value for money while improving access for customers.

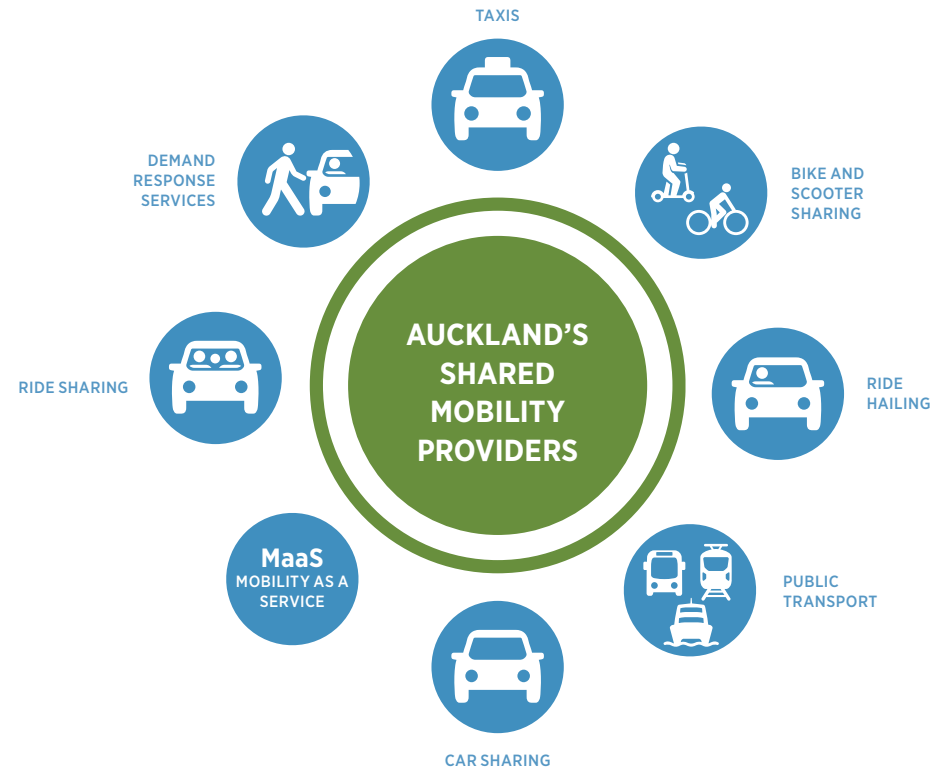


Figure 0-1: Summary of current mobility providers in Auckland

The development of this Roadmap included reviewing Auckland's on-demand and shared mobility marketplace (see Figure 0-1) and interviewing operators, studying what other cities were doing overseas and engaging with local stakeholders to develop an approach for Auckland. As can be seen below, there are already a multitude of on-demand shared mobility providers around the city.

This Roadmap includes twelve principles that, in conjunction with relevant policy, should be used to guide investment and decision-making about on-demand and shared mobility. These are:

1. Provide a great customer experience
2. Everyone is kept safe from death, injury and serious harm
3. Walking, cycling and active travel should be the most attractive choice for short trips
4. Keep the frequent and rapid transit network at the heart of Auckland's transport system
5. On-demand and shared services should support a transition to clean, green and space-efficient travel choices
6. Co-design Auckland's on-demand and shared mobility services with communities, operators and other stakeholders
7. Regulation and licensing should be guided by public benefit
8. Engage with customers and develop marketing to support the shift to on-demand, shared and active modes
9. Be transparent about data and insights, and protect customer privacy
10. Be resilient and responsive to change and feedback
11. Provide a transport system that offers good value for money, is inclusive and equitable
12. Make use of on-demand and shared modes to support existing growth.

A number of scenarios have been identified as suitable for on-demand and shared mobility. These include:

- Rural townships
- Areas with socioeconomic deprivation
- Areas underserved by public transport
- Business parks and employment centres
- New medium-density housing areas where the initial population is insufficient to justify conventional public transport e.g. bus service.

These scenarios were identified by considering: what worked well overseas for different types of land use; access to the RTN and FTN; and the quality of cycle infrastructure. Specific locations and the mix of on-demand and shared services to be deployed will be confirmed during the next stage of developing the business case for on-demand and shared mobility. While AT can access funding for on-demand trials in Year 1, prior to implementing any on-demand and shared mobility schemes more widely, AT will need to secure additional funding.

The actions that AT plan to take over the next few years to deliver this Roadmap's intentions are summarised in Table 0-1.

Table 0-1: Summary of AT's plan to deliver this Roadmap's intentions

ON-DEMAND SHARED MOBILITY: ACTION PLAN SUMMARY	
SHORT TERM - YEAR 1-2: ESTABLISHMENT	
GOVERNANCE	Establish governance systems and implementation team
IDENTIFY LOCATIONS	Identify and prioritise locations in partnership with communities and stakeholders
SHORT TERM TRIALS	Confirm two potential locations for further AT Local Trials
IDENTIFY POTENTIAL SCHEMES	Identify potential schemes and delivery partners along with supporting Travel Demand Management(TDM) programmes
FUNDING	Identify funding sources and partners
PROCUREMENT	Develop and confirm procurement models for potential on-demand shared mobility schemes
POLICY AND GUIDELINES	Establish supporting policy and guidelines
DATA AND DIGITAL	Establish requirements around data sharing and reporting
INFRASTRUCTURE REQUIREMENT AND PLANNING	Establish infrastructure requirement and planning (e.g. infrastructure, kerbside and footpath management plans, walking and cycling improvement plans)
MONITORING, EVALUATION AND REPORTING	Establish and set up evaluation and monitoring approaches
INVESTIGATE/STUDY	Undertake further investigation on Cooperative models for community-led initiatives and Collaborative funding models

ON-DEMAND SHARED MOBILITY: ACTION PLAN SUMMARY	
MEDIUM TERM – YEAR 2-3: IMPLEMENTATION	
IMPLEMENTATION	Implement schemes and manage/make changes to infrastructure
MONITORING AND EVALUATION	Conduct monitoring and evaluation
INVESTIGATE/STUDY	Examine information and emerging trends; Investigate potential MaaS partners and mode of delivery and pricing
LONG TERM - YEAR 4-7: CONFIRMING NEW BUSINESS AS USUAL	
REFINE AND SCALE UP	Refine schemes and scale up
DIGITAL PLATFORM	Confirm the approach for the delivery of a journey planning tool that amalgamates all travel options
POLICY AND GUIDELINES	Refine policy and guidelines based on successes and lessons learned
KNOWLEDGE SHARE	Knowledge share and provide support to other cities and towns in NZ
INVESTIGATE/STUDY	Continue to examine information and emerging trends and investigate the potential for a Mobility as a Service



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Introduction

This 'On-demand and Shared Mobility Roadmap' (the Roadmap) sets out the approach that Auckland Transport (AT) plans to take to shape Auckland's future transport network by expanding access to travel options such as bike share, e-scooter share, car share, on-demand shuttles, dynamic car-pooling and ride-hailing. 'On demand' transport enables users to gain short-term access to transportation modes on an as-needed basis. 'Shared mobility' refers to any mode of transport that can be shared.

These modes are important because they can help to address the key challenges Aucklanders and AT have identified as barriers to the region becoming more liveable:

- Access to jobs and opportunities
- Safety risks
- Congestion
- Noise, poor air quality and other environmental impacts of transport.

Regional policy such as Auckland's Regional Land Transport Plan¹ 2018-2028 (RLTP) supports the consideration of on-demand and shared modes within Auckland's transport system. In their feedback on the RLTP, Aucklanders said that they wanted their transport system to:

- Provide value for money
- Offer affordable public transport and vehicle travel, particularly for low-income households
- Be healthy, i.e. provide opportunities to increase physical activity, improve air quality and reduce social isolation
- Consider the broader costs and benefits of investing (or not investing)
- Support growth in the region.

Auckland's Regional Public Transport Plan² (the RPTP) responded to these concerns and feedback by committing to enhancing performance across the transport network, with a greater emphasis on safety, mode shift to more sustainable modes and the reallocation of road space away from single occupancy vehicles. AT also committed to developing this Roadmap within the RPTP with a view to using on-demand shared services to complement, supplement or replace public transport routes.

The benefits that on-demand and shared services can bring for customers are many, including:

- More choice in the way customers travel to a destination, making a multi-modal trip viable
- Improving access to mass transit by providing a first-last leg connection to public transport

- Alignment with AT's Māori Responsiveness Plan – a key objective is delivering better transport outcomes for Māori
- Offering a cost-effective alternative to traditional, fixed-route bus services in certain scenarios such as providing a late-night or weekend service, or to connect Māori communities with their marae or wahi tapu (places of cultural significance)
- Reducing household transport costs, for example by removing the need to pay for parking or own a car
- Access opportunities to earn extra income by sharing resources, for example by selling space in a car or sharing a vehicle via a peer-peer service
- Providing independence for those who cannot afford to buy and maintain a vehicle
- Enabling a shift away from single occupancy car use by making it easier for people to share rides or pay by the kilometre to use a vehicle instead of owning it
- Reducing traffic congestion, vehicle kilometers travelled and air pollution
- Increased safety: these services help provide a sense of personal safety to many, especially late at night.

WHY WE NEED A ROADMAP

The purpose of the Roadmap is to enable Auckland to seize the opportunity that on-demand and shared mobility services present. By developing this Roadmap, AT is seeking to influence the on-demand and shared mobility market at a region-wide level, in a transparent manner, thereby enabling it to mature and expand in a way that meets the needs of people living, working, visiting or travelling through Auckland. Whilst Auckland is developing an effective Rapid Transit Network (RTN) and Frequent Transit Network (FTN), these networks are within walking distance of fewer than half of Aucklanders. There is a real opportunity to provide a first/ last leg connection to the rapid and frequent transport network via on-demand and shared services.

The task of integrating on-demand and shared mobility services is complex. Consideration needs to be given to:

- Which services will work, in which locations
- Giving people access to healthy transport choices
- Taking an inclusive approach by:
 - Investing in a way that is geographically and socially fair
 - Designing services in a way that does not exclude people who don't have access to data or digital devices
 - Providing affordable transport choices to those on low incomes
 - How our infrastructure needs to adapt including how parking for shared bicycles and scooters should be managed, how we manage the kerbside to enable pick up and drop off by on-demand shuttles and how customers are supported at places where they change from one mode to another
 - How to ensure services are optimally designed for people, such as involving communities in co-designing services
 - How procurement might need to change, for example to include partnering or other collaborative models of operation
 - What systems and services customers might need to help them understand their travel options, and book and pay for trips.

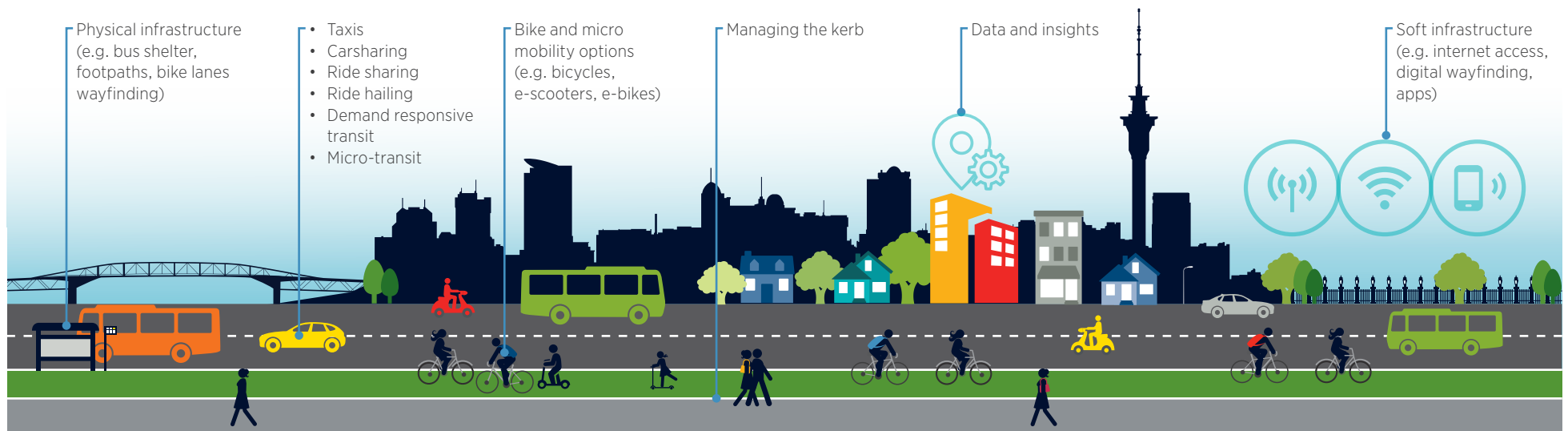


Figure 1-1 Components of on-demand and shared mobility within a transport system

ROADMAP DEVELOPMENT PROCESS

This Roadmap has been informed by relevant policy, by reviewing approaches taken overseas and from discussions with local operators and stakeholders, including the New Zealand Transport Agency (NZ Transport Agency).

A context diagram showing where this Roadmap sits strategically and within the NZ Transport Agency's Business Case Approach is shown in Figure 1-2. AT committed to developing the Roadmap in its RPTP. Parallel to its development, a Programme Business Case has been produced which makes the case for funding and explains how the Roadmap will help AT deliver on regional and national policy goals. Once the Programme Business Case has been accepted by AT and the NZ Transport Agency, a Single Stage Business Case will be developed which will be informed by delivering the Action Plan set out in Section 7 of this document. In parallel with the delivery of the business cases required by the NZ Transport Agency, AT will continue to run trials and support pilots that work towards this Roadmap's intent of integrating on-demand and shared services into Auckland's transport system so that they become 'business as usual' for both AT and customers.

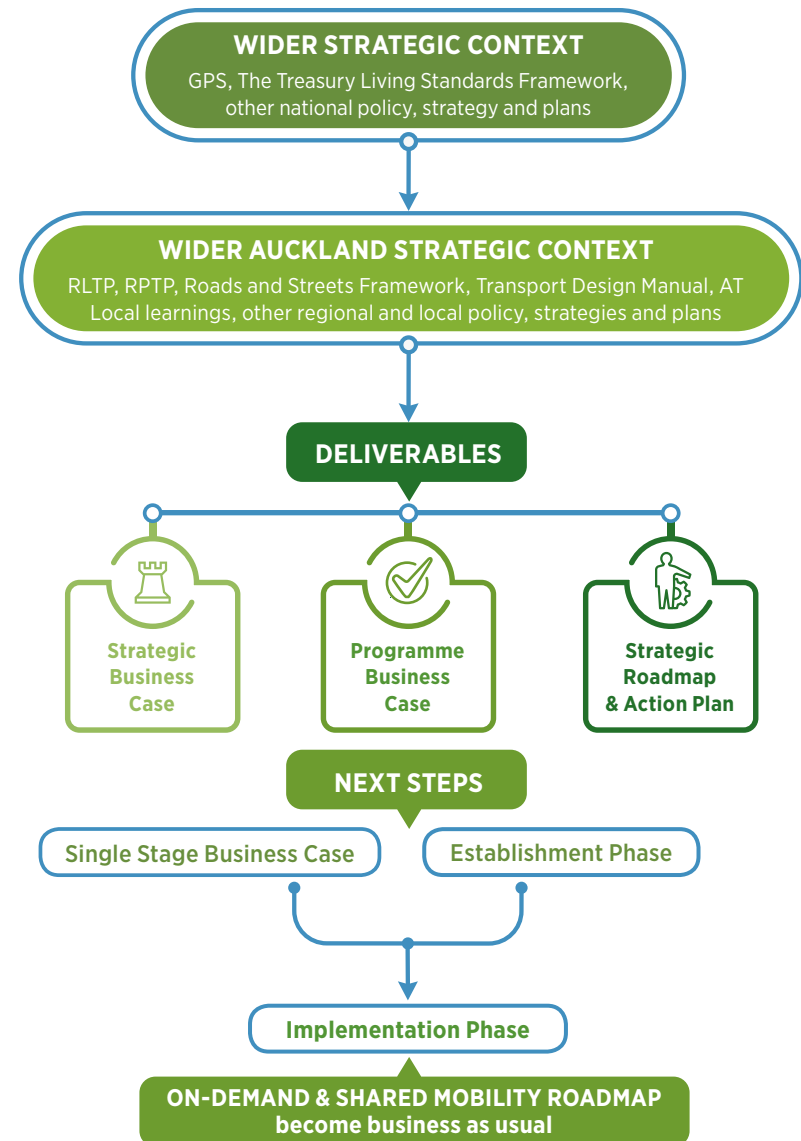


Figure 1-2 Diagram to show this Roadmap's context

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2019 Auckland shared mobility snapshot

The on-demand and shared mobility services available in Auckland during 2019 are shown in Figure 2-1 below. Figure 2-1 shows that there are a wide and growing range of providers operating in Auckland, however AT recognises that coverage across the city is patchy and that customers could benefit from wider service coverage in some areas especially where there are gaps in the public transport network. Each of the operators shown in Figure 2-1 requires customers to download their app to book, plan or pay for a trip- that's a lot of apps for customers to navigate and AT would like to make it easier for customers by providing a 'mobility as a service' app that offers a one-stop-shop via which customers can plan and book trips.

To inform the development of this Roadmap, existing operators and those that had expressed interest in operating were interviewed. These interviews informed AT about what on-demand and shared services were available, the appetite to expand, barriers to entry, issues that operators faced in the Auckland market, and what they would like to see changed. Operators indicated that they would welcome the opportunity to work more collaboratively with government, and in some cases, with each other.

AT and Auckland Council have made active efforts to develop shared mobility services, notably by providing the AT Local Trial in Devonport and the e-scooter pilot licenses in Auckland, see case study boxes.



Figure 2-1 Auckland shared mobility providers

HOW DOES AUCKLAND COMPARE TO GLOBAL CITIES?

Many cities overseas have been actively integrating on-demand and shared mobility into their transport systems, many have set up pilots or innovative trials and some have published plans detailing how they will organise their on-demand and shared mobility services. A small selection of interesting and leading-edge examples have been mapped in Figure 2-2. Cities that have developed roadmaps, strategies or action plans include Chicago-Roadmap for the Future of Transportation and Mobility⁵; Los Angeles- Shared Mobility Action Plan⁷ and Twin Cities- Shared Mobility Action Plan⁶.

Over the past few years, several on-demand and shared mobility services have established in Auckland including Onzo bikes, Lime and Wave e-scooters, various car share companies, Uber, and AT has trialled an on-demand rideshare service in Devonport (AT Local). Although numerous services are now available, when compared to similar cities overseas, Auckland's on-demand and shared mobility marketplace is still in its infancy. While providers are motivated to gain, win and keep customers, ultimately the new operators are profit-driven and do not have an obligation to provide a consistent service to all areas and for all Aucklanders. As a result, operators are not providing vehicles or service in areas that could benefit from a first and last-leg service.

International experience has shown that while commercial enterprise services can show initial promise they often fail to grow, resulting in gaps in the network that disproportionately impact people without good access to transport. Analysis of the causes for this lack of consistent services suggests a need for stronger policy and a programmatic approach to ensure that, over time, on-demand and shared services meets customer needs and provide broader coverage in a manner that complements the existing transport network and is equitable for customers.



Overseas, governments have intervened in many ways including:

- Partnering with providers
- Issuing licenses to operate
- Developing codes of conduct
- Laying down challenges to be solved
- Requiring businesses to provide service coverage in localities that are less desirable as a trade-off for access to more commercially attractive areas
- Investing in on-demand and shared mobility schemes to bring coverage to areas that might not be commercially viable for operators.

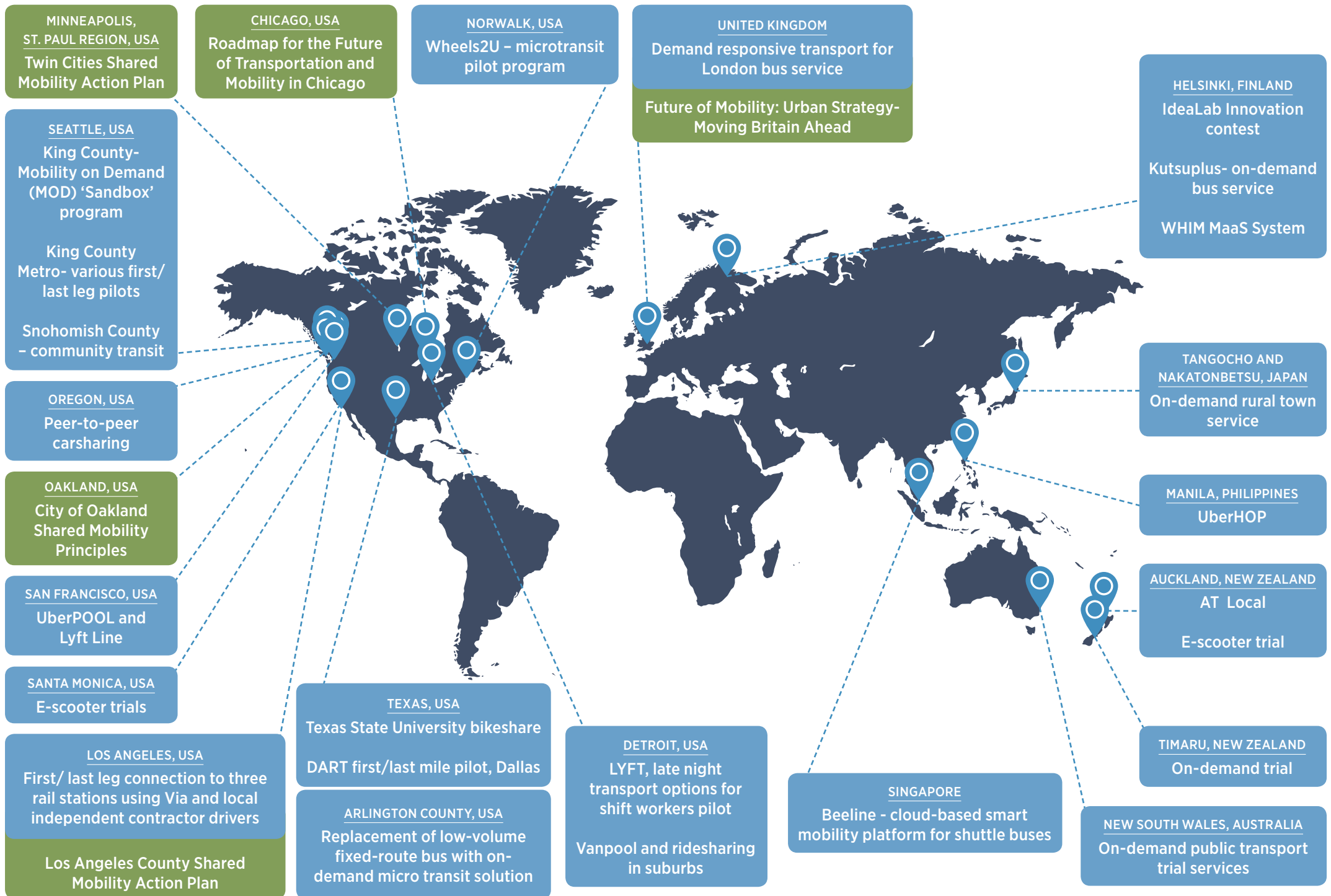


Figure 2-2: Recent selected highlights for on-demand and shared mobility services

CASE STUDY 1

AT LOCAL: AN ON-DEMAND TRIAL IN DEVONPORT

Auckland Transport launched the fully electric 'AT Local' service in November 2018. The 12-month trial offers customers a corner-to-corner on-demand shared shuttle service within the Devonport suburb (see map), and there is a discount for those connecting to the Devonport, Bayswater and Stanley Bay ferry terminals³.

The trial area was selected in response to concerns about congestion and delays on Lake Road in Takapuna and to ease pressure on parking at the ferry terminals. Lake Road is the only road linking Takapuna and Devonport. It is also a key route to get to the ferry terminal linking Devonport to Auckland city.

By August 2019, the service had delivered over 27,440 rides, with ridership increasing week-on-week (see graph). The average distance per trip is approximately 2.2km. On its busiest day, the service delivered 262 rides. It is tracking ahead of its target of 200 rides per day, now averaging 213 rides per weekday, with 43% of riders having switched away from the private motor vehicle.

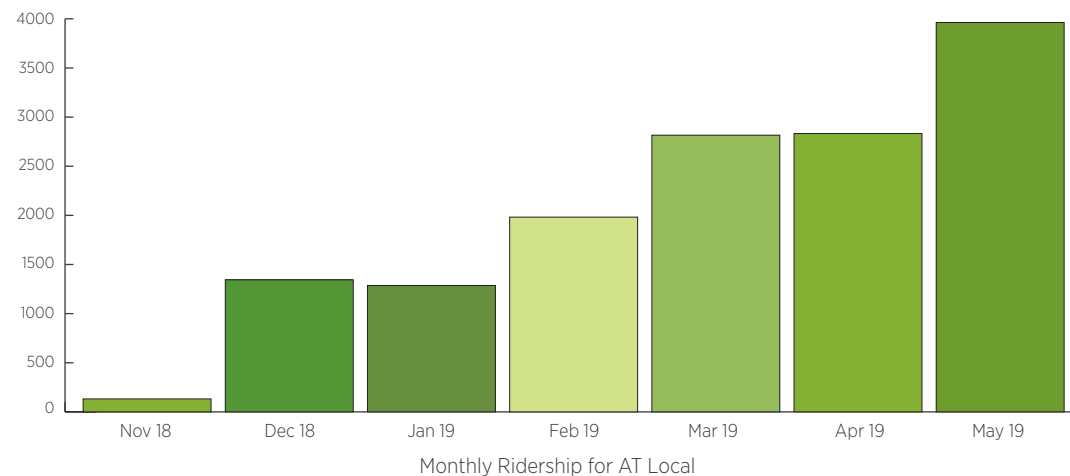
User feedback has generally been positive, and a number of changes have been made to the service as a result of customer and driver feedback. Still in its early stages, the trial is helping create a better product for future expansion and application to other parts of Auckland.

By February 2019: The AT Local service was supported by a subsidy of \$35 per ride. This amount reduced to below \$11.75 per ride by August 2019. Compared to other similar rideshare schemes, AT Local rated in the top three performers on all passenger performance metrics.



Figure 2-3: Map of AT Local trial

Figure 2-4: Graph showing monthly ridership on AT Local



“Fantastic service. Quick, easy and didn’t have to find a park in Devonport. I really hope this service continues past the trial.”

AT local user

CASE STUDY 2

E-SCOOTER TRIALS

In October 2018, Auckland began an e-scooter-share pilot programme to establish whether e-scooters could become a permanent travel choice for Aucklanders. Initially, three operators were granted licenses to operate over a four-month summer period bringing 1,000 e-scooters into the city centre and inner-city suburbs, but only Lime e-scooters were seen on the streets during the trial period. In February, the trial was extended and in March 2019, Bird launched its Wave e-scooters with a license to deploy 500.

In May, Auckland Council announced Lime, Wave and Flamingo to be the three e-scooter operators that would participate in phase two of the e-scooter trial which will run through to October 2019⁴. A total of 1,875 e-scooters have been deployed as part of the trial. To address safety issues and concerns raised over the sharing of space with pedestrians, low speed zones have been introduced where riders will be restricted to a top speed of 15km per hour. Auckland Council has introduced a tier system to encourage providers to make e-scooters available outside the inner suburbs. Lime and Flamingo have both applied for deployment in the outer suburbs (tier three) while Wave will only provide e-scooters in tiers one and two.

A new code of practice was released in April 2019 informed by the findings of the initial trial.

“A new and exciting way to get around and interact with the city”

E-scooter user

According to the initial findings of the trial, approximately half of the Aucklanders surveyed considered shared e-scooters to have had a positive impact on the city. Auckland Council and AT are considering how micromobility is accommodated in future.



Santa Monica in the US is also undertaking a similar trial process to aid with the development of long-term policy solutions. In September 2018, Santa Monica began a 16-month Shared Mobility Pilot Program allowing four operators (Bird, Jump, Lime, and Lyft) to provide shared e-scooters and e-bikes. Initially the e-scooters were capped at 2,000 but the city under its dynamic cap adjustment process has increased the fleet size to a total of 2,250. Under its regulatory framework, operators are required to pay a \$20,000 annual fee and additionally \$130 per device. Besides this, operators are required to share all real-time data with the authorities, ensure that scooters are evenly distributed in all locations, establish a 24-hour complaint hotline, promptly move improperly parked scooters. Riding on the Sidewalk is prohibited and helmets are mandatory.

According to the findings of a user survey, more than half of the respondents reported using the private car (including drive alone, ride share services, taxi, etc) less. 50 percent also said that their most recent e-scooter trip replaced a car trip, while 38 percent replaced a walking trip.



A NOTE ON FUNDING ON-DEMAND SERVICES

In its RTP, AT has expressed a desire to consider on-demand shared services when they can:

- Complement existing services: by providing a first-last leg connection to scheduled, fixed route public transport, including where park and ride facilities are full and constrained
- Replace existing services: where scheduled, fixed route public transport services are inefficient to run and access could be improved by providing on-demand / shared mobility solutions
- Supplement existing services: a low frequency bus route could be supplemented by an additional on-demand / shared mobility service where there is low demand outside of standard working hours i.e. early morning and late night.

As this Roadmap was developed, an opportunity was identified for these services to also:

- Enable growth: traditionally, planning a rapid and frequent transit route has relied on estimating patronage based on number of households within a certain distance or the space available to cater for park and ride. New forms of active and shared transport may open up possibilities for new RTN and FTN routes by allowing us to build patronage in new growth areas that don't yet have the population density to justify fixed route services.
- Improve access and levels of service for those with limited mobility: on-demand and shared mobility services can improve access for customers with accessibility needs by providing travel options and choices better suited to their needs.

3

Principles to Guide On-Demand and Shared Mobility Decisions

Our approach to seizing the opportunity presented by on-demand and shared transport will be, as far as possible, guided by a set of twelve principles. These design principles have been informed by discussions with stakeholders; a national and international review of on-demand and shared mobility literature; the international Shared Mobility Principles for Liveable Cities (endorsed by the Transport Agency); the Auckland Transport Statement of Intent; and similar principles in policy documents from overseas, including Chicago, Twin Cities and Auckland's tripartite partner city, Los Angeles. The purpose of the principles is to guide how we invest and make decisions about on-demand and shared mobility.

THE TWELVE PRINCIPLES ARE:

1. Provide a great customer experience
2. Everyone is kept safe from death, injury and serious harm
3. Walking, cycling and active travel should be the most attractive choice for short trips
4. Keep the frequent and rapid transit network at the heart of Auckland's transport system
5. On-demand and shared services should support a transition to clean, green and space-efficient travel choices
6. Co-design with communities, operators and other stakeholders Auckland's on-demand and shared mobility services
7. Regulation and licensing should be guided by public benefit
8. Engage with customers and develop marketing to support the shift to on-demand, shared and active modes
9. Be transparent about data and insights, and protect customer privacy
10. Be resilient and responsive to change and feedback
11. Provide a transport system that offers good value for money, is inclusive and equitable
12. Make use of on-demand and shared modes to support existing growth.

1

PROVIDE A GREAT CUSTOMER EXPERIENCE

Auckland's on-demand and shared transport system has a distinct identity that customers can easily recognise. Customers should be able to make efficient, seamless trips via physical connections, common payment platforms, and combined information. Customers with accessibility needs should experience seamless trips as standard.

On-demand and shared modes can improve transport choices but they may also increase the number of modes customers take to reach their destination. This additional complexity may make it harder for some customers to navigate the transport system. It should be easy for customers to understand routes and costs, plan and book trips, pay for and use the transport system, whether they are making a single mode or multi-modal journey.

Customers should benefit from the flexibility of on-demand and shared transport whether they are making a regular or a one-off trip. Fares should be affordable and easy to understand.

2

EVERYONE IS KEPT SAFE FROM DEATH, INJURY AND SERIOUS HARM

Customers using on-demand and shared services should be protected from death, injury and serious harm via appropriate licensing agreements, regulation and infrastructure. Services should be accessible, healthy and safe, as well as being clear about which ages and abilities they are catering to.

Some modes of transport, such as cycling or e-scooters, may be new to some people, so training and education programmes should be easy to access and widely available.

On-demand services could be used to prevent customers from being left stranded on the transport system as part of a guaranteed ride home system.

The rights of pedestrians need to be protected, particularly those of the most vulnerable, e.g. Customers with accessibility needs, young, old and infirm.

3

WALKING, CYCLING AND ACTIVE TRAVEL SHOULD BE THE MOST ATTRACTIVE CHOICE FOR SHORT TRIPS

Avoid displacing active trips such as walking and cycling with, for example, door-to-door/corner-to-corner on-demand services. Access and convenience need to be balanced with the best overall investment for health and well being. If safe infrastructure is a barrier to greater uptake of active modes in an urban area, this should be addressed before investing in on-demand and shared services. Even when there are safe and easy-to-use walk and cycle routes in an area, there is a risk that on-demand services can replace active trips, hence the need to carefully consider a community's transport options when deciding on where to provide on-demand services.

This of course must be balanced with the benefits of door-to-door/corner-to-corner services to improving social interaction.

4

THE FREQUENT AND RAPID TRANSIT NETWORK SHOULD BE AT THE HEART OF AUCKLAND'S TRANSPORT SYSTEM

Mass transit (bus, rail and ferry) is the most efficient way for Auckland to move large numbers of people at once. On-demand and shared services should facilitate and complement the use of the rapid and frequent transit network (RTN and FTN). on-demand and shared services can make it easier for people to access mass transit by feeding interchanges and stops where there are gaps in connector bus services or where community needs are not being met. Pick up and drop off zones must not be designed to impede transit.

5

ON-DEMAND AND SHARED SERVICES SHOULD SUPPORT A TRANSITION TO CLEAN, GREEN AND SPACE-EFFICIENT TRAVEL CHOICES

Shared mobility should reduce greenhouse gas emissions and provide people with access to cleaner and more space-efficient travel choices that allow them to connect with employment, services and opportunities. Shared-use fleets play a key role in accelerating the shift to zero-emission vehicles. Transportation and land use planning and policies should minimise the street and parking space required per person and maximise the use of each vehicle. We will discourage the use of single-passenger cars, single-passenger taxis, and other oversized vehicles transporting one person. This transition would need to be supported with changes to infrastructure such as:

- Allowing recharging for electric vehicles
- Providing space for shared modes to travel in safely (e.g. lanes for micromobility)
- Encouraging people to share rides by providing T2/T3 lanes, and
- Catering for storage/interchange by allocating space in which shared bikes, e-scooters, cars etc can be parked in between rides.

6

CO-DESIGN WITH COMMUNITIES, OPERATORS AND OTHER STAKEHOLDERS AUCKLAND'S ON-DEMAND AND SHARED MOBILITY SERVICES

A broad range of stakeholders will be actively engaged in an inclusive manner to involve them in the decision-making process. This is necessary because changing the transport system has direct impacts on the lives, investments and economic opportunities of residents, workers, businesses, and other stakeholders.

Outreach and co-design processes need to be inclusive and designed in a way to include low-income communities, those living in areas underserved by public transport and people with accessibility needs.

The voluntary and community sector needs to be supported to facilitate grassroots action that supports the design and delivery of on-demand and shared services that are 'homegrown' alongside those provided by international businesses.

It will be easier for existing or potential operators to approach and engage with AT to understand what's needed, discuss ideas, understand what the rules are and to identify opportunities to operate new services.

7

REGULATION AND LICENSING SHOULD BE GUIDED BY PUBLIC BENEFIT

New regulation needs to be considered where it is required, reasonable and robust where it is needed to protect the public whilst enabling innovation. Licensing will be used both to give businesses the confidence to invest, such as by limiting the number of operating licenses or restricting the right to operate in an area, and to formalise expectations between government and operators.

8

ENGAGE WITH CUSTOMERS AND DEVELOP MARKETING TO SUPPORT THE SHIFT TO ON-DEMAND, SHARED AND ACTIVE MODES

Customers will be encouraged to the shift away from single occupancy car use and ownership towards the use of shared, active and on-demand modes, where it is the right choice for them, to connect with employment, services and opportunities. Outlining different travel choices in an accessible way through social media and using easy tools will help to support behaviour change. This may be to encourage a regular behaviour such as using more sustainable transport for a commute, or for big one-off decisions such as deciding to sell a car because there are sufficient travel choices available to live 'car-free'.

9

BE TRANSPARENT ABOUT DATA AND INSIGHTS WHILE PROTECTING CUSTOMER PRIVACY

The data infrastructure underpinning on-demand and shared transport services must enable interoperability, competition and innovation whilst ensuring privacy and security.

Obtaining data and sharing insights will enable AT and interested parties to understand how the transport system is performing and where it could be improved. Data will be made open where there is public benefit to do so and customer privacy can be assured. Data handover should be a prerequisite to service partnerships.

10

BE RESILIENT AND RESPONSIVE TO CHANGE AND FEEDBACK

Data and feedback from customers and operators will be acted upon so that our transport system can continually adapt and change as needed.

11

PROVIDE A TRANSPORT SYSTEM THAT OFFERS GOOD VALUE FOR MONEY, IS INCLUSIVE AND EQUITABLE

Investments in on-demand and shared services will align with these principles and offer good value for money.

The transport system will promote equity: physical, digital, and financial access to active, on-demand and shared transport services are valuable public goods and it requires thoughtful design to ensure use is possible and affordable by all ages, genders, incomes, and abilities.

Shared mobility should help lower the combined cost of housing and transportation in low-income communities where consideration also needs to be given to making fares equitable.

The geographical area served by on-demand and shared transport and the opportunities to which it connects people, should be planned based on geographical equity but with regard to land use so that any investments made offer good value for money.

12

MAKE USE OF ON-DEMAND AND SHARED MOBILITY TO SUPPORT EXISTING GROWTH

On-demand and shared modes have the potential to support existing land use and growth. We will consider how these modes can enable positive change too for example by enabling 'car-lite'⁸ developments. We will be careful not to allow these modes to be used to justify sprawl or distract us from making sensible decisions about the way our city grows.

4

Other Relevant Policy and Decisions

This section refers to key policies and trip distance information that need to be considered when making decisions about shared and on-demand mobility.



THE AT ROADS AND STREETS FRAMEWORK

The roads and streets framework is used to identify the movement and place functions of the street network in any given area, as well as assigning modal priorities. It takes Auckland-wide network planning and applies it to specific locations, examining the current state and setting the future priorities. The Roads and Streets Framework can be used when considering on-demand transport to determine the priority public transport should have in an area in locations where there is currently no public transport services, which can trigger an examination of opportunities for on-demand services.



TRANSPORT DESIGN MANUAL

The Transport Design Manual should be used when considering infrastructure wayfinding and signage. Its purpose is to enable the Auckland Council family and developers to deliver a consistent suite of design across the Auckland region and offers a holistic approach to planning and design, including wayfinding.

A simpler wayfinding system with enhanced information will be more user friendly, contributing to Auckland being a more liveable city¹⁰. This is of relevance when making decisions about the look and feel of on-demand and shared mobility services that are supported or endorsed by AT, and any wayfinding signage that helps customers to locate or find out about a service.



AT CAR SHARE POLICY

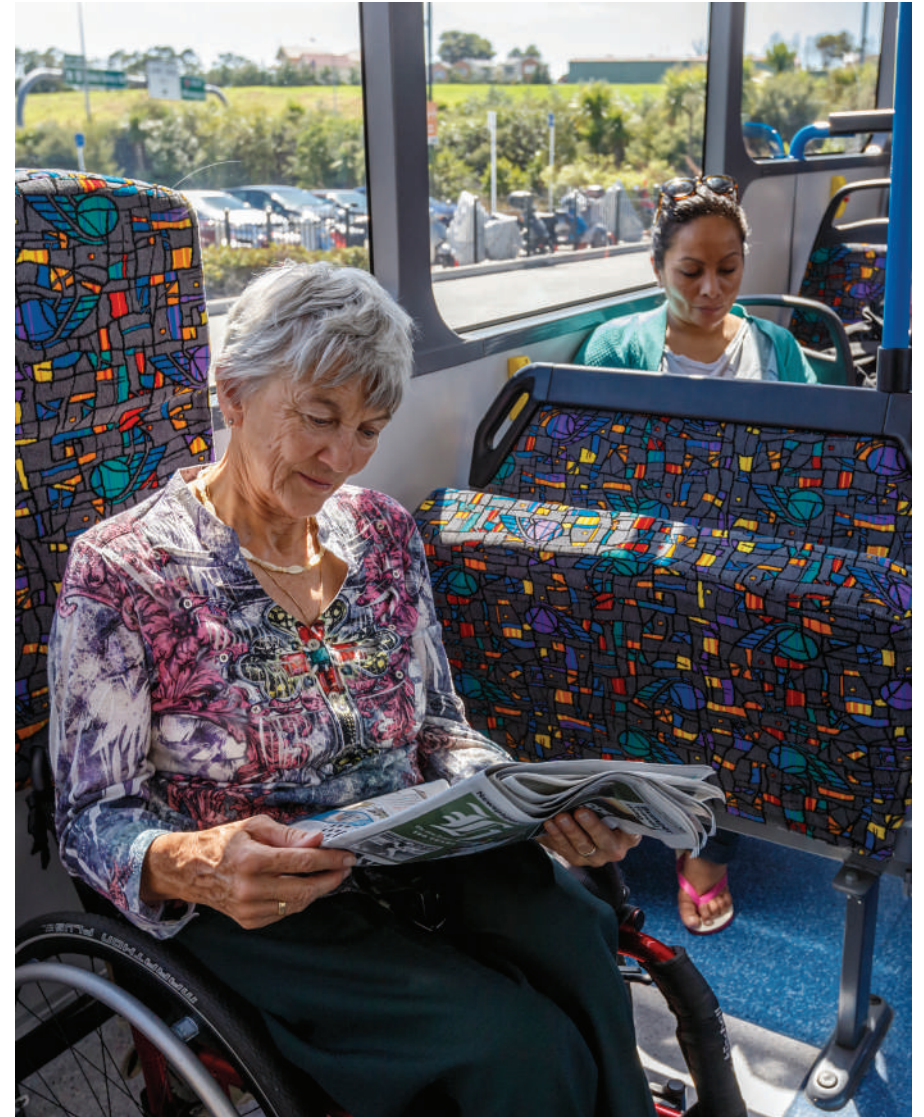
AT's Car Share Policy adopted in October 2019 enables multiple car share operators to compete in the Auckland market for the first time. Car sharing provides greater flexibility for trips over shorter distances than traditional car rentals when PT or active modes may be unsuitable. It is not seen as a substitute for PT given its cost but more of a niche market whose performance will be closely monitored. The Policy outlines how potential operators can apply for approval from AT and how the relationship is governed, including what type of public parking privileges apply, what discounts apply on paid parking, what data is required from operators, and vehicle safety requirements. The Policy recognises the need to ensure parking availability for residents and business owners and so includes an overall cap on the number of car share bays within the city centre and fringe.

ACCESSIBILITY ACTION PLAN

The traditional (medical) view of disability focuses on a physical or intellectual impairment as the cause for inequality, such as vision impairment, mobility impairment, or hearing impairment.

A more accurate and inclusive view focuses on outside factors - the barriers that make the world inaccessible for someone who has an impairment. The barriers may be physical, e.g. inaccessible vehicles and infrastructure, or social, such as lack of information or people's attitudes. AT can make a significant difference by removing or addressing physical barriers to travel and by ensuring that information is accessible.

It is important to note that while we generally talk about people with disabilities as needing accessible transport, there are people whose accessibility needs are temporary, but who do not fit within a medical definition of disability. Given this, when planning services, information and infrastructure, it is necessary to plan not just for people with the traditional access needs, but also for other groups such as those below.





ELDERLY PEOPLE



PREGNANT WOMEN



PEOPLE WITH AN
INJURY OR ILLNESS



PEOPLE WITH
PRAMS/STROLLERS
OR SMALL CHILDREN
ON FOOT



PEOPLE WITH
LUGGAGE

To remove barriers for these groups, AT is to pursue a focus on 'accessibility'. Accessibility means that, as far as can reasonably be accommodated, AT ensures that **transport facilities, vehicles, information and services are easy to find out about, to understand, to reach, and to use, for people with accessibility requirements and therefore for everyone, as part of their day-to-day lives.**

5

Shared Mobility Scenarios for Auckland

This section describes various scenarios in which on-demand or shared services could work in Auckland. These are summarised in Table 5-1, and were developed by analysing land use patterns, economic deprivation, access to the RTN and FTN or cycle infrastructure. Consideration has been given to how international approaches might be applied in an Auckland context to address known challenges, using the principles and trip distances described in the prior sections. Each scenario is supported by a rationale and possible approach.

The scenarios are expected to expand and change over time as the market matures and as we learn more about what on-demand and shared mobility schemes work best in Auckland. Within the Programme Business Case that has been developed to support this Roadmap, some example areas were selected and rough order costs and benefits for these have been calculated. This data will inform the development of budgets and funding applications to secure investment for the on-demand and shared mobility programme.

The locations or communities in which any schemes will be deployed or piloted will be determined, in partnership with communities and stakeholders. Locations will be selected based on known issues, interest from communities and the appetite for change, and schemes will be tailored with communities to make sure that they are a good fit while aligning with the twelve principles.



POSSIBLE LOCATIONS	RATIONALE AND POSSIBLE APPROACH	POTENTIAL PARTNERSHIPS
Rural townships	<p>Rationale: low utilisation of existing fixed route bus services, limited travel choices, longer trip distances</p> <p>Possible approach: focus on first and last-leg if it is possible to connect to the RTN/FTN; community-led initiatives; on-demand and shared services, eg on-demand shuttles, car share, bike share</p>	Employers, community groups, schools, operators, Local Boards
Areas with socioeconomic deprivation	<p>Rationale: opportunity to improve access to jobs and services, over-reliance on the private car, health issues, non-standard hours of work</p> <p>Possible approach: focus on first and last-leg if it is possible to connect to the RTN/FTN; cater to non-standard work hours; affordable on-demand and shared services, eg means-tested fare structures for car share or on-demand shuttles</p>	Schools, major employers/ business parks, Housing New Zealand, District Health Boards, Sports New Zealand, local marae, Ministry of Social Development, Local Boards
Areas underserved by public transport	<p>Rationale: opportunity to reduce social isolation and improve access to jobs and services in areas with an over reliance on the private car</p> <p>Possible approach: focus on first and last-leg if it is possible to connect to the RTN/FTN; on-demand and shared services eg car share, bike share, e-scooter share, carpooling</p>	Employers, schools, Sports New Zealand, local marae, community groups, new housing developments, Housing New Zealand, Tourism New Zealand, Local Boards
Business parks/ employment centres	<p>Rationale: Many similar trips to one location, opportunity to reduce congestion, limited parking, non-standard hours of work</p> <p>Possible approach: focus on first and last-leg to improve the reach of RTN/FTN; employer-led messaging; guaranteed ride home; on-demand and shared services eg van pooling, bike share, e-scooter share, carpooling; travel plans/transport management associations</p>	Employers, business park management, business associations, operators
New medium density housing area	<p>Rationale: New areas being developed before the expansion of public transport, limited resident parking, commuter-based suburbs, opportunity to reduce congestion, opportunity to change habit during major changes in life, eg moving to a new house</p> <p>Possible approach: residential travel plan and marketing to new residents of local on-demand and shared services which might include: first and last-leg to improve the reach of RTN/FTN; car share, bike share, e-scooter share and carpooling schemes</p>	Developers, community groups, residents' associations

Table: 5-1: Scenarios in which on-demand or shared services could work in Auckland, rationale and possible approaches

6

Next Steps to Confirm Locations & Schemes

The previous section described a range of scenarios in which on-demand and shared services could be deployed. AT will confirm specific locations in partnership with stakeholders, including local communities. Specific locations and the programme of on-demand and shared services to be deployed will be confirmed during the next stage of developing the business case for on-demand and shared mobility.

This section provides an overview of the approach that AT plans to take to confirm and prioritise locations, and then co-design a suitable on-demand and shared mobility scheme with the community and stakeholders in each of those locations. Auckland has a diverse range of land uses and communities, so there is no 'one size fits all' solution for on-demand services. People and communities will need to be persuaded to change their travel habits when new on-demand and shared modes become available, hence the need to tailor each scheme to the communities that it will serve.

While AT can access funding for a few on-demand trials in Year 1, prior to implementing any on-demand shuttle schemes more widely, AT will need to secure additional investment. The level of investment required will be determined as the next stage of the business case process is worked through. As part of completing the next stage, AT will continue to discuss funding requirements with the Transport Agency and also make efforts to understand the level of funding available via other potential sources such as public private partnerships, community-led investments or through cross-agency schemes. Securing investment and resources, gaining stakeholder support and setting up any partnerships is a significant undertaking and will be key to enabling this Roadmap to deliver on its Action Plan (next section).

Once the next stage of the business case has been approved, AT will select locations based on known issues or opportunities to address community needs and aspirations, acknowledging that budget and other constraints will limit the number of areas in which it will be possible to provide on-demand and shared services. Decisions will be guided by the principles presented in Section 3 and AT will consider factors such as the opportunity to improve access to social and economic opportunities, the potential to improve the first-last leg connections to existing FTN and RTN routes and enable active and healthier lifestyles, suitability of existing infrastructure and services for schemes, future plans for the area and value for money.

Once a location is identified, AT will take a customer-centric approach to implementation, making use of community consultation, travel demand management (TDM) and social marketing techniques to understand a location's potential customer base, what matters to communities and which on-demand and shared mobility services will meet their needs.

The approach that AT plans to take to achieve this is shown in Figure 6-1. The first step will involve selecting and prioritising the locations or communities to work with and the potential schemes for each of these areas. Next, AT will engage with communities to understand their appetite for on-demand and shared services, what matters to them and which trips they might be able to make with on-demand or shared modes. An estimate of the cost of introducing the services will be made and funding sources determined. Each tailored, on-demand or shared mobility programme that has successfully secured funding will then be implemented. All schemes that are implemented will be monitored to measure their success and to learn how they might be improved, replicated or changed.

This Roadmap is only the first step towards integrating on-demand and shared services into Auckland's transport network. A collaborative and systematic approach to delivery will be needed to address gaps in the transport system and seize new opportunities as they emerge. The next section provides an action plan for implementation.

ON-DEMAND SHARED MOBILITY *APPROACH TO DELIVERY FRAMEWORK*

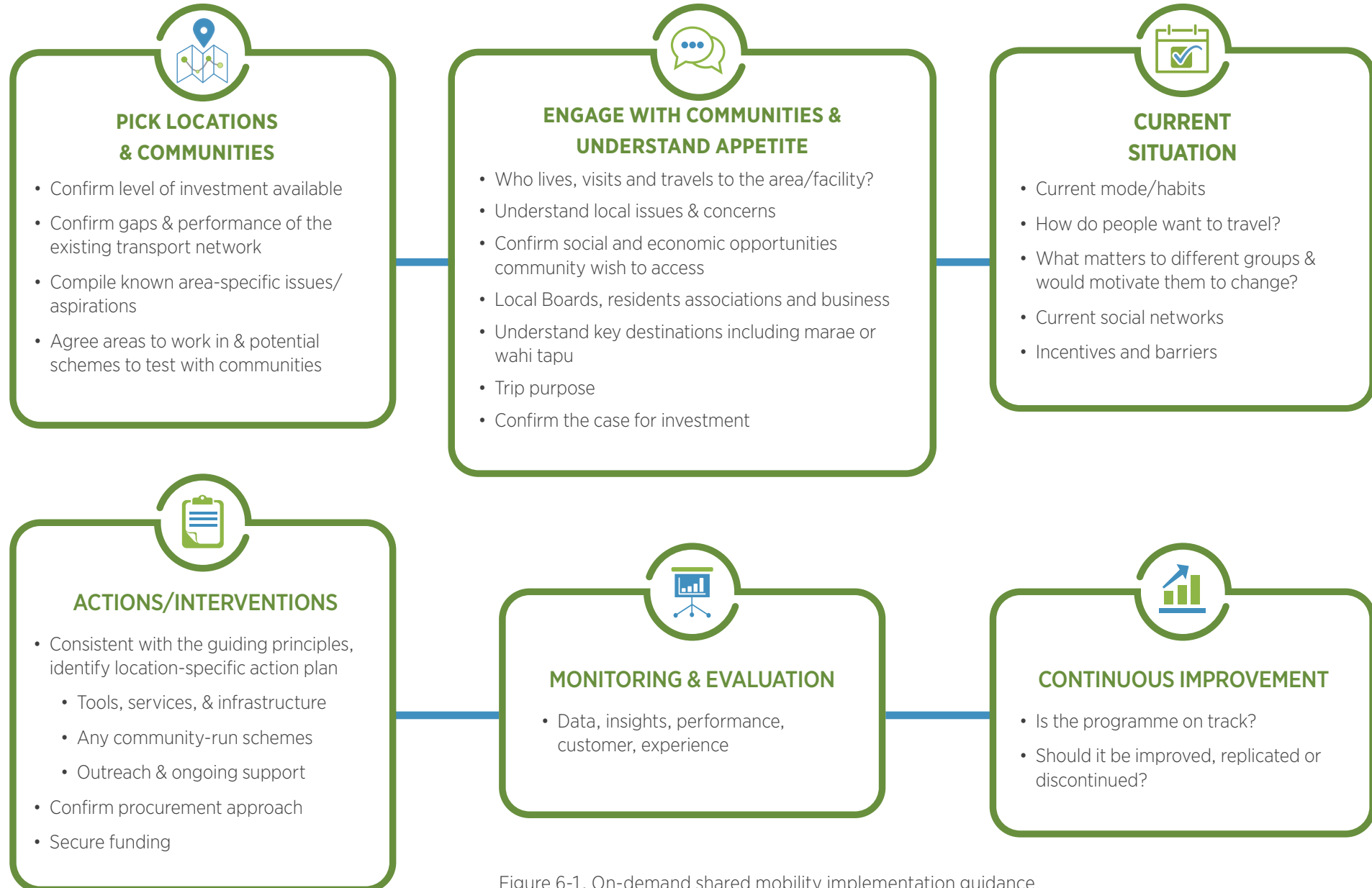


Figure 6-1. On-demand shared mobility implementation guidance

7

Action plan

This Roadmap has described the approach that Auckland Transport will take to integrating on-demand and shared mobility services into our region’s transport network. It has discussed some of the challenges and made clear AT’s intention to work with communities to design and deliver schemes that work for them. The Action Plan in this section lists the tasks that AT plans to complete over the next few years to deliver this Roadmap’s intentions.



ON-DEMAND SHARED MOBILITY: INDICATIVE ACTION PLAN

SHORT TERM - YEAR 1-2: ESTABLISHMENT	
TOPIC	TASKS
GOVERNANCE	Establish governance structure and implementation team
	Identify cross agency opportunities
	Establish communication platforms
	Identify stakeholders and develop consultation plan
	Complete the next stage of the business case process
IDENTIFY LOCATIONS	Develop communication plan
	Identify and prioritise locations in partnership with communities and stakeholders
	Understand gaps in the existing transport network
	Understand community needs and aspirations
	Understanding the potential/ability to support on-demand and shared modes
SHORT TERM TRIALS	Conduct community transport planning assessment
	Identify and confirm innovation zones
	Understand key learnings from AT Local trial
IDENTIFY POTENTIAL SCHEMES	Refine assessment framework for selecting locations
	Confirm two potential locations for the AT Local Trial using the refined assessment framework
	Invite expressions of interest from suppliers, communities, stakeholders
	Identify potential schemes
FUNDING	Develop supporting TDM programmes for each location
	Identify potential partners for delivery
PROCUREMENT	Identify funding sources and partners
	Develop and confirm procurement models (eg partnering and collaborative models of operation)

SHORT TERM - YEAR 1-2: ESTABLISHMENT	
TOPIC	TASKS
POLICY AND GUIDELINES	Establish minimum standard for service based on the 'Guiding Principles' set out in the Strategic Roadmap
DATA AND DIGITAL	Establish requirements around data sharing, transparency, reporting
	Prepare an action plan for a journey planner
	Identify opportunities to amalgamate services on existing platforms (eg bookings)
INFRASTRUCTURE REQUIREMENT AND PLANNING	Infrastructure management plan
	• Kerbside management plan
	• Walking/cycling infrastructure improvement plan
	• Footpath management plan
MONITORING, EVALUATION AND REPORTING	Identify suitable locations for mobility hubs/interchanges
	Establish evaluation and monitoring approaches
	Establish reporting requirements to ensure alignment with goals and progress
	Set up monitoring approach for emerging trends and success of other schemes
	Annual evidence and experience report
INVESTIGATE/ STUDY	Establish live public facing dashboard for on demand shared services
	Cooperative models for community-led initiatives
	Collaborative funding models

MEDIUM TERM - YEAR 2-3: IMPLEMENTATION	
TOPIC	TASKS
IMPLEMENTATION	Launch services
	Make changes to infrastructure/management
MONITORING AND EVALUATION	Conduct monitoring and evaluation
	Confirm KPIs and customer expectations
INVESTIGATE/ STUDY	Investigate potential MaaS partners and mode of delivery and pricing
	Examine information and emerging trends to identify potential threats, risks, emerging issues and opportunities (eg Drones, autonomous vehicles and changes in micromobility)

LONG TERM - YEAR 4-7: CONFIRMING NEW BUSINESS AS USUAL	
TOPIC	TASKS
REFINE AND SCALE UP	Expand, improve and change based on successes and lessons learned
	Secure ongoing funding
	Confirm and review key performance indicators
	Review governance roles and partnerships
DIGITAL PLATFORM	Confirm the approach for the delivery of a journey planning tool that amalgamates all travel options
POLICY AND GUIDELINES	Refine policy and guidelines based on successes and lessons learned
KNOWLEDGE SHARE	Provide support to other cities and towns in NZ
INVESTIGATE/ STUDY	Continue to examine information and emerging trends to identify potential threats, risks, emerging issues and opportunities (eg Drones, autonomous vehicles and changes in micromobility)
	Investigate the potential for a Mobility as a Service (MaaS) platform

Glossary

Accessibility is defined as “people’s ability to connect with people, goods, services and opportunities and thereby engage in economic and social activity”¹². When we talk about ‘access’, we are thinking about how we get to the people or things we want – or, equally, how they can come to us. There are three different factors which affect access: first, spatial location (how close am I to school, work or friends?); second, the transport system, which connects me to those places or opportunities; and third, virtual connections (I can now access friends, films, education and many other people and activities online).

First / last leg is the trip made between an individual’s home or final destination and the nearest public transport stop¹⁴.

Micromobility is the use of small mobility devices designed to carry one or two people, or ‘last mile’ deliveries. E-scooters, bicycles and e-bikes are all examples¹⁴.

Mobility is the ability to move or be moved freely and easily¹⁶. The New Zealand Government Policy Statement states that improving mobility is not essential to improve access as access can also be improved by non-transport solutions such as technology provisions or land use planning¹⁷.

Mobility as a Service (MaaS) is the integration of the different modes of travel choices along with information and payment functions into a single app/platform¹⁸.

Multi-modal journeys refers to trips that are made up of various modes of transport for example taking an e-scooter to the bus stop then taking the bus, or driving a car to a park and ride then taking the train¹⁹.

On-demand and shared mobility is the shared use of a vehicle, bicycle, or other mode as an innovative transportation strategy that enables users to gain short-term access to transportation modes on an ‘as-needed’ basis. The term shared mobility includes various forms of carsharing, bike-sharing, ridesharing (carpooling and vanpooling), and on-demand ride services. It can also include alternative transit services, such as paratransit, shuttles, and private transit services, called micro-transit, which can supplement fixed-route bus and rail services. As many new options for mobility have emerged, so have the smartphone ‘apps’ that aggregate these options and optimize routes for travellers²⁰. See Figure 1-1 in Chapter 1 for a graphic representation of aspects that make up an on-demand and shared mobility system.

Shared mobility can include sharing at the same time (such as when we travel in a car or on a bus with others) or sharing one after another (such as with shared scooters or bikes). It includes any mode of transport that can be shared.

Operators refers to providers of mobility services for example Lime, Uber, Lyft and others. See Figure 2-1 in Chapter 2 for operators in Auckland.

Rapid Transit Network refers to public transport services that run at least every 15 minutes between the hours of 7am and 7pm, 7 days a week, on dedicated right-of-ways, removed from the congestion of general traffic lanes

Frequent Transit Network refers to public transport services that run at least every 15 minutes between the hours of 7am and 7pm, 7 days a week, with priority measures (e.g. bus lanes and signal priority) and are less affected by road congestion than if they operated in general traffic.

Ride-sharing refers to carpooling and vanpooling, in which a vehicle carries additional passengers when making a trip, with minimal additional mileage. Carpooling generally uses participants’ own automobiles²¹. The value proposition to the customer is reduced cost for minor inconvenience.

Ride-hailing is defined as booking rides and paying for on-demand service through a smartphone app with a transportation network company such as Uber or Lyft²².

Roadmap is a strategic, forward looking plan that defines a goal or desired outcome, and includes the major steps or milestones needed to reach it, in this case a strategic plan for on-demand and shared mobility for Auckland.

Travel Demand Management is the application of strategies and policies to reduce travel demand, or to redistribute this demand in space or in time.

Vanpooling is a type of ridesharing which generally uses rented vans (often supplied by employers, non-profit organisations or government agencies) that are driven by one of the employees in the vanpool group²³.

ABBREVIATIONS

AT	Auckland Transport	RLTP	Regional Land Transport Plan 2018-2028
FTN	Frequent Transit Network	RPTP	Regional Public Transport Plan 2018-2028
LTMA	Land Transport Management Act 2013	RTN	Rapid Transit Network
NZTA	New Zealand Transport Agency		

References

- 1 Auckland Transport (2018) Auckland's Regional Land Transport Plan 2018-2028. Auckland Transport, New Zealand
- 2 Auckland Transport (2019) Auckland's Regional Public Transport Plan 2018-2028. Auckland Transport, New Zealand
- 3 Auckland Transport (n.d.) AT Local. Accessed 23 May 2019. <https://at.govt.nz/local>
- 4 Auckland Council (2019) E-scooter Trial 2.0: New Operators Announced. Accessed 15 April 2019. <https://ourauckland.aucklandcouncil.govt.nz/articles/news/2019/05/e-scooter-trial-20-new-operators-announced/>
- 5 City of Chicago (2019) Roadmap for the Future of Transportation and Mobility in Chicago. Accessed 23 May 2019. https://www.chicago.gov/content/dam/city/depts/mayor/PDFs/21755_37_AF_MobilityReport.pdf
- 6 Shared Use Mobility Centre (2017) Twin Cities Shared Mobility Action Plan. Accessed 10 April 2019, https://sharedusemobilitycenter.org/wp-content/uploads/2017/10/SUMC_TWINCITIES_Web_Final.pdf
- 7 Shared Use Mobility Centre (2017) Los Angeles County Share Mobility Action Plan. Accessed 9 April 2019. <https://sharedusemobilitycenter.org/wp-content/uploads/2016/09/SUMC-Single-Page-Web-2.pdf>
- 8 Centre for Liveable Cities, Singapore and Urban Land Institute (2016) Creating Liveable Cities through CAR-LITE URBAN MOBILITY. Accessed 23 May 2019. <https://www.clc.gov.sg/docs/default-source/books/carlite-urban-mobility-finalreport.pdf>
- 9 Auckland Transport (2018) Roads and Streets Framework. Accessed 6 June 2019. <https://at.govt.nz/media/1976084/roads-and-streets-framework-webcompressed.pdf>
- 10 Auckland Transport (2018) Transport Design Manual- signage. Accessed 6 June 2019. <https://at.govt.nz/about-us/manuals-guidelines/transport-design-manual-signage/>
- 11 CB Insights (2019) The Micromobility Revolution. Accessed 10 May 2019. <https://www.cbinsights.com/research/report/micromobility-revolution/>
- 12 Ministry of Transport (2018) Government Policy Statement on land transport 2018/19 – 2027/28. Ministry of Transport, New Zealand
- 13 Washington County Oregon (n.d.) First and last mile. Accessed 26 August 2019. <https://www.co.washington.or.us/LUT/Divisions/LongRangePlanning/PlanningPrograms/TransportationPlanning/first-and-last-mile.cfm>
- 14 Susan Shaheen (2019) Mobility on Demand (MOD) and Mobility as a Service (MaaS) How Are They Similar and Different? Accessed 24 May 2019. <https://www.move-forward.com/mobility-on-demand-mod-and-mobility-as-a-service-maas-how-are-they-similar-and-different/>
- 15 Department for Transport (2019) Future of Mobility: Urban Strategy- Moving Britain Ahead. Access 23 May 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/786654/future-of-mobility-strategy.pdf
- 16 The Oxford Dictionary (2018) English Oxford Dictionary. Accessed 24 May 2019. <https://en.oxforddictionaries.com/definition/mobility>
- 17 Ministry of Transport (2018) Government Policy Statement on land transport 2018/19 – 2027/28. Ministry of Transport, New Zealand
- 18 Susan Shaheen (2019) Mobility on Demand (MOD) and Mobility as a Service (MaaS) How Are They Similar and Different? Accessed 24 May 2019. <https://www.move-forward.com/mobility-on-demand-mod-and-mobility-as-a-service-maas-how-are-they-similar-and-different/>
- 19 VTPI (2017) Introduction to Multi-Modal Transportation Planning: Principles and Practices. Accessed 24 May 2019. http://www.vtpi.org/multimodal_planning.pdf
- 20 Shaheen, Chan, Bansal, & Cohen (2015) Shared Mobility: A Sustainability & Technologies Workshop: Definitions, Industry Developments, and Early Understanding. Access 23 May 2019. http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility_WhitePaper_FINAL.pdf
- 21 Victoria Transport Policy Institute (2013) Ridesharing: Carpooling and Vanpooling. Accessed 23 May 2019. <https://www.vtpi.org/tdm/tdm34.htm>
- 22 Matute, J. (2018) Ride-hailing. Accessed 23 May 2019. <https://www.transitwiki.org/TransitWiki/index.php/Ride-hailing>
- 23 Victoria Transport Policy Institute (2013) Ridesharing: Carpooling and Vanpooling. Accessed 23 May 2019. <https://www.vtpi.org/tdm/tdm34.htm>

