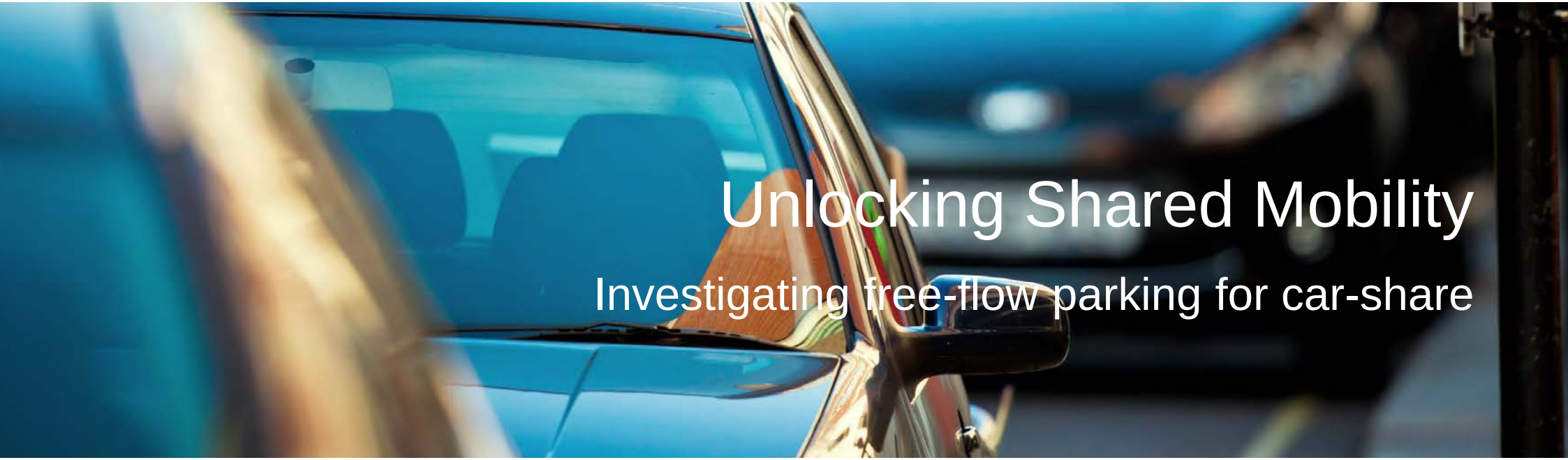
ITS Australia leads this research project though **iMOVE** with research partners **RMIT, Cubic and IAG** to better understand how we can collaboratively work to increase the options for customers to access car-share services to improve outcomes for our communities.



Unlocking Shared Mobility

Investigating free-flow parking for car-share

Problem Definition:

A tangible problem exists, such as a severe shortage of car parking, significant local congestion, and/or limited alternatives to travelling by car.

A 2005 report by Transport for London into car-sharing services began with the premise defined above…

Based on a wide range of interviews and workshops with key stakeholders in government and industry it is apparent that a majority of jurisdictions in Australia are experiencing already or anticipate experiencing these challenges in the near future.

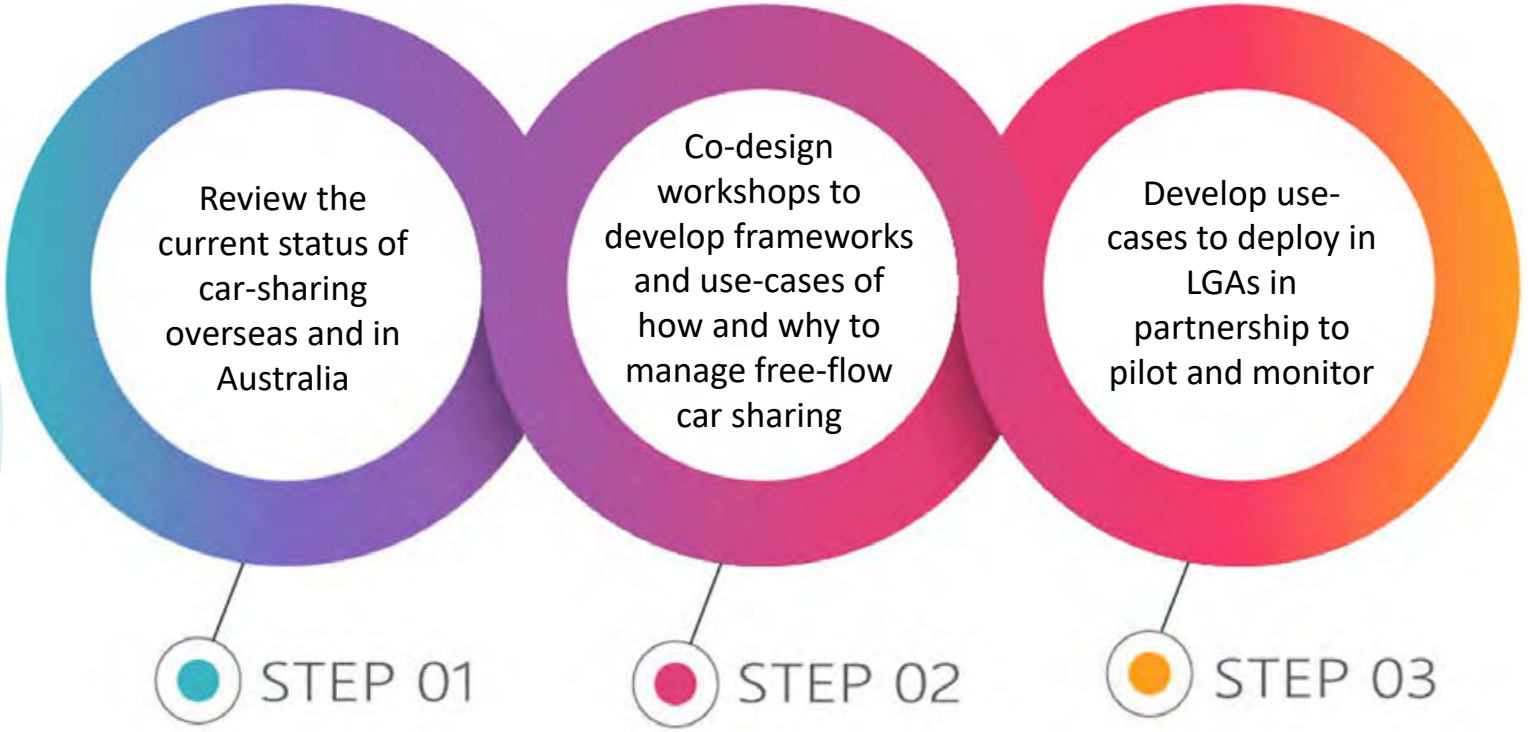
This report will outline opportunities and challenges identified during stage one of the Unlocking Shared Mobility project.

Coincidentally 2005 was also the year the second edition of Donald Shoup's seminal 'The High Cost of Free Parking' was published.

Unlocking Shared Mobility

Project Goals

The project will investigate how parking could be managed to enable free flow car share; what the costs and benefits are and for whom (including in terms of local government policy and transport policy generally); and what framework or hierarchy should guide the implementation. There are benefits for this technology specifically, but also for developing a clearer critical framework around parking and car sharing.



Stakeholder workshops and interviews

Future of Mobility:

Opportunities and challenges

There is increasingly intense **competition** for kerb-side space

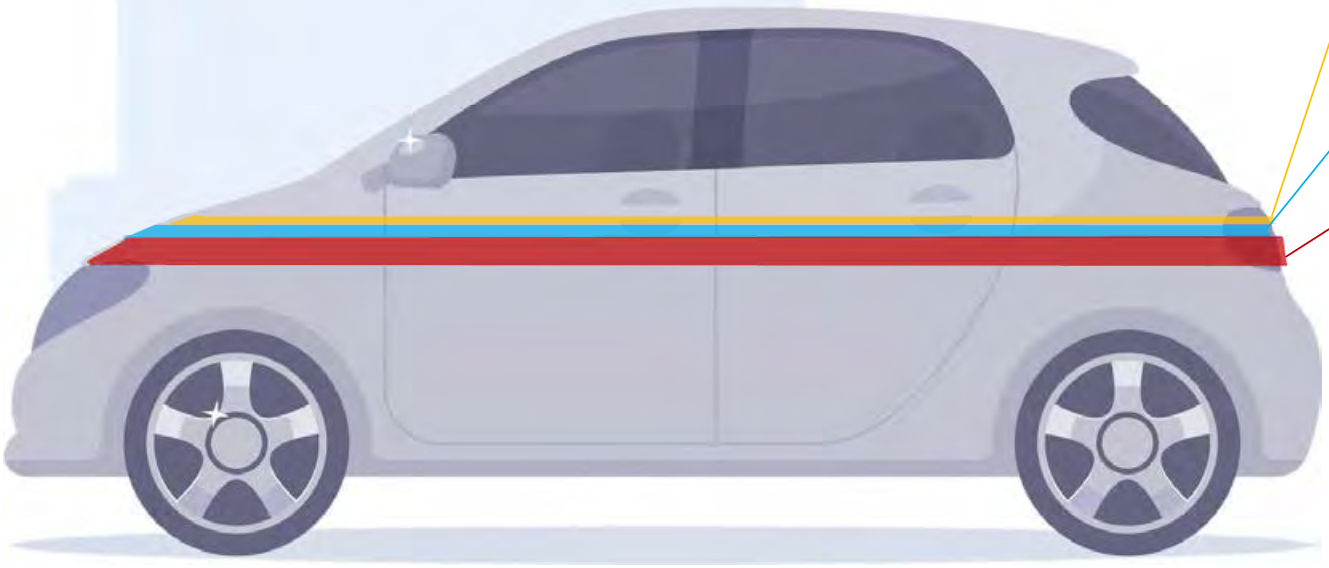
parking and road-side infrastructure management is a **complex challenge**

These European figures are generous with many jurisdictions seeing even higher rates of parking, looking for parking, and congestion. In ‘The High Cost of Free Parking” 2005 Donald Shoup finds a parking rate of 95% in the USA.

The phenomenon of ‘induced demand’ for increasing road capacity also holds when increasing the number of parking spaces.

Build more roads get more cars build more parking lots more cars will park there, after supply increases, more of a good is consumed.

50% of most city land dedicated to streets and roads, parking, service stations, and traffic signs



Typical European car is parked 92% of the time

Ellen McArthur Foundation

Vision for MaaS in Australia

This is the goal but how do we get there?

During the research stage of the MaaS report Industry experts we interviewed highlighted that the MaaS Challenge was to provide a service that is: “more convenient than owning a car” or increases the likelihood of reduced individual private vehicle usage.

This is the ultimate goal of MaaS which will only be possible when we can reliably offer customers seamless multi-modal transport access including car-share. Existing car-share in Australia is back-to-base, in other words fixed to a specific parking space.

Understanding true costs could enable behaviour change

The ITS Australia Mobility as a Service Report survey found that people with a more accurate estimate of their weekly transport costs were MUCH more likely to be interested in MaaS.

The release of Australia's first Transport Affordability Index by the Australian Automobile Association (AAA) reveals the average Australian family is spending up to $22,000 every year to get around.

Commissioned by the AAA and developed by SGS Economics & Planning, the Index will track transport affordability by analysing tax, tollways, public transport and finance costs as a proportion of average household income across states and territories.

The Index initially shows around 13 per cent of an average household budget in most capital cities is spent on transport, which is remarkable when you consider that electricity, water, and telecommunications costs account for only one to three per cent of income combined.

In 2016 a typical two-car Sydney household faced weekly transport costs of $419 per week, ahead of Brisbane and Melbourne (at $376 and $348 per week respectively), even without taking parking costs into account.

Across all capital cities the highest cost for households was the car loan payment of the new car. This cost was followed by fuel, public transport, registration, and licencing.

- In 2016 a typical two-car Sydney household had weekly transport costs of $419 per week. This includes insurance, fuel, and other running costs but NOT parking.
- Survey respondents reported transport costs per week ranging from $98 - $185

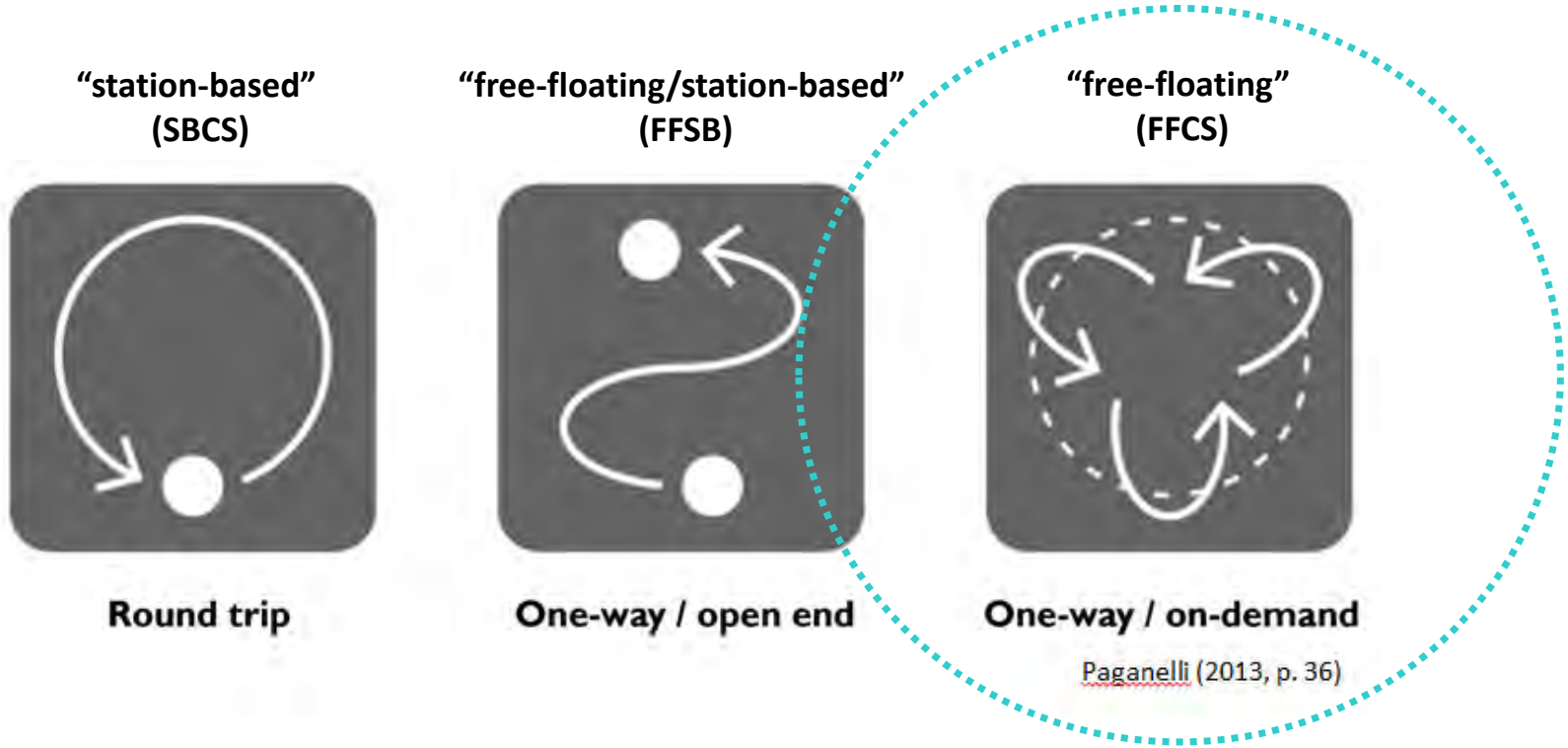
Car sharing could be the key…

There are two main methods by which car sharing operates; free-floating and station based.

Users of a free-floating system are able to leave the car anywhere within a defined ‘geo-catchment’

Station based systems require their user to park in designated parking bays.

*Phillip Boyle & Associates



“free-floating” car sharing (FFCS)

cars can be taken from and left at any available parking spot in the city, as long as they are inside a **service area**, delimitated by GPS. This type of car sharing is also called “free-flow”, “on-demand”, “point-to-point”, “from A to B”, depending on the location and context.

*text extracted from the draft report

Scheme: types of car sharing. Source: Paganelli (2013, p. 36)

Integração entre o sistema de carro compartilhado e políticas públicas de planejamento urbano: estudos de casos múltiplos: São Francisco, Portland, Seattle e Chicago

Car-sharing enables a reduction in pressure on network capacity resulting from population growth and cars owned by residents, which in turn reduces the number of cars competing for parking and driving space. Impressively this can all be achieved at a minimal cost to government and councils and other agencies charged with managing transport networks and parking.*

Round Trip car share users in the City of Sydney reported travelling by car less than before – around 2,000 vehicle kilometres less each year*

*Phillip Boyle & Associates, 2016.
The Impact of Car Share Services in Australia.

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Intelligent Transport Systems

The typical Round-Trip car sharing rental lasts six hours, but involves less than a hour of actual driving (City of Melbourne, 2015)*

*Phillip Boyle & Associates, 2016.
The Impact of Car Share Services in Australia.

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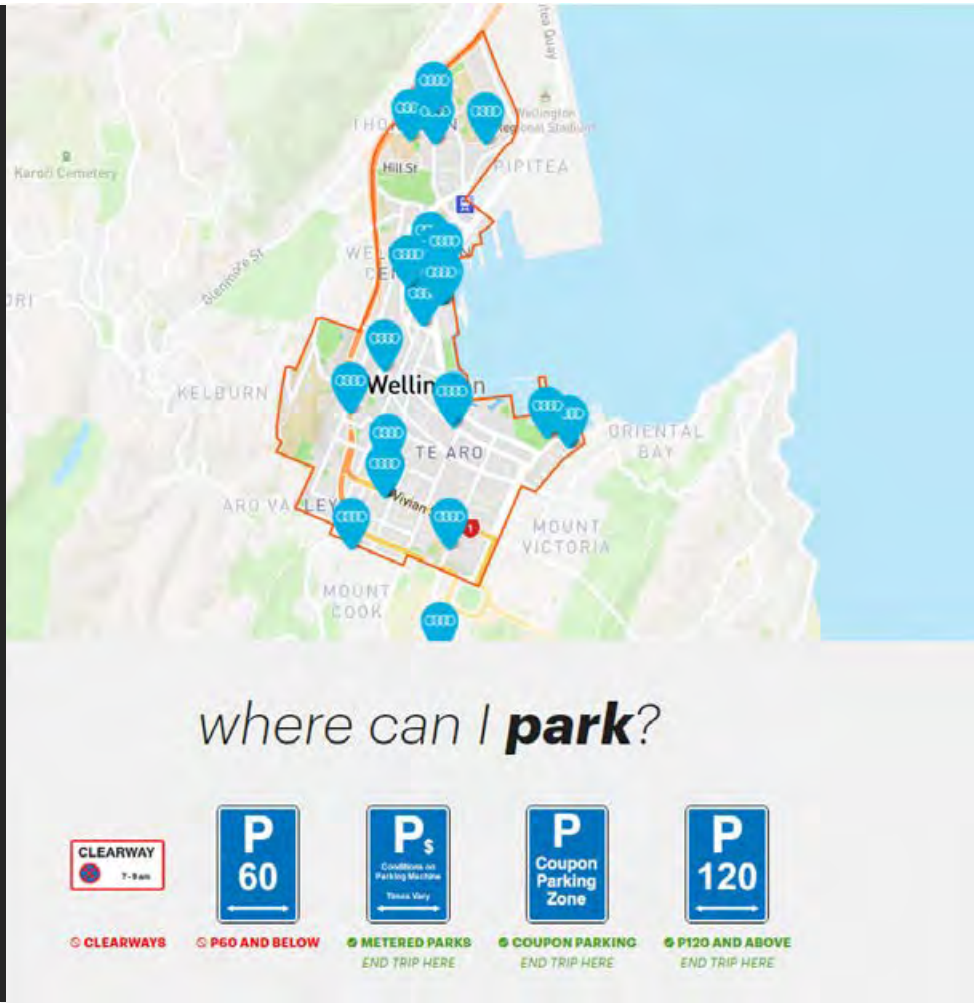
Intelligent Transport Systems

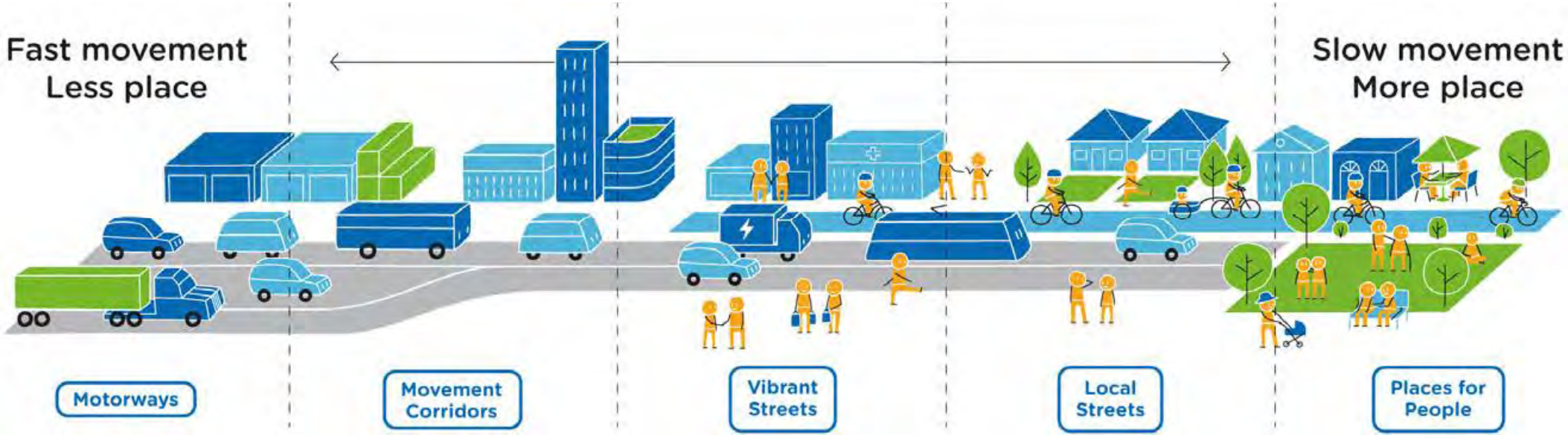
- Free-flow car-share is now available internationally
- This is a service that offers customers by-the-minute one-way trips
- Delimited parking is included in cost



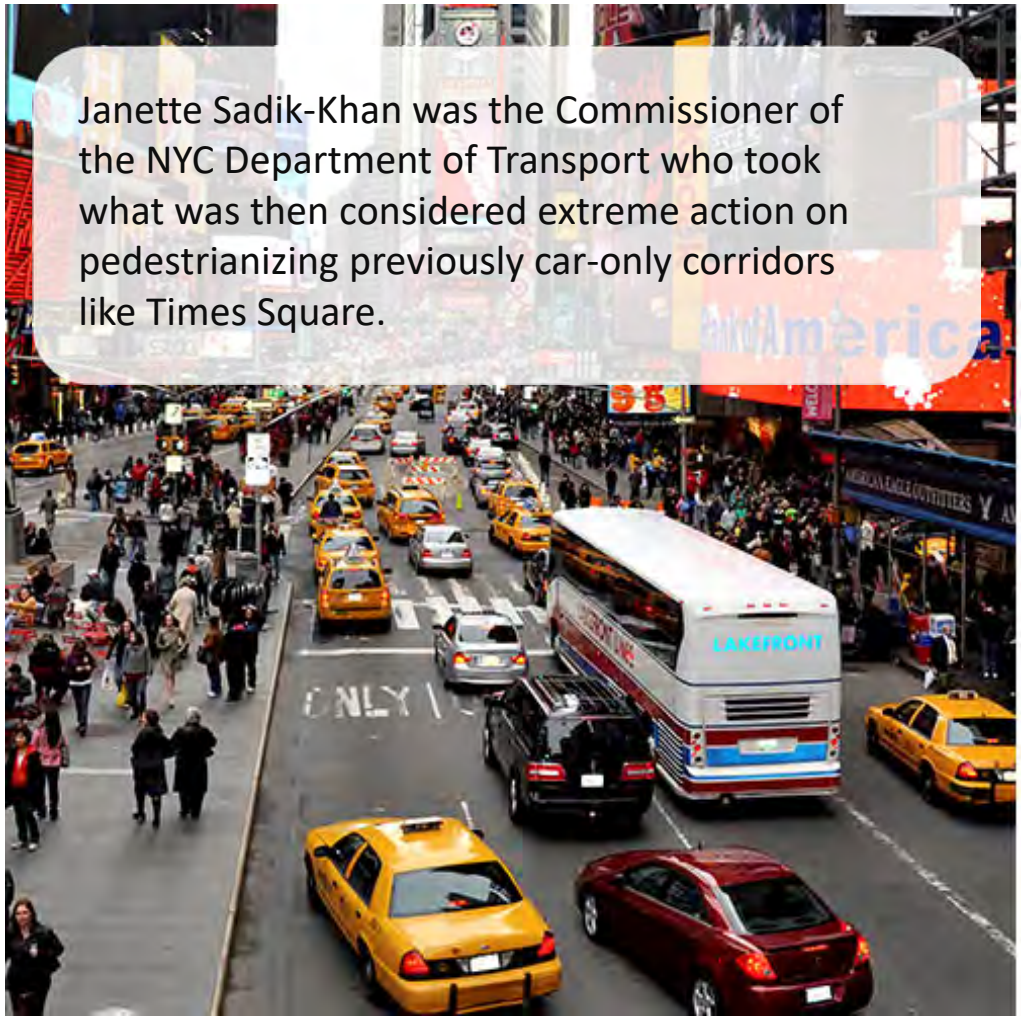
What's the *burning* platform?

Streets as places

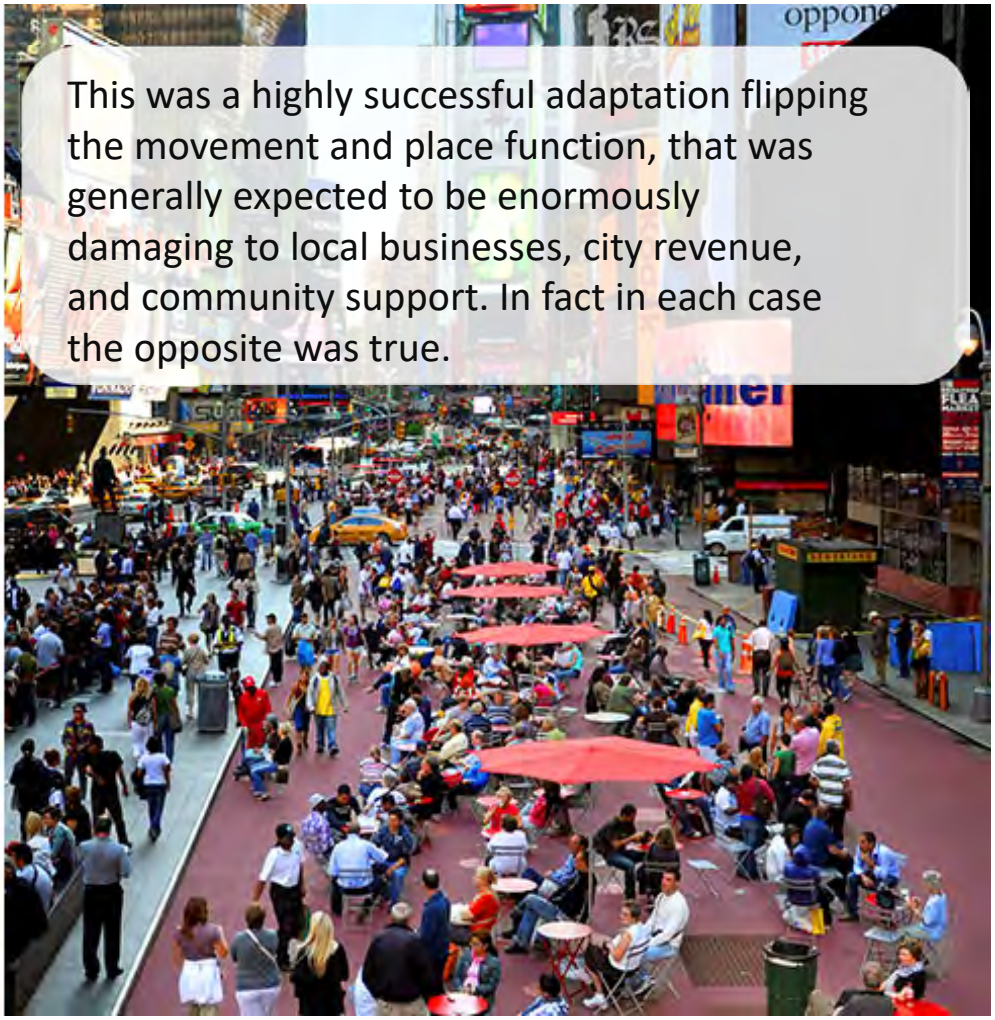
Streets are the most common places in any city. The Greater Sydney Commission *A Metropolis of Three Cities* and *Future Transport 2056* adopted a common approach to balancing the dual functions of streets…



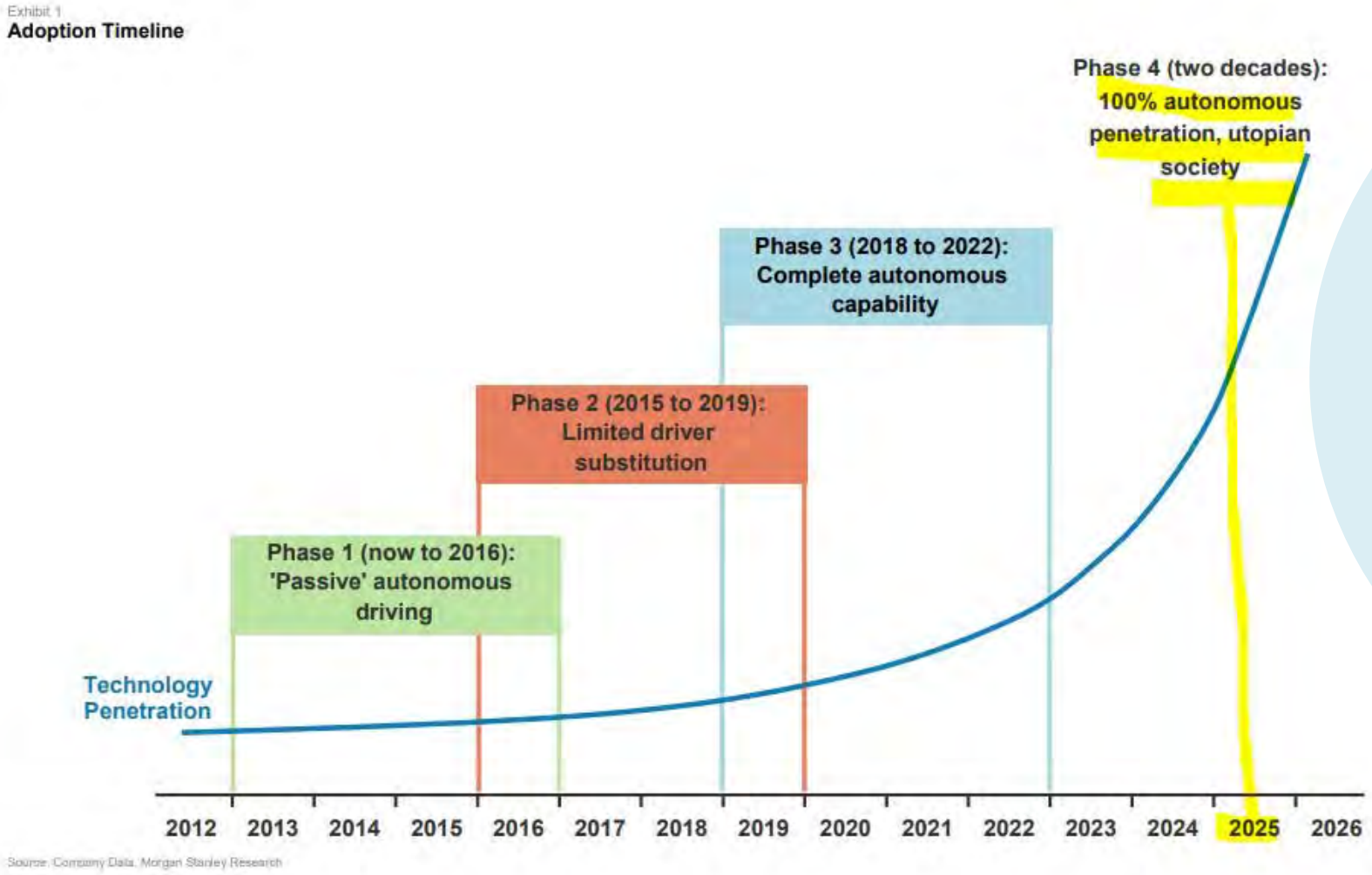
Janette Sadik-Khan was the Commissioner of the NYC Department of Transport who took what was then considered extreme action on pedestrianizing previously car-only corridors like Times Square.



This was a highly successful adaptation flipping the movement and place function, that was generally expected to be enormously damaging to local businesses, city revenue, and community support. In fact in each case the opposite was true.



Automated Vehicles are coming… but not tomorrow



This highly optimistic chart from Morgan Stanley Research ~2011 reflects the bullish fervour for automated vehicles. This confidence is now somewhat diminished as the complexity of the challenge is better understood.

Announced Deployment Timeline

On-road Automated Driving Systems (SAE J3016 Level 4 unless otherwise noted)

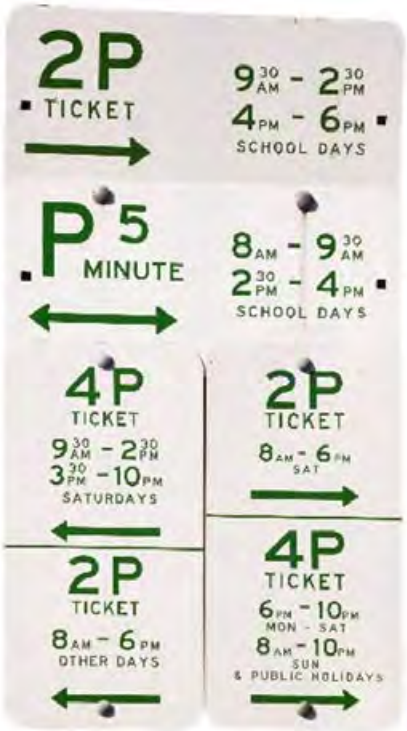
Notes: 1) Waymo has suspended regular level 4 operation until further notice. 2) Volvo's DriveME Pilot started in December 2017 with two level-2 consumer-available vehicles. 3) Audi claims regulations prevent consumer availability of this feature. 4) Nuro has demonstrated *unmanned* operation of a low-speed delivery vehicle but uses a remote safety driver via dedicated wireless link to a chase vehicle. 5) Previous partnership is now inactive.

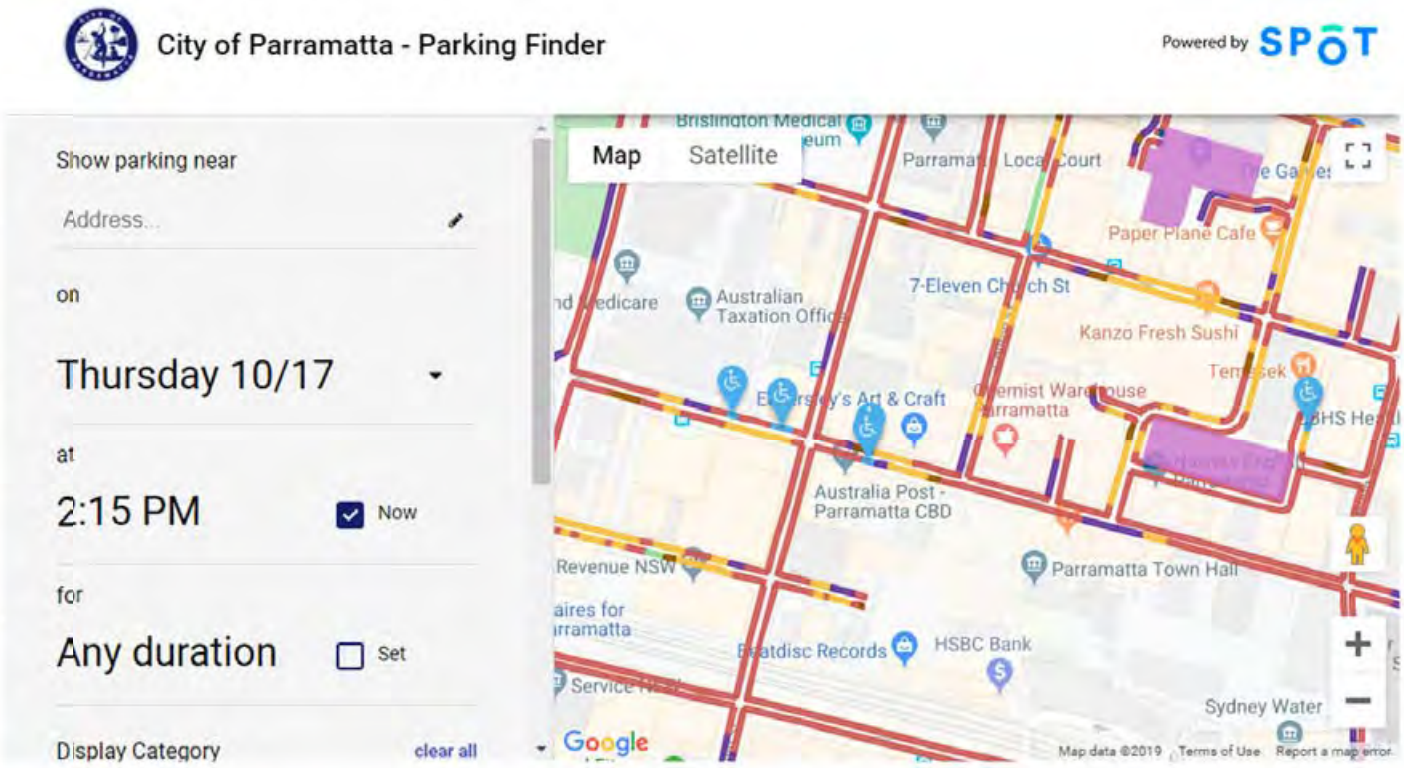
Source: Eric Paul Dennis at The Center for Automotive Research (CAR). Last updated 2019.04.19.

Australians are early adopters

More than 90% of Australians own a smartphone

Data enabled innovation





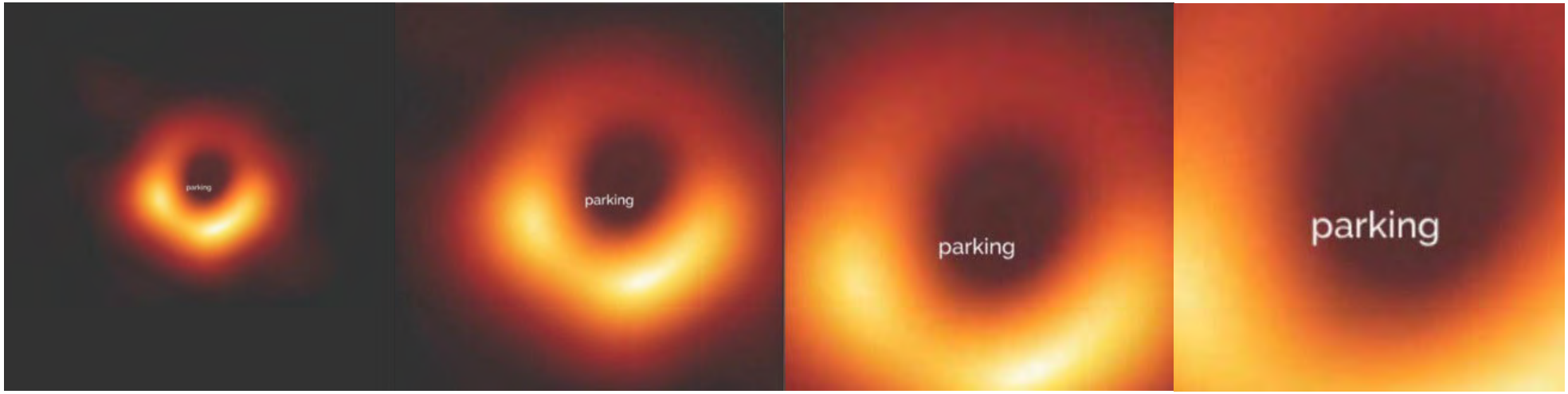
The Parking Finder provides a real-time, digital map of on-street parking rules for cities to share kerbside information with the public

Population growth and congestion

So how do you ‘*fix*’ parking?

Tweet

BREAKING: Scientists have finally captured an image of the colossal force at the center of the urban universe that's tearing cities apart 👇



Parking policy types

(Illustration by Rebecca Clements)
(Based in part on Barter, 2015)

- 'Predict and provide', supply based
- Parking as public good / right
- Minimum off-street requirements
- Site-based
- Low priced on-street parking
- Widespread from mid 20th century

- Manage competing parking demands
- Timing, pricing, permits
- Some use of parking maximums
- Travel demand management
- Shift to precinct-based parking
- Used increasingly especially inner city

- Parking as real-estate / market good
- Limited role for policy
- Off-street, demand-based parking
- No or very limited on-street parking
- Rare: main example is Japan

Criticisms of conventional parking policies

Hidden costs of parking

Opportunity costs

- Disguise real demand for and cost of parking
- Oversupply parking at expense of other land uses
- Subsidise car use and storage
- “Pseudo science of planning for parking” (Shoup 2005 *The High Cost of Free Parking*)

Residential parking: Particularly uneven and politicised

- Parking pressures are blamed on apartments, with calls to increase off-street requirements
- Majority (77–83%) of on-street residential parking use is by residents of detached housing
- Most users of on-street parking have sufficient off-street parking, and half use garage space for storage or housing purposes
- Residents of new flats and apartments account for disproportionately little on-street parking use, are excluded from on-street permits, and have closely controlled off-street parking spaces of which a third are unused (Taylor 2018)

“Our cars haven’t been in the garage for years – it’s being used as storage”

Car parking also essential to car *sharing*

- Just as private car ownership depends on car parking and parking policy, car sharing is likewise supported or constrained by car parking (Dowling et al 2018)
- Car sharing relies on the infrastructure of private car ownership and sharing works both for and against prevailing systems of automobility
- The politics of (private vehicle) parking, and typical policy approaches to parking, have implications for car sharing

What could go wrong?

This project recognises the potential for negative externalities in a changing system including those highlighted below.

Disruptive technologies and innovations are hard to stop though so preparation and adaptation are the best way to off-set potentially damaging impacts.

- In both Australia and internationally there have been a range of unexpected negative consequences in the deployment of new transport services.
- ‘Dockless’ shared bikes received a large amount of negative press due to both real and perceived issues of the way the devices were handled, this now includes e-scooters.
- Ride-sharing platforms like Uber and Lyft and have been proven to increase VKT and emissions.

Car parking for car sharing

- In a meta-analysis of taxonomies of car sharing by Remane et al (2016), parking infrastructure is a key aspect of the ‘service platform’ of car sharing

- Dowling and Kent (2015, 2018) argue “the infrastructure of car parking associated with car sharing is central to the practice, regulation and success” of car sharing

- Car parking is critical to the geography of car sharing as well as to the attraction of car sharing for users

- Key physical types of car parking for car sharing are dedicated carsharing ‘stations’; or stations attached to other locations (airports, or train stations); or (more commonly in Australia) share cars parked on-street; or at private homes (for peer to peer)

Models for parking policy for car sharing

- Allocated (reserved) spaces (on-street)
- Off-street ‘stations’ (including at transit stations)
- Placard permits (exemptions from normal timing and pricing)
- Allocated regions (with differing timing and pricing)
- Technology-based data collection and pricing
- Hierarchical permits
- Market based permits or time-based permits (e.g. for ride-share, deliveries)

Residential Permit Schemes and Exclusions

Postcode / local government area	Residential parking permit entitlements and fees	Residential parking permit exclusions
3121 Richmond 3068 Clifton Hill and Fitzroy North (Yarra Council)	Up to 3 permits for residents before 2015 New residents after 2015: up to 2 permits $36 first permit, $91 second, $171 third	*No* entitlement for new housing (that increases dwelling numbers) built after 2003 Multi-unit housing built before 2003: limited entitlement, based on number of off-street spaces
3108 Doncaster (Manningham Council)	2 free permits for single detached dwellings	1 permit available, $55, for units in multi-dwelling developments
3122 Hawthorn (Boroondara)	3 free permits for single homes on a block or dual occupancy housing	*No* entitlement for new multi-unit housing built after 2011 1 permit available for multi-unit dwellings built before 2001

Car parking policy typologies x car sharing

	Conventional supply-based parking	Parking management policies	Market-based parking
Off-street parking policy for car sharing	Can be used to lower site-based-off-street requirements	Can be used to reduce site-based parking provision Or to transition to parking maximums Support 'precinct parking' / unbundling Parking 'stations'	Allows more efficient use of parking supply in an area Can be peer-to-peer or based on commercial rents
On-street parking policy for car sharing	Limited: few parking controls means no special provisions for car sharing Suits peer-to-peer	Timing, pricing exemptions – reserved spaces or placards High appeal for operators of docked parking spaces in dense areas For users: exemptions = 'rock star park'	Dynamic pricing; No on-street parking: car parking and car sharing is off-street.
Risks	Limited appeal or viability of sharing to users or operators Private cars are dominant/required	Resentment / negative social norms around reserved car share spaces Enforcement issues: others parking in reserved spaces	May have limited appeal: public transport is dominant Higher costs reserve cars and car sharing for higher income groups in high demand areas: equity issues
Barriers particular to free-flow and MAAS	High possibility of clustering and commuting Difficult to address spatial and other equity issues: still likely to be unviable	Dockless competition for parking reduces appeal to users Enforcement risks from clustering/commuting Possible increase in car use and congestion Greater demand for consistent data on parking controls and use	Monetisation: no hierarchy of users or values Difficult to address spatial and other equity issues: likely to be viable but expensive

Parking for free flow car sharing

Define service area!

- Free flow car sharing needs alternatives to reserved spaces: mobility ‘stations’; placard permits / exemptions; or fully integrated timing and pricing systems.
- More intense and technology/demand-based parking and car use: conflicts with conventional rights-based or supply-based understandings
- Policy needs a hierarchy of modes and users

What can we *learn* from on-demand transport?

Navigating The Ponds: Designing an On-Demand Mobility Service that Riders and Cities Love

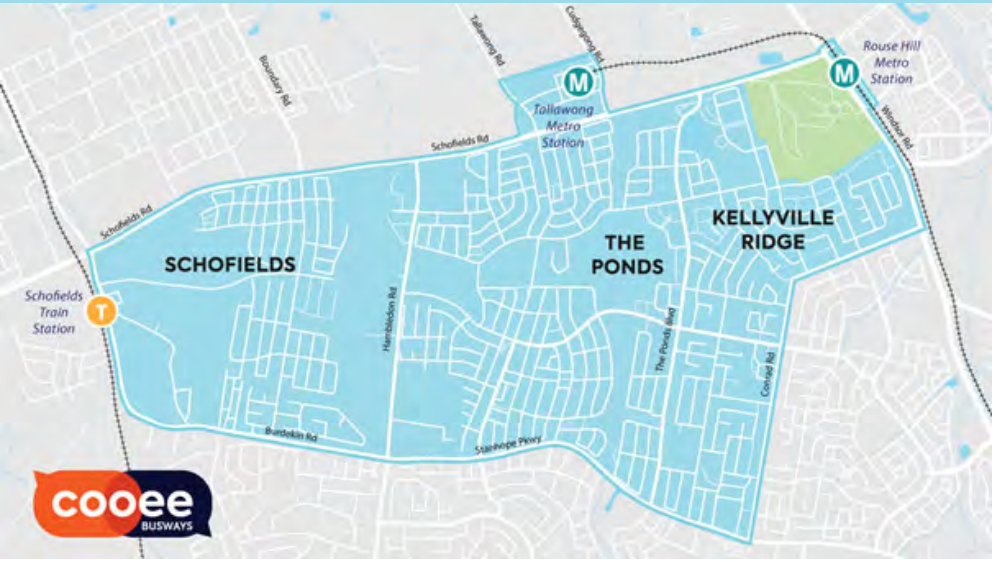
During preliminary workshop conducted with key stakeholders in government and industry discussions regularly included the need to consider the full transport offering available in each jurisdiction and to ensure any changes to approach in managing networks and services avoided any unintended negative consequences, such as loss of public transport patronage or increase of vehicle kilometres travelled.

To ensure this is the case the project undertook to work collaboratively with stakeholders to co-design options that can be tested and measured against agreed benchmarks.
This model has been very effective in the design and deployment of a number of on-demand bus trials in NSW.
The following case study was thoughtfully provided by Busways and Via who partnered with Transport for NSW to design and deliver this on-demand service in Western Sydney.

Busways' Cooee service delivers first and last mile connections for key hubs in the new, fully automated Sydney Metro network.

The on-demand service was launched on May 27 2019 after a 10-day trial, to coincide with the opening of the Sydney Metro Northwest rail link.

The service links The Ponds, Kellyville Ridge and Schofields communities to local transport hubs in Western Sydney. The service area is 50.



The challenge

Through ongoing local engagement in Western Sydney, Busways noted a growing commuter parking problem at Schofields train station and considered a demand responsive option as a solution. They approached software provider Via to provide the technology.

As construction of Sydney Metro progressed, it was clear that Metro stations too would face a shortage of commuter parking once services got under way. With capacity for more than 1,000 passengers every four minutes on the network, a high-capacity feeder service was deemed essential.

To meet these dual challenges, Busways and Via created a demand responsive public transport solution called Cooee covering the rail and Metro service area.

It offers pure on-demand travel, optimising the service to suit the needs of today's commuters and reflect the high-frequency Metro service Cooee supports. Cooee has been developed as a point-to-hub, not point-to-point solution, ensuring it is an efficient use of time, vehicles and resources.

Cooee uses an app-based booking and payment system and a powerful algorithm to match travel requests in real time. Customers can book to travel between a designated bus stop within the service area and one of three transport hubs: Tallawong and Rouse Hill Metro stations and Schofields train station.

As part of the Cooee demand responsive service, Busways operates six Hino Poncho buses that are all low-floor and wheelchair-accessible in line with our broader commitment to provide accessible transport.

Methodology

This modelling informed the proposed operating days and hours for Cooee. Four service level options were assessed and costed, ranging from peak only through to seven-day operation.

Ultimately it was agreed with Transport for NSW that the service would operate weekdays only from 5.00 am to 9.00 pm.

Benefits and outcomes

Busways conducted extensive qualitative and quantitative commuter surveys during the beta testing to capture feedback and identify areas of improvement.

The findings indicate Cooee customers were more than happy with the new on-demand service, as do the comments captured throught the surveys.

Geography

To identify potential areas for a demand responsive service, the Busways' Leadership Team examined criteria such as:

- Distance from the Sydney CBD
- Distance from the transport hub
- Distance from shopping/entertainment precincts
- Station ons and offs
- Parking demand at the transport hub
- The existing bus network

Demography

All feeder bus routes in the service area were assessed based on patronage and passenger origin/destination to determine their suitability for replacement by a demand responsive service. As part of our proof of concept, Busways engaged Via to model expected demand for on demand services based on a range of variables:

- The size of the service area
- The population of the service area
- Its proximity to the transport hub
- The number of hubs being serviced
- Service attributes
- Walking distances
- Maximum wait times
- Travel time

Ethnography

Understanding commuters' use of and relationship to the road network was critical. Busways conducted commuter surveys on feeder bus routes and at candidate transport hubs to:

- Understand current commuter travel to and from the hub
- Determine the percentage travelling from candidate service areas
- Determine the percentage driving to the hub
- Test the willingness of commuters (particularly car drivers and passengers) to use a demand responsive service
- Identify opportunities to replace existing feeder Bus Services within the candidate service area with on demand services

There is *no* one-size-fits-all

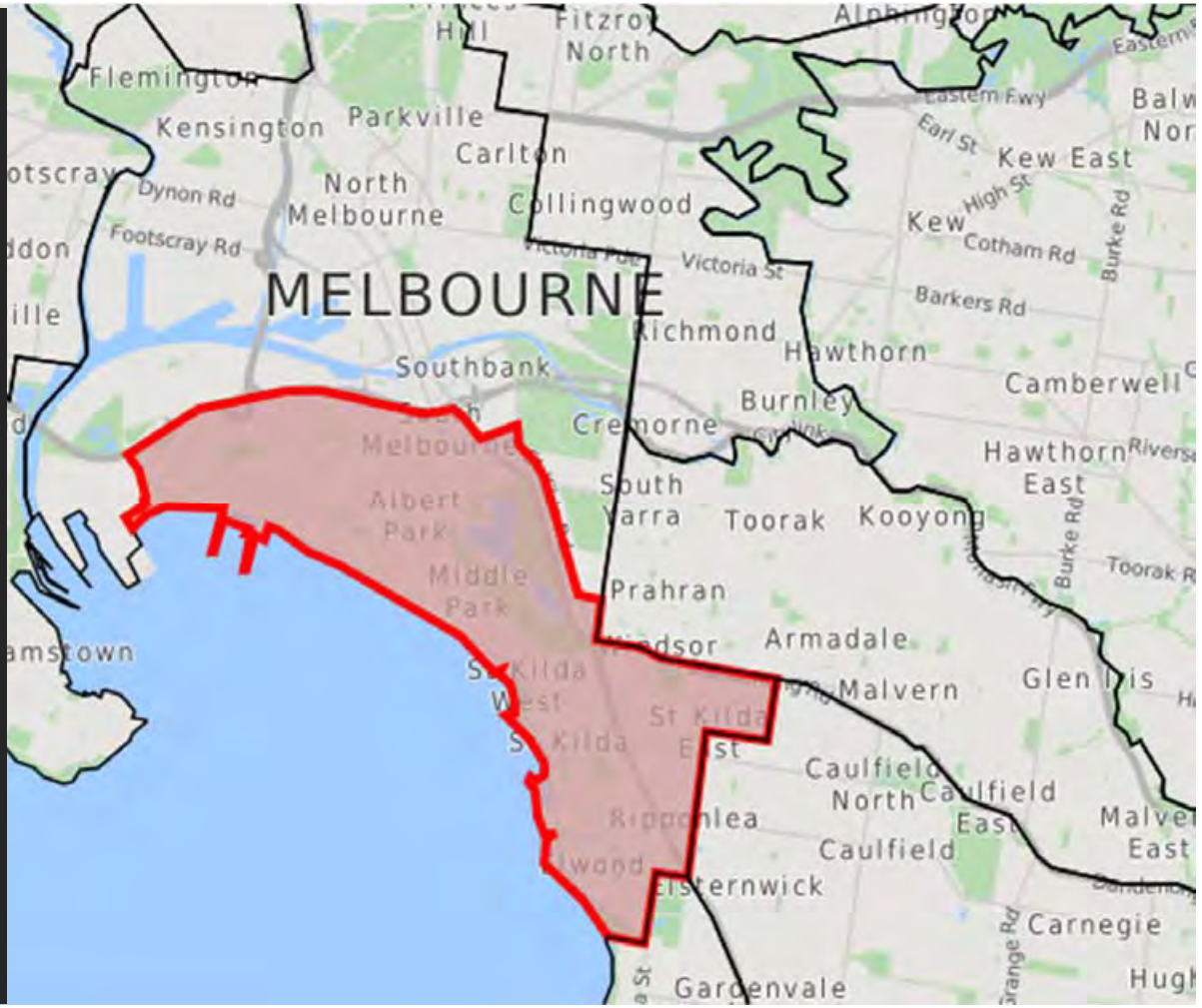
There are more than 500 Local Government Areas in Australia each with their own similarities and differences.

These include but aren't limited to; land mass, population size, topography, revenue, demographics, and even weather.

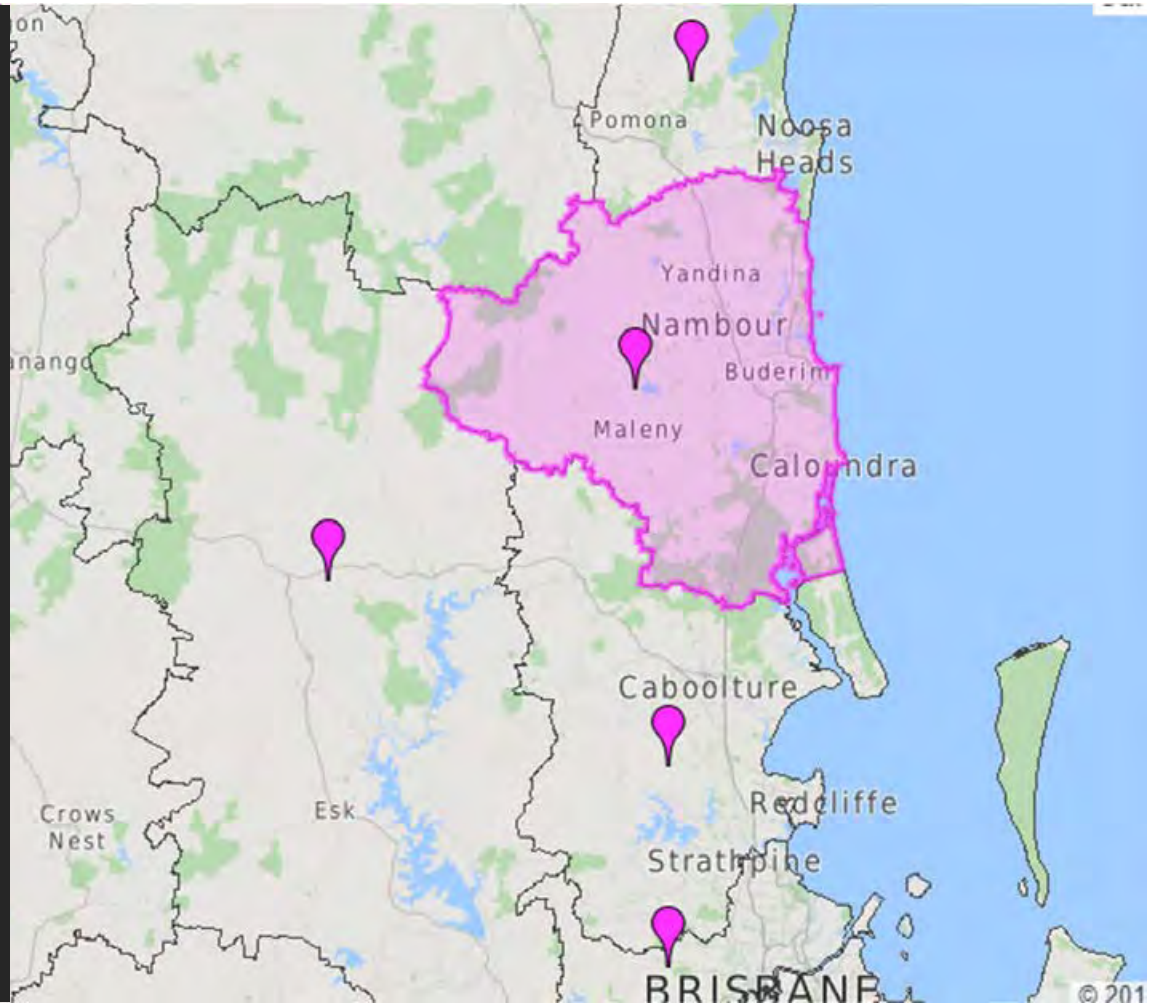
In addition each of them have different approaches to servicing and managing their community assets and communities across a variety of areas, including regulatory requirements and strategic goals.

- City objectives, strategic plans and timelines
- Regulatory framework and policies
- Permits – types and applications
- Restrictions and controls
- Boundaries / parking areas / zones
- Compliance with Local Government Acts

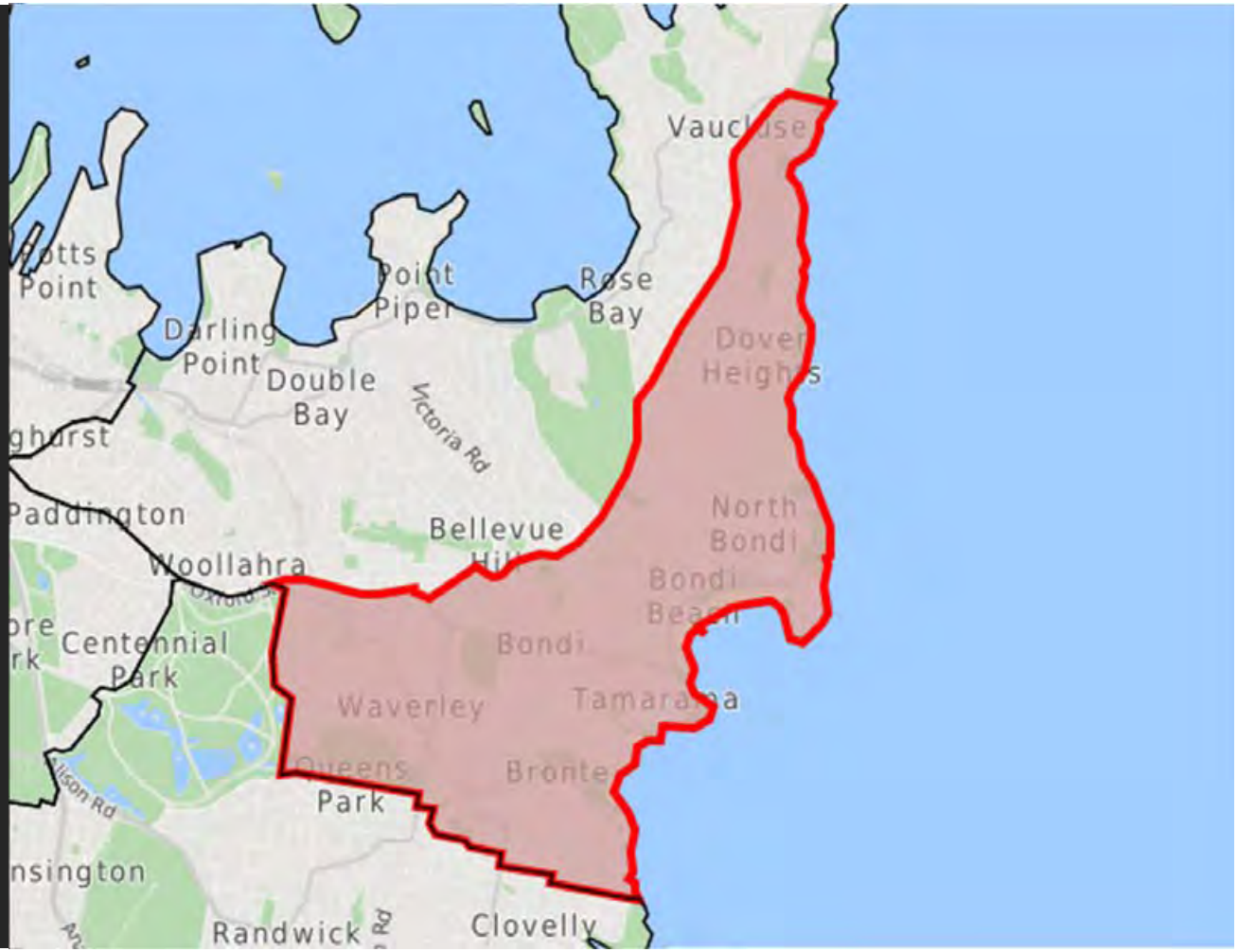
- 43 662 passenger vehicles
- 113 200 total population
- 86 032 working age population (15-64)
- 2,070.9 land area (ha)



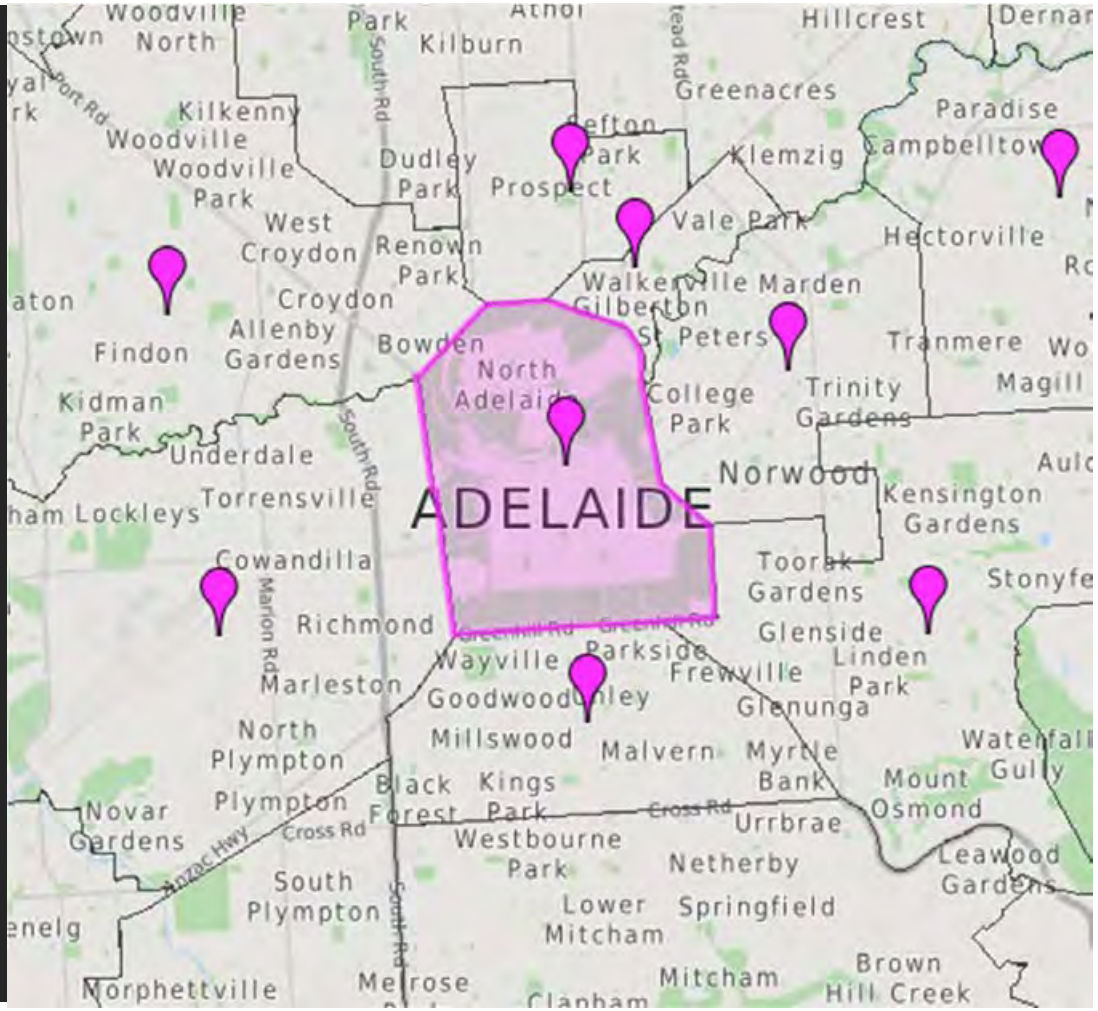
- 225 028 passenger vehicles
- 311 142 total population
- 189 796 working age population (15-64)
- 225,385.3 land area (ha)



- 31 068 passenger vehicles
- 73 300 total population
- 71 300 working age population (15-64)
- 935.1 land area (ha)



- 22,644 passenger vehicles
- 24,794 total population
- 20,157 working age population (15-64)
- 1,557.3 land area (ha)



Commute Time

How long do people usually commute in Sydney by public transport everyday?

The average amount of time people spend commuting with public transport, for example to and from work, on a weekday. 82 min

Singapore, Singapore 84 min
Melbourne, Australia 80 min
London, United Kingdom 84 min

The average distance people ride by public transport in Sydney is 9km. Yet 60% of riders travel over 12km in a single direction.

Walking Distance

How far do people usually walk per journey in Sydney?
The average distance people walk every day in one direction, for example on their way home or to work. 0.65 km

Singapore, Singapore 0.56 km
Melbourne, Australia 0.78 km
London, United Kingdom 0.53 km

How many people walk for more than 1 km in Sydney?
The percentage of people who walk for over 1 km each day to reach a specific destination, for example to or from work. 17%

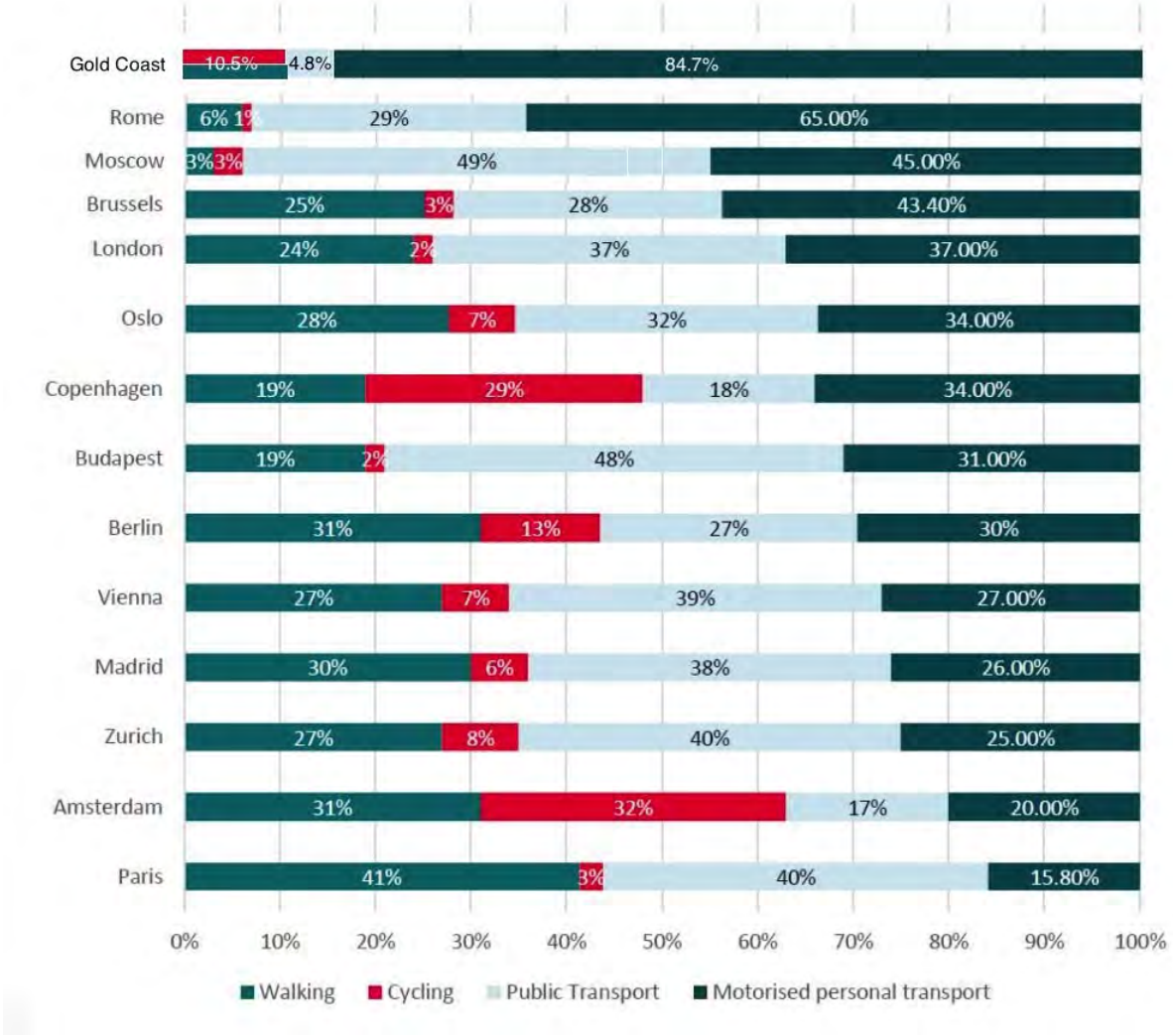
Singapore, Singapore 12%
Melbourne, Australia 26%
London, United Kingdom 11%

Gold Coast is a city of 630,000 people.
Approximately 85% of trips are by car – similar to Los Angeles

- Less than 5% by public transport.
- The 6 train stations that could be the hubs of the city are surrounded by car park
- These are being expanded at a cost of $20-$40 thousand per car space.

20.9% of people in Sydney travel to work on public transport
13.4% in Melbourne
10.5% in Brisbane
8.3% in Adelaide
8.1% in Perth

79.9% drive to work in Adelaide
79.3% in Perth
76% in Hobart
75.3% in Brisbane
65.6% in Sydney



Work in progress:

Stakeholder engagement + inputs

Interviews, meetings and workshops conducted with:

- relevant industry and government stakeholders
- people involved in the regulation and deployment of FFCS schemes from contexts that are similar to the Australian ones regarding urban and demographic characteristics.

The goals of these activities are to:

- engage with the stakeholders
- understand local demands
- collect valuable insights and data to develop the cases
- map key questions, challenges and opportunities related to FFCS across different jurisdictions and markets in the Australian context.

Potential use-cases for the project

Places that can provide good lessons + with urban characteristics that are similar to the context of Australian cities

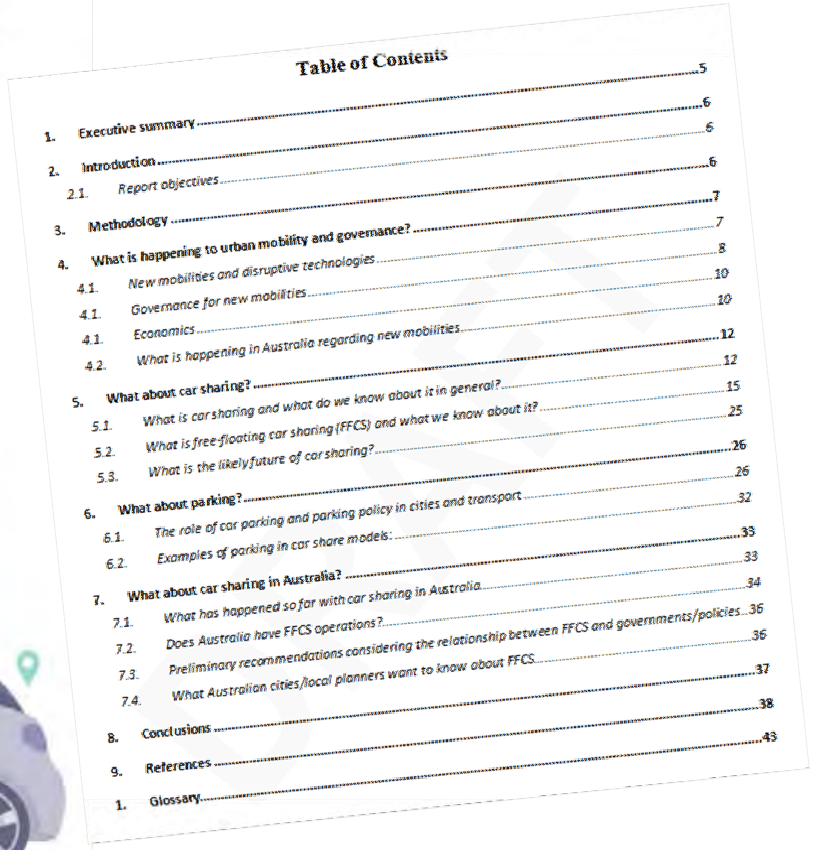
Report objectives

Analyze national and international research and practice of car sharing, in particular FFCS.

Raise main issues related to FFCS facing cities around the world.

Assess and build a foundational understanding of opportunities and challenges for the implementation of free-floating car sharing, contextualized to Australian urban areas, to guide a potential local development of the mode.

Inform the next steps of the project and help with the development of guidelines for future provision of policies and possible deployments of FFCS in Australia.



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The **project** undertakes to **enable** government, industry, and communities to better understand the **possibilities** and **potential** for **shared mobility** and make decisions that **best suit** their **needs** and networks.

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