National parking management guidance

This document provides guidance on best practice management of public parking (on-street parking and publicly owned/managed off-street facilities) throughout New Zealand.

WAKA KOTAHI
NZ TRANSPORT
AGENCY

Te Kāwanatanga o Aotearoa
New Zealand Government

Contents

1. Overview

As our cities and towns grow there is increasing competition for space on our roads and streets. This results in a growing need to increase the use of public transport, walking and cycling, enable more efficient movement of goods and services, and for our streets to be inviting public spaces.

Well-managed public parking can positively contribute to the transformation of urban environments into safer, more vibrant, sustainable, and equitable places with better housing and travel choices. Equally, poor parking management can undermine these goals.

This guide promotes a consistent, best-practice guide for the management of public parking throughout New Zealand. Although public parking includes both parking managed by road controlling authorities and private parking operators, this guidance is mostly applicable to road controlling authorities. It sets out a principles-based process for deciding where it may be appropriate to provide public parking, and how to manage public parking resources in a variety of circumstances:

- Section 1 provides a description of parking management, the purpose of the guide, and the benefits that can be achieved through good practice public parking management.

- Section 2 outlines the process for establishing a comprehensive framework of good public parking management.

- Section 3 provides guidance on the range of approaches to managing public parking. This section can be used to guide the development of a parking strategy or to respond to parking issues. There is also guidance on parking technology and successful public engagement approaches.

This guidance relates specifically to motor vehicle parking. It does not cover bicycle or micro mobility parking, street design, public transport planning and design or park and ride facilities. Guidance on these areas can be found on the Waka Kotahi NZ Transport Agency website.[1]

Image by Flickr/Daniel Chodusov

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1   *Cycle parking planning and design*, https://www.nzta.govt.nz/resources/cycle-parking-planning-and-design/

  Aotearoa urban street planning and design guide, www.nzta.govt.nz/about-us/about-waka-kotahi-nz-transport-agency/environmental-and-social-responsibility/urban-street-guide/

  Getting to and from public transport, https://www.nzta.govt.nz/walking-cycling-and-public-transport/public-transport/public-transport-design-guidance/getting-to-and-from-public-transport/

Image by Our Auckland

Throughout the document are case studies which provide some real examples from New Zealand and around the world that support the parking management concepts described.

During the preparation of this guidance the world was experiencing the COVID-19 pandemic, which disrupted many activities and resulted in people travelling differently than they ordinarily would. For example, people travelled less at times when public health orders to stay home were issued.

The parking management principles discussed in this guidance do not change during extraordinary events like the pandemic, but priorities like the most beneficial use of street space may change.

For example, during the COVID-19 pandemic there was a need for wider footpaths to enable social distancing. The COVID-19 pandemic has focused attention on kerbside management and resulted in the removal of parking in some places to make way for alternative uses. Many of these changes may become permanent.

1.1 What is parking management

Parking management is a packaged approach that aligns with the objectives sought and can include a range of methods such as:

- limiting what space is available for parking
- restricting how long a vehicle can be parked for
- allocating specific space for types of parking (eg mobility parking, loading zones)
- requiring payment of a fee for parking.

The authority to make changes to public parking is enabled through a bylaw and then local authorities approve changes to parking through a parking resolution report. All parking changes must be in accordance with the Land Transport Rule Traffic Control Devices Rule 2004 (TCD Rule) including the types of signs and road markings used.

Relationship between the TCD Rule and manual and this guidance

The Land Transport Rule Traffic Control Devices Rule 2004 (TCD Rule):

a) specifies requirements for the design, construction, installation, operation and maintenance of traffic control devices, and

b) sets out the functions and responsibilities of local authorities in providing traffic control devices to give effect to their decisions on the control of traffic.

The Waka Kotahi Traffic control devices manual (TCD manual) supports the TCD Rule and provides guidance on industry best practice, including, where necessary, practice mandated by law in relation to the use of traffic control devices. Guidance on traffic control devices related to parking control are covered in part 13 of the manual.

The adjacent figure depicts the different roles of the present parking guidance versus the TCD manual part 13.

NATIONAL PARKING MANAGEMENT GUIDANCE

- (Public) parking management - what is it, potential benefits
- Process to develop parking management frameworks
- Parking management approaches

TCD MANUAL PART 13 (PARKING)

- Legal framework - implications and responsiblities
- Design considerations and elements
- Linear and zone parking treatments

1.2 Strategic fit of this guidance

The planning and management of parking can make an important contribution to achieving the outcomes set out in several key national strategies:

- The government's *Urban growth agenda,* which aims to remove barriers to the supply of land and infrastructure and make room for cities to grow up and out. A key component of this agenda is the *National Policy Statement for urban development* (NPS-UD). Policy 11 of the NPS-UD prevents local authorities from setting minimum car parking rate requirements, other than for accessible car parks, and strongly encourages local authorities to manage the effects of car parking through comprehensive parking management plans.

- *Keeping cities moving* released by Waka Kotahi in September 2019, which aims to increase the wellbeing of NZ cities by growing the share of travel by public transport, walking and cycling.

- *Government Policy Statement on land transport 2021/22–2030/31* (GPS) which includes strategic priorities to improve safety, provide better transport options, and reduce carbon emissions. The GPS guides investment in land transport.

- *Road to Zero: New Zealand's road safety strategy 2030–2030* that has been developed by the Ministry of Transport and key partners, which aims to significantly reduce the number of people being killed or seriously injured on New Zealand roads.

- *New Zealand urban design protocol* which provides a platform to make New Zealand towns and cities more successful through quality urban design. Minimum parking requirements and poorly managed parking can create poor urban design outcomes and uninviting public spaces.

- *The Climate Change Response (Zero Carbon) Amendment Act 2019*, and the need to transition the transport system to net zero carbon emissions, to meet our domestic and international commitments.

Keeping cities moving is the genesis of this document, identifying 'provide ongoing parking management guidance and leadership' as a key intervention for influencing mode shift (see the excerpt showing intervention 20 from page 27 of the document below).

Intervention	20. Provide ongoing parking management guidance and leadership
Description	We will provide leadership in the public conversations about parking management, supported by robust research, data and guidance for parking management strategies. We will also make necessary regulatory changes to enable parking fines to be set to discourage inappropriate behaviour in residential areas.

Keeping cities moving recognises that good public parking management can contribute to achieving mode shift in several ways:

- Enabling higher densities and a more compact urban form by reducing the amount of space that is dedicated to parking.

- Freeing up street space for public transport, walking and cycling.

- Reducing price subsidies for parking, thus disincentivising car travel when other modes are available.

A good example of this in practice is in Queenstown where parking management was aligned with strategies to incentivise greater use of the bus service and reduce traffic congestion in the town centre. Refer to case study 1 for more information on this.

The Climate Change Commission's final advice to the government in its *Ināia tonu nei: a low emissions future for Aotearoa report* (31 May 2021)[2] recommends steps to decarbonise transport and meet the requirement for net-zero carbon emissions by 2050. The recommendation includes reducing the reliance on private vehicles (or light vehicles) and supporting people to walk, cycle and use public transport more. Integrated parking management is critical element of achieving this shift.

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2 Refer to Ināia tonu nei: a low emissions future for Aotearoa

Case study 1
Queenstown Lakes integrated parking policy

The Queenstown Lakes area continues to experience significant growth pressure, resulting in concerns about road congestion, car parking, and reduced amenity within the town centre. Parking analysis from 2017 indicated that town centre car parking was at capacity and that approximately 30% of congestion was being generated by people searching for parking spaces.

In late 2017, the district and regional councils responded to these issues by increasing (and in some cases doubling) parking fees, limiting the number of non-priced parking spaces, and removing all discounted long-term commuter parking from the town centre.[3]
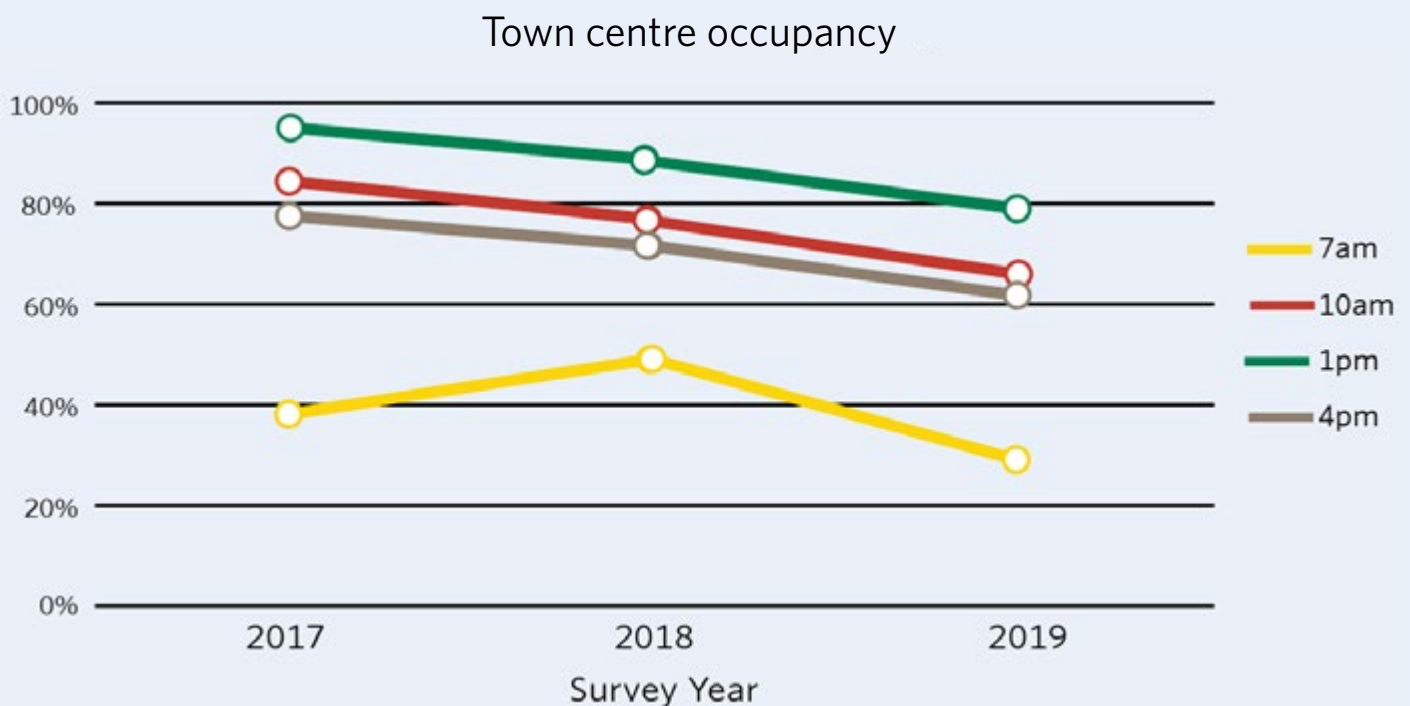
Critically, these changes were coordinated with the introduction of a new frequent bus network and the launch of a subsidised $2.00 flat fare.

Since implementation, both bus ridership and parking revenue have shown a dramatic and sustained increase, while parking occupancy rates have dropped by around 17% between 2017 and 2019. Data from June 2019 show a 64% year to date increase in bus patronage compared to 2017/2018.[4]

A 2019 survey showed that peak occupancy intensity for the town centre was 79% at 1pm, within the typically recommended target occupancy rate of 70–90% to support effective parking turnover.[5] This represents a 10% decrease from 2018 and a further 6% decrease from 2017 as shown in the figure below.

Furthermore, peak parking occupancy appears to have declined across each time point surveyed. It can be expected that this will also have resulted in a reduction in congestion as there are fewer people 'cruising' for parking.

Parking occupancy in central Queenstown

Town centre occupancy

3 https://www.scoop.co.nz/stories/AK1803/S00687/queenstown-cbd-parking-changes.htm
4 https://www.orc.govt.nz/media/7088/appendix-2-queenstown-buses.pdf
5 Stantec, Queenstown Parking Survey 2019, June 2019

Following the increase in parking fees, the council reported a parking revenue surplus of approximately $1.3 million for 2017/18.[6] This surplus was then invested into the bus service to improve bus stop infrastructure and wayfinding.

This is a good example on how parking management can be integrated with public transport management. The objective in Queenstown was to shift people to using public transport to relieve the congestion on the roads. This was achieved through increasing the cost of parking and reducing the cost of using the bus. The results to date demonstrate that this has been successful.

Wakatipu bus patronage and revenue

Legend: 2017/18 Patronage | 2018/19 Patronage | 2017/18 Revenue | 2017/18 Revenue

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6   https://www.odt.co.nz/regions/queenstown/surplus-target-getting-people-out-cars

1.3 The need for good parking management

Good management of public parking is a crucial component of the overall transport system, and essential for creating vibrant and well-functioning urban areas. It is especially important in areas experiencing growth pressure because:

- There will be a much stronger demand for public parking as urban areas experience intensification and consequential increases in travel activity.

- As minimum parking requirements[7] are removed from district plans following the National Policy Statement on urban development (August 2020), private parking stock may not increase as fast as it has historically, placing more demand on the public parking resource. Progressive parking management supports 'achieving more' with less parking supply by better utilising supply and managing demand.

- Parking takes up valuable land. Developing high-quality pedestrian, cycling and public transport infrastructure, or even increasing building stock to increase housing supply, is likely to involve reallocating areas currently used for parking. This reduction in parking will necessitate efficient management of the remaining parking supply.

- Parking availability and pricing is a key aspect of travel decision making and can fundamentally influence travel behaviour. Strategic parking management can support (or hinder) uptake in a range of travel modes, which can, in turn, impact on demand for the parking supply.

While parking can contribute towards the success of a place, poorly managed, located and designed parking can undermine efforts to create highly liveable urban areas by:

- subsidising and encouraging excessive demand for car-based travel, leading to congestion, increased vehicle emissions and poorer public health, as well as undermining investment in public transport and walking and cycling infrastructure

- substituting parking for valuable floor space, thereby increasing development costs, and preventing higher value uses for land (eg community facilities/social services or additional commercial and residential development that contribute more to broader urban objectives)

- eroding the sense of place and character of a town centre and/or limiting potential public realm enhancement. The location and design of parking can lead to poor urban design outcomes

- adding disproportionate costs to low-income households, who may not own a car but pay directly or indirectly for the supply of car parking, either bundled with their housing or publicly subsidised via rates

- increasing the direct financial costs to councils to provide and maintain car parking noting that good parking management can provide a revenue stream[8]

- creating safety issues for other users such as pedestrians (eg moving through off-street car parks) and cyclists (eg dooring and reversing).

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7 Minimum parking requirements are rules in district plans which require at least a certain amount of off-street car parking to be provided on site as part of a development proposal.

8 Donald Shoup provides good general analysis on the negative outcomes conventional parking management can have in: Shoup, D. C. 2005. *The high cost of free parking*, Chicago: Planners Press, American Planning Association.

Internationally there is a growing realisation that while many parking policies and decisions around supply were well-intentioned, they may have done more harm than good when their wider impacts are understood. In particular, efforts to increase parking supply to make it easy for people to find a parking space have had wide reaching (and often negative) impacts on urban form and the overall transport system. Generous parking supply is shown in Figure 1 as a key part of the cycle of automobile dependency by inducing car-based travel demand, and thus parking demand.

This has led to a change in approach to parking management in many places around the world, which focuses on getting the balance right: providing the 'right' amount of parking, in the right place, at the right time, and at the right price.[9][10]
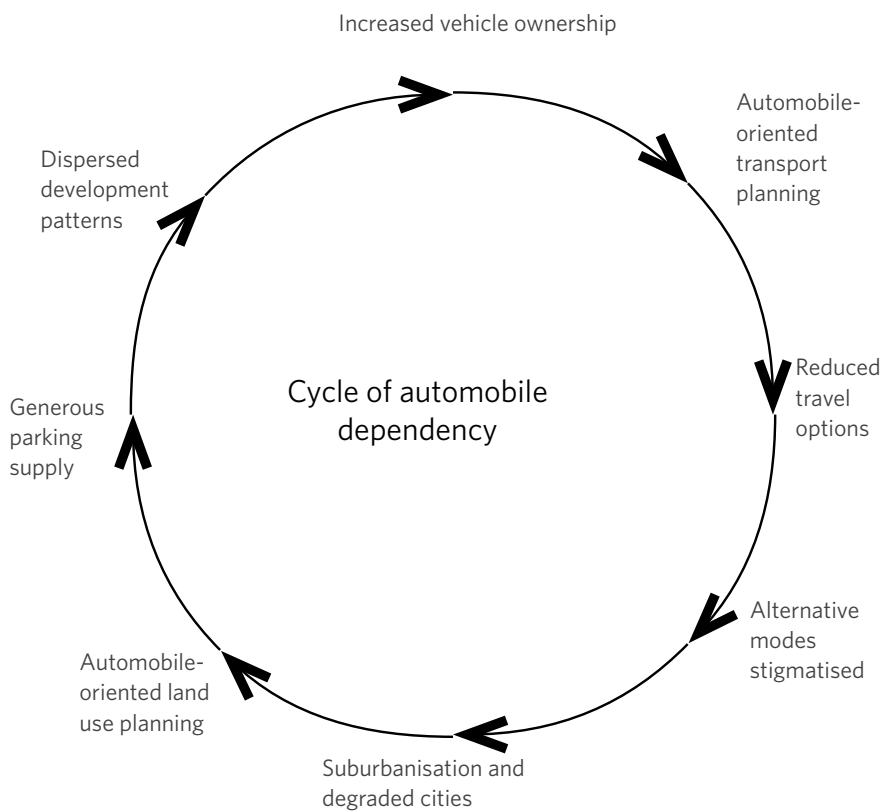
Figure 1: The cycle of automobile dependency adapted from Litman T, Parking Management Strategies, Evaluation and Planning, Victoria Transport Policy Institute, 2016

Increased vehicle ownership

Automobile-oriented transport planning

Dispersed development patterns

Cycle of automobile dependency

Reduced travel options

Generous parking supply

Alternative modes stigmatised

Automobile-oriented land use planning

Suburbanisation and degraded cities

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9   Refer to *The high cost of free parking*, American Planning Association, 2005 and *Parking management best practices*, Routledge 2017

10 Refer to *Parking management best practices*, Routledge 2017

Managing private parking

The NPS-UD removes the ability for councils to impose minimum parking requirements in their district plans. This part of the NPS-UD is intended to avoid a regulated over-supply of parking and help break the cycle of automobile dependency summarised in figure 1. Even without the requirements of the NPS-UD, councils have limited ability to control the provision and management of parking on private sites. For example, councils are not able to monitor and enforce the use of parking on private sites in the same way they can with public parking.

However, private parking is an important factor when making changes to public parking because considering private parking can help the council to:

- understand when they can rely on the private sector parking supply to complement public parking management activities
- avoid the private sector parking supply undermining the intent of public parking management activities
- avoid unintended consequences of public parking management activities.

Therefore, councils should be conscious of the ability they do have to regulate and influence the private parking sector in their planning. For example, through the district plan the council can:

- include maximum parking standards for activities in an area
- regulate that no additional parking is provided in an area
- allow for or preclude the private sector from developing non-accessory parking in an area
- require a developer to apply for a resource consent to develop parking and impose conditions on the consent, either for non-accessory parking or for accessory parking

- require that developers provide integrated transport assessments to support development applications in greenfield areas and require that the integrated transport assessments deal with parking comprehensively
- require accessible car parks to be provided with developments.

There are also considerations not directly related to the district plan:

- Establishing a market for parking is important for ensuring car travel is not subsidised by provision of under-priced parking. The private sector play an important role in establishing a market for parking, especially as the private sector may be more sensitive to the opportunity costs of using land for parking rather than residential or commercial uses.
- The council is not required to provide parking and where a parking market exists the council could rely on the private sector to provide for parking facilities in an area rather than investing public resources in parking.
- The council can work with private sector car park operators to facilitate the development of private non-accessory parking on strategic sites.

1.4 Objectives and principles

The overarching objective of good parking management is to:

enable an appropriate and efficiently used level of parking supply in a way that equitably supports wider transport and urban form outcomes.

Key considerations for achieving this overall objective are:

- What is an appropriate level of parking supply? How might it vary by location? What are the negative effects of too much or too little available parking?

- How can parking management help support wider transport outcomes? Is parking making congestion better or worse? Is parking supporting or undermining public transport, walking, and cycling?

- How can parking management help support a better-quality urban form? Is parking undermining a sense of place and character? Is it helping support higher density mixed use developments?

- Is parking being supplied in an equitable way? Are those who benefit from it paying the true cost? Are those with the greatest need for parking being prioritised?

These considerations and questions help shape the following key principles that should be applied to help deliver good parking management:

- Prioritise public space to achieve the most public good.

- Efficiently use space dedicated to parking.

- Prioritise those with the greatest need for parking.

- Equitably pay for the costs of parking provision.

- Ensure parking supports wider transport outcomes.

- Ensure parking and its location supports a quality urban form.

- Make evidence-based decisions.

- Provide a high-quality user experience.

The way these principles can help guide parking management decision-making is outlined further in sections 2 and 3.

1.5 Benefits of good parking management

This guidance is based on the principle that good parking management practices can create a raft of benefits. These benefits are listed below, along with reference to some of the management measures included in subsequent sections of the guidance.

The potential benefits of parking management include:

- **Enables improvement in the quality of walking and cycling infrastructure** – in constrained street environments, good parking management can enable safer and more amenable walking and cycling environments by, for example, prioritising street space for walking and cycling infrastructure and managing the effects of displaced parking demand.

- **Enables improvement in the quality of public transport services** – good parking management supports transport choice through supporting higher public transport levels of service. Good parking management can enable public transport priority measures to be implemented in streets and can support public transport ridership through applying appropriate fees.

- **Higher quality urban form and safer urban areas** – parking areas may be a blight on urban areas by presenting as quiet, inactive, dead spaces which may feel unsafe and/or induce traffic in pedestrian shopping streets. Parking can be rationalised to ensure parking is provided in the best place and in the best form to create a more amenable environment. For example, multiple dispersed surface level car parks can be consolidated into a single off-street parking structure in an advantageous location and developed with CPTED principles to help ensure user safety.[11]

- **Reduced car travel and congestion** – removing subsidies for car drivers and aligning parking fees to support the use of public transport reduces the incentives for people to make trips by private car. Enabling drivers to find a car park easily reduces the number of vehicles cruising the streets searching for parking.

- **Safer streets** – more people choosing to take alternative travel modes rather than a private car reduces risk of death and serious injuries occurring on road and street networks.

- **Healthier people** - more people choosing to take alternative travel modes rather than a private car reduces air and noise pollution and increases people's physical activity levels, contributing to a healthier population.

- **More equitable access to goods and services** – this is achieved by ensuring those with the greatest need are prioritised, for example, those with few transport options are prioritised over those with more transport options.

11 CPTED is an acronym for 'crime prevention through environmental design. The Ministry of Justice publishes guidelines for CPTED that can be found here: https://www.justice.govt.nz/assets/Documents/Publications/cpted-part-1.pdf

- **More equitable investment in parking resources** – parking management may involve introducing pricing, so that users cover the cost of the parking provision. If parking provision is subsidised through public money, people who do not use the parking likely still pay for it (eg through rates). This can favour those most able to pay and disadvantage those in the community who are least able to pay.

- **Greater public benefit from public land resources** – parking is a private good primarily benefiting the parking user. Developing public land for parking prevents this land being used for activities that provide a wider community benefit such as additional space for outdoor seating or dining.

- **Improved economic outcomes for the local economy** – parking management can improve economic outcomes for local businesses, for example:
  - Prioritising short-stay parking and parking turnover in town centres encourages vitality and economic activity.
  - Enabling people to choose alternative transport options to the private car can reduce their cost of travel, leaving them with more money to spend in the local shops.
  - Locating parking to improve pedestrian activity outside shops can improve the success of the shops.

- **The community gets a return from investment in private good resources** – if public land and resources are invested in a private good like parking, it is fair to expect that users should pay to use it. Under these circumstances the community receives an adequate financial return on that investment.

- **Profits from parking fees can be invested back into the local area including parking facilities and sustainable transport improvements** – this is often referred to as hypothecation and an example of this is seen in Queenstown as shown in case study 1.

- **Supporting the take up of electric vehicles** – planning for the installation of electric vehicle charging infrastructure in priority areas can help incentivise people to change from standard cars to electric cars.

- **A better parking user experience** – well managed parking means that users can easily find a car park and can easily understand and meet any car park restrictions. For example, where parking demand is well managed a proportion of the car parks in an area will be available, so car park search time is minimised. Investment in parking technology can streamline the parking fee payment process.

Image from Business Case for Walking, Auckland Council 2017.

Key principles of parking management

1. Prioritise public space to deliver the most public good.

2. Efficiently use space dedicated to parking.

3. Prioritise those with the greatest need for parking.

4. Equitably pay for the costs of parking provision.

5. Ensure parking supports wider transport outcomes.

6. Ensure parking and its location supports a quality urban form.

7. Make evidence-based decisions.

8. Provide a high-quality user experience.

Image from Kate
Battersby/MRCagney

2. The parking management framework
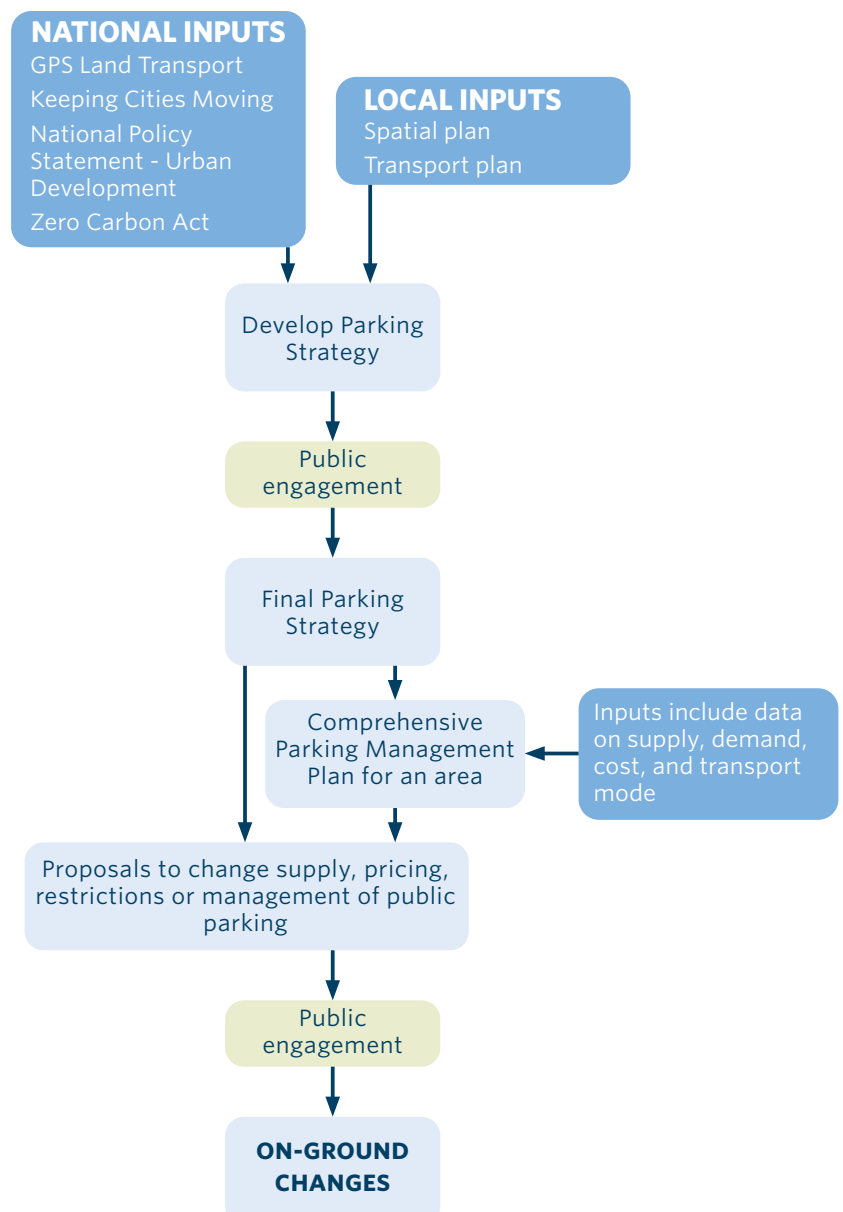
2.1 Parking management overview

Good parking management achieves a situation where the right amount of parking is provided in the right location, at the right time, and at the right price. As discussed in section 1, this means:

- providing an appropriate amount of parking, noting that there may be other higher value uses of public space

- efficiently using space that is dedicated to parking

- prioritising those with the greatest need for parking

- equitably paying for the costs of parking provision

- ensuring parking supports wider transport and urban form outcomes

- making evidence-based decisions

- providing a high-quality user experience.

The first step in approaching parking management is to develop a parking strategy. A parking strategy describes how parking will be managed in a way that is consistent with overarching national and local transport and land use strategic direction. The parking strategy will include policies to support an overall vision and/ or set of clear objectives. The figure (right) shows the parking strategy in the context of local direction.

The next step is to develop area-based parking management plans (PMP) to provide a specific plan to align with the parking strategy, address area specific parking issues or respond to proposed changes. A parking management plan can be prepared for a discrete area such as a city centre, a precinct of a city centre, a suburban commercial centre, or an area around a trip intensive land use like a tertiary education or health facility.

Although the overview of the principles applied to a parking strategy and the process of preparing a parking management plan may appear relatively straight forward, effective implementation of the plan can involve some complexity. It is important that councils plan resourcing for people, technology, processes, and communication to ensure successful implementation. Funding for this resourcing should be included in the planning process as a component of the resource cost of the public parking asset (refer to section 2.3 for a description of the resource costs).

NATIONAL INPUTS
GPS Land Transport
Keeping Cities Moving
National Policy Statement - Urban Development
Zero Carbon Act

LOCAL INPUTS
Spatial plan
Transport plan

Develop Parking Strategy

Public engagement

Final Parking Strategy

Comprehensive Parking Management Plan for an area

Inputs include data on supply, demand, cost, and transport mode

Proposals to change supply, pricing, restrictions or management of public parking

Public engagement

ON-GROUND CHANGES

2.2 Parking strategy

Having a parking strategy, is critical for any town or city where parking needs to be managed. A parking strategy will provide the guidance to operational teams and demonstrate to the public how parking will be managed. The principles outlined in section 1, and the parking management approaches in section 3 of this report should be used in the development of a parking strategy.

The parking strategy is a useful way to evaluate parking issues and plan for what parking interventions should apply and when. The parking strategy should contain parking management objectives that encourage more efficient utilisation of parking resources, manage demand, and articulate when it may be appropriate to change public car parking supply. The strategy will provide analysis of the key issues, what is causing them, and the response to these issues. The strategy should be structured to help support project teams with reallocating road space.

Hastings District Council took an interesting approach in establishing the basis for its parking strategy. They asked the public whether parking should be paid for by everyone through rates or paid for by the users through metered parking. Refer to case study 2 for more information on this.

Image from MRCagney

Case study 2

Hastings parking pricing decision

Parking has been a contentious issue in Hastings for many years. Under its Central City Strategy, the Hastings District Council adopted the Hastings Vibrancy Plan in October 2015, which supported trialling a free parking pilot for the city centre. Together with the direction of the Vibrancy Plan and pressure from retailers, Hastings District Council approved the trial of free parking, while retaining the existing time limit. The trial ran from November 2015 to February 2016 and was extended several times through to June 2017.

To determine the impact of the trial, parking occupancy surveys were conducted before and after the free parking was introduced. This data was used, along with other metrics, in an evaluation of the trial. The evaluation included analysis of parking occupancy and length of stay, parking revenue loss, retail spend, bus patronage, parking complaints and an attitudinal survey to see what the public thought of the free parking. There was also a comprehensive review into the effects of the free parking trial conducted by Marketview, a consumer spending research company, in May 2017.

The evaluation report about the free parking trial was inconclusive about any positive effect to Hastings' retail activity or vibrancy. Although there was some increased retail spend over the trial period, the review found it could not be directly linked to free parking and it could be argued that other macro-economic factors, such as lower interest rates and high levels of employment, had a greater influence.

The evaluation of the trial also showed the loss of $805,000 of parking revenue created an affordability problem for Hastings District Council and would result in an increase in rates to offset the loss. The rates forecast for 2017/18 was 0.9% higher if free parking was retained.

Based on the evaluation, the council included a question in its 2017/18 Draft Annual Plan consultation. The council made it clear that providing parking in Hastings town centre has a financial cost which needs to be paid for by someone. The question was posed to residents like this:

Question: How would you prefer to pay for Hastings city centre on-street parking?

Option A: Parking meters.

This would be paid for via meters on the street as they are used, with some technological enhancements to provide additional payment options, ie credit cards. The charge for on-street parking would be increased to $1.20 per hour (currently $1) to future proof the system.

2017/2018 Hastings District Council Draft Annual Plan consultation document on parking

METERS — BUDGETED OPTION

RATES SHOULD NOT BE USED TO PAY FOR CENTRAL CITY PARKING. A USER-PAYS SYSTEM IS FAIRER, BUT MORE CONVENIENT PAYMENT OPTIONS OTHER THAN CASH PAYMENT SHOULD BE INVESTIGATED.

This will mean investing in new technology which would be funded from revenue generated from parking meter charges.

RATES

NOT HAVING TO PUT CASH IN A PARKING METER IMPROVES THE VITALITY OF OUR CENTRAL CITY, IS MORE CONVENIENT AND IMPROVES THE SHOPPING EXPERIENCE.

I would be happy to pay via a charge on my rates. To cover the cost each ratepayer will be paying based on the property location. This will mean central commercial property owners paying $65 per year, wider urban property owners $22 a year, and rural property owners $11 a year.

Option B: Rates

No on-street payment for on-street parking. Costs for parking in Hastings and Havelock North would be combined so everyone shares the cost. This would be paid via an additional charge on your rates.

The council received almost 3000 submissions on the parking question with 68% preferring the user-pays option (return to parking meters) and 32% preferring the targeted rate option.

Some themes arising from people preferring user-pays were:

- It is not the role of residents to subsidise parking to assist CBD retailers.
- Funding through rates would not be accurate or fair on those who do not go into town often, or rural ratepayers in the northern Hastings District who visit Napier as their nearest town.
- Out of towners, tourists and non-ratepayers will not be contributing, despite using the service.
- Do not believe argument that free parking has increased retail spend – trend happening nationwide.
- Free parking filled by businesses whose staff use it – policing of free parking is never enough to stop this, and businesses see it as their right.
- Having to put a coin in a meter does not make people drive elsewhere…it does make staff and businesses park elsewhere.
- Introduction of easier ways to pay would be good when paid parking reintroduced, eg cellphone apps such as 'Park Mate'.

People preferring Option B thought the free parking had been successful and made Hastings an easier place to visit. There were also comments suggesting the brand of Hastings would be damaged by re-introducing parking meters.

The clear majority of those who responded felt the introduction of a targeted rate to fund the revenue shortfall was not a fair and equitable system for paying for parking, and that a user pays system was a fairer system. In June 2017, at the governing body meeting, the council supported the council officer's recommendation that user-pays charges through parking meters be reinstated in Hastings city centre. They also supported investigations into better electronic payment options and in-ground sensor technology.

Hastings District Council took an innovative approach to resolve the difficult decision around parking charges. By presenting the relevant information in a transparent manner to the public, it was easier for elected councillors to decide on what is normally a contentious topic.

Parking strategy contents

The content of a parking strategy typically includes:

TOPIC	DESCRIPTION
Introduction and purpose	Explain the need for a parking strategy, how it fits within the local planning/strategic context, what it is aiming to achieve (best articulated through a 'vision') and what issues it is seeking to address.
Objectives and principles	Formulate a set of objectives that align with the vision, wider strategic direction and outcomes. The objectives for managing parking may differ for each location and need to describe the local outcomes being sought. Refer to section 1.4 for principles that will help frame the objectives.
Strategic alignment and direction	This section will describe how the parking strategy aligns with and supports government and local strategies and plans. Explain how parking management supports other transport and land-use outcomes for the area.
How different parking uses are prioritised	This could include a parking hierarchy as shown in section 3.2.
Pricing parking and time restrictions	Explains the purpose of pricing and time restricting parking. Explains where time restrictions are appropriate and how parking prices are set and adjusted, and how regularly they are reviewed. Refer to section 3.4.
Parking management approach in centres	Outline the main issues associated with parking in commercial centres. Describe the approach to manage supply and demand in centres and how this aligns with policy objectives. This will include the use of pricing in areas of high demand. Refer to section 3.4.
Parking management in residential areas	Outline the main issues associated with parking in residential areas. Explain the approach to manage these parking issues including where residential permit schemes will be used. Refer to section 3.3.
Park and ride	Outline the approach taken to supply and manage demand for parking associated with public transport stations. This should explain how Park and Ride can support public transport and how it complements other access modes (eg feeder bus services, walking and cycling).
Electric vehicles, car share and autonomous vehicles	Outline the approach taken to support and cater for these vehicle categories. This will explain the benefit to the city of supporting, or not supporting, each of these and how it aligns with objectives and principles. Refer to section 3.7.
Special events, sports, and other venues	Events and sporting fixtures have sporadic spikes in parking activity and can be difficult to manage. Some sporting venues have regular traffic management plans and parking restrictions that are used for each large event. Other considerations for these are how alternative forms of transport are supported and how pick up drop off is managed.
Parking technology	Clearly outline how technology will be used and the associated benefits to the customer or local authority. The public can be nervous about new technology, and it is important to explain how it works and why it is being used. Refer to section 3.9.
Parking management plans (PMP)	Explain the process for developing PMPs and a programme for their application. Refer to section 2.3.

Application of the parking strategy

Once the objectives or parking management policies and principles have been established via the parking strategy, it can be applied to areas of the city or town that have identified parking issues and pro-actively support wider transport and land-use plans. The strategy can also be used to support re-vitalisation initiatives for town and city centres, where alternative uses for areas of public parking may have net benefits for the success of the centres.

Whether responding or working proactively, useful first steps in devising a management response include scoping out an area of influence, gathering information on the parking stock and utilisation within the area, and applying the agreed parking policies to plan measures to manage the parking resource. This management response is often referred to as an area specific 'parking management plan' or a 'comprehensive parking management plan'.

2.3 Parking management plan

A parking management plan (PMP) is a location specific plan that outlines parking management interventions for a centre, a neighbourhood, a particular land use (such as residential) or an area that is influenced by a land use (eg commercial parking spill over to a residential area). As explained above, a PMP may be used to respond to known problems, or to proactively contribute to wider transport and urban outcomes. PMPs should be informed by reliable survey data, and by an understanding of the resource cost of parking. A PMP should collect information on all parking assets within the study area – both public and private, if this is available. While a PMP will provide analysis on all parking assets it will typically only develop management measures for the public parking supply.

A PMP is not always needed before parking management measures are implemented. For example, implementing relatively straight forward measures at a local level, where the measures are unlikely to be controversial or to have widespread flow on effects, can be done without considering the area-wide parking situation.

Collecting data

Undertaking parking occupancy surveys gathers the data essential for developing a parking management plan. Surveys should collect parking supply information and occupancy data for the on-street parking spaces and off-street car parks, which can be geocoded for subsequent spatial visualisation and analysis.

Surveys typically include the following attributes:

- Audit of parking supply, both public and private if available.
- Existing parking restrictions (eg P60, pay parking, residential parking, clearway, unrestricted).
- Parking occupancy.
- Parking turnover (number of new vehicles parked per hour or per day) – hourly counts are very useful for observing parking turnover and length of stay behaviour, but more frequent counts can be useful in busy areas or areas with a short parking restriction (eg P30), and less frequent counts in areas where interest is in long-stay parking.
- Average duration of stay.
- Surveys should cover different days of the week including weekends. The survey should cover the opening hours of businesses on the street but will depend on the level of activity in the centre. Typically, a survey will cover 8am–6pm.

Origin-destination surveys of parked cars can also provide useful information when considering other means of accessing the centre.

Reviewing the survey data enables the council to determine current parking conditions, the level of demand for existing parking resources, whether existing parking management favours long-term commuter parking or short-stay visitor parking, and the ease of finding a parking space at different times of the day.

Survey data can be converted into graphs, tables, static and online maps for easier communication.

Data should also be collected that shows the current and predicted transport mode share to the centre. This will demonstrate whether kerb space needs to be allocated to support alternative sustainable transport modes.

Resource cost

The resource cost of parking is the value of investment that could be redeployed to other community projects if it were not invested in public parking, i.e. the resource cost equates to the opportunity cost.

The publication from the Australian Government, the *National guidelines for transportation system management in Australia*,[12] outlines the components that contribute to the resource cost of public parking. It states that, while the resource cost of parking varies widely depending on the value of the land and the type of parking involved (eg surface parking versus structure parking), the overall cost is comprised of:

- the capital value of the land
- the construction costs of the car parking
- the operation and maintenance costs of the facility.

Having extensive survey data alongside an accurate understanding of the resource cost of providing parking is necessary to properly understand:

- whether parking is being subsidised or under-supplied
- whether observed demand is for subsidised parking or market-priced parking.

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12 Refer to *National guidelines for transportation system management in Australia.* https://www.atap.gov.au/technical-support-library/ngtsm/index

Contents

A parking management plan should consider the following:

CONTENT TOPIC	DESCRIPTION
Introduction and background	• Information on area context • Current transport projects • Parking strategy direction • Public transport and active transport strategies and targets • Public transport services • User or visitor surveys • Parking utilisation surveys • Other relevant events and activities not covered by surveys. • Plans for car park divestment • Information and data on vehicle traffic on roads within the area • Information and data on walking and cycling within the area • Information on any current or planned projects that will change conditions for traffic, walking or cycling.
Current parking patterns	• Analysis of current parking supply • Current utilisation of parking stock • Spatial variation in parking utilisation • Duration of stay including proportion of short-stay versus long-stay users • Origin of visitors • Mobility parking.
Planning and development implications	• Information on key planning and development observations • Future parking scenarios including impacts of car park divestment • Future transport networks and changes • Future parking demand • Implications of urban growth strategies • Street design implications • Implications of parking trends and management strategies. • Freight, loading and servicing
Recommended management measures/ actions/interventions	• Short-term, medium-term, and long-term parking management measures.

Monitoring and enforcement

Monitoring and enforcement of parking restrictions is a crucial part of ensuring parking management activities are successful, and councils should ensure adequate resourcing of these activities. Because the level of parking fines is set at a national level, it may be difficult to recoup the cost of monitoring and enforcement activities through parking infringement fines. However, the operation (including enforcement) and maintenance costs of car parking should be included in the resource cost of providing the parking. Therefore, any cost implications of the necessary monitoring and enforcement activities can be accounted for in setting the parking rates for an area.

Parking management around schools

Schools can be associated with short and high peak parking demands that can impact both the school grounds and the surrounding neighbourhoods. School boards are responsible for how staff, children and visitors access school grounds.

For schools in busy environments and/ or with constraints on providing on-site parking and drop-offs, traffic management measures may be needed around the school during peak times. This is to discourage people from parking illegally on the street and contributing to a safety risk, as well as to minimise congestion and keep traffic flowing.

Council management of parking around schools needs to be addressed on a case-by-case basis. But it may be beneficial for councils to coordinate with schools to actively manage parking and kerb side use in the streets around the school, potentially including:

- developing pick-up/drop-off zones
- providing bus stops
- supervised pedestrian crossings
- marking out no stopping areas
- implementing targeted enforcement
- engagement with the community on safe driving and parking around schools
- ensuring adequate walking and cycling infrastructure is included in the surrounding streets.

These types of initiatives can be addressed proactively by councils as part of an integrated school travel planning programme aimed at providing safe travel for children traveling to and from school by any mode of transport.

Both the Ministry of Education and Waka Kotahi publish guidance for school boards on developing a travel plan,[13] which is described as a necessity to make sure everyone is safe, and traffic can move smoothly. The guidance advises that travel plans should consider what parking is needed and how parking will be managed at the school. The guidance also covers the need for the travel plan to include a system for dropping off and picking up students.

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13 For Ministry of Education guidance refer to: https://www.education.govt. nz/school/property-and-transport/ health-and-safety-management/traffic- management/#developing
For Waka Kotahi guidance refer to: https:// education.nzta.govt.nz/assets/Education- portal/Teacher-resources/School- community-partnerships/Safe-school-travel- plan-June-2011.pdf

Key messages

1. Decisions on parking management and supply should be guided by a parking strategy that aligns with local and government policy direction.

2. Parking management plans can be used to respond to parking issues or to proactively guide urban improvement initiatives and should align with the parking strategy and include area-specific considerations and clarity on what interventions are needed.

3. Gathering information about parking supply, utilisation and resource costs is an essential part of developing a robust parking management plan.

Image from Flickr/
Kristina D.C. Hoeppner

Parking management approaches

3. Parking management approaches

This section provides the key parking management approaches that can be used to manage public parking supply. For each management approach there is context, principles, and guidance on how to implement the approach.

The content covers the following:

- When to allocate street space to parking, including guidance to ensure other uses of this space are considered.

- How parking is prioritised through use of different parking restrictions for different types of users, including a hierarchy for different types of on-street parking.

- Managing parking in residential areas.

- Parking management tools such as time restrictions and pricing.

- When to provide new parking or replacement parking.

- Provision of wayfinding to direct drivers to parking locations.

- Emerging mobility trends and how parking could support these.

- Public engagement and implementation strategies.

- A description of different parking technology options.

3.1 Allocating street space to parking

Context

Car parking is one of the largest uses of land in cities. Studies typically find that about half of all land area in post-1950s towns or city centres is occupied by on-street or off-street car parking.[14] While centres typically require some public car parking to accommodate visitors, successful centres are creating high-quality street environments and providing more space for people.

The concentration of activity in urban areas, particularly busy commercial or service centres, means that space is a limited and sought-after resource. This means allocating street space to parking needs to be done through a careful decision-making process that considers all potential users and uses, as well as how the benefits and costs of this allocation are distributed within the community.

Many towns and cities (see case study 3) are starting to allocate more kerbside space for pedestrian and streetscape improvements, including wider footpaths, parklets,[15] bus and cycle lanes, and cycle parking.[16] Prioritising public transport, walking, and cycling supports wider transport outcomes, as well as supporting local businesses by making it safe and easy for people to access them.

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14 Taylor, E and Clements, R (2018) *Empty car parks everywhere, but nowhere to park. How cities can do better*; Shoup D (2005), *The high cost of free parking*

15 A parklet is the conversion of a small number of parking spaces to public space for people to use

16 Refer to Waka Kotahi guidance *Cycle parking planning and design: cycling network guidance technical note*, https://www.nzta.govt.nz/resources/cycle-parking-planning-and-design/

Case study 3

Cities repurposing on-street parking

In the early 1990s, the city centre of Sheffield (UK) faced significant challenges with a decline in local steel and engineering industries and the opening of a new 'big box' shopping centre on the fringe of the town, redirecting economic activity away from the city centre. This challenge forced the local government to rethink its city centre strategy to ensure people would continue to visit the centre and business would have the confidence to invest. The city developed the Heart of the City project; a strategy aimed at attracting people back into the city. A suite of streetscape projects were implemented, including narrowing carriageways on key streets, and rationalising car parking to provide more space for pedestrian activity and events. An evaluation of the streetscape projects throughout the city centre reported a 35% increase in foot traffic, and a further estimation of a net increase in spending of £4.2 million (based on 7% attribution of additional spend of £12.20 per visitor).[17]

San Francisco introduce the Pavement to Parks Programme in 2010. Developed by the San Francisco Mayor's Office, Planning Department, Department of Public Works, and Municipal Transportation Agency, the programme aims to revitalise the city's streets through inexpensive and non-permanent features. Pavement to Parks creates temporary 'parklets' by converting on-street car parking space into publicly useable space and expansion of floor space for adjacent cafés/restaurants. Parklets present a more valuable use of kerbside space, which can generate greater social and economic benefits than using the space exclusively for storing parked vehicles. Since 2015, more than 60 parklets have been built in the city.

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17 The pedestrian pound: the business case for better streets and places
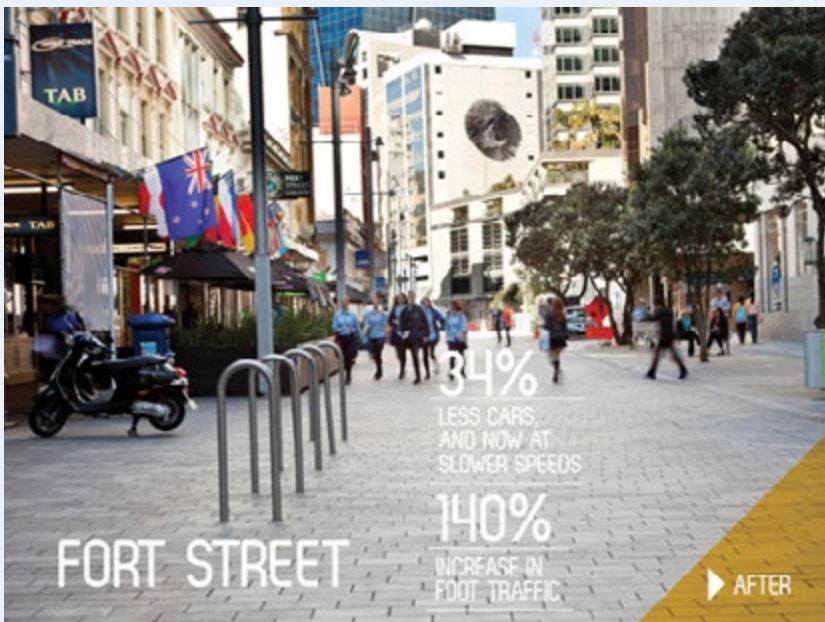https://www.livingstreets.org.uk/media/3890/pedestrian-pound-2018.pdf

Wellington parklet -example of on-street parking being re-purposed into extra cafe seating. Image from MRCagney.

The first trial parklet saw an increase in pedestrian traffic of 37% in the area during weeknights. Similar outcomes have been recorded in other areas across the city.[18]

Auckland has implemented a shared space programme in its city centre, transforming traditional city streets into shared spaces where pedestrians, cyclists and motor vehicles share a space with no defined carriageway, and where pedestrian movement is prioritised over vehicular movement.[19] To date, eight shared space projects have been implemented in the Auckland city centre, resulting in the conversion of over 100 on-street parking spaces. In these locations, design speeds are as low as 10km/h and the only parking available is for loading and unloading (6am-11am, seven days a week) and for motorcycles (time-restricted spaces). Through traffic is discouraged because of the slow speeds and busy pedestrian environment, although access to local buildings is still maintained. A post-implementation evaluation report was commissioned by Auckland Council for the Fort Street shared space project. The evaluation found that, when comparing pre-works in 2008 to post-works in 2011, Fort Street foot traffic increased by 50% during peak hours, consumer spending increased by 47%, vehicle traffic decreased by 25% and 80% of people felt safer in the street.[20]

In 2019, a similar pilot project in Auckland's High Street created additional footpath space by inserting temporary platforms into the parking bays on one side of the street. The remaining parking was reserved for deliveries and mobility users. The design was developed in collaboration with the business owners which has ensured their support. Compared to a full street redesign, this is a low-cost option and results in very little disruption to businesses.

Fort Street after the shared space changes - Image from Auckland Council

18 http://www.greencitiescalifornia.org/urban-ecosystems/san-francisco-pavement-to-parks

19 Davis, D (2015) A Tale of two cities (2): Auckland's shared space programme turns streets into places https://www.vienncouver.com/2015/01/aucklands-city-centre-shared-space-programme/

20 Case study: Fort Street: Auckland New Zealand https://globaldesigningcities.org/publication/global-street-design-guide/streets/shared-streets/commercial-shared-streets/case-study-fort-street-auckland-new-zealand/

Principles

Street space allocation priorities will differ depending on the context of the streets involved. Therefore, this section sets out general principles, and principles for residential environments, commercial centre environments and industrial environments.

General principles:

- Safety is the foremost priority, because any use of street space should put the safety of all street users first. This could mean that street infrastructure is installed to improve safety (eg crossings and kerb buildouts), or infrastructure may need to be removed to improve safety (eg taking out parking or moving bus stops to improve sightlines).

- Existing property access is a high priority for all environments because of legal obligations to maintain existing access to vehicle crossings, which includes accommodating vehicle movements along a street to access properties.

- Footpaths are a high priority in all environments because they are required for people to move around the area safely and easily.

- Public transport and cycling are prioritised to provide safe and attractive facilities, supporting increase use of these modes.

In residential environments:

- On arterial roads, the efficient movement of people and goods (especially by public transport and active modes) are prioritised over vehicle parking.

- In non-arterial environments (eg local residential streets) pedestrian movement is prioritised, then car parking is prioritised over maximising vehicle movements. This is because after property access and pedestrian movement has been provided, these roads are not intended for the large through movement of vehicles, and

parking provides more benefits to the community. Parking can be prioritised for short-stay and residents.

- On-street parking can help keep traffic speeds low as road space is reduced and creates side friction effect.

- The density of housing can impact the demand for on-street parking required, particularly if developments chose to not provide parking.

In commercial centre environments:

- On arterial roads, movement of people and goods (especially by public transport and active modes) is prioritised over vehicle parking.

- On non-arterial roads, vehicle movement is the lowest priority. Where there is a trade-off between movement and place, place should take precedence in commercial/activity centre environments so that people can slow down, enjoy the environment, and spend time/ money. Also, providing high levels of amenity is critical to the success of the centre. Research shows that streetscape improvements create a more attractive centre than high levels of through traffic.[21]

- As such, both car parking and streetscape improvements rank higher than vehicle movements on non-arterial roads in commercial/activity centre environments.

- Streetscape improvements are prioritised over parking because commercial/ activity centres generally have higher footfall, better public spaces, and more 'people activity', so amenity is of a higher importance.

- Public transport stops and cycle parking are more efficient uses of space because

21 The pedestrian pound – the business case for better streets and places, Eilís Lawlor, 2014 edition, Updated by Moira Tasker for Living Streets 2018 Editing and additional case study material Rachel Lee and Stuart Hay https://www.livingstreets.org.uk/media/3890/pedestrian-pound-2018.pdf

they allow access for more people compared to vehicle parking. Therefore, it is important to make these travel options safe and attractive.

- Small footprint commercial developments with street frontage may require loading to take place on-street.

In industrial environments:

- The efficient movement of vehicles and goods along arterial roads is a high priority, to facilitate the flow and access of freight to/from industrial areas.

- On arterial roads, parking can create safety issues. Guidance such as Austroads[22] discourages on-street parking on arterial roads with speeds at or above 60 km/h.

- Vehicle parking and loading is a low priority on all roads because:

  - parking and loading should be accommodated on site in the first instance. Even though there may be no requirement for parking on site it is likely that it will be provided, along with loading, in industrial areas for practical reasons, however staff parking may spill over onto the street

  - it's more important to facilitate the tracking movements of heavy vehicles in an industrial environment

  - where public transport and safe walking or safe biking options are available, it is important to encourage commuters to use these options (in accordance with national, regional, and local policies). An abundance of car parking incentivises private vehicle use for commuters.

Practice guidance for allocating street space to parking

Prioritisation framework

Street space allocation frameworks will help guide trade-offs that need to be made between competing uses for limited street space. A framework should contain a priority order for use of kerbside space for each different environment using the principles listed above. Project teams can then refer to these frameworks when making decisions about use of the space. These frameworks need to be endorsed by elected members, so they are meaningful when projects are presented for approval and on-street parking supply has been reduced.

Removing existing car parking

The removal of existing on-street parking can be a controversial and challenging process. Where parking is removed there are several approaches to manage displaced demand from the loss of on-street parking in that location, including:

- optimisation of the space, for example marking individual spaces if currently a parking lane

- encouragement of other transport modes or carpooling

- better utilisation of parking on side streets by implementing additional time restrictions

- limitations on who can use parking spaces (eg resident parking schemes)

- better utilisation of off-street parking sites

- improving wayfinding signage to alternative parking locations

- investigate additional parking opportunities in the road reserve, eg converting parallel parking to angle parking where there is enough road width.

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22 *Austroads guide to traffic management* Part 11, parking management techniques.

Importance of data

When considering kerbside reallocation, it is important to get data to support your case. The collection of data before and after changes is important to validate proposed benefits and this can be used in subsequent projects. For example, the Fort Street shared space in Auckland recorded substantial benefits that were used to support the case for future shared space streets.[23]

3.2 Prioritising the allocation of parking

Context

There are a variety of demands on public parking in urban areas, particularly in diverse commercial and service centres where residents, workers, visitors, public transport, and delivery activities may all be competing for the use of kerbside space and off-street public parking facilities.

New trends are increasing competition for kerbside space in cities. These trends include:

- an increase in e-commerce and delivery demands
- an ageing population and increasing mobility needs
- increasing use of on-demand transport apps and space for pick up and drop off
- the sharing economy and the increased popularity of car-share type activities
- electric vehicles and demand for charging infrastructure
- the increase in the popularity of micromobility transport options (including e-bikes and e-scooters).

Some of these trends are covered in more detail in section 3.7.

23 Case study: Fort Street: Auckland New Zealand https://globaldesigningcities.org/publication/global-street-design-guide/streets/shared-streets/commercial-shared-streets/case-study-fort-street-auckland-new-zealand/

Image from MRCagney

The wide and growing variety of demands for kerb space means increasingly flexible management approaches are required, where the allocation of space for different uses changes by time or day. For example, there could be a need for goods delivery space in the morning, short-stay car parking in the afternoon, and taxis and pick up / drop off in the evenings.

As an example, shown in case study 3, Auckland has a network of shared-space streets which allow loading between 6–11am.[24] There is no parking after 11am, when the streets experience higher levels of pedestrian activity.

Principles for prioritising the allocation of parking

As parking demand increases, decisions will need to be made about how space is allocated between different types of parking. These decisions should consider the following principles:

- Inclusive access: public car parking should be allocated preferentially to serve different parking needs so that all members of the community are able to access amenities fairly.

- Variety and flexibility: Public car parking should provide for a range of parking types and restrictions on parking should be responsive to the dynamic nature of demands.

Allocating space for high priority users is important to ensure their needs are met first. Examples of high priority users and a justification is provided below:

- Adequate provision of mobility parking because well located, accessible and safe mobility parking is crucial for people with disabilities to access amenities.

- Cycle parking[25] as it requires less space than cars, and cycling reduces traffic congestion, has a lower carbon footprint, and is good for people's health.

- Parking for car sharing schemes because it contributes to lower car ownership and vehicle kilometres travelled, allows the flexibility for people to commute by public transport and active modes, and provides an equitable transport option for those who cannot afford to own a car.

- Parking for taxis and ride hail services because it serves more people and provides access for some people who are not able to drive, catch public transport, walk, or cycle.

- Loading zones serve an important function by facilitating the delivery of goods to centres, commercial areas, and industrial areas.

- Motorcycle parking because motorcycles require less space than cars, take up less space on the road and therefore impact less on traffic congestion and air pollution.

- Electric vehicle (EV) parking because electric vehicles have a lower carbon footprint than internal combustion vehicles and do not emit at point air pollution.

Practice guidance for prioritising the allocation of parking

If parking is determined to be the most appropriate use of the street space, then the type of parking provided should be decided in accordance with a parking preference hierarchy such as the one in Table 1: Example of Parking Preference Hierarchy, developed in line with the parking management principles. Elements with a higher priority in the hierarchy would be accommodated first, with uses determined on a case by case basis considering the demand for different types of parking and the available supply of parking.

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24 Fort Street shared space
  http://www.aucklanddesignmanual.co.nz/
  resources/case-studies/street_fort_street_
  precinct

25 Refer to Waka Kotahi guidance - *Cycle parking planning and design: cycling network guidance technical note*,
  https://www.nzta.govt.nz/resources/cycle-parking-planning-and-design/

Table 1: Example of parking preference hierarchy

PRIORITY	COMMERCIAL/ ACTIVITY CENTRES	INDUSTRIAL AREAS	RESIDENTIAL
1	Loading zones	Loading zones	Car share parking
2	Mobility/accessible parking	Car share parking	Exclusive parking for residents (only in a residential parking scheme area. More detail on this in section 3.3. Otherwise residential use is considered as long-stay general parking)
3	Car share parking	Mobility/accessible parking	Mobility/accessible parking
4	Taxi & pick up drop off spaces	Short-stay motorcycle parking	Short-stay general parking
5	Short-stay motorcycle parking	Short-stay general parking	Long-stay general parking
6	Short-stay general parking	Long-stay motorcycle parking	
7	Long-stay motorcycle parking	Long-stay general parking	
8	Long-stay general parking	Taxi & pick up drop off spaces	
9	Exclusive parking for residents		

Some councils identify and prioritise 'carpool' parking areas. If this is done it should be done in a way that it results in significantly more shared car trips and reduce the number of single occupant car trips. However, monitoring and enforcing carpool parking restrictions is difficult, so there can be a lack of surety the intended outcomes are happening. Carpooling can also be encouraged by pricing parking because people can share the parking costs if they have carpool passengers.

Image from MRCagney

Types of parking and loading restrictions

Below is some guidance for the use of different types of parking restrictions. This information could be used in the development of a parking policy.

Loading zones

- Can be reserved for goods vehicles only or for any vehicle delivering goods. In busy commercial areas, goods vehicles should be prioritised.

- Should be located on main streets or immediate side streets in older town centres where there is a lack of onsite loading access. On-street loading zones should allow for the ability to pull in easily to parallel with the kerb. Angled parking should be avoided as longer vehicles may cause safety issues.

- Should be at least 12m in length to accommodate delivery trucks. Longer loading zones will also offer more certainty to delivery drivers and reduce congestion and illegal parking.

- A time limit of 15 minutes or less should be used to encourage turnover.

- In busy areas loading zones can be used during the morning and the space converted to another use in afternoon or evening.

Mobility parking

- Vehicles must display a valid mobility parking permit issued by a certified agency.

- There is no prescribed ratio for providing on-street mobility parking, but local authorities should work with local advocacy groups to determine locations and numbers. Off-street mobility parking is required under the local district plan regulations and the Building Act.

- The New Zealand Standard NZS4121 provides dimensions and specifications for mobility parking.

- On-street mobility parking is unlikely to be required in residential areas as there is usually enough on-site parking or general on-street parking available.

- Generous time restrictions should be applied to mobility parking to reflect the added time mobility parking users need to

get to and from their parking spaces. It is recommended that this is 30 – 60 minutes more than the time restriction of the surrounding parking.

- Sophisticated wheelchair loading technology is becoming more commonplace, so when designing new mobility spaces, it is important to allow enough space for loading equipment such as rear-loading wheelchair devices.

- Mobility parking should be avoided on busy roads because of safety issues with accessing mobility devices. Side streets and level surfaces are best locations. There should be level kerbs provided.

- Local authorities should decide which exemptions mobility parking permit holders should receive in their area. Often permits holders are given additional time on top of posted time limit.

Pick up drop off

- Two types of restriction can be used. A P5 restriction will allow anyone to park for five minutes to quickly pick something or someone up. A 'No Parking' restriction with pick up drop off allows vehicles to stop quickly to pick up and drop off people, but the driver must remain with the vehicle.

- P5 restrictions can be used outside convenience businesses such as dairies or dry cleaners, especially if they are grouped together.

- The pick up drop off is best used near busy public spaces or venues but thought needs to be given to the location of the parking space. This restriction can attract a lot of vehicle movements, so it is sometimes best to locate away from busy pedestrian areas.

- Pick up drop off parking can be used to provide space for ride hailing in busy areas. In night-time areas, regular parking could be converted to pick up drop off in the evenings to provide a safer experience

for customers.

- Addressing car-based school pick-ups and drop offs with amendments to parking restrictions near schools is a reactionary or 'short-term' solution to the wider problem of the declining rate of students walking, cycling, or taking public transport to school. Looking at this issue alongside other interventions, such as school travel programmes, will be a more sustainable long-term solution.

Motorcycle parking

- Should be provided on a level surface.

- If provided in a parallel parking space, it should be at least 2.1m wide to avoid motorcycles protruding into the carriageway.

- Time limits should be used in busy commercial areas to ensure efficient use of the space. All-day motorcycle parking can be located in quieter streets.

Taxi and ride hail parking

- In 2017 the government introduced changes to passenger service regulations. Under these changes, taxi, shuttle, private hire vehicle and ride hail services (Uber etc) are all classed as small passenger services. All these vehicles can use dedicated taxi stands.

- In 2019 Waka Kotahi amended the TCD Rule to allow for local authorities to use either taxi stand or small passenger service vehicle (SPSV) signs when allocating space for taxis and ride hail vehicles.

- Taxi stands should not be located adjacent to bus stops, mobility parking or loading zones, to avoid spill over parking into these areas.

- In busy night-time areas parking or loading zones should be converted to taxi stands in the evenings.

Electric vehicle parking

- Local authorities first need to decide where EV charging infrastructure should be located. There are safety implications with locating charging infrastructure on the street which need to be considered. Off-street parking is usually the most suitable location for charging sites.

- Another decision is whether to charge for the EV user to utilise the charger. This will depend on any policies supporting EV uptake.

- If EV charging infrastructure is being installed it is sensible to provide multiple spaces in a row to spread the costs of connecting the power source to the parking. This also makes it more legible for EV users.

- EV charging works best in angled or perpendicular parking rather than parallel parking as the EV charging points are either at the front or the back of vehicles.

- It is recommended that time limits and parking costs should remain the same for electric vehicles, as they are still contributing towards car parking demand and congestion in and around busy town and city centres.

- The Land Transport Rule Traffic Control Devices Rule 2004 (TCD Rule) includes a sign for electric vehicle charging.

General public parking

- There are two types of parking restrictions that manage public parking: priced parking and time restrictions. Use of these are referred to as demand management, which is discussed in more detail in section 3.4.

3.3 Residential streets

Context

Parking in residential streets is often a contentious issue. Residents sometimes feel they have preferential rights over the parking in their street and if the parking is unrestricted it is seen as a convenient and cost-effective parking option for people working nearby, or for people parking in residential streets and then using public transport (ie informal park and ride).

Residential streets adjacent to a successful commercial street or centre can experience parking spill over from the commercial area. This spill over can be exacerbated if the parking supply in the commercial area is reduced when on-street parking is reallocated for pedestrian, cycle or public transport priority, or divestment of off-street parking facilities.

A wide range of parking management tools are currently used in residential areas. These range from using a time restriction on sections of street within a residential area, to a residential parking zone with permit exemptions across a collection of streets. Different approaches have advantages and disadvantages, and this often depends on the location and surrounding land use.

Principles for residential streets

In line with the general principles outlined in section 1.4, principles for managing parking in residential streets include:

- Treat residential streets as a wider community resource, with the space in streets used to achieve the most public good benefits.
- Treat general parking demand pressures in residential streets in line with the demand management and pricing policies outlined in section 3.4.
- Only consider prioritising on-street parking for residents where residents are unable to park on private property. This

is particularly for heritage properties in older suburbs that lack space for on-site vehicle parking. New builds that are not providing parking shouldn't be given priority to on-street parking.

- Residential parking schemes should be as fair and equitable as possible.
- When managing parking on adjacent residential streets, consult local retailers and business association to ensure the needs of the wider community are considered, not just those of the residents.

Practice guidance for residential streets

Firstly, local authorities should develop a residential parking policy that guides decision-making in a clear and consistent way. This could be part of an overall parking management policy or a standalone policy to deal with residential parking issues. The policy should include public consultation, as public input at the policy stage will help successful implementation. The policy should carefully explain how the management of parking in residential streets will contribute to better outcomes for the community and align with local land-use and transport objectives.

The residential parking strategy should decide how parking will be managed when demand increases, and which users should be prioritised. In section 3.4 there are principles for managing the demand for parking using price adjustments to achieve optimal parking utilisation.

In many residential areas, a time limit (usually 2 or 3 hours) on one side of the street or small sections of streets can be enough to ensure turnover of parking and availability for visitors, while not inhibiting general residential use along the whole street.

Residential parking schemes

If parking permits are to be used, the table below provides some guidance.

PARKING PERMIT APPROACH	DETAILS
Use tight eligibility criteria	This might involve only offering permits to properties with no ability to provide their own off-street parking.
Limit the number of permits	This can either be done on a per property basis or an overall limit on the number of permits issued in an area.
Limit the ability for residents of new developments to obtain permits	This encourages developers to provide parking to meet the needs of their development. It could be unsustainable to offer permits to every new apartment in dense residential areas.
Apply a reasonable time period	Permits are usually renewed annually. Make it clear in the parking strategy or permit conditions that the number of permits may be reduced if parking space is re-purposed for other uses such as cycleways. This manages the expectations of the parking permit holders and enables the local authority to redevelop street space for more beneficial community outcomes if the opportunity arises in the future.
Pricing permits	Parking permits should be priced to accurately reflect the value given to the permit holder. It is important to not price parking permits too cheaply as they allow unrestricted use of a valuable public asset. It is preferable to try and achieve a market price for parking permits.[26] [27]

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26 Professor Donald Shoup, a well-known expert on parking reform, suggests in his 2018 book *Parking and the city* that a 'uniform price auction' is the best way to achieve this. A uniform price auction involves limiting the number of parking permits to fewer than the number of available parking spaces (eg 85% of the available space) and asking residents what price they would be prepared to pay for an annual permit. Then, all winning bidders pay the same price - the lowest accepted bid.

27 The Land Transport Act 1998 22AB (o) has requirements for consideration when setting parking permits prices.

Other considerations for residential parking schemes are:

- Times and days of operation. Often parking restrictions are only needed during the working week to manage the impact of commuter parking from nearby commercial areas. Therefore, Monday to Friday parking restrictions are often suitable. The period for which restrictions apply could be limited to minimal hours to deal with the commuter parking problem, eg 9am to 5pm.

- Consider how to deal with streets just outside the residential parking zone area. Residential parking zones often shift the parking demand on to surrounding streets, but it might not be feasible for the council to keep extending the zone area. There could be some sections of parking restrictions on streets outside the zone area to help manage localised issues or a statement to residents that parking will only be reviewed every five years.

- An alternative to a residential parking scheme is to utilise priced parking in the residential streets. This will achieve more equitable outcomes providing a fair and transparent system and allowing residents and non-residents alike to pay for the parking they need. Pricing would only need to be applied when demand is high. Some periods, such as evenings and weekends, could be free and unrestricted, which would reduce the impact on local residents.

- Consider allowing car share vehicles to park in residential parking zones to support local residents to reduce car ownership.

3.4 Parking demand management tools – time restrictions and pricing

Context

In areas of high parking demand, encouraging vehicle turnover is important to making the most efficient use of dedicated car parking space. Methods to achieve turnover include:

- time restrictions
- pricing (with or without time restrictions).

In areas of lower parking demand, time limits may be sufficient to help make spaces available for short-stay parking. However, in places with high parking demand and high employment, pricing public parking will be more effective and efficient at managing this demand.

Time restrictions and pricing both have advantages and disadvantages, as shown in the table below.

A key goal of pricing and time restrictions is to help ensure parking spaces are well-used but not full. If prices are too low or time limits are too generous in areas of high parking demand, streets will have no vacant spaces and vehicles will need to cruise the streets searching for a space, adding to congestion and emissions. Conversely, if prices are too high or time limits too restrictive, then parking spaces will be under-utilised and will not be playing their role in enabling access to opportunities. Time restrictions and price should therefore be set with the goal of achieving around 85% utilisation in high demand areas, so that around 1 in every 7 spaces is available.

Technology, notably sensors, are enabling councils to better calibrate supply and demand of parking with demand responsive pricing, to better achieve the 85% utilisation target. Good examples of this type approach are shown in Case study 4. Parking technology is discussed further in section 3.9.

	PRICING	TIME RESTRICTIONS
ADVANTAGES	• Parking users cover more of their costs, reducing subsidies for driving and supporting a more mode neutral transport system. • Parking revenue can help support public investment in improved facilities and services. • Prices can be adjusted relatively quickly in response to changing demand while still allow people flexibility in how long they stay.	• Relatively cheap and easy to implement compared to pricing. • Useful for encouraging very short-term parking outside convenience type retail.
DISADVANTAGES	• Requires capital investment in parking machines or a payment app (although payback period is usually relatively short). • Can be unpopular with local businesses and general public (see section 3.8 for tips). • Requires more administration to handle faults and customer complaints.	• Difficult to respond to increases in parking demand. One approach is to reduce time restriction, but this limits options for people wishing to park for longer. • In areas of high employment and parking scarcity, time restrictions are often abused by staff who are looking to take advantage of free parking. • Leads to higher levels of parking infringement issuance. This negatively impacts peoples experience of visiting a place.

Case study 4

## San Francisco demand responsive pricing

Demand responsive pricing

In 2011, the Municipal Transport Agency of San Francisco (SFMTA), launched SFpark, a pilot programme to test demand responsive parking technology. The goals of the pilot included making it easier for people to find a parking space, reducing congestion and improving reliability for buses.[28] It was hoped that this would, in turn, reduce vehicle kilometres travelled, reduce emissions and improve safety.

The programme ran from 2011 to 2014 and used parking sensor data to develop a formula to allow the agency to adjust parking rates based on demand. Prices were increased in high-demand areas and decreased in low-demand areas. This was intended to encourage drivers to park in less congested areas or consider other modes. Pricing varied across both location and time of day to achieve occupancy targets of between 60 and 80 percent. The programme has been described as 'the biggest price reform for on-street parking since the invention of the parking meter' (Pierce & Shoup, 2013).

SFPark Pilot and Control area (pilot = orange, control = blue)

28 http://sfpark.org/wp-content/uploads/2014/06/SFpark_Pilot_Summary.pdf
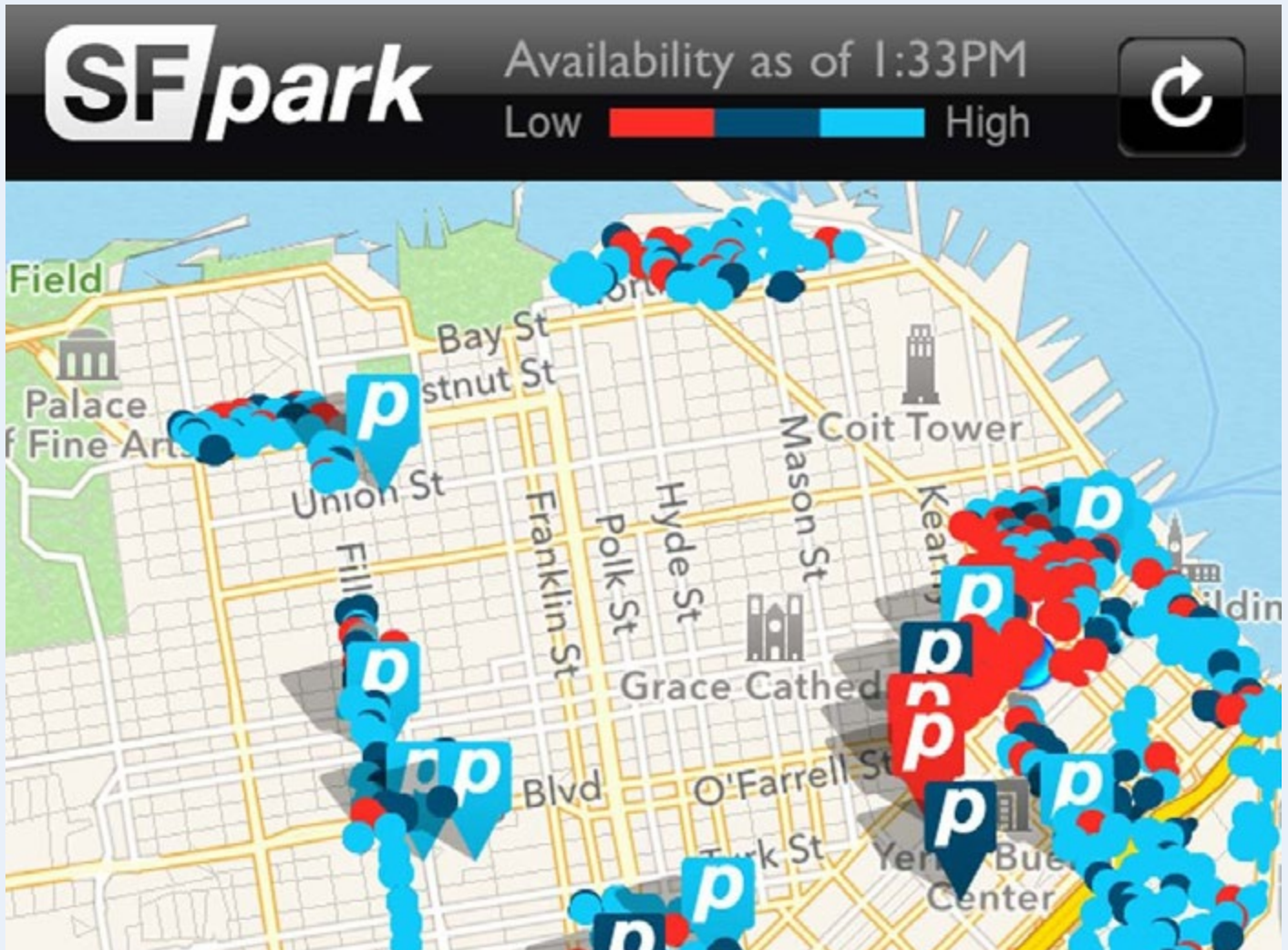
Within the pilot study areas, target occupancy was met 31% more often than in areas with no intervention. Surveys showed that drivers could find spaces three and a half minutes more quickly after the introduction of SFpark (SFMTA, 2014). In addition, greenhouse gas emissions were reduced by 30% after SFpark was introduced, as were vehicle kilometres travelled (SFMTA, 2014). Traffic volume was also estimated to have decreased in comparison to non-pilot areas, while traffic speeds increased (SFMTA, 2014). In early 2018, the policy was extended from the pilot areas to all 28,000 City-run on-street parking spaces, and 14 City-operated parking buildings, using smart meters rather than sensors. Despite these results, the programme's policy manager notes that putting a price on something that was previously free (the installation of meters in new locations) was much more effective than the time and expense associated with trying to get the price right through the SFPark programme.[29]

When Auckland Transport introduced the "AT Parking Strategy" in 2015 it included a demand responsive pricing policy. Under this policy, parking prices are set to target 70–90% occupancy at peak times. If the parking utilisation is found to be above or below this range, the price is either increased or decreased. Prices are also applied in different locations for the hours of the day with the highest demand for parking. For example, in Kingsland, which has a night-time economy, the parking prices apply from 9am–9pm. In the Auckland City Centre prices are $5 per hour but in Albany on the North Shore prices are $1 per hour.

The policy intends that parking occupancy is recorded every 3–12 months and prices are amended in line with measured utilisation levels.

Auckland Transport lists parking occupancy as one of its metrics in the organisation's Statement of Intent issued annually to Auckland Council. The requirement is to target a 70 – 90% parking occupancy range. Since the adoption of the Parking Strategy in 2015, Auckland Transport has managed to keep peak parking occupancies within this range even though on-street parking has been removed and demand has risen. This shows that demand responsive pricing policies have been effective.

Auckland's approach to parking reforms may be transferable to other cities. Auckland's approach emphasises:

(1) complementary strategies and policies for managing the supply and price of parking; and

(2) the use of low-cost trials to gather evidence and build the case for further changes to policy.

The effectiveness of Auckland's approach, therefore, depends on the capacity and effectiveness of public institutions and policy settings, rather than financial resources. One of the lessons from Auckland's approach is the importance of price adjustments (which can occur every three months) being an administrative process, in line with the policy that is set politically, to ensure that they are not delayed. In Wellington, for example, parking pricing changes still requires council approval which has created a challenge in establishing demand responsive pricing.

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29   Parking and the city, Donald Shoup, 2018

Principles for parking demand management tools

Time limits

The following principles apply to the use of parking time limits:

- The time limit should aim to achieve a parking occupancy of around 85%.

- Time limits do not reflect the full costs of driving and therefore drivers are subsidised by the community, which can encourage travel by private car over other transport modes.

- Use of different time limits can reflect the needs of the adjacent land-use.

Pricing

The pricing of parking should be guided by a policy, to help ensure clear and consistent decisions. Below are the recommended principles for a parking pricing policy:

- Introduce pricing when parking occupancy is regularly above 85% across a parking area.

- Link prices to demand or parking occupancy. If parking occupancy increases above a set threshold, then prices should increase and conversely if parking occupancy decreases, then prices should decrease. Thresholds for when the price should go up and down should be agreed. A range is useful, say 80–90%, with prices remaining the same if measured parking occupancy is within the range.

- Prices should be reviewed regularly by measuring occupancy. Quarterly or half-yearly are appropriate time frames to allow for parking prices to respond quickly to any changes in demand. The price may not change at every price review.

Practice guidance for parking demand management tools

The flowchart below is useful to demonstrate the parking management response to increasing demand for parking. Acknowledging that other wider transport and planning responses can also assist in reducing demand.

UNRESTRICTED PARKING

↓

If occupancy regularly exceeds 85% at peak times

↓

Introduce time restricted parking and/or Introduce paid parking

↓

If occupancy regularly exceeds 85% at peak times

↓

Reduce time restriction and/or Increase prices

↓

If occupancy regularly exceeds 85% at peak times

↓

Introduce demand responsive pricing policy or Consider providing additional off-street parking (if financially viable)

Measuring demand

The method of measuring parking demand is important. This can be done through manual parking survey counts or through technology options like sensors or cameras. Most sensor systems have an online reporting system where you can determine occupancy on any street or a selection of streets across any time period. However, sensors are expensive and have associated operating costs. Another method is to use manual occupancy surveys. This involves a team of people capturing the number of vehicles present on each street across the day. It is important to establish a framework for how the data will be captured and analysed. Vehicle counts should be done at least every hour across the day and across multiple days of the week.

In areas without pricing the parking utilisation levels will reflect the demand for free parking, and this distortion needs to be accounted for in any demand assessment so that that it does not inadvertently cause an over-supply of car parking and an inefficient use of land. The best way to account for this is to apply pricing when demand for parking increases rather than increase supply.

Parking management plan

If time limits or pricing are imposed in an ad hoc manner without planning, then outcomes can be less than ideal. It is worth developing a parking management plan (PMP) (see section 2.3) if there are growing parking problems in a town centre or if on-street parking is being re-purposed for another more valuable use. The PMP will guide the application on pricing or time limits or provide a plan to manage the displaced parking demand. This will reduce the impact and potential public opposition to the loss of parking.

Time limits

The following are considerations for the implementation of time limits on parking:

- The time restriction should initially be set to reflect the needs of the surrounding land-use. For example, if there are many convenience retail outlets such as bakeries or dairies, then a short time restriction such as P5 would be appropriate.

- Using two or three hour time restrictions is useful in residential areas that experience spill over commuter parking. Managing commuter parking can help to reduce peak hour congestion and encourages people to switch to other forms of transport. This can also be considered with a residential parking permit scheme if many houses do not have off-street parking.

Pricing

Pricing parking can be contentious with the public and should be guided by a pricing policy. A pricing policy can be part of an overall parking strategy or a standalone policy. As with any policy development it is important to get public input. This is also an opportunity to explain the justification for pricing parking. A pricing policy should include the following:

- A clear goal for what the pricing of parking is trying to achieve (ie support the efficient and equitable use of public parking).

- The target occupancy range with trigger points for increasing or decreasing prices. It should also include the value or proportion of the increase, for example, prices could be increased by $1 or by 20%.

- How often prices are reviewed. More frequent reviews respond quicker to changes in parking demand and will result in a more efficient system. However, it can be expensive and difficult to capture parking occupancy on a regular basis especially if manual process is used.

Monthly price reviews would be a very responsive system however half yearly or annual reviews may be more practical.

- The process for changing the price. As price changes are based on measured parking demand or utilisation it is useful to try and streamline the approval process for price changes and remove the need for public consultation and council approval. This will assist in moving towards a more demand responsive system.

- Establish the geographical area for setting the price. This could be at a street (or section of street) level or at a town centre level. Price areas should be small enough to be easily walkable and have a similar level of parking occupancy otherwise the price will not be effective in achieving the optimum availability.

- Ensure clear signage and customer information about the price and the times pricing applies.

The effect pricing has on utilisation levels (elasticity) depends on several other factors, including access to alternative modes of travel, and can be difficult to predict with certainty, So, where pricing is being introduced, it may be pragmatic to set the initial fees at a relatively low level. Once pricing is established, subsequent occupancy surveys will reveal if the fee is set too low and can then be incrementally adjusted until the optimal level of parking utilisation has been achieved.

Image from Waka Kotahi

Impacts of pricing on parking utilisation

A recent report prepared by the Victoria Transport Policy Institute[30] reviewed the body of research that has analysed how various types of price changes affect transport activity. The conclusions of this report may inform the direction of parking pricing policy. A key conclusion was that although the impacts of a change in price of one mode (eg private cars) vary widely, patterns were evident, such as:

- Discretionary travel is more price sensitive than travel people are obliged to make.

- Higher income people tend to be less sensitive to pricing and more sensitive to service quality than lower-income people.

- Consumption is influenced by prices in proportion to their share of household budgets.

- Consumers tend to be more responsive to price changes they consider durable, such as fuel tax increases, compared with oil market fluctuations perceived as temporary.

- Pricing impacts tend to increase over time. Short-term (first year) effects are typically a third of medium to long term (more than five year) effects. For example, if the use of parking reduces by 10% in the first year following the introduction of pricing, it could be expected to reduce by 30% after five years.

- Travel tends to be more price sensitive if there are better options available, including different routes, modes, and destinations.

- Travellers tend to be particularly sensitive to direct and frequent prices, such as road tolls, parking fees and public transport fares, compared to prices for car maintenance or prices that are bundled with property taxes/rates for example.

- How fees are promoted, structured, and collected can affect their impacts.

Pricing without time restrictions

When pricing parking there may be less need to apply time restrictions as the price will encourage turnover. If the price is set to achieve a vacancy rate of around 15% then people will usually be able to find a parking space nearby. This approach tends to reduce the number of parking infringements issued and offers greater flexibility for visitors. Charging for parking reduces the public subsidy to driving. It also makes people more likely to consider walking, cycling, public transport or even carpooling as alternative travel options. Where an authority wants to discourage long-stay parking and encourage faster turnover they may choose to combine pricing and time restrictions.

See section 3.8 for helpful tips about engaging with the public when introducing parking pricing.

Considering payment methods

Different parking payment technology may limit access for some segments of the populations. For example, systems that solely rely on smartphone apps to management the transaction will exclude members of the community who don't own or use smartphones. See Section 3.9 for guidance on parking payment technology and the characteristics that may need to be considered when deciding on a type of system.

30 Refer to *Understanding transport demands and elasticities: how prices and other factors affect travel behavior,* Todd Litman, Victoria Transport Policy Institute, 14 June 2021. https://www.vtpi.org/elasticities.pdf

Parking enforcement and technology

Parking enforcement is a critical component of good parking management. Without enforcement, demand management measures will be ineffective which can have flow-on impacts on the functioning of the transport system.

This not only impacts other car drivers but also public transport users, delivery and services, mobility users, cyclists, and pedestrians. If drivers are aware that regular parking enforcement is occurring, they will be more likely to comply with the controls in place. Parking management technology has improved significantly allowing for efficient enforcement operations as described in section 3.9. Vehicles with licence plate recognition cameras can enforce large areas with less enforcement staff.

Image from Auckland Transport

3.5 Providing new parking

There are likely to be two situations when it may be beneficial to provide new public parking. These are:

- providing replacement parking when parking areas are re-purposed
- providing new parking to add to the existing supply.

When looking to develop additional parking supply it is essential to understand the costs of providing new parking. In some projects around New Zealand the construction costs for new parking have been as high as $50,000 per parking space created. Tauranga City Council intended to construct a 550-space central city car park building costing $29 million at over $52,000 per space.[31] The Lichfield parking building in Christchurch opened in November 2011, providing 805 spaces at a cost of $31 million, or around $39,000 per park. Construction costs have risen considerably in the past few years so the same project today would be likely to cost much more.

New replacement parking

There are several reasons existing public parking may be replaced with new public parking, including for asset renewal purposes and for transforming and improving areas. For example, a car parking building may reach the end of its useful life and need to be either disposed of or replaced, or there may be benefit in a council divesting several surface parking facilities and consolidating these into a single facility, potentially a parking structure.

Some matters to consider when thinking about providing new parking are:

- Assessing whether the same amount or a lesser amount of parking is needed - Consider the utilisation levels of public parking, whether user fees are covering the full cost to the community of providing the parking, and alternative transport options for the area should be investigated in this assessment.

- Councils are not required to provide public parking. There may be more benefit to the community if the parking area is divested or converted to a different use - the private sector may be able to provide replacement parking if needed.

- The broader transport, land use and urban design objectives for an area. For example, if a council has a transformational plan to reduce vehicle traffic and increase pedestrian activity in an area, it may be beneficial to reduce rather than replace parking and/or to situate replaced parking strategically to encourage foot traffic outside shops.

- The proportion and location of different types of parking. For example, it may be beneficial to increase the proportion of accessible car parks in a location, increase access to electric car charging facilities, or to convert some car parks to car-share car parks or pick-up / drop-off areas for taxis and ride hailing activities.

- Implementing improved technology to provide users with a better parking experience and to provide the council with better data for monitoring and managing the car parks.

- Public engagement to explain the changes that will be happening and describing the improvements people will experience.

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31 https://www.stuff.co.nz/bay-of-plenty/300027834/council-spent-19-million-on-failed-tauranga-car-park-complex

New additional parking

Additional parking can be provided by either developing new areas for parking or by redeveloping an existing area of parking to increase the number of car parks, for example, by developing or increasing the size of a parking building.

Decisions on whether to provide additional parking should be informed by a comprehensive understanding of the use of the current public parking stock, private parking supply in the area, the level of transport choice people have when accessing the area, and how people are envisioned to access the area in the future. Ultimately, whether providing new public parking will be a benefit or not is context dependent, including consideration of the future development strategy for the area.

Some matters to consider when thinking about providing new parking are:

- Councils are not required to provide public parking, and there may be more benefit to the community if the private sector provides new parking if new parking is needed, for example, resources that would have been deployed for parking provision can be deployed for the benefit of the community in other areas.

- Whether adequate demand management has been implemented along with improving access for alternative modes of travel so people can choose from different transport options.

- Whether demand management measures have been applied to the existing public parking stock, including pricing of the parking to a level where at least the resource cost to the community of providing the parking is covered by user fees.

- A business case to assess the benefits of additional parking supply.

- Strategic reasons to cap or reduce the amount of parking in an area, for example, in town or city centres where pedestrian activity is prioritised and where there are other travel options.

- The effects of additional car traffic induced into an area by providing more parking.

3.6 Wayfinding

Wayfinding signage directs drivers to take the optimal route to parking locations, typically off-street. This directional parking signage can serve an important role in your parking management particularly because it can:

- Help reduce congestion caused by vehicles circling while searching for available parking

- Alleviate perceptions of parking shortages.

Often when road controlling authorities propose to reduce or move on-street parking, the public, notably local businesses and motorists, can express anxiety about increasing scarcity of local parking resources. Signage to support wayfinding and availability information about parking can assist by showing people where alternative parking is available.

Wayfinding signage can be:

- static information simply showing where off-street parking is located (see image below), or

- live availability information (see image right).

These signs should be placed on key access roads into town centres and inform motorists of the locations, availability, and potentially the price and maximum duration of stay associated with off-street parking facilities. This information allows drivers to, firstly, identify the nearest available parking facilities and, secondly, evaluate the relative value associated with different parking areas. It may be advantageous to target short-term customer parking sites or places where drivers may not be as familiar with available parking locations (eg around tourist attractions).

Real time parking availability information can support drivers to find efficiently find parking, reducing unnecessary circling for parking. Image from Thomas Chu

An example of static parking wayfinding signage. Image from James Wratt

3.7 Parking and emerging mobility trends

Context

New technology is driving significant change to how people travel around urban centres. These changes affect parking management, requiring increased flexibility to adjust quickly to new transport arrivals.

Key changes include:

- **On-demand transport services.** These are ride-hail app services such as Uber that offer a much higher level of customer convenience that traditional taxi services.

- **Electric bikes.** E-bikes have extended the range that people are willing to commute by bike. Electric bikes are also used for a wider range of activities including supermarket shopping due to the assistance they give with heavier loads. Sales in New Zealand increased over 800% between 2015 and 2018. The use of e-bikes for commuting to work is growing rapidly in New Zealand cities.

- **Micromobility.** Micromobility is a general term used to describe small mobility devices such as bicycles, standing scooters and skateboards. These can be electric powered or non-powered. The Waka Kotahi research report, Mode shift to micromobility, concludes that it is reasonable to assume that micromobility mode share in urban areas will be between 3% and 11% by 2030, depending on the type of urban environment.

- **Electric vehicle (EV).** EV sales are starting to increase rapidly, and all car manufacturers are quickly converting their product lines to manufacture EVs.

- **Car sharing.** Car sharing has been around in New Zealand for the past ten years and is now available in Auckland, Wellington, Christchurch, and Hamilton. Car sharing has proved very popular in overseas cities. In Sydney, there are over 2000 car share vehicles that members can book by the hour. In Europe, there are multiple car share services with many companies offering electric only vehicles. There are two main types of car share operation: fixed location and free floating. With fixed location car share the vehicle has a dedicated parking space (either on-street or off-street) and the vehicle must be brought back to this location after each booking. With free floating car share the vehicle can be parked in any legal parking space within a defined zone. Fixed location car share typically operates by users making bookings in advance whereas free floating car share is booked in real-time as someone needs to use the service. Car share can play an integral role in managing parking demand, enabling lower car ownership by supporting those who do not own a car to be able to easily access one for occasions when they might need to use one.

- **Shared micromobility services.** Shared electric scooter services were rolled out to most major urban centres in New Zealand between 2018 and 2021. These services have been very popular and provide another transport option for short trips that might have been made by car. Some of these companies now offer electric bicycles.

- **Online shopping.** There has been significant growth in online shopping for supermarket, other food delivery services and online consumer goods.

- **Working from home.** Increasing ability to work or study from home, this trend has been hastened by the COVID-19 pandemic.

- **Online parking marketplace platforms.** Technology has enabled parking platforms, or apps, that connect drivers with available parking spaces that people or businesses can casually 'rent' out.

This technology is relatively new to New Zealand and to date has largely been used for private, off-street parking. That said, the increased ability to match demand and supply has the potential to reduce pressure on on-street parking spaces by enabling drivers with a larger supply of potential places to park while enabling a potential revenue source from what might otherwise be unused parking assets.

These changes create new parking management issues to consider, such as:

- potential reduced parking demand with emerging mobility trends enabling car-free or car-light lifestyles

- whether to provide dedicated or discounted parking for drivers of electric vehicles. On the one hand, this would encourage more people to use electric vehicles but on the other hand, it could encourage greater car use and benefit high income people the most

- whether parking management can help encourage car sharing by, for example, providing free and premium dedicated spaces to car sharing operators

- growing demand for very short stay 'pick up and drop off' spaces to safely accommodate deliveries and passenger service vehicles. Refer to case study 5

- space requirements for parking of micromobility devices.

Section 3.9 outlines technology related to parking management.

Case study 5

Washington DC kerbside management

The Washington DC Department of Transportation (DDOT) has developed an innovative programme to address negative impacts associated with the growth of ride-hail services, such as Uber, in dense activity centres. Pick up drop off (PUDO) zones have been established at several locations across the city with the following objectives:

- **Safety**: facilitate safe and efficient movement of people and goods to and from the kerbside.
- **Kerbside efficiency and utilisation**: reduce kerbside turnover time, decrease queue lengths, and increase trip completion.
- **Traffic control**: make space for all modes to interact with the kerbside while improving throughput.

The programme has grown out of an initial trial in the busy nightlife area of Dupont Circle. DDOT worked closely with the Business Improvement District (business association) to reallocate kerbside parking space to kerbside passenger loading. Previously, this space allowed parking free of charge between 10pm and 7am. The trial was so successful that 60 parking spaces have been removed along the major arterial of Connecticut Avenue to accommodate the PUDO zone, which now operates across the whole day.

As of March 2020, the programme has been expanded to create 25 PUDO locations and DDOT is hoping to double the number of PUDO locations soon.

PUDO locations are identified in collaboration with local businesses and residents. Business and public reaction to the creation of the zones has been positive, with little or no negative feedback to the loss of metered parking. Instead DDOT receives many requests for additional locations to be established.

DDOT has undertaken several measures to ensure the zones operate effectively. The penalty for parking in a PUDO zone is US$75, in contrast to the $30 penalty for a metered parking violation, which has been an effective deterrent to misuse of the zones. DDOT has also worked closely with agencies responsible for parking enforcement and the management of ride-hail companies in the district to establish a shared understanding of how these zones should be used. Finally, a public outreach campaign has been developed to ensure the concept of these new zones is well understood.

While the initial motivation for establishing the PUDO zones was to manage the negative impacts of ride-hail operations, the zones are also used for fast turn-around commercial kerbside loading by services such as Uber-eats or DoorDash. This complements the city's commercial kerbside loading management programme which includes metered loading zones. DDOT has also been exploring technology-based options to manage demand for loading zones by allowing commercial vehicles to reserve specific windows of time through a third-party app.

Principles for parking and emerging mobility trends

The first step in managing the parking demands of emerging mobility trends is to understand their contribution towards wider strategic outcomes. For example, e-scooter share systems may contribute towards shifting people from single occupant vehicles and reducing congestion, but they may create new safety risks and require space on streets and/or footpaths for their storage.

The following principles apply:

- Parking should serve multiple types of users so that it can accommodate variations in demands associated with different activities. For example, general parking could be converted to pick up drop off in the evenings outside busy night-life areas.

- The most desirable spaces should be managed to favour higher priority uses as per section 3.2.

- Collect and use data on emerging trends to understand how they contribute towards your organisation's goals and outcomes. Use data and analysis to fully understand the costs and benefits. Research how other cities are dealing with these issues.

- Parking needs to be adaptable in the face of uncertainty and change. To make the most use of valuable street space it is important to get acceptance, both internally and politically, that car parking can be repurposed to another use such as e-scooter parking.

Practice guidance for parking and emerging mobility trends

Ride-hailing on-demand services

- Create pick up drop off areas in busy locations to improve safety and reduce congestion caused by illegal parking. Refer to case study 5 to see a good example of this.

- Work with individual operators to control where they can pick up and drop off customers. In busy pedestrian areas it might be possible to prohibit pick up and drop off and require services to use a waiting area nearby.

- Convert some regular parking to taxi stands or pick up drop off areas in the evenings in busy night-time areas.

E-commerce and deliveries

- Work with retailers in commercial areas to collectively develop delivery and servicing strategies.

- Collect data on where delivery hotspots are and allocate more loading zone space in these areas, as per the prioritisation framework discussed in section 3.2.

- Investigate the use of off-street car parks for deliveries and reserved parking for service companies.

Electric vehicles

- Offer priority EV parking in off-street car parks.

- Work with EV charging companies to see if they would like to install chargers in off-street car parks.

Case study 6

Wellington EV charger rollout

Wellington City Council (WCC) has identified that to achieve the status of a zero-carbon city by 2050, all new vehicles in the city from 2030 will need to be fully battery electric. A key barrier to achieving battery electric vehicle (EV) uptake is a lack of charging facilities within the city. Accordingly, WCC has developed a trial programme to introduce EV charging in selected residential streets and council car parks as part of their climate response package. EV parking and charging has also been specifically included in the WCC parking strategy.

Approximately one in four Wellington residents currently cannot charge an EV at home particularly in older residential areas where there are low levels of onsite parking.

To combat this barrier for EV uptake, WCC is:

- installing EV chargers in council-owned off-street parking facilities
- trialling the installation of EV chargers in residential streets.

Car share

- Develop a car share policy to decide to what extent you want to support car share. This policy should:
  - enable different types of car sharing, eg free floating and fixed location
  - decide how car share operators will pay for parking and what if any discount they get. For fixed location car share, decide whether the spaces will be dedicated to one operator and how many locations to provide
  - promote the use of EV car share through discounted parking or preferential locations
  - decide on the mix of on-street and off-street locations.
- Refer to case study 7 for an example of how car sharing can benefit a city.

Cycles

- Practice guidance for cycle parking can be found in the Waka Kotahi guidance *Cycle parking planning and design guidance*.

General

- Track data from the new transport trends.
- Decide which of these new transport options is important and contributes most to the goals and outcomes of the city/town/region.
- Work collaboratively with operators and the public to get the best outcomes.

Image from Waka Kotahi

Case study 7
Christchurch car share

After the 2011 earthquake destroyed much of Christchurch city centre, Christchurch City Council looked at innovative ways to encourage businesses back to the city centre and to support sustainable transport initiatives. They decided to run a tender process for a car share company to provide a shared fleet of vehicles that the council and other businesses could use. The concept was that the vehicles would be managed by a separate car share company but would be available for registered members to use at any time of day and any day of the week. Instead of leasing a vehicle, businesses could book vehicles when they needed them, without the costs of leasing, parking, vehicle maintenance, registrations and warrant of fitness.

Christchurch City Council's analysis indicated that this approach offered significant financial benefits as the fleet of vehicles was used much more efficiently over a seven day and 24-hour period. The council also wanted the vehicles to be 100% electric, to meet Christchurch's green policy objectives. The tender was won by Yoogo (now called Zilch) and the scheme launched in 2018. In 2020, there are over 50 vehicles in operation, and they are shared by the council and several other businesses and residents. Vehicles are located in off-street parking across several hubs, including a library. The scheme has reduced the number of individual vehicles and parking spaces needed in the new city centre and has attracted businesses back into the city. The vehicles are all electric so there is no pollution or emissions created.

As of early 2020 there are over 1000 trips per month taken in Christchurch Yoogo vehicles. Yoogo have estimated that the car share service has resulted in 55 fewer vehicles in central Christchurch with an estimated reduction in carbon emissions of 200 tonnes since the scheme was implemented.

Image from Zilch Zero Emission Car Share

3.8 Public engagement techniques for parking issues

Parking is an emotive topic, because it sits at the heart of competition for limited space in urban areas. Undertaking effective public engagement can be challenging.

It is very important to effectively engage with the public when developing parking policies or planning transport projects that involve changes to parking. Many projects utilise a short explainer video as an effective communication approach. Examples of successful public engagement include Wellington City Council's development of an updated parking policy in 2019/20 and Auckland Transport's parking strategy in 2015.[32]

Transport projects that involve the reallocation of parking space may become unstuck if the removal of parking is not well communicated or there is not a mitigation plan or clear justification explaining the change. The public focus immediately becomes the lost parking and not the benefits that the project is looking to deliver. Media is often quick to pick up on outspoken disaffected stakeholders and this can quickly build into wave of opposition to the proposal.

Hastings District Council took an innovative approach to public engagement on priced parking in 2017 as part of their draft annual plan consultation. They decided to ask the public whether the costs of parking should be covered by everyone through an increase in rates or should be paid for by the users of parking through metered parking. This made the public consider the actual costs of parking and the fairest way to pay for them. More information on this approach is shown in case study 2.

Introducing or increasing fees can also generate a financial surplus and this surplus can be invested in improvements to streets and public transport in the area they have been collected from. This approach can help with securing support for the changes from the community.

Case study 8 demonstrates a successful communication campaign around summertime parking management in Mangawhai. The council worked collaboratively with the community in developing the proposals and so mostly avoided the risks of community backlash.

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32 Wellington City Council parking policy engagement https://www.letstalk.wellington.govt.nz/41514/widgets/235013/documents/142728 ; Auckland Transport parking strategy video at https://www.youtube.com/watch?v=Kojo6hDxGTA

Case study 8

Small town summer parking management

During the summer months, many of New Zealand's popular holiday towns swell in population, and local governments struggle to cope with increased congestion and parking demand. Several towns are implementing new strategies to manage congestion and safety issues generated by this increased demand.

Kaipara District Council implemented a 2019/20 summer trial of traffic and parking management strategies in Mangawhai Heads, a coastal town between Auckland and Whangarei. Within the town centre the main street was made one-way and a 60-minute time limit was introduced for on-street parking adjacent to the shops. Additional off-street parking capacity was created within a short walk from the main street and way-finding signage was installed. Bike racks were also installed on the main street to encourage people to cycle rather than drive to the shops.

To address community concerns that employees were occupying on-street parking during business hours, businesses were each provided with four parking permits for off-street parking behind the shops. The clear message from the council was that public parking was not for business staff. The Kaipara District Council policy does not currently allow on-street parking charges, but time restrictions are being considered to manage demand in constrained areas.

These trials were prompted by the Mangawhai Business Association, after concerns were raised about congestion and safety over summer. Kaipara District Council undertook a participatory design approach with the community to identify appropriate interventions that could be trialled for the peak summer period. This approach meant the community had a sense of ownership regarding the changes and resulted in widespread support for the trial.

After the summer trial, the council carried out some public consultation to get feedback on the changes. Most respondents indicated very strong support for the changes, particularly the one-way operation of the main street and the additional parking. After the success of the summer trial, a next phase of interventions has been proposed. Additional steps include the introduction of a pedestrian zone in the shopping centre. Two elements considered critical to the success of these trials are strong buy-in from the community (generated through the consultation and co-design process), and the trial approach, which allows the council to consider more permanent implementation of successful interventions while discarding others.

In addition to the traffic and parking management changes, a free summer shuttle between the town and surf beach, providing access to key destinations along the route was also trialled. There is limited parking at the surf beach and during busy summer periods the parking regularly fills up, leading to vehicles circulating and parking illegally on grass berms. The service was intended to provide a safe alternative to private vehicle use along this corridor, where there are constraints on walking and cycling.

The service was co-funded by Kaipara District Council and Northland Regional Council and operated between 27 December 2019 and 11 February 2020. The shuttle, which was free of charge, carried a total of 963 passengers over this period, with the highest patronage recorded on 30 and 31 January. Key groups that utilised the shuttle included grandparents traveling with young children and unaccompanied older children accessing the activity centres along the route.

The shuttle was so successful that operation was extended for several weekends beyond the initial trial period. While there is interest in establishing the shuttle as a commercial service, there are challenges around the initial financial viability. A mechanism that has been discussed for supporting the early operation of such a venture is 'sunset' funding, an initial subsidy reducing over time as the service becomes commercially viable.

Consultation feedback form on the Mangawhai Heads summer trial changes

Below are some useful tips achieving better outcomes for projects that involve changes to parking. In addition to these tips, useful guidance can be found on developing successful communication strategies in a literature review undertaken by The Workshop in 2020, How to talk about urban mobility and transport shift: a short guide

This review was done on behalf of Waka Kotahi to inform a message guide for technical experts, communicators and advocates working on mode shift in urban environments.

TIP	DETAIL
Link back to strategy	Clearly explain how the project aligns with relevant local, regional, and/or national strategies or policies and desired outcomes.
Collect data	Collect data to support the case for change. Data will help understand how different parking restrictions such as loading zones or mobility parking are used. It is often useful to include data to show how many get on and off public transport in the project area and how many cyclists use the corridor.
Understand your stakeholders	Demonstrate understanding of local issues and work closely with key stakeholders such as local boards and business associations. Gather any relevant data from public customer requests, social media, and surveys to understand existing issues or concerns that the public may have that can be addressed by the project.
Sell the benefits	Clearly articulate the benefits of the project so that the public can consider the trade-offs of lost parking or increased parking fees. Show them examples of other projects where a similar change has happened and how well that worked out. Benefits can also include the profits from parking fees being invested specifically in parking and other access or public realm improvements.
Have a plan for lost parking	Have a mitigation plan for well utilised parking spaces that will be lost. Assess parking occupancy information and if possible, demonstrate that there will be minimal or no loss of customer parking if additional time restrictions are applied to surrounding streets.
Involve key stakeholders early	Groups representing the community become annoyed if they receive a proposal cold without prior notification or input. Involve key stakeholders early in the options development stage to improve the chance they will support the project later. This also improves the chance of approval. Refer to case study 7.

3.9 Parking technology

Parking technology has advanced considerably in recent years and has made parking much easier to pay for and manage. Before investing in new parking technology councils should clearly understand the problems that technology can address and benefits that it brings. The table below provides guidance on the advantages and disadvantages of different parking technology options. It is important to clearly understand the problems or challenges that are present before selecting parking technology.

To realise maximum benefits from the technology it is preferable to invest in systems that can easily be integrated with other systems. For example, when considering different suppliers for on-street parking machines, smartphone apps for parking payments, and enforcement ticketing systems, these systems should integrate with each other in real-time. This needs to be a requirement when dealing with technology providers as it will improve the ability to efficiently manage and enforce parking.

Technology can mitigate some negative public sentiment towards parking management. For example, while introducing priced parking can be contentious, offering a smartphone app that shows how many spaces are available in real-time and letting the customer pay only for what they use may make pricing parking more acceptable.

Before investing in parking technology, one should properly assess the costs and benefits using a robust business case process. Most technology has ongoing operational costs, and these should be offset by benefits in either increased efficiency or revenue.

A parking payment system with solar panels on the side to power the machine. Image from Lorelei Schmitt

Parking data standards

Parking management generates a lot of data which can be used for improving operation and planning. However, parking data in New Zealand is currently fragmented geographically and commercially. Councils and other parking operators such as hospitals and airports may all manage their parking data differently. This data is often not standardised which can lead to poor integration between parking management systems and customer interfaces, with the asset owners (e.g. councils) being 'locked into' proprietary systems that are difficult to integrate to other systems. This can stifle innovation, increase costs and lead to poorer outcomes for both the parking asset owners and customers.

Internationally, many countries are moving towards parking data standardisation to overcome these problems. The Netherlands established a national parking register which has been operational for over a decade. Around 90% of parking transactions go through this system, which also supports mobility parking, parking permits, and enforcement. Globally, the Alliance for Parking Data Standard (APDS) was established in 2014 and the APDS version 3.0 was published in 2021. In England, the Department for Transportation worked together with Manchester City Council on a parking data project. They developed the first APDS compliant parking data repository which has been tested with data from all parking operators in Manchester and some other cities.

Standardising data:

- better enables data-driven decision making
- reduces the duplicate development work by each council to utilise different data sources
- avoids councils getting locked into contracts where they do not own or manage the data
- provides useful data on parking to inform council transport projects that may require a change to parking provision such as bus lanes or cycleways
- enables higher interoperability between parking management systems which can reduce costs and support adoption of innovative technologies as they are produced.

Waka Kotahi has been working with Palmerston North City Council on a data standardisation pilot. There have also been discussions with councils regarding developing national standards for parking data. If you would like to find out more about this, please contact parkingmanagement@nzta.govt.nz

Evaluation of parking technology options

The table below provides a summary of the pros and cons of each type of parking technology.

TECHNOLOGY	PROS	CONS
Parking meters* – *Pay and Display* The customer gets a receipt from the machine to display in the car windscreen.	• Familiarity – public are familiar with the operation. • Receipts – are available from the machine.	• Expensive to maintain – require regular servicing to replenish paper rolls, printer maintenance. • Waste – paper creates waste and can result in littering.
Parking meters – *Pay by Plate* The customer enters the licence plate of the vehicle into the machine.	• Integration – can be integrated with enforcement systems by using vehicle plate as identifier. • Enforcement options – enforcement can be carried out by licence plate reading camera. • Cheaper to maintain – than Pay and Display (no paper or printers). • Convenience – customer does not need to return to vehicle once they have paid.	• Errors – customer can key in wrong plate. • Privacy – some customers may have privacy concerns. • Inconvenient – in high tourist areas can be inconvenient if meters too far from the vehicle as plate details not known by non-owners.

* Note: Most modern parking meters accept coins and credit cards. Some accept text payments or stored value cards. Cashless meters significantly reduce the cost of the meter and maintenance costs. A large part of the cost of a meter is the coin handling equipment and security features to deter vandalism. The parking meter can be up to 50% cheaper if cashless options are offered. Cash collection costs are also expensive as collection needs to be carried out over multiple small value sites. Coin jams are a common problem with parking meters and lead to higher operational costs. Many parking operators are encouraging parking app payments and reducing the number of parking meters.

TECHNOLOGY	PROS	CONS
Parking meters – *Pay by Space* With Pay by Space meters the customer enters a unique parking space identifier into the machine. Pay by Space meters can be linked to parking sensors. The sensor confirms when the vehicle arrives, and the meter confirms if the vehicle has paid. The integrated systems then notify enforcement of vehicles that have parked and have not paid.	• Flexibility – ability to charge different rates for different parking spaces. • Cheaper – no paper or printers. • Convenience – customer does not need to return to vehicle once they have paid.	• Complexity – need to be programmed with each parking space and updated as parking changes. • Maintenance – parking space numbers can be difficult to read or become vandalised. • Integration – difficult to integrate with app payments via vehicle plate identifier.
Parking payment apps Allow payment of parking through a smartphone app rather than using a meter. Most apps require the customer to pre-register and use a credit card. Apps can either be hosted and managed by the operator or a third party. Using a third-party app is usually more cost efficient for the local authority as the app provider will charge the customer a transaction fee for using the service. Parking apps can show other useful parking information such as prices, times of operation and live availability.	• Running costs – usually lower than installing meters. • Convenience – customers who own a smartphone generally enjoy the convenience of paying through an app. • Fair – customer only pays for the parking they use unlike a parking meter when an estimation of time required is needed at the start. • Additional features: prices, times of operation and live availability. They also allow for instant updating of information and events like street closures.	• Flexibility – third-party apps limit the ability for the parking operator to influence the range of services offered through the app. • Additional costs – this charge can disincentivise the public to switch from using cash at the machine to using an app.

TECHNOLOGY	PROS	CONS
Ground parking sensors The sensors, installed on the road/in the middle of each parking bay, have a wireless connection to a server. Parking enforcement officers get a live feed from parking sensors to know how long a vehicle has been parked and whether it has overstayed a time limit.	• Parking enforcement efficiency – no need to chalk tyres or look for infringements. Parking sensors can increase the efficiency of parking enforcement officers or allow a reduction in staff numbers without a decrease in the number of infringements issued. • Data – most sensor products provide a rich set of data and a backend reporting system that can be used to determine parking occupancy and turnover for any time period. This data can be used to set parking prices according to a demand responsive pricing policy. • Live availability – parking occupancy information can be received in real-time and shared on websites, parking apps or electronic signage to inform the public of the number of vacant parking spaces. This can reduce congestion associated with people cruising for available parking.	• Cost – sensors can be expensive to purchase and maintain. They also have account monthly operating costs. Before road works, parking sensors need to be removed, stored, and reinstalled, usually by the contracted vendor. • Accuracy – another factor to be aware of is parking infringements can only be issued when there is total confidence that the parking sensor system is working properly, and tickets can be defended.

TECHNOLOGY	PROS	CONS
Licence plate recognition (LPR) systems LPR is growing in popularity in the parking industry. Two typical uses are: **Off-street car parks**: cameras at the entrance and exit of the car park read the plates of vehicles entering and exiting. The customer pays at a pay machine using the licence plate as the identifier. There can be a barrier arm at the exit that only opens for vehicles that have been paid for, or non-paying customers can be sent a fine by mail. **Enforcement**: A vehicle fitted with LPR cameras can drive around detecting vehicles throughout the day, recording when a vehicle has overstayed a time limit. The footage can then be packaged up, confirmed by a parking officer and infringements issued in the mail. Alternatively, the vehicle can stop, and a parking officer issue the infringement on the spot. These systems can incorporate a list of vehicles with residential permits and exempt them from the time limit.	**Off-street car parks** Integration – can integrate with multiple payment systems that use licence plate as the payment identifier (smartphone apps or parking meters) No lost tickets – the time of entry is recorded by the camera, which removes the problem of lost tickets and associated customer conflict. **Enforcement** Coverage – larger coverage area for on-street enforcement than using parking officers on foot. This is good for covering large enforcement areas like residential parking zones. Compliance – for on-street parking, can lead to an increase in compliance as the customer cannot check for tyre chalk to know that a parking officer has viewed the vehicle. Infringements – license plate check means infringements for warrant of fitness and registration offences can be issued. Data – vehicle counting ability can be used to determine occupancy of streets covered by the vehicle. The system can also report the number of unique visitors to an area.	Cost – can be expensive to purchase. Accuracy – it is difficult to realistically achieve much higher than 99% accuracy. Therefore, in off-street car parks, there needs to be a backup process to assist customers when their vehicle plate is not read correctly. Likewise, on street parking enforcement still requires a manual check to ensure that the information collected by the system is accurate and the warranted parking officer needs to issue the infringement. This can erode the efficiencies of the system but usually will result in more infringements than a parking officer on foot.

TECHNOLOGY	PROS	CONS
Electronic permit systems The customer applies for a permit online. The electronic permit is linked the vehicle's licence plate. Electronic permit systems are sometimes called 'digital permit systems.'	Robust – physical permits were open to abuse by forgery or simply sharing the permit amongst other people which electronic permits are not. Real time – electronic permits can be amended or cancelled in real time. Integration – Electronic permits can be integrated with enforcement systems to allow for efficiency of enforcement without the need to check for a physical permit. Convenience – for most customers, an online system is much easier than a manual application process. Speed – the permit can be issued more quickly as no posting is required.	Cost – systems can be expensive, and cost may be prohibitive if only a small number of permits is issued. Electronic enforcement system required – because the permits are not visible, enforcement officers need to have an electronic enforcement system (eg a handheld enforcement device and software system) that can be uploaded with licence plate permit information.

References, glossary and acronyms

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Note: Images on pages 4, 5, 25, and 62 from MRCagney

Glossary and acronyms

Austroads	Austroads is the peak organisation of Australasian road transport and traffic agencies. Austroads undertake leading-edge road and transport research which underpins our input to policy development and published guidance on the design, construction and management of the road network and its associated infrastructure.
District Plan	A district plan is a requirement under the Resource Management Act, 1991, to assist local authorities in carrying out their functions in order to achieve the sustainable management purpose of the act.
Car sharing	Car sharing is a type of car rental where people who are members of the car share organisation rent cars for short periods of time, eg by the hour. The car share vehicles are operated by an organisation to provide its members, for a fee, access to a fleet of shared vehicles which they may reserve for use on a short-term basis.
EV	Electric vehicle
GPS	Government Policy Statement on land transport (GPS) sets out the government's strategic direction for the land transport system over the next 10 years and is updated every three years. It provides guidance on how we invest the National Land Transport Fund (NLTF), and how we assess and prioritise activities for Regional Land Transport Plans (RLTPs) and the National Land Transport Programme (NLTP).
Minimum parking requirements	Minimum parking requirements are district plan rules requiring new buildings and/or activities to include a fixed number of off-street parking spaces based on an assumed demand for parking generated by the buildings' use.
NPS-UD	National Policy Statement on urban development. This provides direction to local authorities about when and how cities should plan for growth and how to do this well. It aims to remove unnecessary restrictions on development, to allow for growth 'up' and 'out' in locations that have good access to existing services and infrastructure.
NZ	New Zealand
P180	An example of a time restriction on parking. The 'P' denotes a parking restriction and the '180' refers to the time limit allowed in minutes.

Parklet	A parklet is the conversion of a small number of parking spaces to public space for people to use
PMP	Parking management plan
Regional Land Transport Plan	Regional land transport plans (RLTPs) are six-year plans that document the regions' land transport objectives, policies, and measures as well as providing a statement of transport priorities for the region.
TCD manual	This manual provides guidance on industry best practice, including, where necessary, practice mandated by law in relation to the use of traffic control devices. Part 13 Parking control provides guidance on the use of traffic control devices related to stopping, standing and parking.
TCD Rule	Land Transport Rule Traffic Control Devices 2004. Traffic Control Devices Rule. This rule specifies requirements for the design, construction, installation, operation and maintenance of traffic control devices (including all parking restrictions), and sets out the functions and responsibilities of road controlling authorities in providing traffic control devices.
Urban form	The physical characteristics of urban areas
Waka Kotahi	Waka Kotahi NZ Transport Agency

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