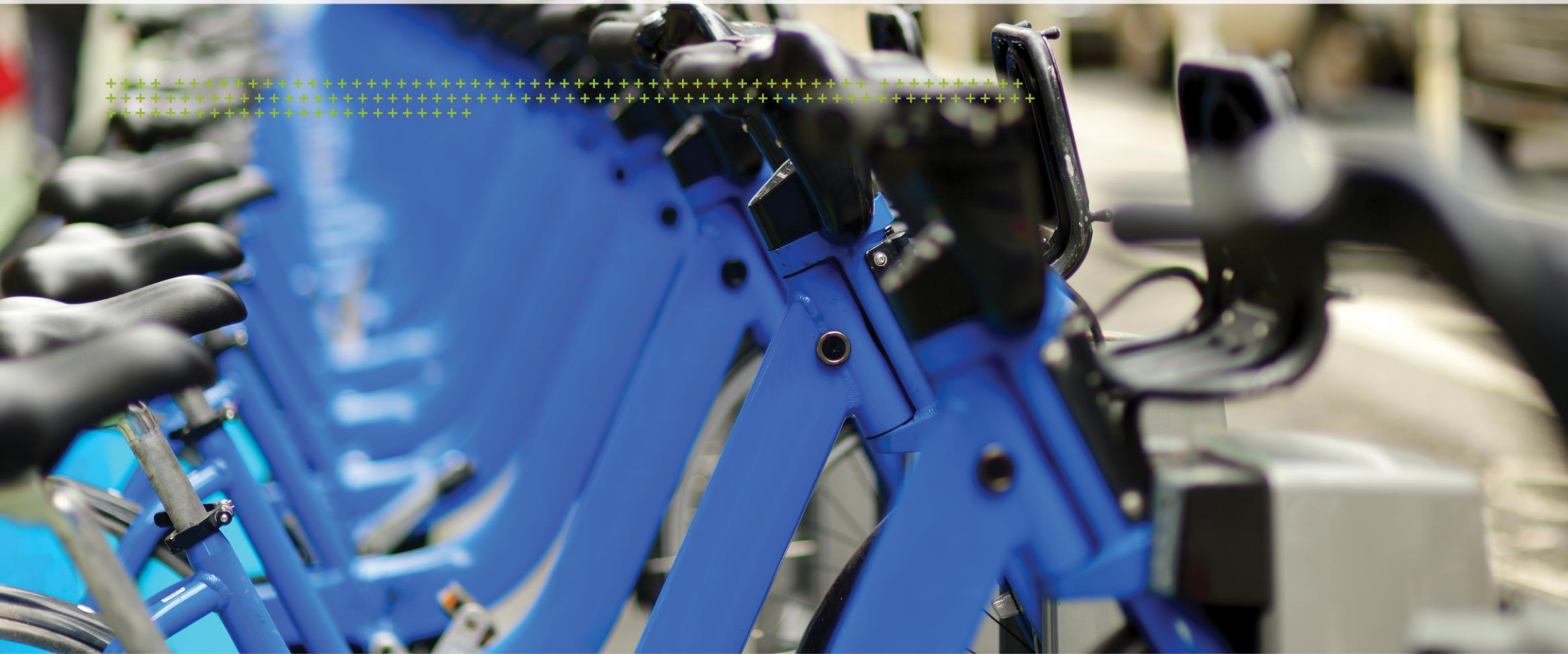


AUCKLAND TRANSPORT

AUCKLAND CYCLE HIRE ASSESSMENT

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Auckland Cycle Hire Assessment

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Glossary of terms

Access card	A magnetised or chip based card similar to a credit card used to hire bicycles on a number of schemes currently operating worldwide.	Electric bicycle	A bicycle with an electric motor to provide additional propulsion. Although electric bikes are becoming popular they are limited by their cost and the requirement to charge them after a given period of time. Their popularity is likely to increase due to advancements in technology.
Annual member / yearly subscription	An annual subscription to use the bicycle hire scheme. Annual subscriptions usually offer free periods of use and discounted rates.	Member	Someone that has decided to join the bicycle hire scheme be it for a day, week, month or year.
Bike share	See Cycle hire scheme.	Public bikes	See Cycle hire scheme.
Bike & Train system	A concept emerging from the Netherlands where the bicycle is used to target egress trips to and from train stations in order to increase the efficiency of the train based journey.	Rebalancing	The redistribution of bicycles between docking stations based on usage, for example as more people are likely to ride downhill compared to uphill there will be more bicycles in downhill stations. This rebalancing is critical for the overall success of the scheme.
Catchment area	The area (or coverage) from which public transport or a cycle hire scheme attracts a population to use that service.	Service area	May either refer to the service of a specific docking station or the catchment/ service area of a train station. See Catchment area.
Cycle hire scheme	Sometimes called bike share, social bikes or public bikes. A bicycle hire scheme consists of a network of stations of bicycles available for the public to hire.	Social bikes	See Cycle hire scheme.
Docking station	A docking station is comprised of a central payment terminal along with a series of racks containing bicycles for hire (typically around 10-20 bicycles). Users first pay the nominated fee to hire a bicycle which then unlocks a specific bike from the docking station. Upon return of the bicycle to any docking station users simply need to push the bike into an available slot on the rack.		
Egress trips	Trips to and from a train/bus station that are undertaken as part of a larger public transport based trip chain.		

Executive Summary

This report provides an assessment of the potential for a cycle hire scheme in Auckland. The first part of the report examines a selection of international cycle hire schemes and identifies the key features of what makes schemes successful. The report then undertakes a demand analysis for a potential cycle hire scheme in Auckland and suggests possible options for a scheme. The report also covers the financial and business model aspects of cycle hire.

Operating / Funding Models

Several different operating models exist related to cycle hire schemes. Following is an overview of the most prevalent models used around the world.

1. **Publicly owned, privately operated** – the most common model tends to be one where the infrastructure (cycles and stations) is publicly owned with operation being contracted out to a private operator. Examples include London and Melbourne.
2. **Privately owned and operated** – under this operating model, a private entity owns and operates the cycle hire scheme in exchange for a revenue source through public subsidy, advertising revenue, user fees and/or sponsorship fees. Examples of this model include Paris whereby the private operator (JC Decaux) is responsible for the capital and operating costs in return for exclusive advertising rights on the city owned billboards. In New York City, the Citibike scheme is privately owned and operated and does not receive any public subsidy. The scheme benefits from significant sponsorship and user fee revenue.
3. **Publicly owned and operated** – another model involves the local government entity taking complete responsibility for the development, capital and ongoing operating costs of the cycle hire scheme. The OV-Fiets scheme in the Netherlands and the Guangzhou scheme in China are both publicly owned and operated.
4. **Non-profit** – some cycle hire schemes are operated by not for profit organisations that have been created for the sole purpose of operating the cycle hire scheme. These schemes tend to be smaller in nature. Examples include Minneapolis and Denver.

Network Approaches

There are three different approaches to the configuration of cycle hire schemes:

1. **The dense central city network** – this is the traditional approach to cycle hire and relies on a dense network of docking stations typically located in a grid like pattern. The key success factors of these types of schemes are: ensuring that they provide for opportune use (location and density of stations is paramount), the coverage area of the scheme is large enough to ensure optimum use and that the scheme is convenient to use. Successful examples of this network approach tend to be in larger cities such as Paris, New York and London.
2. **Public transport orientated (Bike & Train concept)** – the concept behind this network approach is that the slowest part of train journeys tends to be between the origin or destination and the train station¹. Therefore, if this section of the journey could be sped up, a train-based journey could be faster than one undertaken by private vehicle, therefore giving the train the competitive advantage. The key success factors to this network approach are convenience (hire stations located next to station entrances and ease of use) and price.
3. **Hybrid schemes** – a hybrid scheme utilises components of the two network approaches to increase (or improve) public transport patronage at key railway stations whilst also targeting short trips in the central core of a city. The key success factors of the hybrid scheme are similar to the other schemes identified above. However as these schemes are smaller than the denser networks in larger cities the design of these schemes is crucial to ensure optimal usage.

Cycle Hire Best Practice

While there is no set formula for creating a successful cycle hire scheme, there are a number of common trends and similarities between successful cycle hire schemes around the world.

¹ 2016. Kager, R. *Cycling and Transit - Competition, Synergy or both?*

Successful schemes tend to have the following key characteristics:

- The distinctive brand was developed and the launch was widely publicised and often coincided with improvements to the cycle network or upgrades of the public realm;
- The coverage area of the launch stage of the scheme was large enough to cater for trips between a variety of trip generators;
- Subsequent phased expansion was planned before the launch and was implemented swiftly afterwards, building on the use already occurring in the initial deployment area;
- Schemes received widespread public and political support;
- Each cycle is used for upwards of 2.5 trips a day; and
- Flat topography is beneficial for a cycle hire scheme and can increase the uptake of cycling in an area; however, the density and convenience of cycle hire stations and the rebalancing of cycles has been found to have a greater influence than topography on the success of a cycle hire scheme.

Other key points and considerations related to cycle hire schemes are as follows:

- Most schemes require public subsidy;
- Attracting a naming sponsor can provide a lucrative revenue stream as well as raising awareness of the bike hire scheme;
- The operational aspects of rebalancing cycles and cycle maintenance can be significant;
- Convenience is a key factor for users;
- Annual subscription and short trips (up to 30 or 45 minutes), are encouraged through the pricing mechanism;
- Many schemes integrate payment with a public transport smart card; and
- Sometimes schemes achieve a higher rate of cycle hires if the overall cycling modal share in the city is low.

Considerations for a Cycle Hire Scheme in Auckland

The preferred cycle hire scheme design for initial launch in Auckland would consist of a dense network within the city centre, which would likely be extended to the city fringe areas as part of the future scheme expansion.

The city centre indicates the highest potential for existing and future demand for a cycle hire scheme due to its high residential and employment density. The Urban Cycleways Programme will accelerate the delivery of key sections of the Auckland Cycle Network within the city centre over the next three years and delivering safe infrastructure in the city centre is a main focus. The provision of a safe, high-quality, connected network of cycleways within the city centre will further enhance the attractiveness of a cycle hire scheme in this location.

The initial preferred cycle hire scheme design is shown in Figure A. The first phase (Stage 1A), would be centred around Britomart with the network radiating outwards to Wynyard Quarter, Aotea Quarter and the Learning Quarter and stations are recommended approximately every 300m (as shown in Figure B). These locations would form a comprehensive cycle hire network and maintain walkable distances between individual stations to improve access and maximise cycle hire ridership.

A dense network of cycle hire stations in the city centre will attract use including commuters, residents, students, visitors and tourists alike. For commuters, the cycle hire scheme will capture egress trips from Britomart. A cycle hire scheme will provide travel time savings for users with cycling often being the most efficient transport mode for moving around the city centre.

The second phase of Stage 1 (Stage 1B as shown in Figure A), is recommended to quickly follow the first and builds on the success of Stage 1A in the city centre. The contiguous expansion of Stage 1A allows for incremental growth of the scheme and provides greater potential cycle hire scheme patronage. Stage 1B would involve extending the cycle hire network to Ponsonby and Westhaven to the west of the city centre, and to Devonport, Parnell, Newmarket and along the waterfront to the east.

City fringe areas indicate considerable potential for cycle hire usage as these areas are typically characterised by higher population density, lower car ownership and shorter commuting trips which could realistically be made by cycle. A large number of key tourist and visitor destinations are located in these areas and these locations indicate high potential demand for a cycle hire scheme, particularly with the planned improvements to east-west cycle connections as part of the Urban Cycleways Programme. The Eastern Bays and Westhaven are well-suited for a cycle hire scheme due to the flat topography and provision of safe, cycling infrastructure along the waterfront.

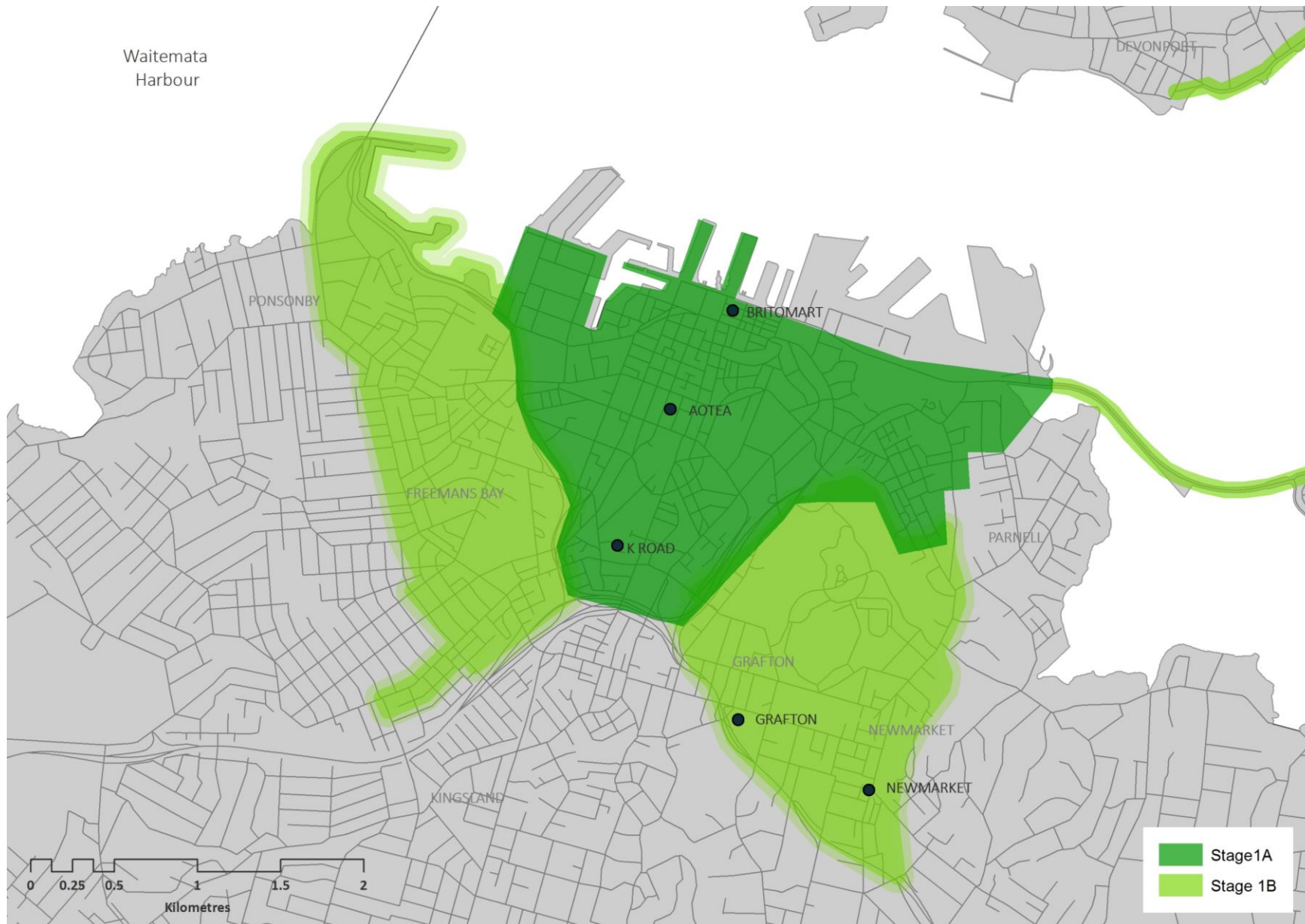


Figure A: Preferred initial cycle hire scheme design in the city centre



Figure B: Preferred Auckland cycle hire scheme design including indicative cycle hire station locations in the city centre

Estimating the possible capital cost of the first two stages is challenging at this stage due to uncertainty regarding a number of factors including the type of cycle hire system, IT requirements, planning and consenting requirements, power requirements and shipping costs to New Zealand. However, two basic cost estimates have been developed to provide a high level ballpark figure for the capital costs of a cycle hire scheme in Auckland.

The first estimate is based on the average capital cost per cycle of four schemes in North America. Assuming a start-up scheme with 700 cycles in Auckland, the cost estimate would be NZ\$4.6M based on an average set up cost of US\$4,621 per cycle. The second estimate is based on the Social Bicycles system which has a lower capital cost of approximately NZ\$3.1M, excluding shipping costs.

With the continued rollout of the Auckland Cycleways Network and planned investment in cycling infrastructure Auckland-wide, further expansion could include areas beyond the city centre and fringe. Growth into these areas as well as areas with a lower forecast demand would become an important element of the overall cycle hire scheme.

It should be noted that cycle hire schemes do not typically generate a large profit or in many instances, any profit at all; rather, the tangible benefits are observed in increased public transport patronage, retail spend and maintaining a financially sustainable scheme.

While there is considerable potential to implement a cycle hire scheme in Auckland, there are significant potential reputational risks associated with implementing a poorly planned cycle hire system for the operator and implementing agency. To mitigate these risks, it is recommended that further analysis is undertaken to gain a comprehensive understanding of the associated potential issues, risks and challenges.

The location and distribution of cycle hire stations is one of the most important and challenging aspects of a cycle hire scheme. Additional work is required to further refine the likely demand for the scheme, to identify the specific locations of stations, and to determine the number of cycles and docking stations that are required. To explore these aspects of the scheme in further detail, it is recommended that the following additional work items are undertaken:

- Refinement and confirmation of the cycle hire scheme objectives and identification of critical performance indicators;

- Development of a financing strategy to identify sources of funding and the bidding processes;
- Further investigation of a potential law change regarding mandatory helmet use and measures to mitigate the impact of helmets on the level of use of a cycle hire scheme in Auckland;
- Electric bikes are a recent advancement for some international cycle hire schemes and different schemes have experienced varying levels of success; however, further investigation is required as electric bikes present a potential solution to Auckland's hilly topography;
- Undertake soft market testing through engaging with cycle hire providers and operators;
- Carry out a more detailed feasibility study to determine the likely demand for the scheme supported by market research to better understand the target market. This study would also further address implementation issues including costs, pricing, system design, risk and contractual matters;
- Further investigation of organisational structures for Auckland through engagement with managers of successful schemes in other cities and through soft market testing;
- Investigation of the feasibility of integrated user payment methods; and
- Gauge the level of interest in corporate sponsorship of the cycle hire scheme by approaching major New Zealand companies.

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The sole purpose of this report and the associated services performed by Jacobs is to *assess the potential for a cycle hire scheme in Auckland* in accordance with the scope of services set out in the contract between Jacobs and the Client. That scope of services, as described in this report, was developed with the Client.

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1. Introduction

The completion of a number of cycling projects has recently raised the profile of cycling in Auckland and seen a significant increase in the number of Aucklanders cycling over the last few years. As an opportunity to build on this momentum, Jacobs has been commissioned to undertake an assessment for a potential Auckland cycle hire scheme.

The assessment involved carrying out a best practice review of international cycle hire schemes to understand the contributing factors that have led to successful schemes. A demand analysis was undertaken to determine the propensity of Aucklanders and visitors to use the system and to identify areas with the greatest potential for a cycle hire scheme. Business models and financing options that have been applied elsewhere were assessed based on their suitability within an Auckland context.

1.1 Auckland Context Analysis

Auckland's population was 1,414,550 in 2013 and growth forecasts predict an increase of between 700,000 and 1 million people over the next 30 years. Considering all transport modes, over five million trips are made in Auckland per day and 65,000 of these are commuting trips into the city centre².

Future growth will place further pressure on Auckland's transport network. Cycling will be a key contributor to improving transport options for Aucklanders and for increasing the overall reliability and resiliency of the transport network.

Auckland has a number of opportunities for cycling growth and it is estimated that 258,000 people could realistically cycle for everyday trips under the right conditions³. To encourage people to shift away from private vehicles and use cycles for short trips, the barriers which currently discourage people from cycling need to be addressed.

The 'Urban Cycleways Programme' involves funding from local councils, the Land Transport Fund and an additional \$100 million from the Government to be invested in expanding the cycling network over the next three years. It focuses on accelerating the delivery of key sections of the Auckland Cycle Network and includes safe facilities in the city centre, key corridors to the east and west, and connections to public transport hubs.

There is a strong programme of cycling projects planned for Auckland to ensure that cycling growth continues into the future. Existing and planned cycleways in Auckland are illustrated in Figure 1.1.

² Statistics New Zealand. 2013. *Auckland census data for 2013*. Auckland.

³ TRA, 2015. *Measuring and growing active modes in Auckland*.

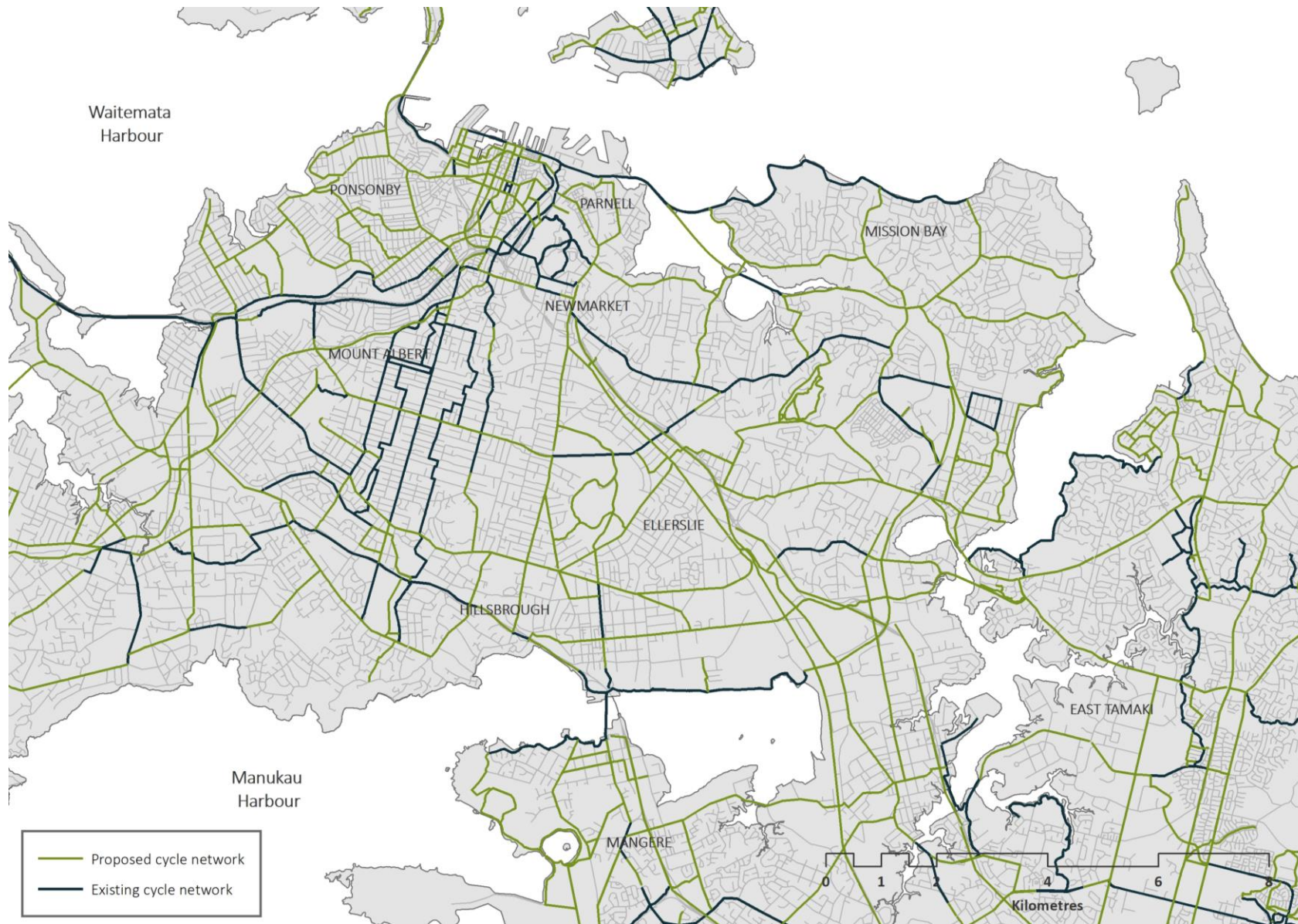


Figure 1.1 Existing and planned cycleways in Auckland

2. Review of Existing Cycle Hire Schemes

This section reviews existing cycle hire schemes to identify key elements and contributing factors that have led to successful cycle hire schemes. This review includes the following:

- Assessment of patronage, user activity, operating costs and business and financial models;
- Assessment of coverage and network approaches utilised by cycle hire schemes;
- Identification of innovative practices from existing cycle hire schemes;
- Identification of key challenges and successes; and
- Evaluation of emerging developments and trends in cycle hire systems.

A review has been undertaken of the following schemes:

- Paris, France;
- London, United Kingdom;
- New York, United States;
- Brisbane, Australia;
- Melbourne, Australia
- Guangzhou, China;
- The Netherlands;
- Madrid, Spain;
- Portland, United States; and
- Seattle, United States.

Initially seven city-based schemes were selected for review as they all have relatively large cycle hire schemes which have been in operation for a period of time as well as the rail station based OV Fiets scheme in The Netherlands. Subsequently, two more schemes were included. The Biketown scheme in Portland has recently launched and utilises a different system to those used in the other case studies. The Pronto scheme in Seattle has also been examined as there are similarities between Seattle and Auckland in terms of topography and mandatory helmet use.

A number of different business models operate but most involve a contract with a company for the operation of the scheme. With the exception of CitiBike in New York, all the schemes reviewed have some element of public subsidy. Table 2.1 below provides a summary of each of the scheme, detailing the contracting structure, as well as the dimensions of the scheme and, where available, information about the set up costs.

A detailed review of each of the schemes can be found in Appendix A.

Table 2.1 Summary of costs to the city of reviewed international cycle hire schemes

Cycle Hire Scheme	Sponsor	Operator	Contracting structure	Capital set-up costs ⁴	Size of scheme	Trips per day	Annual public subsidy	User fee structure	Comments
Velib, Paris	N/A	JC Decaux	Privately operated, (infrastructure reverts to city council at contract end)	██████	<ul style="list-style-type: none"> 23,000 cycles 40,421 docks in 1,800 stations 	109,090	No	<ul style="list-style-type: none"> Annual membership €29 - €39 1 day - €1.70 7 day - €8 Unlimited trips, first 30 minutes free 	JC Decaux pays the Paris City Council annual operating fees and all of the revenue gained from the scheme. This is in exchange for exclusive advertising rights on publicly owned advertising space.
Santander, London	Santander	Serco	Privately operated / publicly owned	██████ ██████	<ul style="list-style-type: none"> 10,000 cycles 19,000 docks in 755 stations 	27,115	Yes - £7M +	<ul style="list-style-type: none"> Annual membership £90 24 hrs - £2 Unlimited trips, first 30 minutes free 	Sponsorship with Santander is worth £37.5 million.
Citibike, New York	Citi Bank, MasterCard	NYC Bike Share (owned by Motivate)	Privately owned and operated	██████	<ul style="list-style-type: none"> 8,000 cycles 12,000 docks in 500 stations 	48,676	No	<ul style="list-style-type: none"> Annual membership US\$155, unlimited trips and first 45 minutes free Casual use, first 30 minutes free; 1 day – US\$12; 3 days – US\$24 for unlimited trips 	The New York Department of Transportation imposes penalties if performance indicators are not met.
City Cycle, Brisbane	Lipton Ice Tea	JC Decaux	Privately operated / publicly owned	██████	<ul style="list-style-type: none"> 2,000 cycles 150 stations 	943	AU\$500,000	<ul style="list-style-type: none"> Annual membership – AU\$60.50 1 day – AU\$2, 7 days – AU\$11 	During its initial phase, the scheme was subsidised by AU\$1 million per year.

⁴ Information on capital set up costs has not been verified.

Cycle Hire Scheme	Sponsor	Operator	Contracting structure	Capital set-up costs ⁴	Size of scheme	Trips per day	Annual public subsidy	User fee structure	Comments
								<ul style="list-style-type: none"> Unlimited trips, first 30 minutes free 	
Melbourne Bike Share, Melbourne	N/A	RACV	Public / private	██████	<ul style="list-style-type: none"> 600+ cycles 900 docks in 57 stations 	470	Estimated at AU\$5.5M over 5 year period	<ul style="list-style-type: none"> Annual membership – AU\$60, unlimited trips, first 45 minutes free 24 hr – AU\$3, 1 week – AU\$8, unlimited trips, first 30 minutes free 	N/A
Guangzhou, China	N/A	Guangzhou Public Bicycle Operation Management Co.	Public	██████	<ul style="list-style-type: none"> 15,000 cycles 113 stations 	20,000	Unknown	<ul style="list-style-type: none"> Up to 1 hour - free 1 - 2 hours - 1RMB (NZ\$0.21) 2 - 3 hours - 2RMB More than 3 hours - 3RMB an hour 	
OV Fiets, the Netherlands	N/A	NS – state owned rail company	Public	██████	<ul style="list-style-type: none"> 8,000 cycles 277 stations 	5,205	Unknown	<ul style="list-style-type: none"> Annual membership €10 €3.35 for 24 hours 	
BiciMad, Madrid	N/A	Bonopark	Privately operated / publicly owned	██████	<ul style="list-style-type: none"> 1,560 cycles 4,116 docks in 165 stations 	10,000	€535,000	<ul style="list-style-type: none"> Annual membership €25 or €15, first 30 minutes €0.5; 2nd 30 minutes €0.6 Casual use - first 30 minutes - €2; second 30 minutes - €4 	The operator, Bonopark required €3.6 million to prevent bankruptcy in 2015. It is not clear if this bailout came from public funds.

Cycle Hire Scheme	Sponsor	Operator	Contracting structure	Capital set-up costs ⁴	Size of scheme	Trips per day	Annual public subsidy	User fee structure	Comments
Bike Town, Portland	Nike	Motivate	Unknown	██████	<ul style="list-style-type: none"> 1,000 cycles 100 stations 	Not available	No	<ul style="list-style-type: none"> Annual membership – US\$144 for up to 90 minutes ride time per day 1 day – US\$12 up to 180 minutes Single trip US\$2.50 up to 30 minutes 	Sponsorship worth US\$10 million over 5 years.
Pronto, Seattle	Alaska Airlines (and others)	Motivate	Privately operated / Publicly owned	██████	<ul style="list-style-type: none"> 500 cycles 54 stations 	387	Currently owned by local council, operational costs estimated to be US\$2m per year.	<ul style="list-style-type: none"> Annual membership – US\$85 for unlimited trips with the first 45 minutes free 1 day – US\$8; 3 days – US\$16 for unlimited trips, first 30 minutes free 	Initially owned by a non-profit organisation which went bankrupt and brought by the local council for US\$1.4 million. Seattle Department of Transportation have committed US\$3.4 million to expand the system.

2.1 Business Models

2.1.1 Organisational structures

In London, Santander Cycles operates with a high level of cost transparency. The contract with Serco is based on cost-plus principles whereas in Paris, the contract with JC Decaux means that advertising revenue is used to cross subsidise the bike hire scheme. In the Paris example it is far more difficult to identify the indirect cost to the public (i.e. over the hire fee).

The New York scheme puts all the financial risk on the operator Motivate. The user fees are higher than in other schemes but there is still a high level of patronage. Motivate are bearing the financial risk of the scheme and the financial imperative appears to have driven innovation and improvement at a more rapid rate than in other schemes.

The Pronto scheme in Seattle was originally owned by a non-profit organisation but it became insolvent and was brought by Seattle City Council. The financial problems were largely due to the fact that loans were taken out to fund part of the capital cost of the scheme implementation. The income from user fees and sponsorship was not sufficient to fund the operating costs and repay the loans.

2.1.2 Managing performance

Within the various contractual arrangements, the Operators are monitored against performance indicators. Even though the Citibike scheme in New York is privately owned and operated, performance penalties can still be applied by the NYC Department of Transport for poor performance.

The contract between Transport for London and Serco for Santander Cycles includes a performance framework consisting of 33 performance indicators. These indicators are reported each month and these are linked to the terms of payment.

2.1.3 Pricing

Most systems have a subscription fee and users can hire a cycle for 30 or 45 minutes before any additional charges are incurred. Pricing is generally structured to encourage

annual membership and also journeys of 30 minutes or less. Table 2.1 above details the pricing structure for each of the schemes.

The electric cycle scheme, BiciMad in Madrid has a reasonably low cost annual membership fee but users have to pay for the full period of hire. This pricing structure is likely due to the higher operating costs involved in operating an electric cycle fleet.

Some schemes offer corporate membership, either in the form of a membership which employees can use to undertake work related travel or where corporate membership enables employees to take advantage of free or discounted annual membership offers.

Discounted membership is also offered in some schemes for students and tenants in affordable housing schemes to encourage use of the cycle hire scheme to lower income individuals.

2.1.4 Sponsorship

Sponsorship is a key feature of some of the schemes, particularly London, New York and Portland which have naming sponsors who contribute a significant financial boost to these schemes. An advantage of having a long term naming sponsor from the start is that the branding can easily be incorporated. In the case of London, the sponsor for the first five years was Barclays and when Santander became the new sponsor, Transport for London incurred costs of approximately £300,000 to make branding changes.

The CityCycle scheme in Brisbane did not have a sponsor when it was first launched but is now sponsored by Lipton Ice Tea. Melbourne Bike Share does not have a sponsor, despite being interested in securing sponsorship in the past.

It may be that sponsors are less likely to sign up to a deal prior to a scheme going live as there is uncertainty about how successful it might be and it is difficult to place a value on an unknown sponsorship opportunity.

The Seattle scheme has a number of sponsors and offers companies the option of sponsoring individual stations for an annual fee. This could be an attractive option to companies who have shops or offices located close to docking stations or those that can see the potential for advertising on stations in areas of high footfall.

2.2 Operational Considerations

2.2.1 Network Size

Most schemes start with a core area covering the city centre and expand in stages; building momentum and patronage. It is generally recognised that small pilot schemes are not effective and suffer from low patronage. Potential users need to see that the cycles can be used to access a variety of locations that they might wish to travel to and they need the security of knowing that as long as they are within the deployment zone, they will be able to find a station to pick up or drop off a cycle.

In the two Australian cities, the proximity of employment and home are two key factors which influence the use of the scheme. Research conducted in Brisbane and Melbourne highlighted that 83% of members worked within 500m of a docking station and between 44% and 54% lived within 500m of a docking station. In Melbourne, the strongest trip patterns occur between stations located in areas of relatively poor public transit coverage and accessibility.

2.2.2 Station size

Station size varies depending on available space and likely demand. In London, it seems that the scheme was not initially aimed at 'after rail' use. However, whether by design or not, the scheme does cater for after rail journeys and the demand for cycles at some mainline rail stations is higher than the capacity of the docking stations.

2.2.3 Station density

In the majority of successful hire schemes, stations are located approximately 300m from each other. This station proximity provides good coverage and also provides customers with options when they either cannot find an open docking station or available cycle.

Station location should be driven by utility rather than considerations around advertising potential of the station.

2.2.4 Number of cycles and docking points

The ideal ratio of cycles per population is between 10 and 30 cycles per 1,000 residents. Generally the ratio of docking points to cycles is between 1.5 to 2 spaces per cycle.

2.2.5 Operating Systems

The schemes reviewed generally work in the same way with a terminal at each station and users either hiring the cycle via the terminal or using a smart card at the docking space to release the cycle. The London, Melbourne and New York schemes are similar as they all use the 'BIXI' system.

A common teething problem with many of the schemes relates to IT issues at the docking points. The most common IT issues either result in customers being unable to check a cycle out, or being unable to return it to a docking station.

Social Bicycles (SoBi) are used in the Portland Cycle Hire scheme Biketown which has recently been launched. Social Bicycles have the technology on the bike rather than the docking station which means that there is no need for standalone terminals or powered docking spaces. This reduces the cost of the on-ground infrastructure and means that expanding the coverage area of the scheme will be easier. The cycles have on-board GPS trackers which makes it easier to track down the cycles if stolen.

2.2.6 Link to public transport smart cards

Most systems are integrated with public transport smart cards. However, the London scheme is not integrated with the Oyster Card but this will be implemented when the new contract commences in July, 2017. Under the new contract arrangements, the IT aspect of the system will be delivered through a different contract to the supply and operation of the cycles and stations.

2.2.7 Rebalancing and maintenance

Rebalancing of cycles to ensure adequate supply of both cycles and empty docking spaces is an important factor in the efficient operation of the scheme. Most schemes require some level of rebalancing by crews with vehicles. In London there is a strong tidal demand for cycles and this demand is serviced by a significant rebalancing operation. In cities with a hilly topography, rebalancing is needed to ensure there is an adequate supply of cycles for use at the top of hills.

A number of techniques have been employed to incentivise users to help to rebalance the system by docking cycles at certain stations such as providing users with a credit on their account if they dock their cycle at a high demand station. If these measures work, they

present a far more cost effective and sustainable way of managing the supply of cycles and docking stations. Citibike, New York, has recently launched a 'Bike Angels' initiative which uses volunteers to help to address rebalancing issues.

In addition to ensuring the availability of cycles, ensuring that the cycles are in a safe and usable condition is also a key operational consideration. Santander Cycles in London has a performance indicator of 95% of cycles being on-street at all times. This allows for 5% (approximately 500 cycles), of their fleet to be in a workshop for maintenance or repair. As well as fixing cycles in their two workshops, mechanics also travel around the city on mopeds to fix cycles at docking stations.

2.2.8 Helmets

Helmet use is mandatory in Melbourne and Brisbane. Initially courtesy helmets were not provided but were later introduced to boost patronage. The courtesy helmets seem to have been well received by the public. The cost of providing, cleaning and replacing the helmets is not known.

In Melbourne, the City Council subsidises low cost helmets which users can purchase for AU\$5 at a number of convenient and high volume locations. Free courtesy helmets are also available for use and are left with the bike upon completion of the ride.

It is difficult to quantify the impact the helmet law has on patronage in the Brisbane and Melbourne schemes. A limited amount of research has been undertaken and the main barrier to using the cycle hire scheme was identified as convenience. The strongest responses were⁵;

- "Driving is more convenient";
- "Docking stations are not close enough to my house and work"; and
- "I don't want to carry a helmet with me".

In the New York scheme, members receive a coupon to contribute towards the cost of a cycle helmet and in Salt Lake City a limited number of members have been offered a free branded helmet.

There is a legal requirement to wear a bike helmet in Seattle. The approach to helmet provision was well considered during the feasibility stage and various options were costed and considered. The solution was to provide helmet dispensers next to docking stations which reportedly costs approximately US\$200,000 a year to operate and to purchase the helmets which is offset by user fees.

It can be assumed that the need to carry a helmet is likely to be a factor in whether people use the cycles opportunistically in the spur of the moment.

2.2.9 Safety of cycle hire

Cycle Hire safety generally compares favourably with private cycle safety with a lower level of accidents occurring for those on hired cycles. A study in London found that those on Santander Cycles are three times less likely to be injured on a trip than other cyclists.

Hire cycles are heavier and slower than most private cycles and riders have a more stable, upright riding position. The cycles are distinctive in appearance and drivers are perhaps more aware of hire cycles.

Figure 2.1 below illustrates cyclist injury data collected from five cities in the United States that are involved in cycle hire schemes. It indicates that cycle related injuries have reduced following the implementation of cycle hire schemes.

⁵ 2014. Fishman et al. Barriers to bikesharing: an analysis from Melbourne and Brisbane.

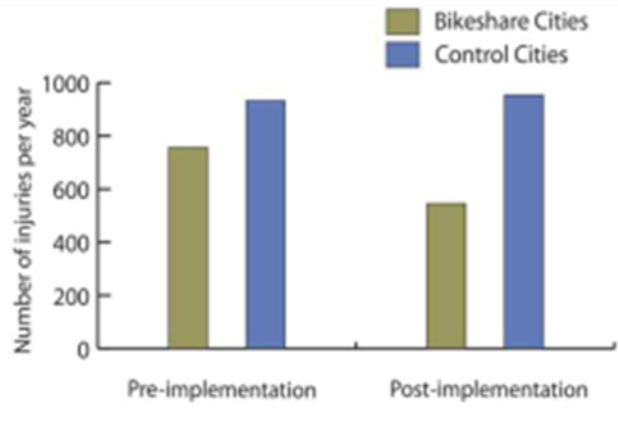


Figure 2.1 Cyclist injury rate for all injuries from five North American cities in the United States⁶

2.2.10 Mode substitution

The objectives differ between schemes and are usually tailored to the circumstances of the city, particularly in terms of the journeys which cycle hire trips may replace.

The public transport network in London is congested (especially during peak hours), and almost 60% of trips undertaken on a hire cycle would previously have been made using public transport. In Brisbane and Melbourne, approximately 20% of cycle hire trips would have been made by car.

Figure 2.2 shows which mode of transport people would have used if the cycle hire scheme did not exist in five different cities.

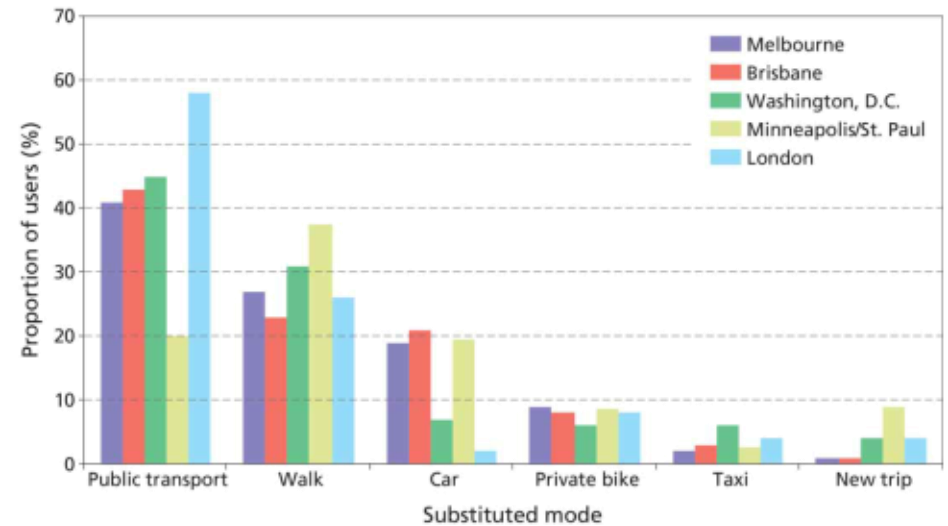


Figure 2.2 Mode substitution in Melbourne, Brisbane, Washington D.C., Minnesota and London⁷

2.2.11 Cycle infrastructure improvements

Many of the schemes were implemented around the same time that new cycleways were built. The London Mayor(s) was keen to promote cycling and improve conditions in the city for cyclists. The development of cycle superhighways and cycle hire schemes was pushed by the Mayor as a way of delivering a high quality transport choice in the city.

Likewise in New York, there was a programme of change to improve streets for pedestrians and cyclists and the cycle hire scheme has complemented this.

⁶ Graves et al. 2014. *Public Bicycle Share Programs and Head Injuries*.

⁷ 2014. Fishman et al. *Bike share's impact on active travel: Evidence from the United States, Great Britain and Australia*.

2.3 Challenges and Successes of Existing Schemes

Table 2.2 summarises some of the challenges and successes experienced by the reviewed cycle hire schemes. The common successes include:

- The coverage area of the launch stage of the scheme was large enough to cater for trips between a variety of trip generators;
- Subsequent phased expansion was planned before the launch and was implemented swiftly afterwards, building on the use already occurring in the initial deployment area;

- Schemes received widespread public and political support;

A key challenge for the majority of schemes is the significant rebalancing operations which are required to ensure an adequate supply of cycles.

Table 2.2 Summary of challenges and successes of international cycle hire schemes

City	Challenges	Successes
Paris	<ul style="list-style-type: none"> • The level of bicycle theft and vandalism of cycles and stations has been higher than expected. • Occasionally there are no cycles at stations. 	<ul style="list-style-type: none"> • The scheme is well used – 86% of Parisiens use Vélib' and each cycle is used around 4.6 times a day. • High level of user satisfaction – 87% like the service and 99% would recommend it to a friend. • Around 8% of tourists visiting Paris use Vélib'. • The profile of cycling has improved and the number of cycles in Paris has increased by 41%. Car use has decreased by 25%.
London	<ul style="list-style-type: none"> • There is a significant rebalancing operation to ensure adequate supply of cycles. Notwithstanding this the performance indicators which measure full and empty docking stations are in the failing zone. • In 2014 an economic appraisal of the scheme calculated the Benefit-To-Cost Ratio (BCR) for the scheme of 0.7:1. • The level of use of each bike (around 2.5 uses a day) is on the lower end of what is considered desirable from a cost / benefit perspective. 	<ul style="list-style-type: none"> • The scheme is very popular with users and has firmly established itself as a viable transport choice. • The branding / sponsorship of the scheme is very visible • The scheme has had a positive impact on cycling in London. • The scheme is well regarded by users; surveys conducted in 2015 show a high level of satisfaction, 86% of casual users and 80% of members were satisfied with the service. • Cyclists on Santander Cycles are 3 times less likely to be involved in an injury accident than cyclists on private cycles.

City	Challenges	Successes
New York	<ul style="list-style-type: none"> Initial problems were experienced with software. The resolution of the problems entailed a retrofit of all of the docking spaces. Ensuring the supply of cycles and docking spaces is a challenge. 	<ul style="list-style-type: none"> The scheme has been well received and is well used. Each cycle is used for around 6 trips a day. Solutions have been swiftly implemented to overcome some challenges. The 'Bike Angels' scheme has been recently launched to incentivise rebalancing.
Brisbane	<ul style="list-style-type: none"> There is a very low level of use per cycle - around 0.56 uses a day. Initially the scheme operated between 5am to 10pm which drew some criticism, the bikes are now available 24/7. The level of public subsidy is higher than anticipated. This has hindered political support for the scheme. There is a legal requirement to wear a bike helmet in Brisbane. 	<ul style="list-style-type: none"> The scheme is well-liked by users. Use of the scheme continues to grow each year. CityCycle users said that they felt safer on a CityCycle than their own private bike. Initially courtesy helmets were not provided but were later introduced and this move boosted patronage.
Melbourne	<ul style="list-style-type: none"> The scheme has very low levels of patronage, with each cycle achieving between 0.4 and 0.8 uses a day. Promotion of the scheme has been limited. The area covered by the scheme is relatively compact and lack of investment has prevented scheme expansion. The free tram zone in the city centre has had a detrimental impact on the scheme within this area. There is a legal requirement to wear a bike helmet in Melbourne. 	<ul style="list-style-type: none"> The scheme has improved accessibility in areas of poor public transport provision. Five stations have been relocated to outside the free tram zone. Since relocation a 135% increase in use has been seen between the five stations. When courtesy helmets were introduced, there was an increase in scheme patronage of almost 50%.
Guangzhou	<ul style="list-style-type: none"> Users must register to join the scheme in person at a registration outlet. 	<ul style="list-style-type: none"> The scheme has been well received and delivered as part of a city-changing approach to how people travel.
The Netherlands (OV Fiets)	<ul style="list-style-type: none"> The original OV Fiets bike has been criticised for being unsuitable for longer journeys and it does not fit in a standard bike parking rack. Users must have a Dutch credit or debit card. 	<ul style="list-style-type: none"> The scheme is popular and subscription and use is growing each year. Try out roadshows were held to enable users to help select the OV-Fiets mark 2 cycle.
Madrid	<ul style="list-style-type: none"> There has been a significant level of cycle theft and vandalism. The supply of cycles at certain locations does not always meet the demand. There have been problems with securing the funding to expand the scheme and the City Council has had to contribute more than was originally anticipated. 	<ul style="list-style-type: none"> The cycles are well used.
Seattle	<ul style="list-style-type: none"> The scheme is not well used with each cycle achieving around 0.77 uses a day. The service area of the scheme is small (around 7km²) and the station density is below the optimal level. 	<ul style="list-style-type: none"> The cycles weigh less than those used in other schemes and have 7 gears. Helmets are provided at dispensers next to docking stations. This costs around US\$200,000 a year.

City	Challenges	Successes
	<ul style="list-style-type: none"> The steep topography of Seattle means 61% of journeys are undertaken with a downhill destination, giving rise to the need for rebalancing between uphill and downhill stations. There is a legal requirement to wear a bike helmet in Seattle. 	

2.4 Lessons Learnt from the Review of Existing Schemes

The cycle hire schemes all differ in terms of underlying objectives, size, infrastructure requirements, technology and funding models and have experienced varying levels of success as a result. Appendix A1 and Appendix A2 provide a detailed outline of the key business and operational findings for each scheme.

The key lessons learnt from the review include:

- Public subsidy of a cycle hire scheme is the norm and should be planned and budgeted for. Cycle hire schemes should be viewed as a part of the public transport network and subsidised in a similar way.
- Riding a hire cycle is safer than riding a private cycle.
- Cycle hire schemes have the potential to provide improved accessibility to areas which are poorly served by public transport (based on evidence from the Melbourne scheme).
- There is a strong correlation between employment location and patronage. In Melbourne and Brisbane, around 83% of scheme members work within 500m of a docking station.
- Convenience is a key factor for users.
- Rebalancing is a critical part of the scheme operation and can be costly. Potential efficiencies can be found by finding innovative ways for users to rebalance the system.

- Recent developments in technology mean that smart docking stations may be replaced by the smart technology on the cycles (as in the Portland scheme).
- The ratio of cycles to docking spaces tends to be between 1:1.5 and 1:2.
- Most new schemes launch during the summer months.
- The most successful schemes launch with an initial deployment area and have well developed plans for expansion phases which are implemented swiftly after the initial launch. Ongoing expansion of the cycle hire scheme is usual.
- Docking stations should be around 300m apart.
- The deployment area needs to be large enough to cater for trips between a variety of generators so that users can access a variety of locations.
- Branding, marketing/promotion and sponsorship are important elements of the scheme and should be carefully planned.

3. Auckland Cycle Hire Assessment

Many factors influence the likely success or failure of a cycle hire scheme and these factors are broadly related to the natural and built environment, people and travel choices. This section discusses these factors in more detail to forecast what the demand for a cycle hire scheme in Auckland is likely to be.

3.1 Achieving Transformational Change

Cycle hire schemes have a pivotal role to play in achieving step change growth in both the uptake of cycling and also the improvement of cycle safety. This is partly due to the concept of 'safety in numbers' which identifies that cyclists are less likely to get injured when there are high volumes of bicycle use⁸. Cycle hire schemes also help to normalise cycling and often introduce people to cycling who would otherwise not be, such as 'interested but concerned' cyclists (as shown in Figure 3.1).

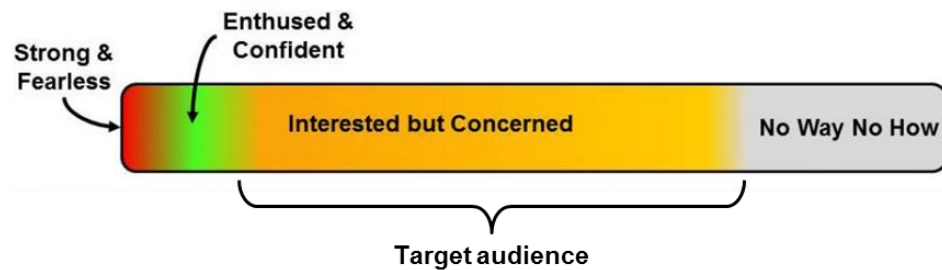


Figure 3.1 Cyclist type classification⁹

Moreover, research has identified that cycle hire schemes are associated with general reduction in cycle injury risk along with a specific reduction in the likelihood that cycle hire users will suffer fatal or severe injuries compared to other cyclists¹⁰.

3.1.1 Commuting trends in Auckland

The dominant trend relating to commuting patterns is the movement of people from the outer suburbs to the inner urban area for employment with 57% of all commuting trips ending in this area based upon 2013 census data¹¹. The significant number of people commuting from the outer suburbs to the inner suburbs places pressures on the transport network; particularly during peak travel times. This is illustrated in Figure 3.2 which identifies that although the number of trips into the city centre is highest in the inner suburbs, there are also a considerable number of trips from the outer suburbs.

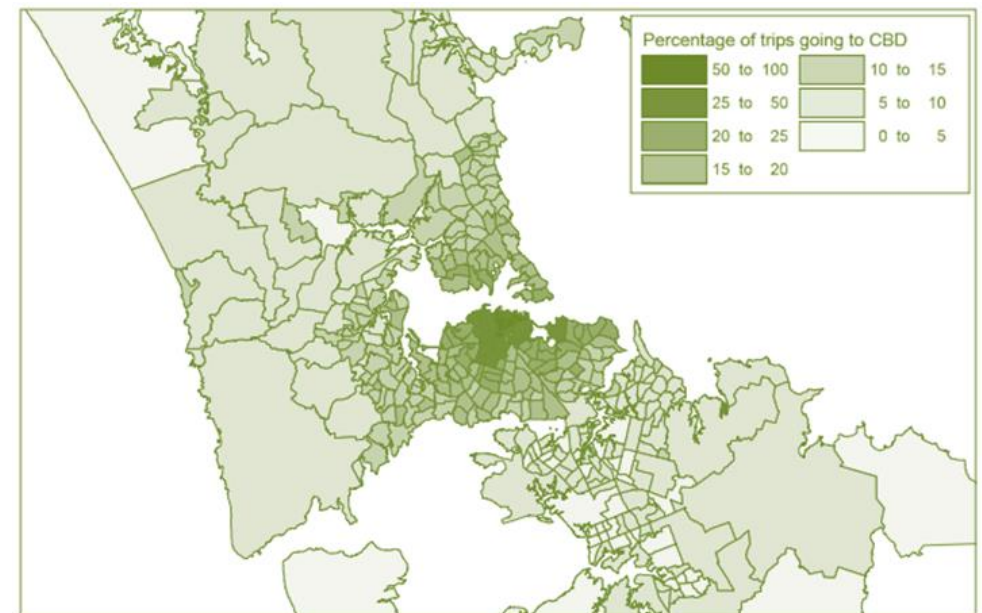


Figure 3.2 Percentage of trips going towards the CBD by origin location based on 2013 census data¹²

⁸ 2003. Jacobsen, P. L. *Safety in numbers: More walkers and bicyclists, safer walking and bicycling*.

⁹ 2009. Geller, R. *Four Types of Cyclists*. Portland, United States.

¹⁰ 2015. Fishman, E. & Schepers, P. *Global bike share; what the data tells us about road safety*.

¹¹ 2014. Richard Paling Consulting. *Journey to work patterns in the Auckland Region: Analysis of Census Data for 2001-2013*.

¹² 2014. Richard Paling Consulting. *Journey to work patterns in the Auckland Region: Analysis of Census Data for 2001-2013*.

Although the introduction of the Northern Busway and the improvement of train services have helped to alleviate pressures on the road network, a significant percentage of journeys into the city centre are still made by private vehicles.

Although many people continue to travel into the city centre by private vehicle, the use of public transport is steadily increasing. The 2013 Screenline Transport Survey found that 47.5% of trips into the city centre during the peak morning period were made using public transport¹³. The use of public transport to access the city centre is predicted to further increase as a result of delivering projects which aim to expand the capacity of the public transport network.

3.1.2 The 'bike & train' concept and applicability to Auckland

The 'bike and train' concept emerged from the Netherlands as a way for public transport (primarily train based), to compete with the private motor vehicle for longer distance commuting trips.

The concept behind bike and train is that the slowest part of train journeys is between the origin or destination and the train station¹⁴. Therefore, if this section of the journey could be sped up, a train-based journey could be faster than one undertaken by private vehicle.

As cycling is often the quickest mode of transport in complex urban environments, if these egress trips were undertaken by cycle then the overall travel time of the train based journey would be significantly improved. This would effectively increase the competitive advantage of train travel.

Another advantage of switching these egress journeys to cycle-based journeys is that the catchment area of transit hubs would significantly increase from between 1-2 km for a walking catchment to approximately 4 km for a cycling catchment¹⁵ as shown in Figure 3.3. This is especially relevant to Auckland as only 14% of people in Auckland live within walking distance of frequent or rapid public transport stops¹⁶.

This not only increases the overall service area of a transit hub but also could mean that fewer train stations are required. This increases the overall speed of the rail service as the train has to stop less often.

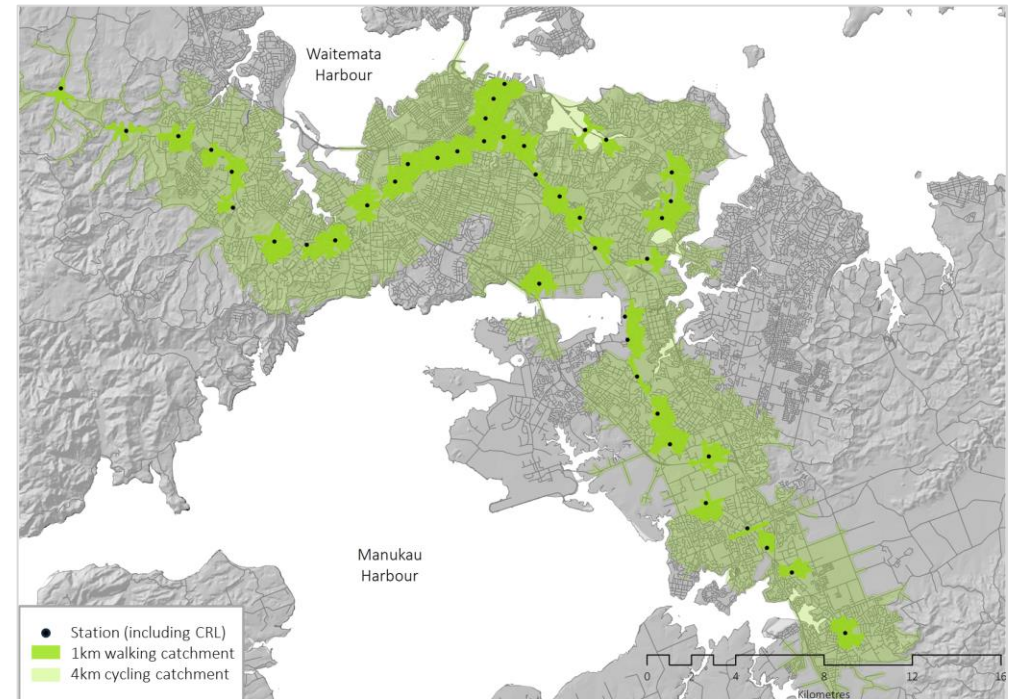


Figure 3.3 Increased service area of rail network

As the majority of commuting trips undertaken in Auckland are from the outer (origin) suburbs to the inner (destination) suburbs, the introduction of the bike and train concept could have considerable advantages including:

- Reduction in overall travel time, increasing the competitive advantage of public transport;
- Reduction in congestion on roads, increasing capacity for the movement of freight;

¹³ 2014. Traffic Design Group Ltd. *Passenger Transport Patronage Surveys: Screenline 70 Inbound summary report.*

¹⁴ 2016. Kager, R. *Cycling and Transit - Competition, Synergy or both?*

¹⁵ 2016. Kager, R. *Cycling and Transit - Competition, Synergy or both?*

¹⁶ 2015. Auckland Transport. *Auckland Regional Public Transport Plan.*

- The requirement for fewer public transport stations and associated capital expenditure – cycle hire scheme infrastructure costs are considerably less than bus or rail capital expenditure; and
- A healthier population due to the promotion of active transport as part of everyday activities.

Figure 3.4 and Table 3.1 present the patronage data for Auckland’s busiest stations in the rail network for 2014/2015 and 2015/2016.

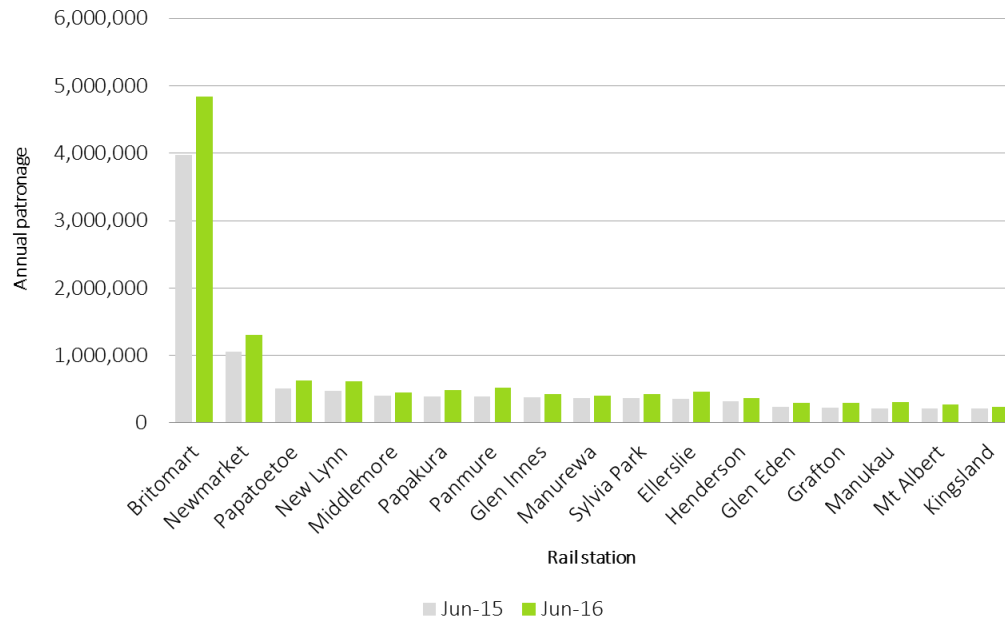


Figure 3.4 Auckland train stations with highest annual patronage¹⁷

Table 3.1 Annual patronage of the busiest Auckland train stations¹⁸

Station	2014/2015	2015/2016
Britomart	3,973,982	4,840,540
Newmarket	1,057,911	1,303,920
Papatoetoe	508,588	632,444
New Lynn	469,420	613,908
Middlemore	398,499	452,529
Papakura	391,666	489,852
Panmure	386,399	521,419
Glen Innes	375,683	427,843
Manurewa	369,404	397,801
Sylvia Park	369,343	426,823
Ellerslie	360,293	462,110
Henderson	316,797	370,395
Glen Eden	238,891	291,218
Grafton	228,722	298,567
Manukau	217,953	312,324
Mt. Albert	215,195	266,526
Kingsland	210,186	231,736

The bike and train system relies on the use of the cycle for at least one leg and sometimes two legs of the overall journey. If cycling for two legs, the customer would cycle to access the departure station from the origin location and to access the end destination from the arrival train station.

¹⁷ 2016. Auckland Transport. *Annual rail patronage data for 2015-2016*.

¹⁸ 2016. Auckland Transport. *Annual rail patronage data for 2015-2016*.

The first leg of the bike and train trip (from the origin location to the departure train station), is typically undertaken on a personal cycle due to the train station acting as the converging point of multiple trips over a broad catchment area. This converging nature of trips makes a cycle hire scheme infeasible unless a dense network of cycle hire stations can be achieved. To encourage converging trips, secure cycle facilities could be provided.

The second leg of the bike and train trip is the train trip between the departure train station and the arrival train station. The availability of a cycle hire scheme at the arrival train station also allows people to park the cycle at the departure station, thereby freeing up valuable space on the train.

The third leg of the bike and train trip (from the arrival station to the end destination), is ideally suited to the provision of a cycle hire scheme due to the diverging nature of trips. This requires a high level of density for docking stations at the end destination.

The key messages in promoting cycle hire schemes as part of a larger bike and train system include:

- Riding a cycle in a complex urban environment is often quicker than walking and motorised transport;
- Cycle hire schemes are convenient and do not require people to maintain and store cycles at home or to take cycles on public transport; and
- The trip on a hire cycle is often 'free' if a yearly subscription is purchased and the cycle is checked out for only a short period of time.

3.1.3 Mode substitution

The choice to use a hire cycle is most likely at the expense of a trip on public transport or walking¹⁹.

If the rollout of a cycle hire scheme is to specifically target car use, the hire scheme needs to be considered as part of larger trip chain in order to achieve this substitution. In an Auckland context, introducing a cycle hire scheme is not likely to significantly change

mode choice but could increase cycle mode share if coupled with improved cycle infrastructure, facilities and education programmes.

3.1.4 Role of cycle hire schemes in the commuting context

There are two main ways in which cycle hire schemes can be utilised in the commuting context, these are; the substitution for short trips (1-5km) from being vehicle based to cycle based and the incorporation into the bike and train system as a means of facilitating egress trips to transit hubs.

Due to the complex nature of the urban environment, short trips are often quicker by cycle. For trips up to 1 km, the competitive advantage is typically with walking; however, for trips between 1 and 5 km, the advantage is in cycling as motorised transport is often hampered by high traffic volumes and the absence of cheap and convenient parking.

If a cycle hire scheme is to target these short trips, cycle docking stations need to be located in an area that is most convenient to the largest number of people and the density of the network needs to be right to allow for optimal use.

In the bike and train system, egress trips to train stations are often undertaken on personal cycles whilst egress trips away from stations are often undertaken on hired cycles; therefore, docking stations need to be located adjacent to destination train stations. If the intention of the hire scheme is to target these egress trips then the following factors need to be considered when designing the scheme:

- **Docking stations** - need to have enough cycles to meet demand and be located next to destination stations to increase the convenience of the scheme, therefore increasing utilisation; and
- **Scheme design** - the hire scheme can either be designed to ensure that there are docking stations adjacent to key employment locations or designed so that cycles are hired for a period of one day. If the intention is to allow one day hires then there needs to be sufficient availability of cycles at destination train stations and pricing needs to remain attractive to ensure that the scheme is utilised.

¹⁹ 2014. Fishman, E., Washington, S., & Haworth, N. *Bike share's impact on car use: Evidence from the United States, Great Britain and Australia.*

3.2 Demand Analysis

3.2.1 Identifying the target market

In general, four groups of people are likely to be the target market of any cycle hire scheme: commuters, leisure users, tourists and opportune users. In identifying the target audience it is important to understand that each of these groups would place different requirements onto any potential scheme, therefore it is important to understand these requirements so that they are able to be incorporated into the design of the scheme.

- **Commuters** - commuters would tend to use hire cycles as part of a larger trip chain, often for egress trips after taking a train or bus rapid transit (the main component of their trip chain). Hire schemes targeting the commuter audience are often designed so that the whole trip chain (train/bus + bike) is seen as a viable alternative to the use of the private car.

The key characteristics of a hire scheme targeting the commuter audience relate to: price point, convenience of use and pick up/return to stations located next to public transport interchanges.

An effective example of a hire scheme targeting this audience is the OV-Fiets programme in the Netherlands.

- **Leisure users** - leisure users are likely to use hire cycles as part of a larger day trip to explore a specific destination. The attraction of hire schemes to leisure users is that they are seen as an enjoyable, convenient and inexpensive way to explore a destination.

The key characteristics of a hire scheme targeting the leisure audience relate to: convenience of use (locations next to public transport), cycle comfort and the enjoyment provided by this mode of transport

An example of a hire scheme targeting this audience is the OV-Fiets programme in the Netherlands.

- **Tourists** - tourists are likely to use cycle hire schemes to explore specific locations or sections of a city (for example to get around a park or waterfront) and will often use hire schemes on impulse as they offer a cheap, convenient and fun

means of transportation. Tourists will often only utilise hire cycles for short periods of time (for example, the 30 minute period of free hire offered by some schemes).

The key considerations for a hire scheme targeting tourists include locating hire stations nearby key attractions and destinations, price and convenience of use.

Effective examples of hire schemes targeting this audience include Velib in Paris, Santander Cycles in London and Citibike in New York.

- **Opportune users** - opportune users are unlikely to put much thought into the use of hire cycles to carry out tasks as part of daily life. The key to opportune use is that the decision to use the cycle is carried out unintentionally in the spur of the moment.

As the decision to use a hire scheme by opportune users is carried out unintentionally it is important that the scheme is presented in a way that builds into this unintentional use. Key features to attract opportune users revolve around the perceived convenience of use (e.g. docking station locations, price and ease of use).

3.2.2 Key scheme requirements

Each of the four target audiences listed above will have different requirements that need to be fulfilled before this audience is likely to use a cycle hire scheme. These requirements are summarised in Table 3.2.

Table 3.2 Target market requirements for a cycle hire scheme

Requirement	Commuters	Tourists	Leisure	Opportune users
Hire stations located next to public transport	Very important	Somewhat important	Somewhat important	Somewhat important
Hire stations located next to key activity areas	Somewhat important	Very important	Somewhat important	Very important
Hire cycle used as part of a larger trip chain	Very important	Somewhat important	Very important	Not important
Price point to be competitive with other transport modes	Very important	Somewhat important	Somewhat important	Very important
Ease of use, time to hire	Very important	Very important	Somewhat important	Very important
Cycle comfort vs speed	Speed	Comfort	Comfort	N/A
Hire periods (day vs hours)	30 minutes to hours	30 minutes to hours	Half day to day	30 minutes to hours
Convenience (stations are visible, easy to access and use)	Very important	Very important	Very important	Very important

3.2.3 Specific factors influencing cycle hire demand

Cycle hire schemes achieve a higher rate of cycle hires in locations with low cycle modal share²⁰ with schemes known to fail in locations with high levels of cycling as the mains users of these schemes are tourists.

The decision to use a bike hire scheme for a typical journey depends on:

- a) How quick, easy and cheap is it to make the journey by bike?
- b) How difficult, slow and expensive is it to make the same journey by an alternative means?

If it is quick and easy for a large number of people to make the journey by bike and slow, expensive and inconvenient to make the journey by other means then the scheme is likely to attract a high level of use²¹. In addition, previous research has identified that the following factors also influence the overall success of the scheme²²:

- **Cycle friendliness**
A cycle hire scheme is more likely to be successful if there is an attractive network of cycle friendly routes. This does not specifically mean that a comprehensive cycle network is required but rather how attractive, safe and navigable is the area covered by the hire scheme for cycling.
- **Traffic congestion and overcrowding of public transport**
Congestion of roads and overcrowding of buses and trains present alternative transport modes such as cycling in a more favourable light. Research from London identifies that the main mode switch to cycling comes from public transport. Conversely, if streets are not heavily congested and if public transport is attractive, affordable and reliable, there is less incentive to switch to the cycle. In Melbourne the introduction of the free-tram zone has had a negative impact on use of Melbourne Bike Share within the zone.

²⁰ 2011. *Optimising Bike Sharing in European Cities: A handbook.*

²¹ 2011. Jacobs Engineering Ireland Ltd. *Proposals for Introducing Public Bike Schemes in Regional Cities – Technical Feasibility Study.*

²² 2011. Jacobs Engineering Ireland Ltd. *Proposals for Introducing Public Bike Schemes in Regional Cities – Technical Feasibility Study.*

- **Cost and availability of car parking**

Cycle hire schemes are likely to have a higher appeal if the cost of car parking is high and is in a limited supply and/or difficult to access. High car ownership, low levels of congestion and cheap car parking would provide people with little incentive to use a cycle hire scheme.

- **City size**

Mobility demand is higher in areas with high population and employment densities therefore cycle hire schemes are likely to be more successful in larger cities compare to smaller ones. Therefore as demand is higher in larger cities there is often a higher density of cycle hire stations (and the number of cycles available at each station), to meet this demand. Moreover, as larger cities are likely to face problems associated with congestion and a limited amount of car parking spaces, cycling becomes a viable alternative over short distances (up to 7km).

- **Size and distribution of student population**

Analysis conducted during the implementation of the London cycle hire scheme identified that students are likely to have the highest uptake of a hire scheme when compared against all other potential users. The favourability of hire schemes among students is likely do with the appeal of a cheap (almost free) mode of transport along with the difficulty of storing a cycle in student accommodation and concerns about bike theft.

The success in which a hire scheme can attract the student population is linked to how well the distribution and density of docking stations links up with the origins and destinations of students intended trips. In addition to this, it is unlikely that a cycle hire scheme would be able to serve a student campus that is several kilometres from a city centre due to dense distribution of docking stations required.

- **Density and distribution of trip attractors**

Analysis conducted during the implementation of the London cycle hire scheme identified that the ideal trip length on a hire cycle was between 1 and 8 km. For trips less than 1 km, walking is a more attractive transport mode and for trips over this taking public transport is likely to be more efficient. However, in reality, trips undertaken on cycle share bikes are likely to be much shorter (under 20 minutes for 4 km), with the range of 1 to 5 km being the ideal.

Cities where the key trip attractors are between 1 and 5 km apart are likely to attract a high degree of cycle hire use.

- **Tourism**

Cycle hire schemes are becoming increasingly popular with tourists as they offer an inexpensive and novel way to explore a destination. Because of this cycle hire schemes are becoming an integral part of how cities market themselves to both local and international audiences. An example of this is in Paris where the phrase “La Ville est plus belle a velo” (‘the city is more beautiful by bike’), is used to attract tourists to use the cycle hire scheme.

An important consideration in attracting tourists to use a hire scheme is to ensure that visitors are able to access the scheme on a casual basis rather than on a monthly or yearly subscription. In addition to this overall user friendliness of the hire scheme is also important.

3.2.4 Basis for demand predictions

The development of detailed demand predictions for a potential cycle hire scheme requires the undertaking of market research in order to determine the willingness of certain populations to use the scheme. It is recommended that this market research is undertaken if Auckland Transport decides to further investigate the feasibility of a cycle hire scheme. The Institute for Transportation and Development Policy (ITDP) Bike-share Planning Guide states the ideal ratio of bikes per population is between 10 and 30 bikes per 1,000 residents²³.

3.2.5 Predicting demand for a potential cycle hire scheme in Auckland

Predicting demand of a cycle hire scheme consists of firstly calculating the base requirement of the scheme (e.g. number of bikes, docking stations and scheme size). This base rate should be considered as a bare minimum requirement for the operation of any scheme. After the base rate has been calculated then it is possible to calculate the inflated rate which is how many cycles and docking stations the scheme realistically requires.

The base rate: the base rate was calculated to determine what the base requirement for a cycle hire scheme would be and assumes a uniform trip distribution (e.g. there are no destinations of particular importance). Once the base rate has been calculated it is

²³ 2013. *Bike Share Planning guide*. Institute for Transportation and Development Policy.

possible to build on this rate to gain a realistic picture about the potential demand for a cycle hire scheme in Auckland.

Table 3.3 identifies the base rate of a cycle hire scheme focused on the core of the CBD based upon population counts from the 2013 census and assumes a requirement of 10 bikes per 1,000 people as a bare minimum provision²⁴.

Table 3.3 Base rate calculations of a bike share serving the core of central Auckland

Area Unit	Population	Number of cycles required
Harbourside	4,500	45
Auckland Central West	11,700	117
Auckland Central East	10,104	101
Total	39,858	399

The inflated rate: once this base rate has been calculated for potential cycle hire scheme locations then it is possible to inflate the number of cycles required based around various weighting factors including:

- Employment density (number of employees and density of work places in a given area);
- Number and concentration of key activity areas and tourist attractions (shopping areas, museums, public spaces etc.);
- Presence of universities and other tertiary education providers;
- Availability of alternative transport modes (if there is limited transport options available then demand for a hire scheme will be increased); and
- Any potential decrease in use due to hilly conditions.

In factoring in inflations on the base rate, it is important to account for any reduction in usage of the scheme due to mandatory helmet laws. New Zealand law actively enforces mandatory cycle helmets use and this is likely to impact how the cycle hire scheme will be

used. The base rate forecast for a cycle scheme in King County, United States, assumed that casual trips would be approximately 30% lower due to the compulsory helmet requirement²⁵.

The fact that the system will operate within a helmet law environment will impact how the system is used. Whilst there is likely a portion of the community that will decide not to use the bike share system because they are required to wear a helmet, there will also be potential users that will decide to use the system because of the access provided to helmets. This is discussed further below.

3.2.6 Projected demand

In predicting the projected demand for a cycle hire scheme, it is important to firstly identify that demand predictions are likely to vary dependant on the design of the scheme and the target audience. For example a catchment orientated cycle hire scheme targeting commuters is likely to have different factors influencing scheme demand compared to a blanket inner city scheme.

The factors which influence a catchment based scheme include the following:

- Catchment size;
- Population size of the catchment along with net increase;
- Number and density of residential units/address points;
- Commuter flows into the central city/ number of train boardings; and
- Mode share.

The factors which will influence the demand for a blanket city based scheme include the following:

- Population growth and housing density;
- Employment growth and workplace density;

²⁴ 2013. *Bike Share Planning guide*. Institute for Transportation and Development Policy.

²⁵ 2012. *King County Bicycle Share Business Plan*. Alta Planning + Design. United States.

- Number of train disembarkations (net increase);
- The quality and extent of the cycle network (particularly separated cycle ways); and
- Increase in tourism and the development on new visitor attractions.

Based upon these factors, it is likely that the projected demand for a cycle hire scheme is likely to increase in the foreseeable future, particularly in the city centre. The Auckland Regional Transport (ART3)²⁶ strategic model estimates a considerable increase in employment and residential land use to 2026 as summarised in Table 3.4. The combined employment and population density in 2026 is shown in Figure 3.5.

Table 3.4 ART3 land use forecasts for 2016 and 2026

City centre zone	Employment		Population	
	2016	2026	2016	2026
Harbourside	31,700	42,600	4,300	7,300
Auckland Central West	28,000	55,600	19,400	24,300
Auckland Central East	13,100	16,900	10,200	12,900
Total	72,800	115,100	34,000	44,400

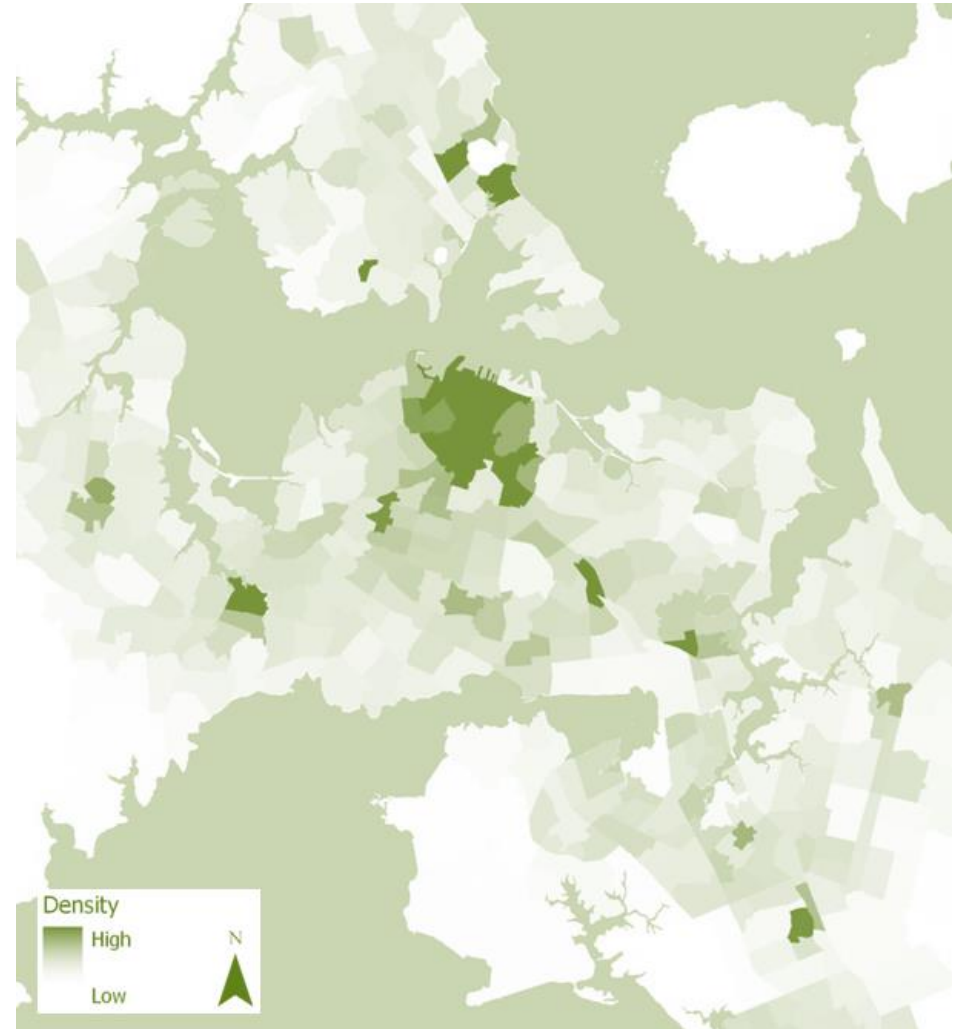


Figure 3.5 Combined employment and population density in 2026

²⁶ Auckland Council. Scenario 1 version 9 land use forecasts.

3.3 Cycle Hire Scheme

Based upon our research and lessons learnt from other systems, three different design options for a cycle hire scheme have been assessed as part of this study, which include:

- **Option 1:** A scheme consisting of a dense network of hire locations in the city centre;
- **Option 2:** A commuter orientated scheme; and
- **Option 3:** A hybrid of the central city and commuter orientated scheme.

3.3.1 Option 1 – Dense central city cycle hire scheme

Option 1 proposes a central city cycle hire network based around the concept of establishing a dense network of docking stations located approximately 300m apart to ensure maximum usage. The intention of this option would be to capture usage based around the key attractors identified in Table 3.5.

Indicative locations for cycle hire stations in the city centre are shown in Figure 3.6. Figure 3.7 includes a 300m by 300m grid overlay to show the approximate recommended cycle hire station spacing.

Table 3.5 Key benefits of providing cycle hire stations at key city centre precincts

City centre precincts	Key benefits
Britomart / Downtown	<ul style="list-style-type: none"> • Captures rail based commuters of the busiest station in the network • Key tourist location • Catchment area includes the lower CBD and waterfront • Establish eastern, southern and western connections • Very high employment density • Very flat topography • New cycleways being planned and delivered
Wynyard Quarter	<ul style="list-style-type: none"> • Emerging employment hub and residential area that is currently underserved by public transport • Significant growth area • Key tourist location • Establish east-west connection with Britomart • Very flat topography • New cycleways being planned and delivered
Midtown	<ul style="list-style-type: none"> • Entertainment and cultural hub • Establish Northern connection with Britomart • Significant growth area • Aotea Station is predicted to become one of the busiest train stations following implementation of the CRL • High population density • New cycleways being planned and delivered • Moderate slope

City centre precincts	Key benefits
Victoria Quarter	<ul style="list-style-type: none"> • Entertainment hub • Tourist destination • High population density • Significant growth area • Moderate slope • New cycleways being planned and delivered
Beach Road	<ul style="list-style-type: none"> • Establish western connection with Britomart • Establish eastern connection with Vector Arena and ASB Tennis Centre • High population and employment density • Very flat topography • New cycleways being planned and delivered
Learning Quarter	<ul style="list-style-type: none"> • High employment density • Key activity area • High student population • Moderate to steep slope • New cycleways being planned and delivered
Newmarket/ Auckland City Hospital/Grafton	<ul style="list-style-type: none"> • High population and employment density • Key activity area and tourist destination • High student use • Flat to moderate slope • New cycleways being planned and delivered (current 24 hour bus lanes can be used in the interim)



Figure 3.6 Cycle hire scheme design – Option 1 showing indicative cycle hire station locations in the city centre



Figure 3.7 Cycle hire scheme design – Option 1 showing indicative cycle hire station locations in the city centre and gridlines at 300m spacings

3.3.2 Option 2 - Commuter orientated cycle hire scheme

Option 2 is a commuter based cycle hire scheme designed to capture the egress trips undertaken as part of a larger train based journey (as shown in Figure 3.8). In the design of a commuter based scheme it is important to consider these key questions:

- **Should there be a uniform approach across all stations in the transit network?**

One option is to treat all stations as equally important with the goal to improve ridership across the whole network. If this is the case then there is a possibility that providing the hire scheme in the catchment of all stations on the network may be advantageous.

- **Is it best to only target the key destination stations for commuter trips? (e.g. Britomart and Newmarket)**

Another option is that egress trips to the train station are most likely to be undertaken on private cycles, therefore there is little to be gained by locating cycle hire schemes at all train stations. Instead, hire schemes should be targeting destination stations where there is a high concentration of employment in the surrounding area.

- **Should specific stations be targeted? For example, only those stations with the highest or lowest ridership?**

The final option is to target specific stations to increase ridership in a specific area, for example targeting the high car dependence in the area surrounding Manukau Station and Manukau Institute of Technology (MIT) as shown in Figure 3.9. A scheme targeting this area would have the advantage of being able to attract both people travelling into the area due to the presence of MIT as well as people travelling out of the area for work.

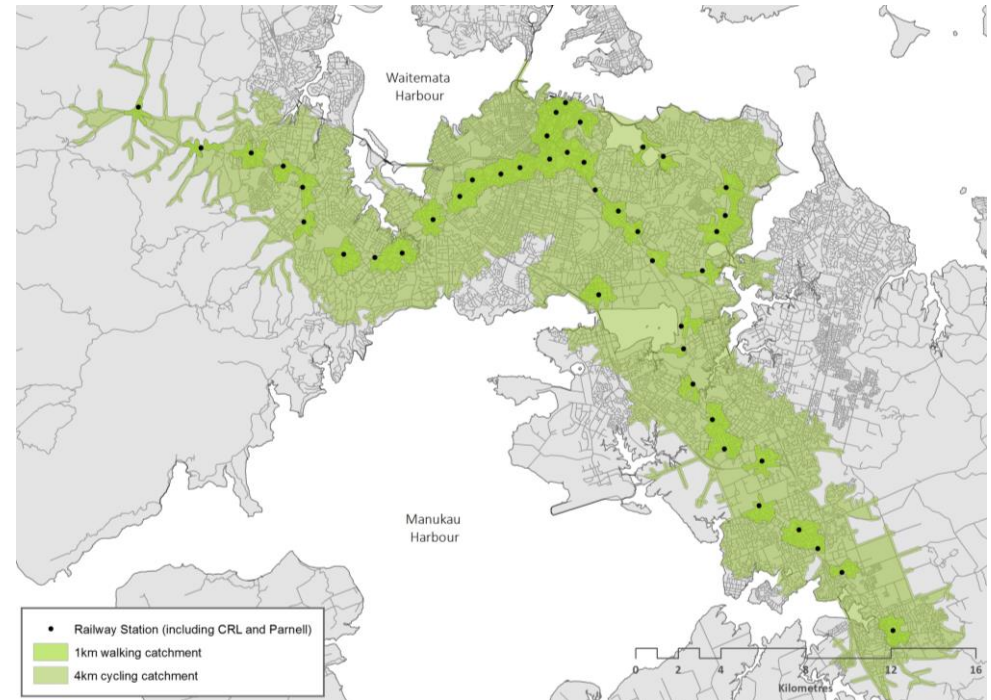


Figure 3.8 Cycle hire scheme design – Option 2

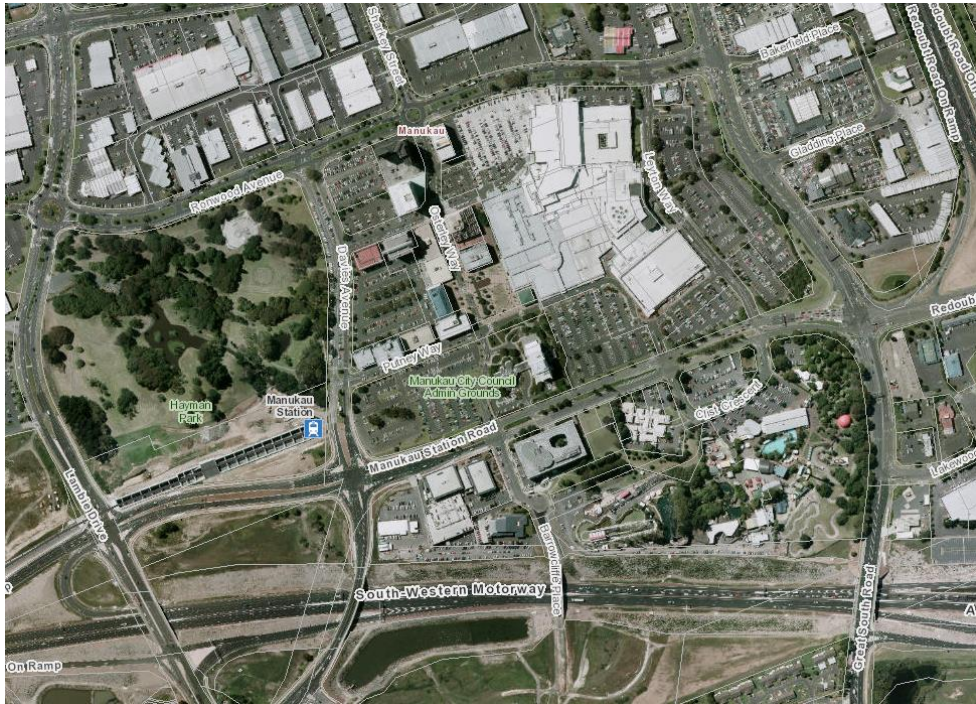


Figure 3.9 Manukau Station and MIT aerial

3.3.3 Option 3 – Hybrid scheme

The final option considers a hybrid which incorporates aspects of both Options 1 and 2 and would be carried out in two stages as shown in Figure 3.10.

Stage 1 would consist of two phases and the first phase (1A), would be centred around Britomart with the cycle hire station network radiating out towards Wynyard Quarter, Aotea Quarter and the Learning Quarter. Cycle hire stations are recommended approximately 300m from each other. Building on the success of Stage 1A, it is recommended that Stage 1B be implemented shortly afterwards and involves incrementally extending the cycle hire network to Devonport, Ponsonby, Westhaven, Newmarket, Parnell and along the waterfront to the Eastern Bays.

Following Stages 1A and 1B, Stage 2 would involve the establishment of cycle hire stations at key train stations including Mt Eden, Kingsland, Morningside and Remuera as warranted by demand. This is designed to capture egress trips undertaken as longer, train-based trips. This will encourage people to cycle to and from these stations and would significantly increase the catchment of these stations. It should be noted that timing is critical to the success of Stage 2 as it is highly contingent on the successful implementation of a dense network within the city centre and city fringe areas (Stages 1A and 1B).

The benefits of Option 3 are that it would increase the physical presence of cycling in central Auckland whilst removing the requirement to have docking stations in locations that are unlikely to achieve a high patronage (i.e. lower patronage stations in the outer suburbs).

Overall, Option 3 would:

- Increase the physical presence of cycling in central Auckland;
- Provide train passengers exiting Britomart, Newmarket, Grafton, Mt Eden and Kingsland, Remuera, Morningside and Parnell stations with a viable cycling option to complete their trip;
- Focus on key trip generators (employment hubs, key attractions, the Learning Quarter and the waterfront); and
- Provide a two-stage approach (Stages 1A/1B followed by Stage 2), to implementing a successful cycle hire scheme in Auckland.

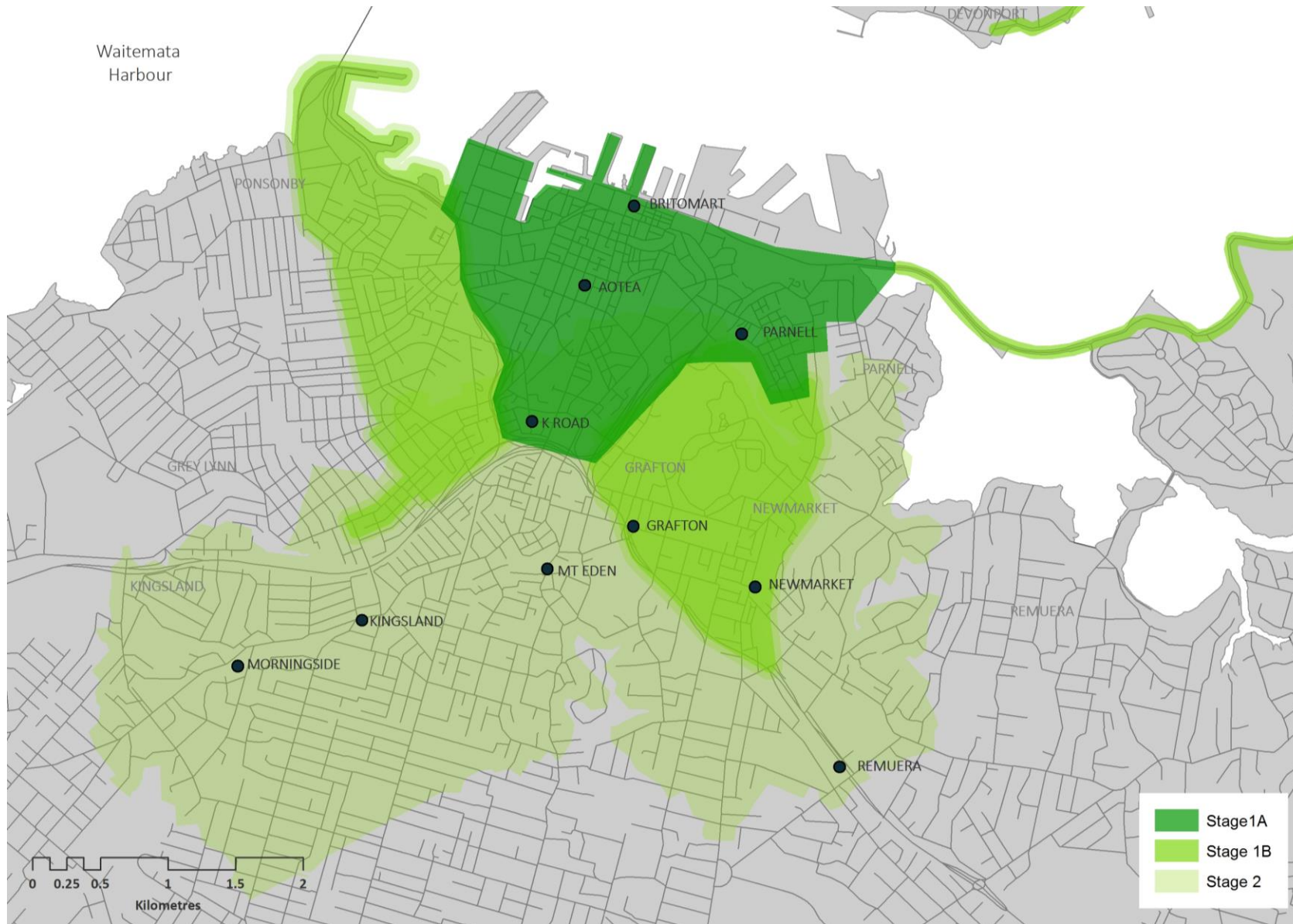


Figure 3.10 Cycle hire scheme design - Option 3, shown as a two-stage approach (Stages 1A/1B followed by Stage 2)

4. Cycle Hire Scheme Design

Cycle hire schemes consist of two components as shown in Figure 4.1; factors relating to the physical design of the scheme (e.g. type of bikes, docking stations etc.) and factors relating to the institutional design of the scheme (e.g. contract tendering, costs and financing). Although only the physical factors may be visible, the success of any hire scheme depends on the careful design and implementation of both the physical and institutional factors.



Figure 4.1 Components of cycle hire schemes²⁷

4.1 Physical Design and Infrastructure

The physical design of a cycle hire scheme reflects the intended use of the scheme. For example hire schemes targeting egress trips from train or bus stations require little physical presence in the form of docking stations whilst more dense networks targeting opportune trips or tourists require more complex stations.

4.1.1 Access Technologies

Card based access

Cycles can be accessed through the form of cards enabled with either a magnetic, chip, RFID or credit card based technology. Cycles used for these schemes are either rented through a central terminal at the docking station or on the cycles themselves depending on where the technology has been embedded.

Advantages of card based technology include the following:

- Relatively inexpensive compared to other options and able to be mass produced; and
- Technology can be configurable into other use cards such as transport cards or into key ring pendants.

Typical disadvantages of card based technology include the following:

- As some access cards are linked to credit cards this information could fall into the wrong hands if lost or stolen; and
- Requirement of more technology intensive docking stations.

App based access

Rental of Spark bikes in Christchurch (see Figure 4.2), is based upon the use of an app downloaded to a smart phone. Pre-registration on the app is required before cycles can be hired which includes linking one's credit card to the app for payment. To rent a bike, users scan the QR code on the bike they want to rent which then sends the users a notification text containing the access code for the combination lock securing the cycle.

This system has also been adopted by the Nextbike rental scheme which currently operates at two locations on Auckland's waterfront.

²⁷ 2011. *Optimising bike sharing in European cities.*

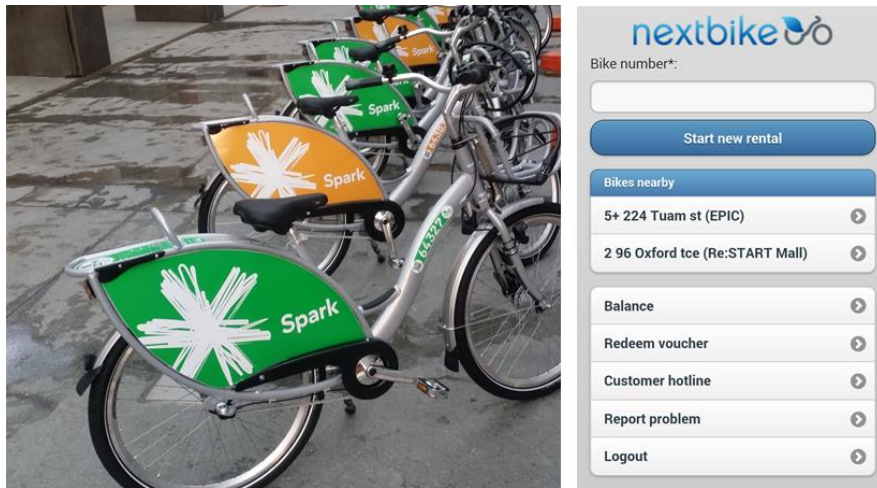


Figure 4.2 Spark Bikes (left) and app (right) - photo credit: Glen Korey

To return the cycle, users scan the QR code on the bike and enter the location where the cycle was returned to.

Examples of the advantages of app based technology include:

- The app registers the hire of a cycle to a specific user;
- As the technology is in the app, the docking stations can be low tech and inexpensive;
- Users are able to identify which docking stations have available cycles in advance;
- The ability to operationally detect where bikes need to be redistributed to; and
- As the access technology is phone based, it is unlikely to get lost or stolen.

Examples of disadvantages of app based technology include:

- Hiring a cycle requires the use of a smart phone (and mobile data) which may restrict the widespread availability of the scheme as new technology may appear complicated to some users; and
- Not as user-friendly as more steps are required to access cycles.

4.1.2 Docking Stations

The requirements of a docking station are related to the access technology embedded in the cycle hire scheme. Three main types of docking stations were used by the cycle hire schemes that were reviewed:

- Basic;
- Low tech; and
- High tech.

Basic docking stations

Schemes using this type of docking station still rely on human contact to hire a cycle and are therefore more aligned to the traditional way of hiring cycles than hire schemes.

An example of a scheme using this approach is the OV-Fiets scheme in the Netherlands. As the intention of this scheme is to offer cycles for egress trips as part of a larger trip chain, this method works well as the vast majority of train stations in the Netherlands have manned cycle storage/ repair stations. Therefore, the hire of OV-Fiets can be seen as an extension of the services already offered rather than a completely separate entity.

The advantages of basic docking stations include:

- Minimal setup and operational costs; and
- Freedom to take the bike 'off the grid' as it has its own lock.

Disadvantages of basic docking stations include:

- Lack of theft protection;
- No ability to capture monitoring data;

- High staffing needs results in high operating expenses;
- Cycles are not used by as many people each day; and
- Difficult to have good coverage with this model.

Low tech docking stations

For hire schemes where the technology is embedded elsewhere (for example Spark Bikes in Christchurch as shown in Figure 4.3), docking stations can be fairly basic and easy to implement. Stations of this type are often modular, fabricated off site and require little modification to the surrounding area as no services (power) are required for the operation of the docking station.

Advantages of low tech docking stations include:

- Off-site fabrication of stations;
- Low set up and maintenance costs; and
- Freedom to take the bike 'off the grid' as it has its own lock.

Disadvantages of low tech docking stations include:

- Lack of theft protection/ bike secureability;
- Data capture is app based and relies on 'cloud' data storage; and
- Helmets are stored on the bikes and both are exposed to the elements.



Figure 4.3 Example of a low tech docking station for Spark bikes in Christchurch. Photo credit – Glen Korey.

High tech docking stations

When the hiring mechanism is card based, relatively high tech docking stations are required as there has to be an electronic means to both hire and secure the cycles.

The implementation of high tech stations has traditionally been a long, complex and intrusive process as the docking and payment points had to be connected to underground services. The construction of high tech docking stations has recently been streamlined due to the modular fabrication of the stations. Sometimes this necessitates a connection to a power supply although solar powered stations have been used successfully in some schemes.

Advantages of high tech docking stations include:

- High levels of customer satisfaction;
- User friendly;
- Possible off-site fabrication of stations;
- Large potential for data capture;

- Size of stations increases the physical presence of cycling as a transport mode; and
- Provision of vending machines to dispense cycle helmets.

Disadvantages of high tech docking stations include:

- High set up and operational costs; and
- Requires a larger amount of space compared to low tech and basic docking stations.

4.1.3 Bikes

The cycle used in a hire scheme should be attractive, durable and functional. As the cycle is often the strongest advertisement for a hire scheme it is essential that it projects a clean, modern image that is likely to attract people to use it.

As referenced in the 'Bike-Share Planning Guide'²⁸, the following components should be considered for hire cycles:

- **The cycle** - upright 'Dutch' style riding position to increase rider comfort, visibility and safety;
- **Theft protection** - the cycle should be designed and assembled in a way that deters theft; in addition parts used should be unique to hire cycles to decrease re-sale value;
- **Front Basket** - the provision of a front basket increases the utility nature of the cycle;
- **Docking mechanism with RFID tag** - for schemes using card based technology the RFID tag carries the bike's identification information allowing the docking station to recognise when the cycle is returned. The docking mechanism should also ensure that the cycle is held in an upright position when docked;

- **Sturdy/ puncture resistant tires** - wide profile, puncture resistance tires are recommended to increase the comfort of the cycle, prevent punctures and to prolong the service life of the tire;
- **Drum brakes** - drum brakes and internal cable routing require little maintenance increasing the time between services whilst internal cabling also contributes to the sleek look of the cycle;
- **Step-through frame** - a step-through frame ensures that the hire cycle is compatible with a wide range of rider heights and is rideable by people wearing a broad range of clothing types;
- **Safe pedals** - wide flat pedals ensure that the cycle is easy to pedal and prevent the foot from slipping. Pedals with sharp points should be avoided as these have the potential to cause injury;
- **Protected chain and internal components** - covering the working parts of the cycle (e.g. the chain), prevent the riders clothing from getting damage or grease stained whilst also protecting the components from the elements increasing the time between services;
- **Automatic lights** - front and rear lights powered by a dynamo hub ensure that the cycle is able to be ridden in a variety of weather conditions and at night. Lights and reflectors are also a mandatory safety requirement;
- **Gears** - 3 or 8 speed internal gears reduce the amount of effort required to pedal the cycle in hilly and/or windy conditions;
- **Mudguards and advertisement space** - front and rear mudguards protect clothing whilst advertising space on the frame and over the rear wheel offer a source of revenue for the cycle hire scheme operator;
- **Adjustable seat post** - having an adjustable seat post ensures that the cycle can be ridden by riders of all different heights;
- **Comfortable saddle** - a comfortable saddle ensures that riding the cycle is a comfortable experience, increasing the likelihood of return customers; and

²⁸ 2013. *Bike Share Planning guide*. Institute for Transportation and Development Policy.

- **GPS tracker** - this enables the location of the cycle to be tracked which assists recovery if the cycle is lost or stolen. It could also enable users to be provided with data about their usage including distance travelled and calories burnt.

4.1.4 Electric bikes

Electric bikes are increasing in popularity and feature a small, electric motor to assist the user's pedal-power which is particularly helpful when cycling up hills. Electric bikes can be a solution to challenging topographies and can mitigate the impacts of hilly areas on cycle hire ridership.

Electric bikes are still a relatively new technology and the use of electric bikes in cycle hire schemes presents a number of potential challenges. This technology is quickly evolving; therefore there is some risk that it may render electric bike fleets obsolete with future developments to technology. Electric bikes are considerably more expensive than regular cycles and are therefore more likely to be a target for theft or vandalism.

Electric bikes were introduced into the OV-Fiets hire scheme in the Netherlands and the Bicing scheme in Barcelona, Spain. Due to initial set-up costs, technical issues such as the requirement for constant charging and high maintenance requirements, electric bikes were withdrawn from the OV-Fiets scheme and their use was also reduced on the Bicing scheme in Barcelona.

The BiciMad cycle hire scheme in Madrid uses only electric bikes. The scheme has been reasonably well received but a number of problems have been encountered including funding shortfalls and issues with cycle theft. The scheme has a reasonably low annual membership fee but users have to pay for the full period of hire. This pricing structure is likely due to the higher operating costs resulting from operating an electric bike fleet.

Electric bikes were also considered for use in the Pronto scheme in Seattle however they were not deemed suitable due to reasons similar to those noted above (e.g., high capital and maintenance costs, theft concerns, etc.). Although electric bikes were rejected for the initial implementation of the Pronto scheme, it was noted that they would be considered at a later date when the technology associated with electric bikes had improved, thereby increasing their functionality.

Electric bikes were introduced to Copenhagen and Frederiksberg as part of the Bycyklen cycle hire scheme which now features 1,860 electric bikes at 100 docking stations. The

implementation of the scheme experienced a number of start-up challenges during its earlier stages which primarily related to the construction of the cycles and software issues. However, the majority of these issues have since been resolved and the scheme has seen a significant increase in popularity and ridership. The electric bikes have a built in GPS which enables them to be tracked which is an advantage for this scheme. This has resulted in a significantly lower level of bike loss compared to other cycle hire schemes around the world which is a major and costly issue.

An electric bike hire scheme will shortly be trialled in Paris and the Paris City Council is currently subsidising the purchase of electric bikes for private use.

In general, the following issues need to be considered as they relate to using electric bikes for a cycle hire scheme in Auckland:

- Battery capacity and time required between charges;
- Redistribution requirements - unless only electric cycles are used for a scheme, it is likely that they will only be able to be docked in specific stations. This will reduce their use and increase cycle redistribution requirements;
- Significantly higher per unit cost when compared to conventional hire scheme cycles; and
- Theft protection - electric cycles are likely to become a target for theft and vandalism compared to conventional hire cycles due to their higher cost and electrical components (e.g. electric motor and battery), which are likely to have a high resale value.

4.1.5 Helmets

Although the requirement to wear cycle helmets is often cited as the main barrier to a successful cycle hire scheme, this is not necessarily the case. The main factor relating to the success (or failure) of a scheme relates to how convenient the scheme is. Therefore, if helmet use can be incorporated into the scheme in a way that they are both convenient and hygienic to use, this requirement may not limit the success of the cycle hire scheme.

5. Cycle Hire Scheme Business Model and Costs

5.1 Organisational Structure

There are a number of possible organisational structures for an Auckland cycle hire scheme, the detail of which will be influenced by how the capital cost of the scheme will be funded as well as the how user fees will be collected and whether or not the AT HOP card is used.

The key roles required for the cycle hire scheme include:

- Implementing Agency (Auckland Transport); and
- Operator.

There are multiple combinations of this organisational arrangement which are further described in section 5.3.

Implementing Agency

Auckland Transport as the Implementing Agency will oversee the planning, implementation and operation of the scheme, as well as the longer term strategy for expansion and upgrades.

In the pre-implementation phase, tasks will include the following:

- A more detailed cycle hire scheme feasibility assessment;
- Detailed system design;
- Contract preparation and tendering;
- Development of the financial and pricing models;
- Seeking and confirmation of sponsorship; and

- Overseeing implementation.

Once the scheme is operational, the role will shift to managing the operator's performance and payment. In addition, Auckland Transport will develop the strategy for increasing patronage, expanding and upgrading the scheme as well as planning for future contract re-tendering.

Operator

The operator will carry out the day-to-day operation of the scheme, including maintenance of the cycles and stations and the rebalancing of cycles. The operator may also handle collection of user fees, however if the user payment is to be integrated with the AT HOP card, it may be more effective if the IT system and user payment is handled by the AT HOP provider.

One potential drawback of separate contracts for the operation of the hardware (cycles and stations), and the software (payment and smart systems) is the risk of the interface between the two not working effectively. It is expected that this issue could be mitigated but could require considerable coordination between software and hardware providers.

Table 5.1 sets out the various types of operator and the strengths and weaknesses of the different approaches.

Table 5.1 Strengths and weaknesses of different types of operators²⁹

Operator type	Strengths	Weaknesses	Example
Government	<ul style="list-style-type: none"> Maintains control of legislative and public assets necessary to make cycle hire successful. Have no ulterior motive other than to operate a high-quality system. 	Lack of expertise in cycle hire schemes.	Buenos Aires (as of June 2013).
Public transport authority	<ul style="list-style-type: none"> Has experience in managing transport-related services. Facilitates cost sharing with existing assets such as customer service, maintenance personnel and depots. 	<ul style="list-style-type: none"> Difficulty in accessing and working with other transport providers because they are seen as competitors. Cycle hire scheme may expand such that it needs its own customer service, maintenance and depot facilities. 	DBRent (German systems)
Private sector	<ul style="list-style-type: none"> Generally achieves a high level of efficiency. 	<ul style="list-style-type: none"> Profit-oriented which can conflict with maximising the utility of the system for the user. May reduce its efficiency due to financial constraints or suboptimal contractual conditions. 	<ul style="list-style-type: none"> Santiago Paris London Washington D.C. Boston New York

		<ul style="list-style-type: none"> Limited ability to push for policy and planning changes in government. 	
Not for profit organisation	<ul style="list-style-type: none"> Prioritises the utility of the cycle hire scheme to the user. 	<ul style="list-style-type: none"> Frequently financially constrained. Normally below-average business focus. Leading to financial unsustainability. 	<ul style="list-style-type: none"> Denver Minneapolis

There are a number of private sector operators who have gained much experience of operating cycle hire schemes in various locations around the world. These Operators will have experienced a range of problems and issues that can affect cycle hire schemes and will have made improvements to over-come these. The experience gained from other schemes elsewhere makes a compelling case for procuring the ‘Operation’ function through a private Operator.

5.2 Asset Ownership

The assets are the stations which consist of terminals and docks, the cycles and the IT system. Sometimes the assets are solely owned by the Implementing Agency or the Operator or a combination of the two. Generally the asset owner will have the most control over how that part of the scheme operates as they will determine the investment. The strengths and weaknesses are summarised in Table 5.2.

²⁹ 2013. Institute for Transportation and Development Policy. *The Bike Sharing Planning Guide*.

Table 5.2 Strengths and weaknesses of asset ownership types

Asset owner	Strengths	Weaknesses
Private Operator	<ul style="list-style-type: none"> The operator has an incentive to ensure the infrastructure is well maintained. It may be possible for the capital cost of implementation to be spread across the contract duration. Risk of infrastructure failure rests with the operator (although this risk is likely to be priced in to the contract). The operator may have more buying power to negotiate lower prices. 	<ul style="list-style-type: none"> The operator is unlikely to invest in upgrades or improvements towards the end of the contract period meaning there could be a reduction in the level of service. This is especially likely if the model is a build, operate and transfer (BOT) ownership to the public authority at the end of the contract. If the operator is unable to secure sufficient capital, the expansion of the scheme may be impacted. The implementing agency may have less control over the quality of the infrastructure as the operator will procure infrastructure which meets their needs in terms of longevity. Ongoing upkeep and maintenance of the system could decline if appropriate penalties are not incorporated into the contract.

Public (Implementing Agency)	<ul style="list-style-type: none"> Control over the choice and quality of the infrastructure to ensure longevity. No requirement to transfer ownership when operator contracts change. 	<ul style="list-style-type: none"> Major capital investment will be required at the outset. Risk of infrastructure failure rests with fully with the implementing agency. Teething problems due to inexperience as the agency is unlikely to have the expertise in being an asset owner of a cycle hire scheme.
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It is not possible to recommend the best asset ownership model for Auckland at this stage as this will be influenced by a number of factors, including:

- Intelligence gained from soft market testing;
- Clarity regarding the amount and timing of capital funding both for the initial implementation and subsequent expansion of the scheme;
- Further work to assess potential income and expenditure and the level of public subsidy; and
- Engagement with the market to assess supplier interest.

Most hire cycles have a three to five year life span and the stations can be expected to last between 10 and 20 years³⁰. The lifespan of the assets is a consideration when thinking of contract and sponsorship durations.

5.3 Contracting Structure and Service Levels

The contracting structure will be influenced by the asset ownership model. Although it is possible to have a number of contracts for various elements of the cycle hire scheme, the most effective model for Auckland is likely to be one where the day to day operations are

³⁰ 2013. Institute for Transportation and Development Policy. *The Bike Sharing Planning Guide*.

carried out by an Operator, possibly with the IT and user fee collection carried out under the AT HOP contract.

The three main contracting structures are:

- Publicly owned and operated;
- Publicly owned and privately operated; and
- Privately owned and operated.

Based on evidence from other cities, it is likely that a cycle hire scheme in Auckland will require some level of public subsidy. As referenced in Section 5.1, there are multiple benefits of using a private operator. Thus, the most suitable contracting structure for an Auckland scheme is likely to be a publicly owned and privately operated scheme. However, as outlined in Section 5.2, the optimum asset ownership model requires further investigation.

It is unlikely that a privately owned and operated scheme such as Citibike in New York City would be viable in Auckland as Citibike relies on a high level of sponsorship revenue which would be difficult to achieve in a smaller city, and thus it would be difficult for a private operator to make a profit.

The Velib scheme in Paris is privately owned and operated and the model seems to be attractive as the City Council generates income through the scheme by receiving income in the form of user fees. However, the disadvantages with this type of model include:

- Loss of revenue that the city would have otherwise gained from advertising;
- Difficulties evaluating the overall costs and income from the model; and
- The objectives of the operator tend to be more focused on the advertising aspects of the business rather than providing a high-quality cycle hire scheme as there is little financial incentive for them to improve the scheme. This can impact all facets of the cycle hire scheme from the quality of the system itself; commitment to ongoing maintenance; and can even adversely affect the quality of customer service.

To mitigate the potential issues above, the Bike Share Planning Guide recommends that the advertising revenue should be contractually separated from the service-level agreements to operate the cycle hire system.

5.4 Contract and Performance Management

The form of contract and payment mechanism will be influenced by the asset ownership model that is selected.

If the assets ownership sits with Auckland Transport, an operator contract based on cost-plus principles, similar to the contract between Transport for London and Serco, may be the most appropriate. This type of contract reduces the financial risk placed on the operator and is more transparent. One drawback of a cost-plus arrangement is that the operator may be less motivated to improve the efficiency of the operation. However, this can be addressed through the performance management regime which establishes different service levels, as discussed below.

In any contracting structure for cycle hire schemes, it is essential that service levels are established and monitored. Commonly utilised service levels have three bands, which include:

1. Performing – the optimal performance level;
2. Performance review; and
3. Failing.

If performance is at the highest level, the operator can be eligible for rewards for good performance. However, if performance is failing, the operator can be financially penalised.

Performance is typically monitored against a suite of key performance indicators (KPIs) which could be grouped as follows:

- **Customer service and satisfaction**
This could include KPIs related to processing member applications on time, answering calls and responding to queries on time. In addition customer satisfaction surveys could be undertaken on an annual basis and the results could feed in to an annual indicator.

- **IT system**

These KPIs could include the speed of carrying out transactions, failure rate of the IT system and the speed of checking out cycles at docking stations. If IT is provided separately, the indicator would not be included within the Operator contract.

- **Maintenance**

These could include KPIs on the percentage of the cycle fleet that is available; time lag between user reporting a broken cycle and repair being undertaken; and overall condition of the cycle fleet.

- **Redistribution**

These KPIs will be focused on the availability of cycles at stations (i.e. the effectiveness of rebalancing cycles), and may include indicators about the percentage of time that stations are empty at different periods during the day.

Although the level of cycle patronage will be dependent on a number of factors, some of which will be outside of the influence of the Operator, it may still be helpful to include a patronage indicator, especially if the Operator has some responsibility for marketing.

One of the impressive aspects of the New York Citibike scheme has been the swift development of innovative solutions to overcome problems. The motivation for this comes from the need for Citibike to be a successful, profit making business. It is possible to use service levels linked to financial penalties and incentives to drive performance and innovation. If there is a desire for innovation to be actively encouraged, it may be possible to include innovation indicators. These are likely to be more qualitative-outcome based rather than quantitative-output based.

Some of the indicators will be more important than others and can be weighted accordingly. A ratchet factor could also be applied whereby the penalty for poor performance is increased by a factor if performance is poor during consecutive months and similarly with an increase in reward for sustained periods of good performance. This mechanism will help to incentivise long-term good performance.

For example, an operator's ability to respond to customer requests for new station locations could be incentivised through the contract.

5.5 Costs and User Fees

Costs associated with a cycle scheme are derived from both the implementation of the scheme along with yearly running costs and are usually calculated on a cost per bike basis. Of the hire schemes operational world-wide there is a significant variation in both the implementation costs and the operating costs.

5.5.1 Implementation costs

Capital costs will include:

- Cycles;
- Stations (terminals and docking spaces);
- Software (could be up-front cost or periodic license fee); and
- Control centre, depot, rebalancing fleet, maintenance vehicles.

In addition to capital funding it is likely that Auckland Transport will need to subsidise the operating cost of the scheme with revenue funding.

Hire schemes such as Spark Bikes in Christchurch or Bike Town in Portland, utilise app based technology for the payment and hire of bicycles and are likely to have lower setup and operational costs per bike compared to more traditional card based schemes. This is due to these systems being software rather than hardware based which makes for easier maintenance of the payment systems as there are no physical payment terminals that need to be maintained.

Table 5.3 provides a detailed breakdown surrounding the implementation costs associated with a hire scheme including which components of the scheme attribute what percentage of the cost.

Table 5.3 Cycle hire scheme average implementation costs³¹

Infrastructure and Implementation	Share of total costs
Station implementation, docking points and locking technology, station planning, ground work and cabling	70%
Bikes	17%
Set-up operations: workshop and logistics	6%
Communication	5%
Administration	2%

This breakdown of costs is a guideline only with actual operating costs prone to fluctuation due the following factors:

- Operating system**
 Compared to terminal based systems, app based operating systems will be associated with less operating costs due to the relative ease in which software code can be changed compared to upgrading/ installation of payment terminals.
- Cycles**
 Larger schemes are likely to have a lower unit cost per cycle due to a larger purchasing power. For example an order for 2,000 cycles is likely to be cheaper per unit than an order for 500 cycles. In addition, cycles used for a scheme implemented in a hilly location will have a higher per unit cost due to the requirement of extra gearing compared to cycles used for a scheme in a predominantly flat location.
- Helmets**
 The costs associated with helmets have not been factored into the above table

and this is therefore an additional cost that needs to be factored in. An indication of these costs can be found in the analysis of the Pronto scheme (Seattle) which identified that the per unit cost of helmet vending machines was US\$8,000 - \$10,000 per unit whilst the unit cost of the helmets was US\$7.50³².

It is difficult to estimate the likely capital funding requirement to implement the scheme as this will depend upon:

- 1) The system used;
- 2) Whether or not smart docking stations are required; and
- 3) The scale of the network.

In order to make a basic estimate, the average capital cost per cycle from other schemes can be used as a guide. The average cost per cycle of 4 schemes in North America (New York, Denver, Minneapolis and Madison) was US\$4,621 per cycle³³. Assuming a start-up scheme with 700 cycles in Auckland, an estimate would be US\$3.3M or NZ\$4.6M.

A basic estimate for a scheme with 700 cycles using the Social Bicycles system (as used in Portland), gives a lower capital cost of approximately US\$2.2M or NZ\$3.1M, excluding shipping costs.

5.5.2 Operational costs

Similar to implementation costs, operational costs are likely to fluctuate due to numerous factors which consist of:

- Staffing**
 Staff will be required covering a variety of functions, management, administration, maintenance, rebalancing and customer service.
- Rebalancing**
 The cost of fuel and general running costs associated with operating a rebalancing fleet.

³¹ 2011. *Optimising bike sharing in European cities*.

³² 2012. Alta Planning + Design. *King County Bicycle Share Business Plan*. United States

³³ 2013. *Bike Share Planning guide*. Institute for Transportation and Development Policy.

- Maintenance**
 The cost of maintaining the cycles and docking stations is likely to be significant. As well as fixing problems it will be important to carry out preventive maintenance and to keep the stations and cycles clean. Annual maintenance costs for a Velib cycle are estimated to be around US\$1,000 or NZ\$1,450.
- Control and Customer Service Centre**
 A 24/7 Customer Service Centre will ideally be required; however, this function could be provided within Auckland Transport's existing Customer Service Centre. Another option would be having limited customer service through the website.
- Marketing and customer information**
 Promotion and marketing of the cycle hire scheme will be necessary as well as providing customers with information regarding the cycle hire scheme.
- Servicing of courtesy helmets**
 The costs involved in cleaning and distributing helmets.
- Insurance**
 Public liability insurance will be needed as a minimum but insurance against theft and vandalism may also be advisable.
- Software licences and connectivity fees**
 Depending on the IT contract, it may be necessary for software licence fees if these are not included in the up-front capital cost of the scheme. There may also be connectivity fees for the docking stations.

For a typical scheme, the redistribution of bicycles is associated with the largest proportion of the operational costs as shown in Table 5.4.

Table 5.4 Cycle hire scheme average operational costs³⁴

Running Costs	Share of total costs
Redistribution of bikes	30%
Bike maintenance	22%
Station Maintenance	20%
Back-end systems	14%
Administration	13%
Replacement (bikes, stations)	1%

5.5.3 User fees

User fees are generated from subscription fees and usage fees. In most schemes subscription includes an unlimited number of uses up to either 30 or 45 minutes in length. Usage fees apply after the free usage period and tend to increase exponentially to encourage short trips.

Table 5.5 sets out the fee structure used in other schemes.

³⁴ 2011. *Optimising bike sharing in European cities.*

Table 5.5 Comparison of subscription fees from reviewed international example schemes

City	Annual Membership fees	Casual user fees	Free usage period	Fees for additional trip time
Paris	€29 and €39	<ul style="list-style-type: none"> 1 day pass - €1.70 7 day pass - €8 	<ul style="list-style-type: none"> 30 minutes €39 annual membership allows 45 minutes 	<ul style="list-style-type: none"> 30 minutes - 1€ 31 – 60 minutes - €2 €4 for the subsequent 30 minutes
London	£90	24 hours - £2	30 minutes	£2 per 30 minutes
New York	US\$155 or US\$14.95 per month	<ul style="list-style-type: none"> 1 day pass - US\$12 with 30 minutes free then \$4 per 15 minutes 3 day pass - US\$24 with 30 minutes free then \$4 per 15 minutes 	<ul style="list-style-type: none"> Annual members - 45 minutes Casual users - 30 minutes 	US\$4 per 15 minutes
Brisbane	AU\$60.50	<ul style="list-style-type: none"> 3 month membership - AU\$27.50 Day pass - AU\$2 Weekly pass - AU\$11 	30 minutes	<ul style="list-style-type: none"> 31 – 60 minutes - \$2.20 61 – 90 minutes - \$6.05 and then in increments
Melbourne	AU\$60	<ul style="list-style-type: none"> 24 hours - AU\$3 1 week - AU\$8 	<ul style="list-style-type: none"> Annual members - 45 minutes Casual users - 30 minutes 	<ul style="list-style-type: none"> Up to 60 minutes - AU\$2 Up to 90 minutes - AU\$7 Every additional 30 minutes - AU\$10
Guangzhou	No charge, although deposit held on smart card	No charge, although deposit held on smart card	1 hour	<ul style="list-style-type: none"> 1 to 2 hrs - 1RMB (0.21NZ\$) 2 to 3 hrs - 2RMB More than 3hrs - 3RMB an hour
OV-Fiets	€10	No casual user scheme	No inclusive period	€3.35 for 24 hrs
Madrid	€25(or €15 if combined with public transport card)	<ul style="list-style-type: none"> Up to 30 minutes - €2 Second 30 minutes - €4 	No inclusive period	<ul style="list-style-type: none"> 30 minutes - €0.5 for members 31 – 60 minutes - €0.6 for members

City	Annual Membership fees	Casual user fees	Free usage period	Fees for additional trip time
Portland	US\$12 a month for up to 90 minutes of ride time a day	<ul style="list-style-type: none"> Day pass US\$12 for up to 180 minutes of ride time Single trip US\$2.50 for 30 minutes of ride time 	<ul style="list-style-type: none"> Annual member - up to 90 minutes of ride time a day Casual users - up to 180 minutes of ride time 	10c per minute for additional ride time
Seattle	US\$7.95 a month or US\$85 a year	<ul style="list-style-type: none"> Day pass - US\$8 3 day pass - US\$16 	<ul style="list-style-type: none"> Annual member - up to 45 minutes Casual users - up to 30 minutes 	<ul style="list-style-type: none"> Up to 60 minutes - US\$2 Subsequent 30 minutes - US\$5

The objectives of the scheme influence the pricing structure as well as knowledge of potential habits of target user groups. It is recommended that market research is carried out using surveys and focus groups to get a greater understanding of user requirements, habits and feedback on pricing structures.

One of the primary objectives of the Auckland scheme is to provide a connection for the beginning and end of public transport journeys. To encourage this, it may be appropriate to consider through-ticketing with rail, bus and ferry fares via the AT HOP card.

If the scheme is linked to the AT HOP card, a consideration will be whether the Gold AT HOP card users can use the scheme for free. Some schemes offer reduced rates for those on low incomes and students.

Many schemes offer corporate membership, either in the form of a membership which employees can use to undertake work related travel or where corporate membership enables employees to take advantage of free or discounted annual membership offers. Corporate membership packages could be combined with corporate sponsorship of stations.

5.6 Auckland Cycle Hire Scheme Objectives

When developing and implementing a cycle hire scheme for Auckland, it will be important to be guided by clear objectives. Below is a list of possible objectives:

- To provide an emissions-free, transport system which will enable short trips in and around central Auckland and it's metropolitan centres;

- To use cycle hire schemes to support an increase in the number of people on bikes and increase the modal share of cycling;
- To support and integrate with Auckland's public transport network by providing an option for the beginning and end of public transport trips;
- To help create a walking and cycling focused city centre with less motorised traffic;
- To promote tourism and provide visitors with an enjoyable and effective transport option for moving around Auckland;
- To improve accessibility for Aucklanders who currently have a low level of transport choice;
- To reduce dependence on private vehicles;
- To achieve success in terms of a high level of ridership; and
- To provide and operate a financially viable and sustainable cycle hire scheme.

6. Summary and Recommendations

There is considerable potential for a cycle hire scheme in Auckland. While small scale cycle hire schemes have been attempted in Auckland in the past with limited success, Auckland has yet to experience the benefits of a full scale cycle hire scheme as has been implemented in many cities throughout the world.

The timing to implement a cycle hire scheme on a larger scale may be right for Auckland for the following reasons:

- Strong commitment to planning and delivering a network of cycleways in Auckland with an initial focus on delivering a city centre cycling network;
- Increasing cycling rates throughout Auckland in recent years suggest that there's significant interest and considerable latent demand for cycling if appropriate cycle facilities are provided;
- Increasing public transport patronage in Auckland which could grow even further if supported by appropriate cycle hire infrastructure that can expand the catchment area of the public transport network;
- Significant economic and population growth is planned throughout Auckland which will put further stress on the existing transport network. A cycle hire scheme in coordination with other public transport improvements can provide greater choice and resiliency to address the anticipated growth pressures upon the transport network;
- Auckland's strong focus on liveability, sustainability and overall customer experience are very well aligned with the introduction of a cycle hire scheme; and
- Congestion and limited access to parts of the Auckland city centre as a result of the CRL construction; and
- Consistency with Transport Demand Management measures Auckland Transport is currently undertaking.

The preferred initial cycle hire scheme design option is Option 3 (hybrid), which would be implemented in two stages. Stage 1A would involve a dense network of hire stations within the city centre; radiating out from Britomart towards Aotea Quarter, Wynyard Quarter and the Learning Quarter. Further expansion is possible from these locations to maximise the benefits of cycling developments in the city centre including the construction of the SkyPath.

To manage expectations and to mitigate the risks associated with implementing a cycle hire scheme, the second incremental phase (Stage 1B), would build on the success of Stage 1A within the city centre. This would involve extending the scheme outwards to the city fringe areas such as Devonport, Ponsonby, Parnell, Newmarket and along the waterfront to the Eastern Bays. This is consistent with plans for improved cycling connections from suburbs to the east and west of the city centre in the near future.

If a cycle hire scheme is to be introduced to Auckland, it will take require a concerted effort to further analyse, plan, deploy and promote the system. Most other cycle hire schemes have taken between 12-18 months to implement.

While there is considerable potential for a cycle hire scheme, it is recommended that additional work is completed to better understand the potential issues, risks and challenges of such a scheme. Specifically, additional work is recommended to clearly define the likely demand for the scheme, to identify the deployment areas and to identify the dimension of the scheme in terms of the number of cycles and docking stations.

To explore this issue in further detail, we recommend the following additional work:

- Refine and prioritise the objectives for the scheme as these will guide the development of the scheme proposal. This will also involve the identification of critical success factors.
- Develop a financing strategy to identify likely sources of funding and bidding processes to be followed.
- Investigate the potential for a change to the law regarding mandatory helmet use as the legal requirement for helmet wearing will undoubtedly impact on the level of use of a cycle hire scheme in Auckland. To some extent this can be addressed by the provision of courtesy helmets; however, this will add additional cost to the scheme. Evidence from other cities shows that cycle hire use is safer than using a private cycle and this helps to make a strong case for

creating an exception to mandatory helmet wearing for people riding hire scheme cycles.

- Undertake soft market testing by engaging with cycle hire providers/operators to enable a greater understanding of the market and to explore in more depth how the cycle hire scheme could operate in Auckland.
- More detailed feasibility study to determine the likely demand including mapping areas of population with the highest propensity to use a cycle hire scheme. This is to be supported by market research to better understand Aucklanders' interests and propensity to use a cycle hire scheme. The feasibility report should also explore implementation issues in further detail to include risk mitigation, costs, pricing, system design and contractual matters.
- Carry out further investigation in to the best organisational structure for a scheme in Auckland. This could be done by engaging with scheme managers in other cities as well as through soft market testing.
- Investigate the feasibility of integrating user payment with the AT HOP card and how this could impact on the procurement of the IT element of the scheme.
- Explore the level of interest in corporate sponsorship of the cycle hire scheme. Sponsorship can be a lucrative funding source for cycle hire schemes so it is recommended that major New Zealand companies are approached in order to gauge their interest in sponsorship opportunities.

Appendix A. Cycle Hire Scheme Case Studies

This section summarises the individual cycle hire scheme case studies.

A.1 Paris – Vélib'



Date started	July 2007
Operated by	JC Decaux
Sponsored by	No sponsor
How many cycles?	23,600
Docking spaces (bike posts)	40,421
Ratio of docking spaces : cycles	1.71 : 1
Stations	1,800

Coverage (km ²)	135
Pop in coverage area	2,861,460
Pop density (people / km ²)	21,196
Patronage (daily use)	108,090 (2014)
Ratio for cycles / daily hires	1 : 4.58
Density of stations	Approx. every 300m
No of members	274,000
Link to PT smart card?	Yes
Costs to User	<ul style="list-style-type: none"> • Vélib' classic • Vélib' passion • 1 day pass • 7 day pass <p>29€ for year, 30 minutes free 39€ for year, 45 minutes free 1.70€, 30 minutes free 8€, 30 minutes free</p> <p>For over 30 minutes 1€, for 30 minutes, 2€ for the next 30 minutes and 4€ for the subsequent 30 minutes. Reduced rates for youth and those on low incomes.</p>
Deposit	150€ pre-authorisation on card at the time of registering.
Cost of initial set up per cycle	Approximately 4500€
Annual running cost per cycle	3000€ (estimate)
Public Subsidy	No direct subsidy – see business model below
Features of the cycles	Weight 22kg 3 gears
Rebalancing	Cycles are rebalanced using trucks

- V+ bonus stations

How it works

There is a terminal at each station and casual users can use their credit or debit card to hire a cycle. The terminal gives the user instructions, the user selects which cycle number they wish to take and when the green light shows on the docking point the cycle is released. Subscribers can use their subscription card to release the cycle directly at the docking space without needing to use the terminal.

Business Model

The scheme is operated by JCDecaux, who paid start-up costs of around US\$115M. The city receives a percentage of subscription and usage fees from the scheme as well as a fee (reported to be around €3.5M) from JCDecaux. In return JCDecaux has exclusive rights for advertising on 1,628 city owned billboards. It was reported that by 2011 the scheme was achieving a budgetary balance. It is estimated that JCDecaux receive revenue of around €80m from billboard advertising in Paris. In effect, Paris City Council have exchanged the revenue it would previously have received for advertising for revenue from cycle hire – the difference between the two is not known.

Around 285 people are employed in the operation of the scheme, approximately 220 of whom are cycle mechanics.

Implementation and Expansion

The scheme launched with 10,000 cycles and 750 stations and was installed over a period of 4 ½ months. Around the same time 68km of new cycleways were implemented.

The scheme expanded in phases over several years.

Innovation

To tackle the problem of vandalism, Velib have run “you break it, you repair it” workshops for young people.

Challenges

JCDecaux have highlighted that the level of cycle theft and vandalism has been higher than initially envisaged. In 2013, 8,000 cycles were vandalised or stolen; however, 87% of stolen cycles were returned or found. Stations are sometimes closed due to vandalism.

It was reported that due to unexpectedly high rate of theft and vandalism, Paris City Council agreed to pay towards the replacement cost of the cycles.

Rebalancing – sometimes there are no cycles at stations. Rebalancing takes place using trucks. Rebalancing has been a problem at some of the stations on higher ground where users are perhaps less keen to cycle up the hill than down it! To incentivise users to end their journeys at these stations, the stations are designated as V+ stations. When returning a cycle to these stations users receive a 15 minute time credit.

Successes

- The scheme is well used – 86% of Parisiens use Vélib’.
- High level of user satisfaction – 87% like the service and 99% would recommend it to a friend.
- Around 8% of tourists visiting Paris use Vélib’.
- The profile of cycling has improved and the number of cycles in Paris has increased by 41%. Car use has decreased by 25%.

Pros and Cons

- It is unclear how performance of JCD is incentivised. There are KPIs but it is unclear what the payment deduction mechanism is.
- There is no advertising on the bikes
- The scheme has been very successful in terms of uptake and the impact it has had on car use.

A.2 London – Santander Cycles



Date started	July 2010
Operated by	Serco
Sponsored by	Santander
How many cycles?	10,000 cycles on street
Docking spaces	19,000
Stations	725
Ratio of docking spaces : cycles	1.9:1
Size of stations	Largest Waterloo Station 126 Average size 18 spaces
Scheme Coverage (km2)	100km2 (<i>figure possibly out of date</i>)
Pop in coverage area	Over 343,000 (<i>figure possibly out of date</i>)
Pop density (people / km2)	5,206
Patronage (daily use)	27,115 average per day Rolling year to end of May 16 - 9,924,427
Ratio of cycles / daily hires	1 : 2.7
Density of stations	300m to 500m
No of members	203,409 (Dec 2015)

Link to PT smart card	No
Average journey time	13 minutes – members 31 minutes - casuals
Split between casual use and members	Around 57% users are members. Member usage reasonably steady throughout, the year. More casual than member use during August.
Cost to users	<ul style="list-style-type: none"> • Annual membership £90 • Casual user (24hrs) £2 • Business Account £90 per card <p>First 30 minutes free, subsequent £2 per 30 minutes</p>
Deposit	£300 charge for theft or damage
Cost of initial set up per bike	Unclear. Contract value for first 6 years is £140M
Annual running cost per bike	£2339 (2014/15)
Public Subsidy	At least £7M £636 approx per bike per year
Features of the bikes	Weight 23kgs, 3 gears
Rebalancing	32 vans (holding 18 bikes)
Safety record	A study has shown that cyclist on Santander Cycles are 3 times less likely to be injured on a trip than other cyclists.

How it works

There is a terminal at each station and users can use their credit or debit card to hire a

bike. They receive 5 digit printed release code which they then key in to the docking station keypad to release the bike.

A key can be purchased for £3 which speeds up the hiring process as users do not need to get a code from the terminal but can use the key to release a cycle.

Casual users are able to set up an account and purchase a key, meaning they can use the cycles without having to go to the terminal and they are automatically charged the £2 casual user fee.

Business Model

The scheme is operated by Serco who won the design, build and operate contract with TfL. It appears that the payment mechanism is based on actual cost (cost-plus) principles. The scheme is funded through user charges, sponsorship from Santander (approx. £37.5m over 5 years), with the shortfall being met by Transport for London (£11.5m in 2014/15).

Approximately 250 staff are employed in the operation of the scheme. Mechanics travel by moped to docking stations to carry out maintenance on the bikes. Ten vans for electricians / cleaners. Contact centre open 24/7.

New contracts commencing July 2017

A procurement process is underway for new contractual arrangements to commence in July 2017. As part of the new arrangements, payment and billing will become linked to the Oyster card system. There will be a contract for a supplier to provide, and maintain the bikes and stations and carry out the rebalancing but TfL will provide some of the other functions.

Implementation and Expansion

The scheme launched with 6,000 cycles and 400 stations, covering 44km². It has expanded in phases to cover 100km² with 10,000 bikes available.

Initially the scheme was only available to members.

The scheme was introduced around the time that 37km of cycle superhighway were implemented.

Mode Substitution

In a survey in 2011, users were asked how they would have made a typical trip before bike share was introduced. Nearly 60% responded that they would have made the trip by

public transport, 25% would have walked and 2% would have made the trip by car. One of the key aims of the scheme was to provide an alternative to the congested public transport options.

Successes

- The scheme is very popular with users and has firmly established itself as a viable transport choice.
- Surveys conducted in 2015 show a high level of satisfaction, 86% of casual users and 80% of members were satisfied with the service.
- The scheme has a high profile and has had a positive impact on cycling in London.

Innovation

A cycle hire app was released in May 2015 and it enables users to bypass the terminal by being given a bike release code via the app.

Blaze Cycle Lights are being added to all cycles as a safety feature.

Challenges

There is a strong tidal flow of bikes, particularly in peak hours. At Kings Cross, for example, bikes are stored overnight in storage containers and then wheeled out to the stations to meet demand in the morning. The tidal demand is likely due to the strong separation of commercial and residential areas in London.

The performance of Serco is monitored against a number of performance indicators. For the last quarter of 2015 it appears that Serco were failing against PI's which measure full and empty docking stations.

It appears that supply of bikes and rebalancing element of the scheme is a substantial and costly element. Unpublished data shows that 1,399,183km are travelled a year by rebalancing vehicles.

In 2014, an economic appraisal of the scheme calculated the Benefit-To-Cost Ratio (BCR) for the scheme of 0.7:1.

In 2015 it was reported that 220 bikes had gone missing due to a software glitch. Release codes which had allowed release codes generated by the system to stay live meaning a code could be used numerous times.

Pros and Cons

- The scheme is well regarded by users and is well used.
- The scale of rebalancing appears higher than for other bike hire schemes and it seems interesting that no incentives have been offered to users to enable user based rebalancing. Perhaps the contract does not drive Serco towards investigating alternatives or possibly the alternatives are too complex to pursue. Perhaps this development will be pursued through the new contract.
- The level of use of each bike (around 2.5 uses a day) is on the lower end of what is considered desirable from a cost / benefit perspective.
- Full or empty docking stations appear to be an issue at certain locations and times. Perhaps a greater ratio of docks to cycles would assist with this. Although this would need caution as it could reduce user-based rebalancing.
- Some users have found that the 30min free period for hire is too short, especially as the geographical area covered by the scheme has expanded. There is perhaps a case for an enhanced membership for 45 minutes free.

A.3 New York – Citibike



Date started	May 2013
Operated by	NYC Bike Share – owned by Motivate (previously named Alta Bicycle Share)
Sponsored by	Citi and Mastercard
How many cycles?	8,000
Docking spaces	12000
Stations	500
Ratio of docking space : cycles	1.5:1
Size of Stations	
Scheme Coverage (km2)	
Pop in coverage area	813,553 (figure is possibly out of date)

Pop density (people / km2)	26,936
Patronage (daily use)	48,676 average per day in June 2016 Over 10million uses in 2015
Ratio of cycles / daily hires	1 : 6.08
Density of stations	16.75 stations per mile ²
No of members	100,000
Link to PT smart card?	No
Length of trips	3.1kms (March 2016)
Split between casual use and members	July 2015 – 83.4% trips by annual members March 2016 – 89.9% trips by annual members
Costs to User	<i>All US\$</i>
<ul style="list-style-type: none"> Annual Membership 	\$155 or \$14.95 per month annual membership – 45 minutes free then \$2.50 for 30 minutes, \$6.50 for next 30 minutes and \$9 for each 30 minutes after that
<ul style="list-style-type: none"> Day Pass 	\$12 – 30 minutes free then \$4 per 15minutes
<ul style="list-style-type: none"> 3 Day Pass 	\$24 –30 minutes free then \$4 per 15 minutes Corporate program enables employers to purchase or subsidise membership for staff. Citi card customers receive 10% discount. Discounts are also available to New York City Housing Association residents, Jersey City Housing Authority residents and members of

	credit unions.
Cost of initial set up (per cycle)	Not available Fee for lost or stolen cycle \$1200 plus tax
Annual running cost per cycle	Unknown.
Annual income	Total 2015 income \$35,091,348
Public Subsidy	No public subsidy. <i>Financial penalties are payable to NYC DOT for poor performance.</i>
Features of the cycles	Weight 20.4kg. 3 gears
Features of the stations	Stations are modular and solar powered
Rebalancing	- seven vans, three box trucks and 14 trikes - Bike Angels scheme (<i>see overleaf</i>)
Safety Record	No fatalities in the 3 years the scheme has been running.

How it works

There is a terminal at each station and casual users can use their credit or debit card to hire a cycle. The terminal issues a printed ride code which can then be used at the dock to release a cycle.

Members are issued with a key which they can use to release the cycle directly at the dock without needing to use the terminal.

Business Model

The scheme is operated by Motivate. The naming sponsor, Citi will contribute US\$41M over 6 years. Mastercard is the official payment sponsor and will contribute US\$6.5M. New York City Department of Transport (NYC DOT) selected Motivate to design, build, operate and finance the scheme. NYC DOT does not contribute financially to the scheme and has no liability. The sponsorship revenue goes directly to Motivate and the user fees are split between NTC and Motivate. Performance is monitored and Motivate have financial penalties if performance is poor.

Citibike employ 200 full time and seasonal mechanics.

Development, Implementation and Expansion

In the planning stage, NYC DOT held numerous events with community boards, stakeholders and institutions to collect suggestions for station locations. New Yorkers were asked to vote for station locations on an interactive map. This information was then used to inform the location of stations.

The scheme continues to expand and in September 2015 it expanded in to neighbouring Jersey City.

By 2017 there will be 12,000 cycles and over 700 stations.

Innovations

Helmet wearing is encouraged and when signing up for membership, members are sent a \$10 coupon towards the cost of a helmet.

In May 2016 the Bike Angels programme was launched. 10,000 Angels have been recruited to the programme and they receive points and incentives for rebalancing cycles. The programme is full and has been well received - a Bike Angels community seems to have been created!

An improved cycle design was launched in 2015; the new design features a redesigned seat to drain rain away, newly designed gears which are less prone to breakdowns and a European-style cycle stand. There were however some problems with the new cycles. The new cycles were initially made in China but assembly has since moved to Detroit.

Challenges

During the first year there were problems with software, with the docking spaces and the

app which often gave users bad information. These problems were resolved but this entailed a retrofit of all of the docking spaces.

Ensuring the supply of cycles and docking spaces is a challenge, even with a rebalancing service. In July 2015, 70,248 (6.47% of total hires) cycles were rebalanced, this number had reduced in March 2016 to 38,006 (4.13% of total hires). The Bike Angels initiative should also bring improvements.

Due to implementation costs being entirely met by Motivate, there seem to have been difficulties at times in securing the capital required to expand the scheme, however these issues appear to have been overcome.

Successes

The scheme has been well received and is well used by the public.

One of the successes of the scheme has been the speed with which it has dealt with the challenges it has faced. In October 2014 Jay Walder became COE of Motivate and it seems that he was quick to use his expertise to enable improvements to the way the scheme was operating.

A.4 Brisbane – CityCycle



Date started	Oct 2010
Operated by	JC Decaux
Sponsored by	Lipton Ice Tea
How many cycles?	2000
Stations	150
Size of Stations	Minimum size 10 docking spaces
Patronage (daily use)	943 (2015) 1126 (2016 so far)
Ratio of cycles / daily hires	1 : 0.56
Density of stations	300-500m
No of members	Unknown
Link to PT smart card?	Yes linked to Gocard
Average trip length	3.2km
Split between casual use and members	Not known
Costs to User	
<ul style="list-style-type: none"> Annual Membership 	\$60.50

<ul style="list-style-type: none"> Annual Student 3 month membership 6 month student Day Pass Weekly Pass 	\$45 \$27.50 \$27.50 \$2 \$11 First 30 minutes of any journey are free, 31 – 60 minutes \$2.20, 61 – 91 minutes \$6.05 and then in increments.
Deposit	\$330 which will be debited if the cycle is not returned after 24 hours.
Public Subsidy	Reported to be around \$500,000 for 2015 (around \$1.45 per trip)
Features of the bikes	3 gears. Lock and chain.
Rebalancing	Vehicles Bonus stations (<i>see below</i>)
Helmets	Courtesy helmets are available attached to some of the bikes.

How it works

All users must subscribe first which is done on the CityCycle website.

Users must visit the terminal with either their user card or subscriber number and then enter their PIN number and the number of the cycle they wish to hire. The cycle will then be released when the button is pressed on the dock.

To encourage rebalancing, users can receive a bonus of 15 minutes for returning cycles to designated bonus stations. At present there are 7 bonus stations.

Business Model

The scheme is operated by JC Decaux who have a 20 year contract with Brisbane City Council to run the scheme. Advertising both on the bikes, terminals and advertising

boards in the city contributes to the overall running costs of the scheme. The user fees are split between JC Decaux and Brisbane City Council. It is estimated that after income, the Council have contributed around \$15m to the scheme.

When the scheme launched, there was no sponsor and subsequently Lipton Ice Tea became sponsor, it is unclear how long this sponsorship deal lasts or how much it is worth.

Development, Implementation and Expansion A year after implementation there were 416 trips per day and 1060 bikes available for hire at 104 stations, the expansion continued to 2000 bikes and 150 stations.

Initially the daily casual rate was \$11 but this was reduced to \$2 in August 2011, with daily hires increasing from 200 in July to over 1000 in September.

Challenges

One criticism of the scheme is that stations are located in places which are best suited for advertising rather than the utility of users.

Use of the scheme continues to grow each year but is still at a low level compared with schemes elsewhere.

One of the main challenges seems to be the cost and the level of subsidy that Brisbane City Council is putting in to the scheme each year. It seems that they were anticipating a lower or no subsidy after the initial set up of the scheme. Unfortunately the on-going council subsidy has meant the scheme has become a 'political football'.

At focus groups held in October 2011, participants stated that they felt take up would improve more people were seen using the bikes.

Other issues cited were the operating times of the scheme, at that time it ran from 5am to 10pm the bikes are now available 24/7.

There was also a sense that there was a lack of safe cycling infrastructure in the city and that driver behaviour towards cyclists was poor. However, CityCycle users said that they felt safer on a CityCycle than their own private bike.

Helmet law

Cyclists are required by law to wear helmets in Queensland. In 2013, a parliamentary committee report into cycling issues recommended to the state government that a two-year trial be undertaken where CityCycle riders over 16 wouldn't need to wear helmets. However the state government decided not to relax the helmet law.

When the scheme was initially introduced, helmets were not supplied with the bikes. In 2011 courtesy helmets were introduced, these are attached to around half of the bikes. Following the introduction of the helmets, patronage doubled.

Members of the scheme who took part in a survey in 2012 were asked what factors would discourage them from joining the scheme, and of the 15 option answers, "I don't want to wear a helmet" was the least selected answer. When asking non CityCycle members about what would motivate them to join the scheme, "helmets more accessible" was a frequent answer. The most popular factor was "More Bike lanes and Paths"

Successes

The scheme is well-liked by users.

Pros and Cons

Issue	Resolution
Bikes available between 5am and 10pm which effects spontaneity of use.	Bike now available 24/7
Helmet – not owning one or having it with them	Helmets are attached to around half of the bikes. Although these often get used first and the helmets tend to disappear.
No facility to hire at the terminal with a credit card	Credit card use at the terminal is still not possible but 'express cards' to enable access can be purchased at 36 libraries and visitors centres
Lack of cycle infrastructure	Brisbane has 1,300km of bikeways and shared routes and proposed to spend \$220m on cycling infrastructure from 2008 to 2016.

A.5 Melbourne Bike Share



Date started	June 2010
Operated by	RACV (The stations and bicycles are owned by the government and operated in a public-private partnership with RACV).
Sponsored by	No major sponsor
How many cycles?	600+
Docking spaces	900
Stations	57
Ratio of docking space : cycles	1.5:1
Patronage (daily use)	Average of 470 (2014) Average of 249 a day in June 2016
Ratio of cycles / daily hires	Range 1 : 0.78 to 1 : 0.41
Link to PT smart card?	No

Costs to User	<ul style="list-style-type: none"> • Annual Membership AU\$60 (unlimited journeys of 45 minutes) • Casual 1 week AU\$8 (unlimited journeys of 30 minutes) • Casual 24 hr AU\$3 (unlimited journeys of 30 minutes) • Corporate membership AU\$100 <p>Overtime fees:</p> <p>Up to 60 minutes - AU\$2</p> <p>Up to 90 minutes - AU\$7</p> <p>Every additional 30 minutes - AU\$10</p>
Deposit	AU\$50
Cost of initial set up per cycle	Implementation and planning costs totalled AU\$5.5 million over four years. AU\$9166 per cycle
Features of the cycles	18kg with 3 gears.
Rebalancing	Undertaken by staff
Helmets	Courtesy helmets are provided as well as \$5 helmets to purchase

How it works

There is a terminal at each station and casual users can use their credit or debit card to hire a cycle. They receive 5 digit printed release code for each trip which they then key in to the docking station keypad to release the cycle.

Annual members must join online and will then be sent a members pack which includes a smart key. The key can be inserted in to the docking station to release the cycle.

Business Model

The scheme is operated by RACV for Melbourne City Council. Motivate have involvement in the scheme. The scheme is based on the BIXI system.

Development, Implementation and Expansion

The scheme opened during at the start of winter with 600 cycles and around 50 stations.

There has been no expansion of the scheme, although some of the stations have been re-located.

At the end of 2013, Victorian Government asked for expressions of interest from companies to take on and expand the scheme as well as securing sponsorship. Apparently three Expressions of Interested were submitted but none were taken forward.

Challenges

Four months after the scheme has opened, only 20,000 journeys had been made. The low take up was felt to be partly due to the need for users to wear a helmet.

By the end of the first year 100,000 journeys had been made. This figure has grown in subsequent years but the scheme is still underused.

The low levels of use can perhaps be attributed to the following factors:

- Promotion of the scheme is limited and low key and low levels of use mean the scheme is less visible
- The area covered by the scheme is relatively compact
- Lack of investment to expand the area covered by the scheme
- The need to wear a helmet may put some users off and users have to be organised and bring their helmet with them if they can't find a courtesy one or do not like to wear a borrowed helmet

In January 2015 a free tram zone was implemented in the CBD. This has had a detrimental impact on cycle share in this area and as a result, five cycle share stations have been relocated to outside the free tram zone. Since relocation, a 135% increase in use has been seen between the five stations.

There are now 16 stations in the free tram zone, leaving users a lengthy walk from their cycle drop-off to their final destination - or a free tram ride.

Helmet law

Cyclists are required by law to wear a helmet.

In Oct 2010 Melbourne Bike Share launched a scheme whereby helmets could be purchased from vending machines at stations for AUD\$5. The helmets could then be used and returned after use for AUD\$3 refund. The helmets were then cleaned and reused.

At present, AUD\$5 helmets are on sale at a number of outlets. Members can also purchase a \$5 helmet online when joining the scheme. Each helmet is subsidised by the state government by approximately \$8.

In 2013 there was a trial of courtesy helmets with 165 helmets available. The helmets were replaced every week with used helmets being cleaned and then reused. The courtesy helmets are still being supplied but it is not known how many and if they are still cleaned each week. After the courtesy helmets were introduced, patronage increased by nearly 50%.

Successes

Geospatial analysis of ridership data has identified that some of the strongest trip patterns occur between stations located in areas of relatively weak public transport accessibility. This shows that in certain areas the scheme is making a positive contribution to accessibility.

The stated objectives of Melbourne Bike Share are:

1. To support the Victorian Government's goals for social sustainability within an integrated public transport system;
2. To provide a viable sustainable transport alternative for inner Melbourne which will help relieve crowding on the transport systems in the inner city and assist in managing the growth of travel demands in Melbourne;
3. To assist in the promotion of cycling for trips under 10 kilometres in and around central Melbourne;
4. To extend the reach of the public transport system, particularly at the "destination" end, as cycling provides an option that is faster than walking and more flexible than trams and other route-based public transport;

- 5. To aid the promotion and growth of cycling mode share, in order to contribute to positive health and well-being benefits for Victorians; and
- 6. To assist State and Local Government in reaching targets to reduce greenhouse gas emissions.

A.6 Guangzhou Public Bicycle



Date started	June 2010
Operated by	Guangzhou Public Bicycle Operation Management Co.
Sponsored by	No Sponsor
How many cycles?	15000
Docking spaces	Not available (see below)
Stations	113
Ratio of docking space : cycles	Not available – more cycles than docking spaces
Coverage (km2)	263 (2013)

Pop density	1,708 (overall city density)
Pop in coverage area	449,204 (2013)
Patronage (daily use)	20,000
Link to PT smart card?	Yes
Costs to User	Up to 1 hour free 1 to 2 hrs 1RMB (0.21NZD) 2 to 3 hrs 2RMB More than 3hrs 3RMB an hour 12 – 24 hrs max of 30RMB
Deposit	Must put 300RMB (\$63NZD) deposit on Yang Cheng Tong card (smart card)
Cost of initial set up	RMB25M (\$5.147m NZD)
Annual running cost per bike	RMB 9.6M (\$1.976m NZD)
Public Subsidy	640RMB per bike (\$133 NZD)
Features of the bikes	14.3kg
Helmets	Not required

Hours of operation

3 outlets are open 24 hrs and 17 are from 7am to 10pm

How it works

All users must first register at one of the registration outlets. Residents must present their ID certificate and Yang Cheng Tong card. Visitors must present ID and pay the deposit and then visitors are issued with a membership service card. Users can hire a cycle by swiping either the Yang Cheng Tong card or the membership service card on the dock.

There are more cycles in the system than docking stations as a number of the cycles are stored at stations and are wheeled out to meet demand.

Business Model

Guangzhou Public Bicycle Operation Management Co is state owned and is a subsidiary of the Bus Company.

The first phase of the scheme initially involved 1000 cycles to test the system, gradually this number increased to 5000. Two further phases were implemented over the following 4 months to bring the total number of cycles to 15,000.

There are a number of benefits of the scheme being run as a subsidiary of the bus company; easier integration with bus stations, use of existing maintenance depots and control centre.

Development, Implementation and Expansion

The scheme was implemented at the same time as Guangzhou Bus Rapid Transport Project (BRT). BRT carries 1 million passengers daily. The BRT corridor was also designed to include lots of greenway, pedestrian and bike paths so that users don't have to cycle with the traffic.

The scheme was implemented in 3 phases over the period of a few months.

Successes

The scheme has been well received and delivered as part of a city-changing approach to how people move around the city.

A.7 The Netherlands – OV-Fiets



Date started	2002
Operated by	NS – State owned rail company
Sponsored by	No Sponsor
How many cycles?	8000 in 2015 but due to expand by 3000
Stations	277 locations nationwide, most of these are at rail stations, but some at bus and metro stations, some city centres and park and ride car parks.
Annual Patronage	In 2015 – 1.9million uses – up 25% from 2014
No of members	177,000 at end of 2015
Link to PT smart card?	Yes
Split between casual use and members	No casual use available – users must subscribe for €10 Business membership is available.
Costs to User	€10 annual subscription charge. €3.35 for 24 hrs

	Costs are billed to the user each month and paid by direct debit. Maximum rental period 72 hrs
Deposit	No deposit but various charges for unreturned cycles
Can a bike be returned to a different station?	Yes but there is a €10 surcharge
Cost of initial set up per bike	Unknown
Annual running cost per bike	Unknown
Estimates annual income	Around €8.135M
Public Subsidy	Unknown
Features of the bikes	The new bikes are made from aluminium
Rebalancing	The rebalancing operations are not known but there is unlikely to be a large demand for rebalancing due to the nature of the scheme and the €10 charge for returning a bike to an alternative station.
Similar schemes elsewhere	-Call a bike – run by DB at Rail Stations in Germany. -Bike and Go – available at a number of rail stations in the UK (NS operated stations).

How it works

In order to hire and OV-Fiets Cycle, users need to get an OV-Fiets season ticket; the season ticket can be added to the OV Chip card (smart card).

There are different types of stations, some are manned and others are self-service, often the cycles are stored in enclosed lockers.

Business and Operating Model

The scheme is owned and operated by NS, the state owned rail company.

The operating model is different to other Bike Hire schemes. It is a bike rental system and is focused on stations throughout the Netherlands. The system is aimed at providing for first / last mile journeys with the cycle being stored during the day or overnight at the destination. Cycling accounts for 31% of rail station access journeys in the Netherlands, but only 9% of egress trips. OV-Fiets was introduced enable a higher level of cycling egress trips.

Cycles can be hired in 24 hour increments up to 72 hrs.

Development, Implementation and Expansion

The scheme was set up in 2002 as a pilot project in 41 stations. The level of monthly rentals was around 5600 after a year of operation.

The scheme expanded and in 2008 NS took over running it.

In 2011 a small number of electric scooters and bikes were introduced for hire at a limited number of stations. The trial ended in 2014.

The busiest months for the scheme are Sept and October and during this time additional bikes are available a certain stations.

Innovations

An app for the scheme was introduced in Oct 2015 to enable users to get real-time information on bike availability.

OV Fiets is expanding the fleet with a newly designed OV Fiets Cycle. A number of roadshows were held where the public could try out the different cycles to see which they liked best and to inform the new design for OV Fiets cycles.

During the summer the OV Fiets team attend major events.

Challenges

The original OV-Fiets bike has been criticised by some users for being unsuitable for long distances and because it does not fit in a standard bike parking rack.

Successes

The scheme is popular and subscription and use is growing each year.

A.8 Madrid – BiciMAD



Date started	June 2014
Operated by	Bonopark
Sponsored by	No Sponsor
How many cycles?	2028
Docking spaces	4116
Stations	165
Ratio of cycles to docking spaces	1 : 2.02
Patronage (daily use)	10,000 a day in winter, 15000 a day in summer
Ratio of bikes / daily hires	Between 1 : 4.9 and 1 : 7.4 a day
Density of stations	300m
No of members	50,000
Link to PT smart card?	Yes – reduced membership fee
Length of trips/ duration / nature of use	Not known

Split between casual use and members	Not known
Costs to User	<ul style="list-style-type: none"> Annual Membership <p>€25 or €15 if combined with PT card</p> <p>1st 30 minutes - €0.5</p> <p>2nd 30 minutes - €0.6</p> <ul style="list-style-type: none"> Casual use <p>1st 30minutes - €2</p> <p>2nd 30 minutes - €4</p> <p>Over 2 hours – €4 penalty</p>
Deposit	Bank card pre-authorised for €150
Cost of initial set up per bike	Not known
Annual running cost per bike	Not known
Public Subsidy	Yes, although unclear how much
Features of the bikes	Electrically assisted bike (360watt motor) with top speed of 25kmph. 3 gears. Weight 22kg. GPS tracking
Rebalancing	Users receive a €0.10 bonus for taking a bike from a station which is over 70% full and returning a bike to a station which is less than 30% occupied.
Helmets	Helmets are mandatory for under 16 year olds. The cycles can be hired by users aged 14 and up
Similar schemes elsewhere	Copenhagen – Bicyklen

San Sebastien – dBizi

How it works

Casual users can register to use the system at the terminals at each docking station where the terminal will dispense a card which is used to release a cycle from the dock. Annual members must subscribe online and can then collect an annual subscription card from the terminal.

Business Model

Madrid City Council awarded the contract to implement and operate the system to Bonopark. The form of contract is unclear, although it seems that Bonopark funded the installation of the equipment.

The website hints that the requirement was not specifically for an electric bike system but that the tendered prices for electric and non-electric were similar.

Development, Implementation and Expansion

The scheme was implemented with just over 1500 cycles and 123 stations and then expanded to 2028 cycles and 165 stations.

Challenges

It has been reported that in the first 20 months of the scheme 470 bikes were stolen or vandalised beyond repair.

The supply of cycles at certain locations does not always meet the demand.

It seems that cashflow to fund the expansion of the scheme has been an issue and that the City Council have had to contribute more than was originally anticipated.

Successes

The scheme appears to be well liked by users.

The scheme appears to be well used although the usage figures have not been verified with the Operator.

A.9 Portland – Biketown



Start date	19 July 2016
Operated by	Motivate
Sponsored by	Nike (US\$10 over 5 years)
How many cycles?	1000
Stations	100
Patronage (daily use)	In the first week 13,491 trips were made, and average of 1914 a day.
Costs to User	
<ul style="list-style-type: none"> Annual Membership 	US\$12 a month for up to 90mins of ride time a day
<ul style="list-style-type: none"> Day Pass 	US\$12 a day for up to 180mins of ride time
<ul style="list-style-type: none"> Single trip 	UD\$2.50 30 mins of ride time

	<p>10cents per minute is charged for additional ride time.</p> <p>US\$2 charge for locking a cycle to a public rack inside system area</p> <p>US\$20 charge for locking a cycle to a public rack outside of the system area</p>
Deposit	Lost bike fee US\$1500
Features of the cycles	Chainless drive shaft. 8 gears. GPS tracker. Smart docking system onboard.
Features of the stations	Stations are modular and do not require power.
Rebalancing	US\$1 credit for taking a cycle from a public rack and returning it to a dock.

Cycles from SoBi cost US\$1600 and an individual rack is US\$450. There are other costs for software and the website and optional terminal points.

How it will work

The system will use Social Bicycles (SoBi). SoBi have been used on a number of schemes and present a different model of operation to other bike hire scheme. SoBi cycles have the technology on the cycle rather than in a terminal or docking point. This means that they can be 'docked' in any cycle parking.

The pricing structure has been designed to incentivise users to return the cycles to the docking racks but they can also be returned at other cycle racks.

All users must join Biketown which can be done online or via the mobile app. Users are assigned a 6 digit user number and they choose their own 4 digit pin number. The user then needs to input both numbers in to the key pad on the cycle to release the lock.

Members will be able to buy a members card which can be used inserted in to the smart unit on the cycle to release the lock.

Cost of SoBi's

A.10 Seattle – Pronto



Date started	October 2014
Operated by	Motivate
Sponsored by	Alaska Airlines plus various other sponsors
How many cycles?	500
Docking spaces	<i>Not known</i>
Stations	54
Ratio of docking space : cycles	<i>Not known</i>
Size of Stations	10 to 31 docking spaces
Scheme Coverage (km2)	7.7km2
Pop in coverage area	<i>Not known</i>
Pop density (people / km2)	<i>Not known</i>
Patronage (daily use)	387 average daily trips in June 2016
Ratio of cycles / daily hires	1 : 0.77

Density of stations	7.7 per km2
No of members	3000 (in first year)
Link to PT smart card?	No
Length of trips	<i>Not known</i>
Split between casual use and members	<i>Not known</i>
Costs to User	<ul style="list-style-type: none"> Annual Membership Day Pass 3 Day Pass
Deposit	No deposit but US\$1200 for non-return of bike after 24 hrs
Cost of initial set up (per cycle)	<i>Not known</i>
Annual running cost per cycle	Estimated UD\$2979

Annual income	<i>Not known</i>
Public Subsidy	Yes
Features of the cycles	7 gears. Weight 16kgs. Aluminium frame
Rebalancing	Carried out with vans

How it works

There is a terminal at each station and casual users can use their credit or debit card to hire a cycle. Both casual users and member can obtain a key at the terminal and the key can be used to release a cycle directly without using the terminal.

Business Model

The scheme is operated by Motivate.

When launched the scheme was under the ownership of Puget Sound Bike Share, a non-profit organisation made up of public and private partners.

In 2015 the system ran in to financial difficulties and was declared insolvent. It was brought by Seattle City Council in March 2016. It would seem that the financial problems stemmed from the fact that insufficient capital was raised to fund the implementation of the scheme meaning that loans were needed to meet the shortfall. The scheme then struggled to make enough revenue to cover running costs and loan repayments.

The primary sponsor is Alaska Airlines who paid UD\$2.5m for a 5 year sponsorship deal. There are also secondary sponsors and it is possible for companies to sponsor individual stations at a cost of UD\$12,000 a year.

Development, Implementation and Expansion

The first phase of the Pronto scheme consists of around 500 bicycles distributed in 50 stations across downtown Seattle and in the University District.

The scheme was intended to be regional scheme with a number of Subsequent expansion phases were planned but have been delayed. Under the ownership of the City Council it is expected that expansion will take place in 2017.

Challenges

Compared to larger schemes, uptake of the Seattle scheme appears to be fairly low. However, it is difficult to determine if this is due to a reluctance of people to use the scheme or if the implementation of stage one of the scheme was too small to reach critical mass. Guidance in the ITDP's Bike Share Planning Guide suggests that the minimum coverage area of a scheme should be 10km² with an optimal station density of between 10-16 stations per square km.

In comparison, the service area of the Seattle scheme was around 7km² which suggests that the size of the scheme and density of stations may be what has contributed to a lower than expected ridership.

Of particular interest to the Auckland context, is the identification that 80,000 trips were undertaken with a downhill destination whilst only 50,000 trips were undertaken with an uphill destination. The scheme relies on a rebalancing operation to redistribute cycles between uphill and downhill stations.

Helmet Law

There is a legal requirement to wear a bike helmet in Seattle. The approach to helmet provision was well considered during the feasibility stage, with various options costed and considered.

The chosen solution was to provide helmet dispensers next to a docking station. Users receive a code when hiring a bicycle which when entered will dispense a helmet. Short term users have to pay US\$2 for helmet hire. Upon returning the bicycle, the helmet is placed in a separate section of the dispenser to be sanitised. The cost of helmet provision is reported to be around US\$200,000 a year.

