The Bikeshare Planning Guide

2018 EDITION

ITDP

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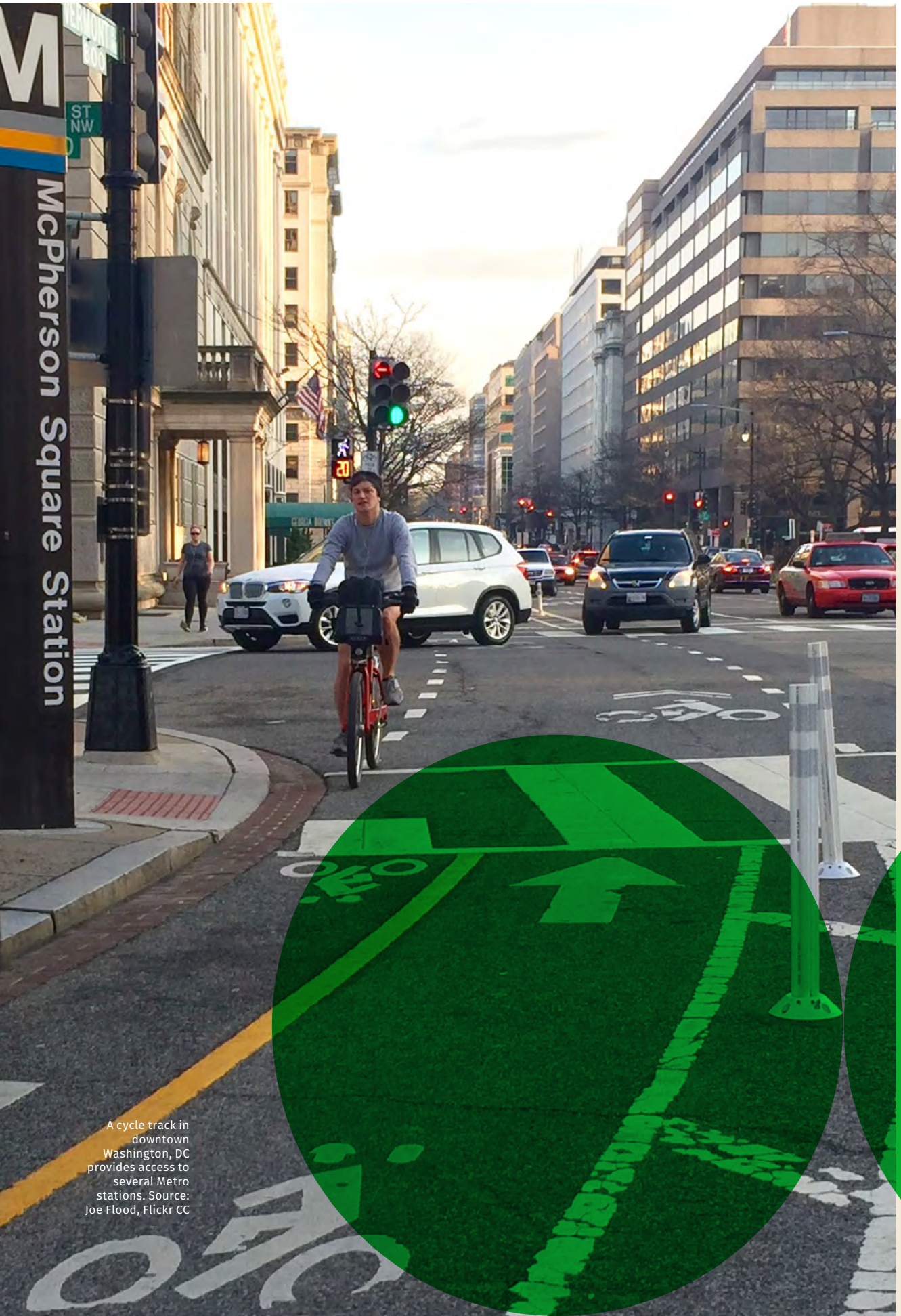


A cycle track in downtown Washington, DC provides access to several Metro stations. Source: Joe Flood, Flickr CC

INTRODUCTION

This Bikeshare Planning Guide compiles the knowledge, experience, and best practices gleaned from bikeshare experts, successful (and not so successful) bikeshare systems, and thought-leaders so that new and expanding bikeshare systems are positioned to succeed. It aims to shed light on every step of planning, implementing, and expanding—as well as regulating—a bikeshare system, taking into account a city's location, size, density, existing transportation network, and other features. So much has been learned since the release of the first Bikeshare Planning Guide in 2013. New, innovative technologies, business models, funding mechanisms, and policy strategies have emerged over just a few years. Given these changes and, in some cases, the uncertainties they have generated, this edition will take a more descriptive approach to system planning. Arming cities with knowledge on the planning, design, management and funding options available to them, as well as potential outcomes yields more successful bikeshare systems and more sustainable transportation networks.

Bikeshare has taken many forms over the past decade, from free bikes distributed throughout a community for all to use, to stations where bike rental was managed manually by an attendant, to the more technologically advanced and secure systems we see in most cities today. The purpose of bikeshare, though, has always remained the same: enabling users to pick up a bike in one place and return it to another, making point-to-point, human-powered transportation practical. The "what" is simple; the "how" is where it gets complicated. Myriad of variables must be taken into account when planning a bikeshare system: the city's density, topography, and weather; its commitment to investing in infrastructure; and its political will to support active transportation, for example.

Many cities have developed and expanded around car travel, sacrificing alternative land uses and streetscapes scaled to the pedestrian in the process. As cities commit to policies that prioritize space for people over single-occupancy vehicles and bolster the affordability and reliability of sustainable transportation modes, bikeshare is critical. A key supplement to public transportation and ridesharing services, bikeshare has been instrumental in enabling people to live car-free, which is a critical step in reducing vehicle travel, emissions, traffic injuries and deaths, etc. Today, cities on every continent offer bikeshare to residents and visitors alike, and the shared mobility mode continues to spread to cities large and small, university campuses, employment centers, and even residential developments. Highly successful systems—like in Mexico City and throughout China—have helped to promote cycling as a viable and valued transport option. Chinese cities now have the highest usage of bikeshares and have significantly shifted mode share away from private vehicles.

This Bikeshare Planning Guide explores and provides recommendations on critical planning topics, with the goal of launching bikeshare systems that are equitable, sustainable, financially sound, and operate within a diverse transportation network.

1.1
UNDERSTANDING THE CURRENT BIKESHARE LANDSCAPE

1.1.1

Developments since the 2013 Planning Guide

ITDP's first edition of the Bikeshare Planning Guide was released in 2013—just as several innovative, game-changing technologies were beginning to hit the bikeshare scene. Several of these developments, introduced below but covered in detail throughout the Guide, have challenged existing financing, pricing, and operating models, catapulting bikeshare toward a new generation.

Dockless bikeshare

While not a wholly new concept in bikeshare—European transit-centered bikeshare systems have operated using a stationless model for years—a new generation of dockless (also called stationless or "free-floating") systems exploded on the scene in 2015, thanks to dozens of private start-up companies that expanded rapidly across China and in cities around the world. The ne w dockless model offers a more flexible bikeshare experience because users are able to start and end their trip at their true origin and destination without having to find a nearby station. Dockless bikes are equipped with global positioning systems (GPS), and are found, rented, and locked through the dockless operator's smartphone app. These systems have the potential to produce robust travel data generated from the on-bike GPS.

In Paris, dockless bikes from multiple private operators have become popular, and supplement the city's station-based system, Velib'. Source: Carlos F. Pardo

Per-trip pricing

Annual membership and 24-hour passes have been a hallmark of bikeshare pricing schemes since their inception, but few systems offered users a more flexible, less expensive, per-trip price. This fare option—usually the equivalent of US$3 or less, and sometimes considerably less—is now offered by both traditional station-based systems (including Capital Bikeshare in Washington, DC, BIKETOWN in Portland, OR, and BIXI in Montreal) and dockless systems. Similar in price to a trip on public transit, the per-trip fare is intended to generate trips on bikeshare that otherwise would have been made walking, or using transportation network companies (TNCs).

Pedal assist e-bikes

These bikes, also called pedal electric ("ped-elec"), provide a battery-powered boost to riders as they pedal. Pedal assist bikes are particularly ideal for bikeshare because of their otherwise high upfront cost to users, and they can improve user comfort by reducing often-cited barriers to cycling such as fatigue, sweating, and longer-distance or hilly trips. Maximum speeds for pedal assist e-bikes are usually capped at around 30 kph (18 mph).

Mexico City's successful Ecobici bikeshare system added pedal assist e-bikes and electric charging stations in early 2018.
Source: Enrique Abe, Mexico City´s Ministry of Environment Department of Cycling Culture and Infrastructure

Hybrid bikeshare systems

In an effort to embrace new technological developments, while still offering users a bikeshare system they understand and feel comfortable using, several cities integrate different types of bikes and docking options into one system. For example, Barcelona's Bicing and Milan's BikeMi offer users access to smart dock bikes as well as pedal assist e-bikes. Portland's BIKETOWN and Atlanta's Relay systems offer a combined station-based and stationless model, enabling users to lock their bike to a rack away from a station, but within a designated hub, to end their trip.

Transit integration

Several cities have made efforts to improve the ease and convenience of multi-modal trip making by better integrating their bikeshare system with public transit. Operated by the transit agency, Los Angeles Metro Bikeshare allows users to check out a bike using their Transit Access Pass (TAP) card. Helsinki's City Bikes system will be integrated into the mobility as a service (MaaS) Whim app, which offers streamlined access to taxis, public transport, shared vehicles, and, soon, bikeshare through pay-as-you-go or monthly plans.[1]

Helsinki's transit agency operates its bikeshare system, City Bikes. Users can already unlock a bike using their transit card, and City Bikes will soon be available in mobility as a service packages.
Source: Michael W. Andersen (Flickr CC)

1 *Whim*, 2018.

1.1.2

Notable Global Expansions

Over the past five years, global bikeshare growth has been astounding. Over 1,600 bikeshare systems—station-based, dockless, and hybrid systems, both publicly and privately operated—are now operating worldwide, up from about 700 systems in 2013.[2] And more systems are launching every day as cities understand the opportunity bikeshare presents to shift travelers away from private car use, and to help meet broader climate, health, economic and other goals.

China

In Guangzhou and other Chinese cities, the scale of dockless bikeshare has contributed to a reduction in private car trips. Source: ITDP China

Bikeshare systems in China have seen explosive growth since 2008. For example, Hangzhou, which launched its bikeshare in 2008 with 4,900 bikes, expanded its system to 50,000 bikes by 2009. By 2016, Hangzhou's system offered more than 97,000 bikes used by over 300,000 people every day—that's 113 million trips per year. And the city plans to expand the system to 175,000 bicycles by 2020.[3] The story is similar in other major Chinese cities, especially since the paradigm-shifting rise of dockless bikeshare swept the country. This technology-focused, on-demand model for providing bikeshare has generated the largest expansion of equipment, rides, users, and mode shift to cycling the world has ever seen. Shanghai reports having one million dockless bicycles on the street, followed closely by Guangzhou with another 800,000, all operated by dozens of private companies vying for market share. In response to challenges that have arisen from this model including piles of bikes and disorderly sidewalks and public spaces, many local governments have developed varying forms of regulation.

North America

Capital Bikeshare in Washington, DC was one of North America's earliest bikeshare systems. The system is still well-used by residents and tourists, even after the introduction of dockless bikeshare to the city in September 2017. Source: Kyle Gradinger (Flickr CC)

In 2016, riders of bikeshare systems in the United States took over 28 million trips, which falls just slightly under the 31 million trips taken across the entire Amtrak passenger rail system that same year. Ridership in North America has grown sharply since 2012, with the introduction of dozens of new bikeshare systems each year. Since 2016, the majority of new bikeshare systems in North America have utilized smartbikes (either hub-centric or stationless).[4] As bikeshare continues to evolve, new operating systems have begun to emerge across the US in particular, most notably using stationless, dockless bikes. In 2017, several dockless operators deployed bikes in the United States, as well as in China, Great Britain, Italy, Singapore, Australia and other locations. Notably, operators offering pedal assist e-bikeshare fleets have also launched in several North American cities as of 2017.

Latin America

Recognizing that the topography of the city could be challenging for casual bike riders, the city of Quito added 300 pedal assist e-bikes to its BiciQuito bikeshare system in March 2016. Source: Carlos Felipe Pardo

Various Latin American cities have improved and expanded their bikeshare systems in the past five years. For example, Medellín, Buenos Aires, Santiago, and Quito transitioned from second- to third-generation systems, and Quito implemented pedal assist e-bikes. With a new operator (Tembici) and, in some cases, equipment, several systems in Brazil, including Rio de Janeiro and São Paulo have improved their planning and service delivery in an effort to increase usage and performance. Currently, Mexico City's Ecobici is the largest bikeshare system in the region, with more than 45 million trips since 2010 and more than 200,000 users. The system added pedal assist e-bikes in early 2018. Also in 2018, dockless bikeshare launched for the first time in Latin America in Santiago and Mexico City.

2 Russell Meddin, "The Bike-sharing World Map."
3 Chen Mengwei, "Hangzhou abuzz over bike sharing," *China Daily*, September 1, 2016.
4 "Bike Share in the US: 2010-2016," *National Association of City Transportation Officials*, March 9, 2017.

India

A woman in Pune rides a PEDL dockless bike, which are available through Indian-based carshare company, Zoomcar. Source: Santhosh Loganaathan

India's national Ministry of Housing and Urban Affairs launched the Smart Cities Mission, an urban renewal and retrofitting program that promotes mixed land use and compact development, walking and cycling. The Mission promotes bikeshare as an option for first-last-kilometer connectivity and encouraged cities like Bhopal, Mysuru and Pune to implement bikeshare. Several more Indian cities have bikeshare systems in the works. Bhopal and Mysuru's systems are single-operator station-based systems, while Pune's is dockless with multiple operators.

Africa

Marrakech's 10 station bikeshare system was the first in Africa. Source: Chris Kost

Africa's first bikeshare program—Medina Bikes—launched in 2016 in Marrakesh alongside the 22nd Conference of the Parties (COP22) climate conference as part of a broader portfolio of actions aimed at reducing Morocco's fossil fuel consumption.[5] A year later, the University of Nairobi implemented a system that features one central station with 20 bikes and is geared toward students and staff traveling around campus.[6] Cycling has gained popularity in Cairo, as well, where the government, in coordination with UN-Habitat, approved a three-year funding scheme for bikeshare in July 2017.[7]

1.1.3

The Need for Outcome-Oriented Decision Making

Emerging innovations and technologies in transportation have generated new mobility opportunities, namely, eliminating barriers to the success of shared-use transportation. A key piece in the sustainable transportation puzzle, shared-use transportation (defined as mobility assets that are shared amongst users such as bikeshareing, ride hailing, microtransit, etc.) is becoming increasingly important for cities as they work to reduce private vehicle travel and reclaim public space for people.

Goal-setting can help to integrate bikeshare into a city's economic development, sustainability, health, and other efforts already being undertaken. For example, bikeshare can plug into climate-related goals as a tool to reduce vehicle kilometers traveled (VKT) and single-occupancy vehicle trips. Or it can contribute to economic development goals by attracting both tourists and businesses, offering an affordable, sustainable transportation mode for visitors to explore the city and as a quality of life benefit for potential employees. Identifying goals for bikeshare will help cities decide which policies to prioritize, and how best to track progress and measure success. Data generated from bikeshare trips will help inform this evaluation, and collecting it from operators will be paramount for cities going forward.

This Planning Guide encourages vision- and outcome-oriented policies instead of identifying specific operating or business models. This allows for greater flexibility in shared mobility policy solutions as contexts, opportunities, and technologies evolve.

5 Mimi Kirk. "Africa's First Bike-Share Just Launched in Morocco," *City Lab*, November 11, 2016.
6 C4DLab, *University of Nairobi*, 2016.
7 "Egypt to launch country's first bicycle-sharing system," *Egypt Independent*, July 25, 2017.

1.2
THE OPPORTUNITY OF BIKESHARE

Well-designed bikeshare systems around the world have provided critical links to transit, jobs, and other destinations, thereby expanding cities' transportation networks and connecting people to new opportunities.

Ecobici stations in downtown Buenos Aires expand access to transit, jobs, and other destinations throughout the city. Source: ITDP Global

1.2.1

Expanding Sustainable Transport through Network Integration

Public Transportation

As cities consider reframing their transportation network as a service that maximizes ease and efficiency for users, opportunities emerge for bikeshare to be seamlessly integrated into the larger transit system. While this may or may not translate into increased ridership, integration between transit and bikeshare would contribute to a better, more seamless transportation network. An April 2016 study conducted by the United States Bureau of Transportation Statistics found that 77% of all bikeshare stations in the US were located within one block of another public transit mode, thereby meaningfully extending the network.[8] Bikeshare stations near bus stops were the most common transit connection; additional connectivity could be gained through on-board stop announcements that alert riders of nearby bikeshare connections, as has been implemented in Milwaukee's buses with connections to the city's Bublr bikeshare.

Several cities, including Los Angeles, Mexico City, and Montreal, have had success implementing "lite" transit integration, linking per trip and annual bikeshare membership payments with their existing transit cards through RFID.[9] On the "back end," however, the user maintains two separate accounts—one for bikeshare and one for transit—each with its own payment system.

"Robust" transit integration, however, is characterized by the use of a single payment platform that enables users to access bikeshare and transit seamlessly. Bikeshare operators' concerns about liability complicate the issue, since the transit card would need to be linked to a credit card or bank account that would be charged if a bike is damaged or stolen. Robust transit integration would enable discounted transfers to and from bikeshare, as are commonly offered between bus and rail lines, offering an alternate transportation option to help mitigate the first-last-kilometer problem. While few systems offer robust transit integration, some are moving in that direction. For example, Pittsburgh launched a transit integration pilot program in October 2017 between its Healthy Ride bikeshare and the city's Port Authority, enabling ConnectCard users to access an unlimited number of free 15-minute bikeshare rides without setting up a separate Healthy Ride account. Transit card users are able to link their account to bikeshare by tapping their card at a Healthy Ride kiosk, and can then immediately rent a bike for free.[10]

8 Theresa Firestine, "BTS Technical Report: Bike-Share Stations in the United States," *US Department of Transportation, Bureau of Transportation Statistics*, 2016.
9 "Pricing," *Metro Bike Share*; "FAQs," ECOBICI; "Subscribe to Opus Access," Bixi Montreal.
10 "Go Further with Your ConnectCard," *Healthy Ride Pittsburgh.*

A Tugo bikeshare station in Tucson provides connectivity to the city's streetcar system. Source: City of Tucson (Flickr CC)

A key aspect of elevating bikeshare to a consistently-used transportation mode is encouraging regular bikeshare use among commuters. Several systems in the US and Canada, such as in Philadelphia, Phoenix, and Vancouver, offer discounted corporate rates for employers to offer bikeshare as a commuter benefit to employees. If offering a discounted corporate rate, the bikeshare implementing agency should encourage employers to provide indoor bike storage and showers and/or changing areas to further lower barriers to cycling to work.

Major challenges to integrating bikeshare with transit arise from a lack of funding and staff time to overhaul existing or implement new technology. Bilateral coordination between bikeshare operators and city and regional transit authorities, as well as other relevant agencies is recommended to help incorporate bikeshare operations into transportation decisionmaking in a more holistic, effective way. Further, cities should take advantage of projected updates to their transit system's payment technology as an opportunity to create links with bikeshare payment options.

In Mexico City, the CDMX transit card can also be used to access bikeshare after users set up an Ecobici account. Source: ITDP Mexico

Examples of Bikeshare Integrated with Transit

City	Country	System Name	Transit Used	Reduced/Free Bikeshare Trips?	Benefits
Buenos Aires	Argentina	Ecobici	MiBA card	Y	All Ecobici trips are free, MiBA card offers more streamlined acces
Cologne	Germany	KVB rad	VRS	Y	VRS (regional train) cardholders can access free 30-minute bikeshare trips in Cologne
Pittsburgh, PA	USA	Healthy Ride	ConnectCard	Y	ConnectCard holders can link their account by tapping their card at a bikeshare kiosk, immediate access to free
Montreal	Canada	BIXI	OPUS	N	CA$100 deposit waived for non-members who use their OPUS card
Helsinki	Finland	City Bike	HSL card	N	
Mexico City	Mexico	Ecobici	CDMX card	N	
Los Angeles, CA	USA	Metro Bikeshare	TAP card	N	

Transportation Network Companies
Some transportation network companies (TNCs) have taken steps to integrate with private dockless bikeshare companies. For example, in China—with Didi Chuxing enabling users to reserve ofo bikes within their app—and India, where ride-hailing company, Ola, and car rental company, Zoomcar, have both launched integrated bikesharing pilots.[11] In San Francisco, Uber users can find and rent dockless pedal assist JUMP bikes through the Uber app. Enabling users to access rideshare and bikeshare through one app has interesting implications for shared mobility and mobility as a service. Reducing barriers to shared mobility modes makes these modes easier for users to choose and link together, offering more robust alternatives to using a private vehicle. Cities should be aware that this type of partnership could occur, and have clear data sharing requirements in place for both TNCs and bikeshare operators in order to gain insights into how and why people are using certain modes for certain types of trips.

Informal Transit
In many developing cities, informal transit modes such as cycle taxis, rickshaws and motorbikes provide affordable first-last-kilometer connections for commuters and other travelers. Depending on the size of the service area, a bikeshare system could directly compete with these informal modes—on the one hand, addressing some of the challenges brought about by informal transit such as congestion, traffic crashes, air pollution, etc., but on the other, generating conflict with existing operators if demand is not high enough to sustain them. More than likely, the unmet demand for first-last-kilometer connectivity will enable bikeshare to complement existing informal transit options.

Cities in which people rely heavily on informal transit should make a point to be transparent with existing operators about how and where the bikeshare system will operate, and discuss options for their inclusion in the system where possible—for example, creating positions to assist new bikeshare users with operating the system, and to provide security. This type of transition for informal operators has been discussed in Cairo, which plans to launch a bikeshare system in 2019. Cities can also undertake efforts to transition former informal transit operators into new jobs created by the bikeshare system's direct operation, including in cleaning, maintenance, and rebalancing activities. Indirect employment opportunities, through the establishment of bicycle shops, bicycle tourism and related activities, may also arise.

However, while local governments should take conversations about how a new bikeshare system might impact informal transit operators seriously, the ultimate goal of bikeshare is to provide a safe, reliable, affordable transportation mode for the public, and cities should not compromise that goal to appease informal operators.

1.2.2

Bikeshare Strengthens a Long-Term Vision for Cycling

Bikeshare can be a key component of transportation plans that include a long-term vision for cycling. Because bikeshare reduces some barriers to cycling, it can help quickly boost the number of cyclists on the road. This, in turn, can generate a political constituency that supports comprehensive infrastructure and other investments that ingrain bicycling into the transportation system. For example, in California, Santa Monica adopted a Bike Action Plan in 2011, which designated bikeshare as a high priority project toward the city's goal to reduce vehicle trips.[12]

San Diego, California citing a goal from its legally-binding climate action plan to increase the share of bike commuters from 2% to 6% by 2020 and to 18% by 2035, is reworking its bikeshare system to better serve commuters.[13] The city relocated 15 stations, which had previously served mostly tourists along the beach, to neighborhoods more connected to public transit and biking infrastructure. At the same time, the transportation department committed to build more bike lanes and pedestrian greenways in downtown San Diego.

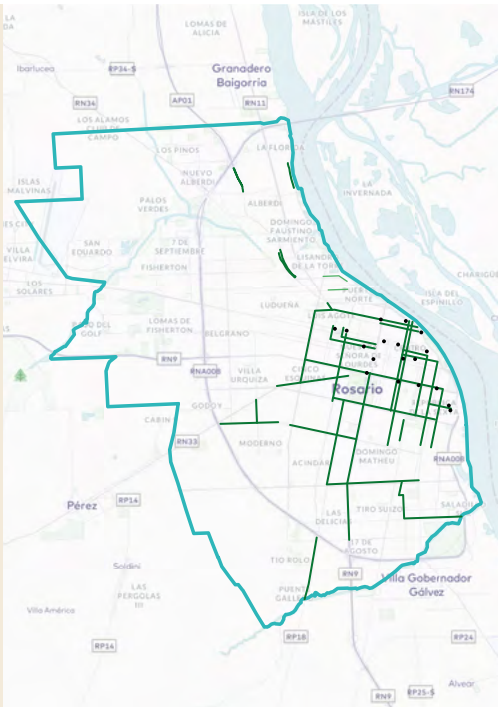
Rosario, Argentina passed municipal ordinance 9030 in 2012, which established the city's public bikeshare system. Article 6 of the ordinance calls for "segregated cycle facilities" to connect bikeshare stations to one another and for these facilities to be built out as the system expands.[14] While these lanes benefit bikeshare users, they can be used by all cyclists and contribute to a safer, more comfortable riding experience. As of 2017, Rosario has 120 km of protected bike paths compared to Washington, DC, which has roughly the same area and 138 km of protected lanes (only 14.5 km of which are on-street).

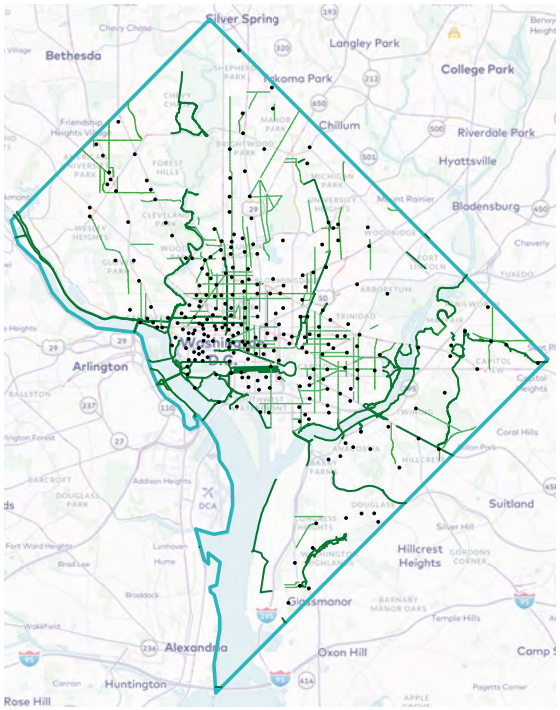
11 Johana Bhuiyan, "Indian ride-hail player Ola just launched its own dockless bike-sharing service," Recode, December 3, 2017.
12 *"Breeze Bike Share," City of Santa Monica Planning & Community Development.*
13 Rachel Dovey, "San Diego Aims to Shift Bike-Share Focus From Tourists to Commuters," *Next City,* September 7, 2017.
14 Interview with Mariel Figueroa, October 25, 2017.

Comparison of Protected Bike Lanes and Bikeshare Station Locations

Nearly all Mi Bici Tu Bici stations in Rosario, Argentina are connected by a protected bike lane. While Washington, DC's Capital Bikeshare has many more stations, most are not adjacent to a protected lane. Source: ITDP data

Bikeshare station
Protected bike lane
Unprotected bike lane





Cities with (or considering) dockless bikeshare also have an opportunity to use bikeshare as a means of achieving long-term cycling goals. Greater Manchester, in the United Kingdom, allowed Mobike to begin operations as part of a smart city demonstrator in June 2017. The approval aligns with Manchester's Cycle City program, which aims to improve air quality and public health, and reduce greenhouse gas emissions through increased bike trips. Salford, a borough of Greater Manchester, has committed to investing £10 million in bike infrastructure, and sees Mobike as a way to get more people on bikes by eliminating the commitment to maintain and store them.[15]

Data generated from bikeshare users—both historical trip data and user feedback surveys—can also provide evidence to support investments in cycling infrastructure and call for more holistic planning of cycling facilities. More details are included in subsection 4.2.2.

1.2.3

Contributing to an overall growth in cycling

Often branded and brightly colored, bikeshare bikes are easy to spot around a city, contributing to increased pedestrian, transit rider, and driver awareness of the presence of bikes on the road. A study conducted by the University of Montreal of the city's BIXI bikeshare program found that, after its second season of operation, those in the general population who were exposed to the system had a greater likelihood of cycling than those not exposed to the system.[16] By design, bikeshare also reduces or even eliminates some of the major barriers to cycling, including the cost and time required to buy and maintain a personal bike, the space needed to store a bike, and the risk of having a personal bike stolen or damaged. Without these challenges, biking becomes a viable transportation option, opening up the potential for additional connections to public transit and more convenient multi-modal trips.

15 Charlotte Cox,"A huge Chinese bike-sharing scheme is coming to Manchester and Salford...and it's Way better than the Boris bikes," Manchester Evening News, June 12, 2017.
16 Daniel Fuller, et al., "Impact Evaluation of a Public Bicycle Share Program on Cycling: A Case Example of BIXI in Montreal, Quebec." *American Journal of Public Health 103*, no.3 (2013): e85–e92.

Getting Started 2

Capital Bikeshare riders in Arlington, VA, just outside of Washington, DC. Source: MV Janzen, Flickr CC

Steps to Plan and Implement Bikeshare

This Planning Guide approaches planning and implementing a bikeshare system using the following decisionmaking framework. Thinking through each step before significant planning or design choices are made will yield a more comprehensive vision for what the city wants from bikeshare, and how bikeshare can contribute to broad environmental, economic, health and safety goals. Cities should commit to integrating consistent public outreach and proactive community engagement, as well as plans for equitable access to, and use of, the system, into all major decisions.

Getting Started

Build political will

for active transportation projects, incluiding bikeshare.

Seek public input

on bikeshare goals, as well as proposed equity commitments. Ask residents how they would use bikeshare and what they want to see out of the system

Goal Setting & Initial Planning

Identify goals for bikeshare,

and stablish targets and metrics to track progress toward those goals.

Release an RFEI

to better understand what investments private companies might be willing to make to operate bikeshare, and weigh the advantages and disadvantages againspublic investment.

Conduct a feasibility study,

and share results with the public for feedback and suggestions.

Choose a bikeshare system type

that meets the needs of residents and takes into account existing city conditions.

Draft financial estimates

incluiding potential cost and revenues to the city.

System Planning & Design

Begin planning the system

For station-based systems, this includes siting and designing stations. For dockless systems, this includes drafting requirements that manage bikeshare operations by private companies. Planning also includes identifying improvements to cycling infraestructure, and choosing bike models

Encouraging Ridership through Community Engagement

Encourage ridership

of the bikeshare system through a strategic combination of branding, marketing and education campaigns, community engagement, and reducing barriers to entry.

System Operations

Clearly define an organizational structure

for system operations, as well as expectations, as well as expectations for quality of service delivery and enforcement of city regulations

Implement performance requirements

for bikeshare operations and hire necessary staff to oversee bikeshare management.

Collect data on system performance

and adjust operations (station-based systems) or regulatory policies (dockless) to improve progress toward goals

Financial Model

Develop a financial model

by calculating capital and operating cost, as well as revenues to the city

Implementation

Implement the system

This could include a soft launch or pilot period

2.1
BUILDING POLITICAL WILL

Depending on the operating model, bikeshare alone may not generate significant revenue, and it can be a difficult sell to politicians who may have concerns about the financial sustainability of bikeshare. Building political will—particularly among more than one political party—is critical to successful design, coordination, and implementation, as well as long-term sustainability. For a deeper dive into approaches to cultivate support from policymakers for sustainable transportation projects, see GIZ/SUTP's "Sustainable Mobility: Getting People on Board".

Educating political officials about the potential of bikeshare is an important first step, especially if public funding will be sought to finance the system. Identifying goals for the bikeshare system, and linking those goals to existing citywide sustainability efforts can help to contextualize bikeshare's benefits. Case studies of how bikeshare in other cities has already generated benefits such as increased access to public transit, reductions in greenhouse gas emissions due to fewer vehicle trips, and improvements in physical activity and overall health, along with site visits to those cities to meet with implementers, can also build a political case. Research on social costs and benefits of investing in cycling infrastructure, like the Netherland's Ministry of Transport's evaluation tool, sheds even more light on how a bikeshare program can benefit a city.[17]

In Indonesia, Bandung's bikeshare system, Boseh, is heavily supported by the city's mayor, Ridwan Kamil, a long-time cycling advocate who co-founded a bikeshare pilot at the Institut Teknologi Bandung (ITB) in 2012, before he was mayor. Early on in his administration, Kamil initiated a program called Bike to School, which encouraged students (and their parents) and teachers to choose biking instead of their cars. In 2016, Mayor Kamil included procurement for bikeshare in budget plans for the city, and helped facilitate a feasibility study. The city government manages Boseh, which began trial operations in August 2017, and the system is fully funded through the Bandung Department of Transportation.[18] Mayor Kamil frames bikeshare, and cycling more generally, as a means of reducing congestion and setting Bandung on a path toward more healthy, sustainable development patterns.

2.2
EQUITY AND ACCESSIBILITY

Reflect, for a moment, on what we have defined as the purpose of bikeshare: enabling any user to pick up a bike in one place and return it to another, removing the complications of having to own or maintain a personal bike, yet still providing a convenient, environmentally-friendly mode for short trips. A survey distributed to cyclists and non-cyclists in New Jersey showed that purchasing and maintaining a bike would be too expensive for 28% of respondents, with people of color and low-income respondents being more likely to feel this way than their counterparts.[19] Bikeshare offers a less-costly alternative to owning and maintaining a personal bike, especially for first time and occasional riders. So why isn't there more diversity of races and socioeconomic statuses among bikeshare users?

Bikeshare systems, to date, have been criticized for not serving cities in an equitable way, with their initial cohort of stations often located in the downtown core and surrounding higher income neighborhoods. Additionally, few systems offered alternative payment options for users without bank accounts (often referred to as unbanked) or those without credit cards. This approach aims to ensure the financial stability of the system—building awareness and ridership revenue in the densest areas before spreading the system to lower density neighborhoods. However, it often results in transit-underserved, low-income populations having little to no physical access to the bikeshare system, and a less tangible notion that these residents would not or should not use bikeshare anyway. Research in the US shows that the majority of bikeshare members are high income, white males, with people of color, women, low-income residents, and less-educated residents being largely underrepresented.[20]

17 Kees van Ommeren, et al., "Social Costs and Benefits of Cycling," *Ministry of Infrastructure and Environment,* June 2012.
18 Interview with Anugrah Nurrewa, October 25, 2017.
19 Charles T. Brown, "Cycling Equity: Barriers to Bike Access and Use in Communities of Color," *Webinar, National Association of City Transportation Officials,* August 15, 2017.
20 Nathan McNeil, et al., "Breaking Barriers to Bike Share: Insights from Residents of Traditionally Underserved Neighborhoods," *Transportation Research and Education Center at Portland State University,* June 2017.
McNeil, "Breaking Barriers to Bike Share: Insights from Residents of Traditionally Underserved Neighborhoods."

Various elements related to how bikeshare has typically been planned, managed and operated perpetuate this demographic divide. Often, a system's service area does not reach less dense, lower-income communities, removing bikeshare as a convenient, point-to-point transportation option for these residents. If stations are available, the majority of systems require users to purchase passes and memberships with a credit card, which makes it difficult for unbanked residents (who tend to have lower incomes) to access the system. Large security deposits, unclear fee structures, and uncertainty around liability if a bike is damaged or stolen further dissuade usage. Dockless bikeshare companies enable riders to find, rent and lock bikes using a smartphone; in a recent study conducted in several US cities, 34% of low income people of color and 13% of low income whites reported not having a smartphone.[21] A deeper exploration of barriers to bikeshare is included in section 5.3: Ensuring Equity by Reducing Barriers to Entry.

Many of these barriers, however, can be addressed by committing to specific equity goals for bikeshare, identifying metrics to measure progress toward those goals, and integrating equity into the major planning and management decisions for the system. Cities must recognize equity as a critical component of the success of their bikeshare system, and should measure equity and access to the system over time. Indicators such as the availability of bikes (number of bikes per 1,000 residents), the percentage of low-income populations who live and/or work within the service area, and the convenience and usability of the system (number of stations per square kilometer, number of trips per bike) are important to track.[22] With this in mind, cities should communicate to bikeshare operators both their equity goals and the data points needed to measure progress toward those goals. Integrating bikeshare into existing citywide goals and establishing metrics to track progress toward those goals is discussed in detail in section 3.1: Identify Goals for Bikeshare.

Historically underserved communities can be wary of bikeshare or, more likely, what bikeshare has represented in other cities—gentrification. For example, gentrification fears in a historically Latino district of San Francisco led to that neighborhood refusing to approve Ford GoBike stations along a major street.[23] Local residents did not feel included in the system. Rather, they saw bikeshare as a means of ushering in newer, wealthier residents.
A bikeshare system planned around equity may lessen such concerns, and should focus on more than just siting stations in low income neighborhoods. A truly equitable system should integrate equity into its hiring practices—for system staff and vendors—as well as ensure that community outreach and promotional efforts are organized with input and/or direct involvement from champions and advocates from target communities.

A group of Atlanta Relay bikeshare staff and users meet before heading out on a community ride. Source: Atlanta Relay

21 Kate Fillin-Yeh,"How We'll Know When We're Getting Bike Equity Right," *Next City,* April 26, 2016.
22 Brock Keeling, "Gentrification fears push bikeshare out of Mission," *Curbed San Francisco,* July 18, 2017.
23 Kate Hosford, "Who Are Public Bikeshare Programs Serving? An Evaluation of the Equity of Spatial Access to Bikeshare Service Areas in Canadian Cities."

Atlanta's Relay and Philadelphia's Indego systems have been particularly successful in empowering local champions to help introduce communities of concern and/or low income neighborhoods to bikeshare. In Canada, Hamilton, Ontario's bikeshare system has focused directly on equity since its inception, and offers a variety of options to reduce traditional barriers to bikeshare. For example, users can pay per minute for a trip (which can be perceived as a better value because you only pay for what you use) or a per month price for unlimited 90-minute rides—reducing the potential for unpredicted usage fees that, for most systems, accrue after 30 minutes. Hamilton Bikeshare also allows users to access the system using a prepaid card, which can be easier to obtain for low-income residents, as opposed to a credit or debit card. Compared to other Canadian bikeshare systems, Hamilton's system is the only one in which a majority of the service area is made up of highly socioeconomically deprived dissemination areas (equivalent to US Census block groups), indicating that Hamilton Bikeshare does largely serve lower-income residents. It is worth noting, however, that a high density of lower-income neighborhoods have been historically located in and around Hamilton's downtown core, enabling the initial bikeshare service area to capture the density it needed to be financially viable while also achieving more equitable service delivery.[24]

Implementing a more equitable bikeshare system that includes, for example, payment alternatives for people without credit cards or a local ambassador program, can present additional financial and logistical costs for the bikeshare implementing agency and operator. Cities should consider reaching out to collaborations like the Better Bikeshare Partnership, which leverages funding to address equity challenges head on, supporting activities such as targeted community outreach, as well as the creation of reduced annual membership fee programs for low-income residents.[25] Supplemental funding for equity interventions could also be generated from fines imposed on operators that violate certain permit terms.

Approaching bikeshare planning with a genuine commitment to equity has the potential to improve access to transit, jobs, and other destinations for historically underserved populations. A bikeshare system that meets the needs of a larger, more diverse group of residents is likely to see solid ridership numbers and a membership base that more accurately represents city demographics.

Hamilton, Ontario's bikeshare has made efforts to reduce barriers to entry for users, and site stations in a way that directly serves low-income communities. Source: Neal Jennings (Flickr CC)

24 Lecture, Transportation Research Board, Washington, DC, January 8, 2018.
25 David Alpert, "Which dockless bikeshare (Mobike, LimeBike, or Spin) is right for you?" *Greater Greater Washington*, September 25, 2017.

Goal Setting & Initial Planning 3

Women in Coimbatore, ride ofo dockless bikes. Source: ITDP India

GOAL SETTING & INITIAL PLANNING

Cities should begin the process of planning a bikeshare system with the following three tasks:

Identify goals and metrics to achieve them | Section 3.1
Bikeshare is not inherently valuable to a city, rather it is a tool for making a city better. To get the most benefit from bikeshare, cities should identify specific goals—such as increasing access by cycling and public transport or reducing greenhouse gas emissions—that bikeshare can help achieve and identify performance metrics to monitor progress toward those goals.

Choose a system type and define planning and policy parameters | Section 3.2
Informed by the city's goals, as well as contextual characteristics of the city (i.e., hilly, existing cycling culture, etc.), the next step is to identify which type of system to pursue (docked, dockless, or a hybrid approach), the locations and sizes of stations and/or service area boundaries. Key planning parameters related to system size and projected ridership should be defined, as well as policies to guide bikeshare operations.

Develop business and financial plans | Section 3.3
This step defines the organizational and revenue models, including contracting or permitting, and enforcement.

The time frame for each step will differ from city to city, depending heavily on political will, staff time, and resources committed to the project. The time frame for publicly funded systems (typically station-based) will likely be longer than private dockless systems—often more than a year—because of tendering and contracting operations, which are dictated by the city's procurement rules if any are in place. Regardless, the time frame for planning and implementing a bikeshare system is far shorter than that of most transportation projects, and can be realized within a couple of years or within a mayoral term.

3.1 IDENTIFY GOALS FOR BIKESHARE

Before making any decisions about the design and planning of a bikeshare system, cities should clearly identify their objectives for bikeshare. Bikeshare systems are often implemented as part of a general sustainable transport initiative to reduce pollution, improve mobility options, and/or achieve other strategic objectives.

For example:

Source: Melinda Stuart, Flickr CC

San Francisco, Mexico City & Pittsburgh

When it was launched, Ford GoBike (formerly Bay Area Bike Share) aimed to address the first-last-kilometer problem for transit passengers by installing bikeshare stations adjacent to Caltrain and BART stations. Similarly, Ecobici in Mexico City was initially designed to complement the city's mass transit network.

The city's Healthy Ride bikeshare system was conceptualized as a means of increasing access to public transit. The system's fare structure mirrors that of a transit system, and provides free 15-minute bikeshare rides to transit cardholders.

Source: Carlos Felipe Pardo

Paris

Vélib' was originally adopted as a mechanism to reach a 25% reduction in greenhouse gas emissions by 2020, in line with the city's Climate Energy Plan.

Source: ITDP Global

Hangzhou

Funded by the city, bikeshare was implemented as a means of developing tourism and generating employment for residents.

Source: Howard Wilde

Manchester

Greater Manchester has a regional goal of increasing the percentage of total trips made by bike to 10%, and is providing bikeshare through a partnership with dockless operator, Mobike, to help expand access to cycling.

These locally defined objectives will inform subsequent decision making around system type, operations, and marketing. For more detail about what types of goals bikeshare can help achieve, see section 1.2. The Opportunity of Bikeshare.

3.1.1

Establish Metrics to Evaluate Performance

Once cities establish qualitative goals for their bikeshare systems, they should define metrics to track progress toward those goals. To meet the performance metrics described below, a certain number of bikes will need to be in service. This can help cities make initial estimates about fleet sizes in addition to evaluating performance after the system has launched. Data from operators will be critical to performing these evaluations, and cities should establish data sharing standards that operators agree to meet prior to starting service. See section 6.5: Data Requirements and Management for more.

INDICATORS

If they do not already, cities should begin to collect data on several indicators that estimate bikeshare's broader effect on mobility and accessibility. These indicators are not associated with a specific target. Instead, cities should track progress over time in an effort to better inform policy choices, but not necessarily operations. The following are suggested indicators; cities can, of course, track alternative indicators such as the percentage of short trips (less than 5 km.) made by bike, but this would require additional data collection capabilities.

Mode Share

Percent of trips made by bike

Tracking mode share changes over time can help cities continue to make the case for bikeshare, especially if the share of total trips made by bike increases and the share of total trips made by private car decreases. Depending on availability, data on mode share can be collected and calculated for all trips or commute trips only.

Accessibility by Low Income Users

Average percentage of low-income residents within 500 meters of a bike or station

Defining how accessible a bikeshare system is can be difficult, but access to real-time data from bikeshare operators allows cities to measure how many low-income residents can reasonably walk to a bike (for dockless systems) or station. This can be done by downloading snapshots of the real-time service map at varying times each day. A 500 m. service area would then be created around each bike and/or station, and then the percent of low-income (defined by the city) residents within that service area would be calculated. Averaging these together would yield the percent of low-income residents near bikeshare.

PERFORMANCE METRICS

The following performance metrics enable cities to measure the utility and stability of a bikeshare system, and compare system performance across multiple cities. An efficient, reliable and cost-effective system will optimize two critical performance metrics:

Average daily trips per bike

Target: 4-8 daily uses per bike

Turnover is critical to a successful bikeshare system, and this metric gets at how efficiently the bikes are being used. Fewer than four daily uses per bike can result in financial unsustainability for the operator (i.e., user fees not able to cover cost to operate each bike), while more than eight daily uses can indicate limited bike availability, especially during peak hours. New York City (6.4), Barcelona (6.4), Mexico City (5.4), and Guangzhou (5.0) showed solid daily usage numbers in 2017.

If bikes are not readily available to as many potential users as possible, the system will not be viewed as a reliable mode that can replace or compete with other options, such as private cars. A high number of average daily trips per bike may indicate that there are too few bicycles in circulation. More stations (and bikes) should be added to station-based systems with high average daily uses per bike (see subsection 4.1.2: Station Sizing for more), while cities with dockless bikeshare systems with high average daily uses per bike should consider raising the fleet size cap, if one is in place, on the number of bikes per operator (see subsection 4.2.2 for more on fleet size caps).

If a system has relatively few uses per bike, this might indicate inefficient usage of infrastructure and low cost-benefit, likely because of a surplus of bikes. A system with many bikes being ridden by a small group of users could result in the perception that bikeshare is not being used enough to justify its expense to the city (in the case of publicly funded systems) or justify its use of public space (especially for privately operated systems). If this is the case, station-based systems may want to consolidate and/or decrease the size of certain stations. Similarly, cities with multi-operator dockless bikeshare systems that show few daily uses per bike may want to lower the cap on the number of bikes per operator, or establish a cap if one is not already in use. Alternatively, to broaden the user base and increase awareness of the system, the city may want to bolster education and marketing campaigns. Existing barriers to ridership may help inform which of these two approaches—fleet size reduction and encouraging ridership—will be most successful. For example, if the city lacks sufficient biking infrastructure, short-term solutions like marketing will not address that issue, and so reducing the number of bikes or stations in the short term may be the best way to increase usage. However, if other barriers to cycling (culture, cost per ride, etc.) are more prevalent, outreach and education efforts may be able to boost infrastructure usage in the short term.

Average daily trips per 1,000 residents (in service area)

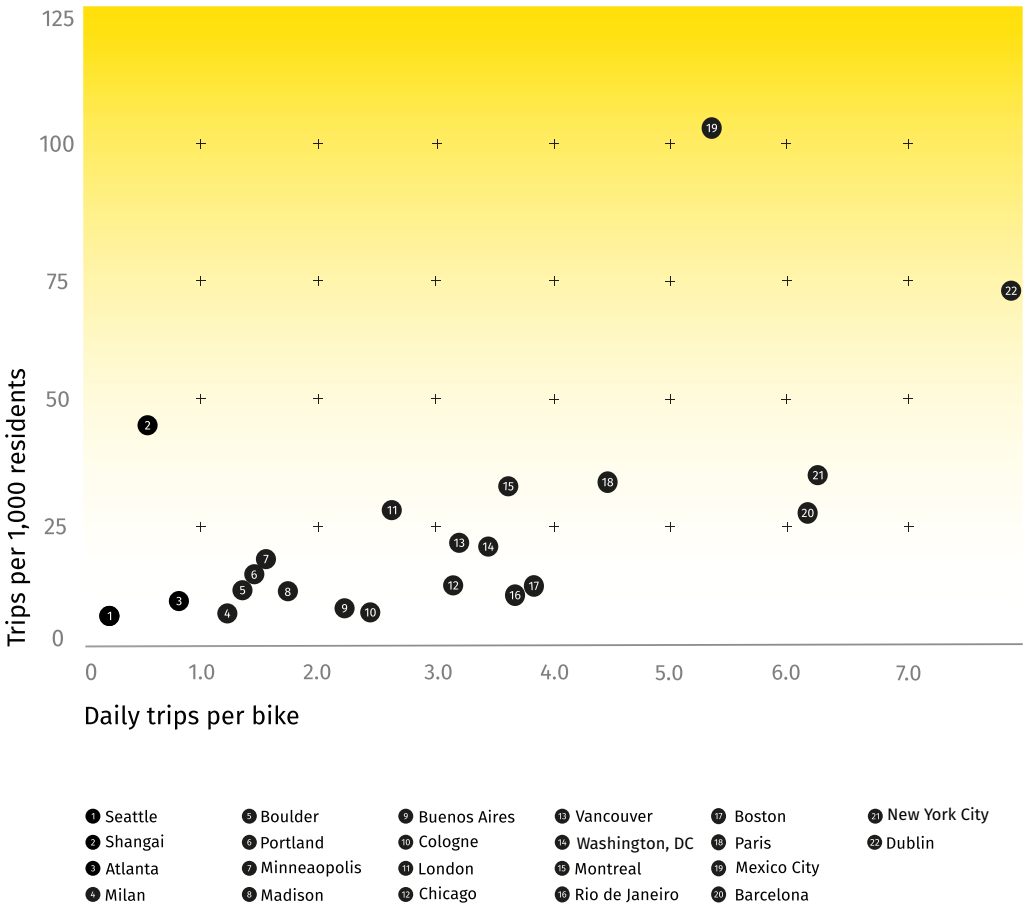
Target: city-generated, improvement over time

This is a metric of market penetration, that is, how many people in the service area are using the system. A high number of uses spread across residents in the service area is key to increasing bicycle mode share, decreasing vehicle and transit network congestion, and promoting safe, clean, healthy modes of transport. Trips per 1,000 residents should be monitored as the system matures, with the goal of increasing market penetration over time (a more prescriptive target for annual improvement in market penetration could be created from baseline trip numbers). An increase in trips per 1,000 residents indicates more trips being taken by bike, and can help to evaluate progress toward citywide mode shift goals.

Mexico City's Ecobici is one of the most successful bikeshare systems in the world, with high ridership across the service area. Source: ITDP Mexico

A well-planned and calibrated bikeshare system will ensure optimum performance for both of these metrics. The following chart of Bikeshare System Performance shows infrastructure usage and market penetration for 21 bikeshare systems. Comparatively, Mexico City has the most trips per 1,000 residents (approximately 105) of the cities that fall within the target range of four to eight daily trips per bike. Dublin also has relatively high market penetration at 75 trips per 1,000 residents and optimal daily trips per bike (5.6). Mexico City and Dublin's high market penetration may be the result of a large influx of commuters who do not reside in the service area taking trips during the work day. Montreal, New York, Paris, and Barcelona fall within the target range for daily trips per bike, but could prioritize efforts to expand market penetration. Conversely, Shanghai's dockless bikeshare system, while yielding relatively high market penetration, has less than one daily trip per bike. This is likely an indication of an oversupply of bikes.

Bikeshare System Performance



3.2
EXAMINE FEASIBILITY & CHOOSE A SYSTEM TYPE

A feasibility study will estimate basic system metrics, evaluate potential investment and revenue sources, and recommend (the agency or department conducting the feasibility study may not be the implementing agency) a contracting or permitting model and an organizational structure. Identifying local contextual elements and potential obstacles to implementation such as weather, topography, cycling infrastructure, culture, and political and legal realities, is critical as well. The goal of a feasibility study, though, is to inform planning decisions that will yield the most successful bikeshare system possible. A successful bikeshare system should be:

- Safe, reliable, affordable and accessible to all potential users
- Flexible and adaptable to changes in technology, trends, and operating models
- Thoughtfully connected to public transit and other modes
- Able to leverage and generate expanded investments and land use dedicated to cycling
- A tool to help meet broader sustainability goals set by the city.

Dockless bikeshare systems operated by private companies change the context around a feasibility study—namely, because they do not have stations to site—however, it is still strongly recommended that cities interested in pursuing a privately-operated dockless system first undertake a feasibility analysis. Items for analysis, in addition to those for station-based systems, should include target fleet size and/or number of operators, location of geofenced "hubs" and/or other dockless bike parking strategies, integration among operators and with the rest of the transportation system, and expected use patterns. Cities interested in transitioning from an existing station-based system to a dockless system should also evaluate these topics, even if a feasibility study was completed prior to the system's original launch.

Furthermore, for any type of system, cities will need to understand whether they are an attractive market for private investments. Many cities are conducting requests for information (RFIs) or requests for expressions of interest (RFEIs) to evaluate whether private companies are interested and willing to invest, and what those investments might look like. This provides a more concrete understanding about what the private sector can actually provide, and enables cities to weigh that option against a publicly operated system.

BASIC SYSTEM METRICS

A range of local data must be collected and analyzed to complete a feasibility study. The following data points are critical to establishing the basic framework for the feasibility study—defining the physical size of the area and the potential number of users:

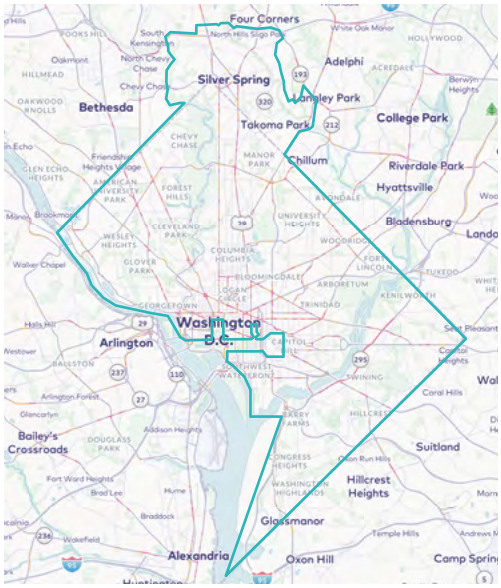
Service Area

The contiguous area in which a bikeshare system operates

For station-based systems (and dockless systems with strict geofenced parking areas), the service area is typically made up of a 500 meter radius around each station. For dockless systems, the service area is typically the jurisdictional boundaries of the city, but could be defined however the government sees fit. Over time, however, the true service area of a dockless system may prove to be smaller than the whole city, and could be further defined based on where bikes are available most often.

Service Area

Using 500 meter buffers around each station, the service area for Barcelona Bicing covers 89% of the city's population and 52% of the entire city area.



In Washington, DC, the service area for dockless bikeshare is the city boundary, excluding any federally-owned land like the National Mall.
Source: ITDP data

Population in Service Area

The number of residents within the service area
This figure can be estimated by summing the population of smaller geographic areas (i.e., census tracts in the US, dissemination areas in Canada, or 100m2 grids for countries in South America and Asia) within the bikeshare service area. For geographic areas that are only partially within the service area, the percentage of the geographic area that falls within the buffer is multiplied by that area's population, and added to the total sum.

At its most basic level, a bikeshare system is comprised of a certain number of bikes (and, in many cases, stations and docks) that will serve a given market. These basic data points are explained below:

Number of bikes

The number of bikes in active circulation
This number includes bikes either in a dock, locked, or in use. This is not the total number of bikes owned by a system or operator (which may include bikes that are being repaired or are part of the contingency fleet), as this is less relevant to measuring the performance of the system.

Number of stations

The number of locations where bikes can be checked in or out
In a station-based system, stations can be permanent or temporary (moveable) and stations may have multiple docks. In a dockless or hybrid system, virtual (using geofencing technology) and/or physical (painted or otherwise delineated, and may include bike racks) stations may be implemented to address indiscriminate parking issues.

Number of docks

The number of spaces in which a bike can be checked in or out
Docks are only found in station-based systems. The total number of docks should exceed the number of bikes at a ratio of approximately two to one to ensure docks are available for returning bikes during peak demand times.

USER TYPES

For planning purposes, two basic types of users are defined. This distinction is used to better understand ridership characteristics and define fees. These are:

Casual

Users who purchase daily or weekly bikeshare passes

Casual users can typically purchase a daily, multi-day, or weekly pass on the day of use—often at a station kiosk—and access the system immediately after using a code. Most tourists fall into this category.

Per Trip

Casual users who purchase a single trip pass each time they ride

A subgroup of casual users, per trip riders pay for each individual bikeshare trip they take. Dockless bikeshare riders are generally per trip users unless they have purchased a multi-ride pack offered by some private operators. Several station-based systems now offer a per trip fare option.

Long-term

Users who subscribe for a month or longer, including annual members

The registration process for annual members typically takes a day or more and often comes with a physical registration key, such as a fob or membership card, that provides more streamlined access to the system. Several private dockless operators also offer long-term

3.2.1 Solicit Community Input and Ideas

At this stage, the city should begin to educate the public on the basics and opportunities of bikeshare, and seek input from community organizations, cycling advocacy groups, and residents about their views on how bikeshare should work in their city. Public meetings to share information about the feasibility study process, as well as in-person and online forums to provide comments and insights will help to establish transparency and cultivate a sense of ownership of the project among residents. This level of engagement should continue past the feasibility study stage, and into system planning and implementation.

3.2.2 Determine Service Area

When beginning to plan a system, identifying a service area (the physical area within which bikes can be rented and returned) and saturating it with the appropriate number of stations and bikes is critical to cultivating high ridership. The service area should be grounded in dense, mixed-use areas with high trip-generation capacity, serving as both the origin and destination points of many trips. These areas—generally city centers—are likely to see the most demand for bikeshare. However, the service area should also extend to lower-density areas where connectivity to the transportation system may be lacking.

For station-based systems, the service area must be large enough to contain a significant set of users' origin and destination points. If it is too small to provide meaningful connections between places, the system will have a lower chance of success because its convenience will be compromised. When defining the service area, the city will have to balance demand with costs. Surveying and statistical data analysis will help to identify the appropriate service area, and should be completed by a qualified planning organization if the city does not have in-house expertise.The service area must be determined in tandem with the system's size to ensure the level of convenience, reliability, and ubiquity necessary for high ridership.

For dockless and hybrid systems, the service area is typically the jurisdictional boundary of the city, and has less of an impact on overall system usability than is the case for station-based systems. Multi-jurisdictional dockless systems could reduce administration costs to implement and oversee a permit process, and provide a larger service area for users. Regardless, the city and bikeshare operators should clearly communicate to users locations that fall outside the system's limits, but are inside the city boundary (e.g., dockless bikes are not permitted to be parked on the National Mall and other federally owned land in Washington, DC). Establishing the appropriate system size is paramount for dockless bikeshare, as increased ridership will come from bikes being available where and when users demand them. See subsection 4.2.2: Fleet Size Caps for more.

26 David Alpert, "Which dockless bikeshare (Mobike, LimeBike, or Spin) is right for you?" Greater Greater Washington, September 25, 2017.

3.2.3

Determine System Size

The size of a bikeshare system is determined by the number of bikes (and number of stations). From a user perspective, density of stations and availability of docks (for station-based systems), and availability of bikes (for all system types) will be the main considerations.

For station-based systems, appropriate station density within the service area ensures that no matter where a user is, there will be a station within a convenient walking distance of both the origin and destination of their trip. A large area of dense stations creates a network that users can learn to count on for all their trips in the city.
The farther apart the stations, the less convenient the system is for the user. Difficulty finding a station or available docking space results in frustrated users.
A more nuanced look at station spacing and location is included in section 4.1: Planning Station-Based Systems.

Whether a system utilizes stations or not, if it has too few bikes, it will have little to no chance of success. To establish reliability at a level that will generate subsequent rides, users must be able to find a functioning, ready-to-ride bike when they need it. The following parameters will help guide planning to ensure that the city's bikeshare network is connected, convenient and reliable. These are meant to be guidelines, or averages, for planning.

ALL SYSTEMS

Bikes per 1,000 residents

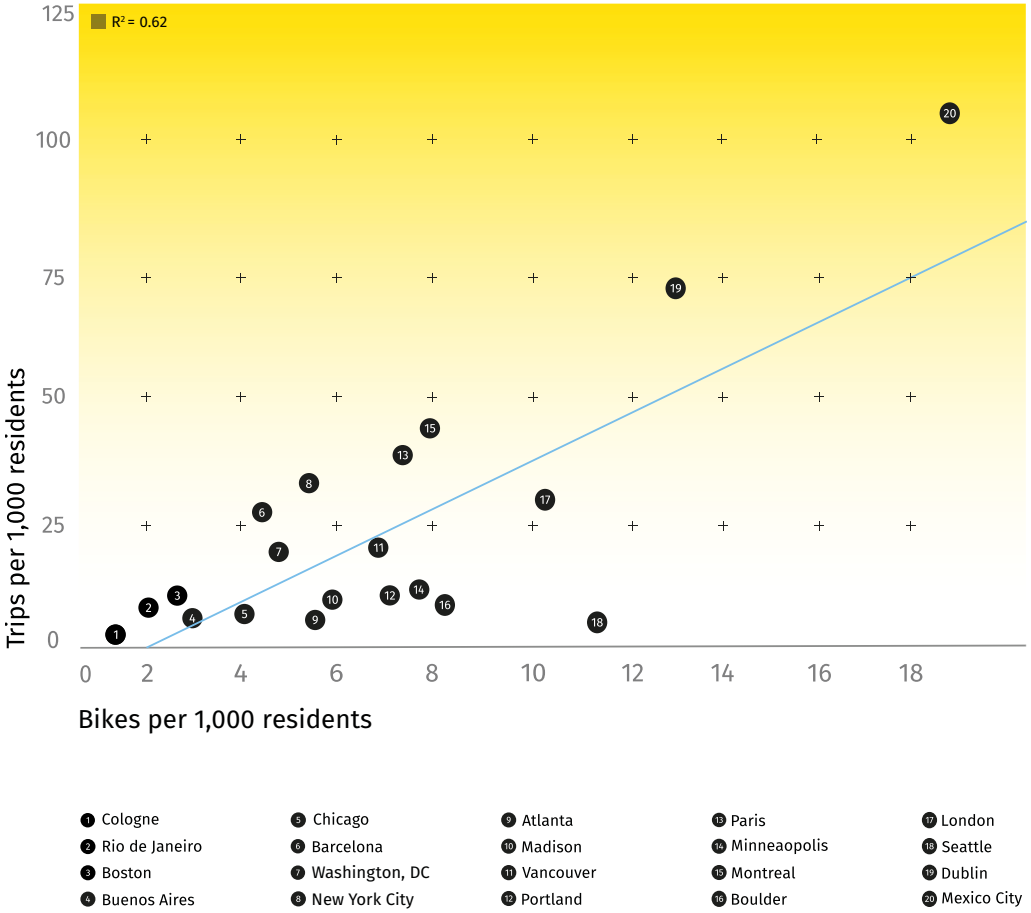
Target: 10-30 bikes per 1,000 residents
This parameter scales the number of bicycles to the number of potential users in the service area to ensure that there are enough bicycles to meet demand. Based on ITDP's analysis of bikeshare system metrics, large, dense cities or areas with high numbers of commuters and/or tourists will likely require 10 to 30 bikes per 1,000 residents to meet demand. Cities that have a large influx of commuters during the day will need a higher ratio of bikes-to-residents to serve that augmented population.

This ratio should be large enough to meet demand, but not so large as to have fewer than four daily uses per bike. Dockless bikeshare in the largest Chinese cities has generated very high bikes per resident ratios (62 bikes per 1,000 residents in Shanghai and 57 per 1,000 residents in Guangzhou), but more moderate ratios in relatively smaller cities like Tianjin (23 bikes per 1,000 residents, which is just slightly higher than Mexico City's 19 per 1,000 residents). This metric serves as a planning guideline to estimate the total number of bikes needed for a system, which can then be used for cost estimate purposes. For dockless systems, this metric can help cities establish a cap on the total number of bikes in operation.

Bike Density

Bikes per square kilometer of service area
Compared to bikes per resident, bike density provides a more accurate picture of how bikes are spread throughout the service area, especially as it relates to population and job density. This metric may be particularly useful in evaluating performance over time—especially for dockless systems. Cities may use this metric to improve reliability by requiring operators to maintain a minimum bike density in certain zones.

Bikeshare Market Penetration



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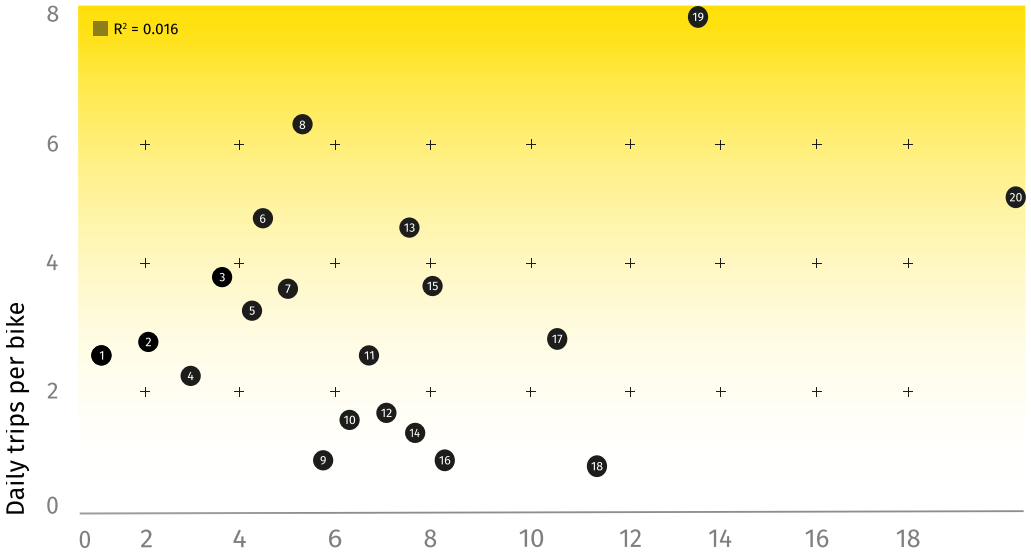
14 Minneaopolis
15 Montreal
16 Boulder
17 London
18 Seattle
19 Dublin
20 Mexico City

Bike Density and Performance

Increasing the number of bikes per resident generates more trips and higher market penetration. The relationship between bikes per resident and bike use is less clear; Mexico City and Dublin are the only two cities in the dataset that meet the 10-30 bikes per 1,000 residents and 4-8 daily trips per bike targets.

Bikeshare Usage



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16 Boulder
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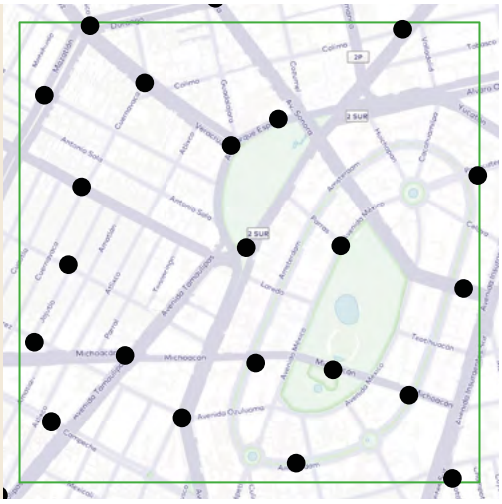
19 Dublin
20 Mexico City

There are 21 Ecobici stations in this square kilometer of Mexico City (left), compared to 8 Hubway stations per square kilometer in Boston (right).
Source: ITDP data

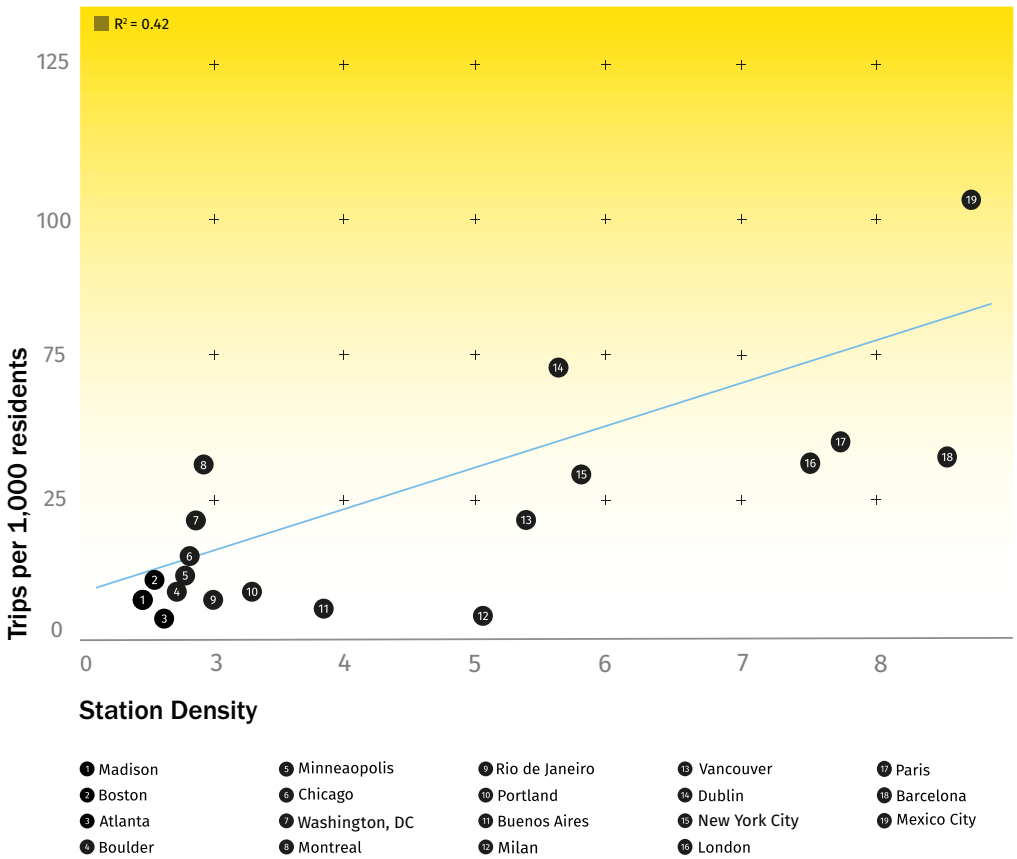


Station Density

Target: 10-16 stations per square kilometer

To create a reliable network, cities should pursue a more or less uniform station density throughout the service area to ensure that users can easily bike and park anywhere in that area. The station density parameter—average number of stations within a given area—ideally scales the spacing of stations so they are within a reasonable walking distance to each other. As shown in the Station Density and Performance graph, below, increasing station density generates increased market penetration (defined as trips per resident). Additionally, station density should correspond to population density; more stations closer together will help meet demand in more densely populated areas, while less dense areas may see demand met with fewer stations. Maintaining a consistent level of convenience in lower density areas by oversupplying stations will generate higher costs; the city should evaluate where those costs will yield the most value. Paris used one station every 300 meters as a guideline for the first phase of its bikeshare system, as did London and New York. Phase one in Mexico City used one station every 250 meters. While this serves as a planning guideline for the detailed design, it also helps to generate the total number of stations needed for the system, which can be used for cost estimate purposes.

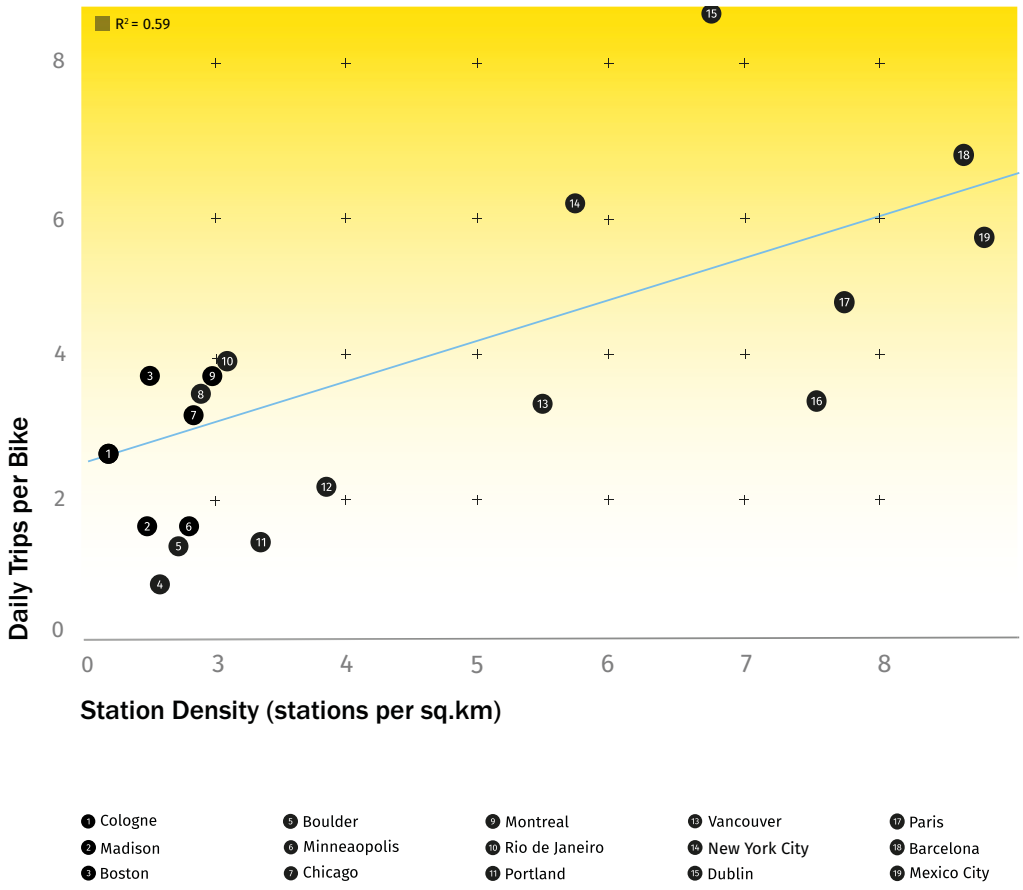
Bikeshare Market Penetration



Station Density and Performance

A higher station density correlates with higher market penetration, and has an even stronger relationship with increased use of bikeshare bikes.

Bikeshare Usage



Docks per Bike

Having more docking spaces than bikes is critical to ensuring that parking is available at multiple locations. A low dock per bike ratio will likely result in the need to rebalance the system more frequently to avoid station saturation—especially at peak destinations. Once the number of bikes for the system has been determined, the number of docks needed can be calculated. As an industry standard, most medium and large systems have 2-2.5 docking stations for each bike in service. Vancouver, Portland, and Dublin have 2.1 docking stations for each bike in service, while Rio de Janeiro has 3, New York City has 2.4, and Washington, DC has 2.2. The docks per bike ratio is important to keep in mind for initial system planning, as well as when expanding the system. However, the docks per bike ratio is not necessarily used for analyzing system performance.

Washington, DC's Capital Bikeshare has approximately 2.2 docks for every bike in the system to reduce instances where users might want to end a trip at a station, but no docks are available. Source: MV Jantzen (Flickr CC)

3.2.4

Choose a Bikeshare System Type

Once the feasibility analysis is underway and the goals for the bikeshare system have been agreed upon, the city must decide on the type of bikeshare system that will best achieve those goals. System types include:

Station-based
Systems that require bikes to be picked up from and returned to designated docking points or smart docks.

Dockless
Systems that do not require any standard docking points and do not have physical stations or hubs in which bikes must be locked. Users typically locate and unlock a bike via a web or mobile application and complete trips by closing the bike's onboard lock. Dockless systems may—on their own accord or at the direction of the city—utilize virtual parking zones; however users are not forced to end their trips in these zones, just encouraged to. There are two distinct subtypes of dockless systems, which can affect parking needs and approaches to orderly streets.

Lock-to
Bcycle (Dash), JUMP, nextbike, Zagster (Pace)

Bikes have an on-board u-lock or cable lock that requires riders to lock the bike to a fixed object (i.e., bike rack, sign post, etc.) to end their trip.

Wheel lock
Limebike, Mobike, oBike, ofo, Spin

Bikes have a self-lock on the rear wheel that enables riders to end their trip simply by engaging the lock. Wheel lock bikes do not need to be locked to a fixed object.

Hybrid
Systems that include docking points at both physical stations and geofenced hubs. Users are given the choice to a) pick up and return a bike to a station, b) pick up a bike from a station and lock it up anywhere within the designated hub, c) pick up a bike from within a hub and return it to a station, or d) pick up and lock a bike anywhere within the hub. Ending a trip at a station is typically incentivized by reduced user fees. While most hybrid systems currently in operation use lock-to bikes, wheel lock bikes may also be used if geofenced stations are implemented.

System Type Strengths Weaknesses Chart

Strengths

Weaknesses

Station-Based System

	For city	For users	For city	For users
Manual bikes with smart or non-smart stations. CitiBike (NYC), Divvy (Chicago), Santander Cycles (London).	**Longevity** - heavy infrastructure implies permanence and stability **Well-managed public space** - city is directly included in siting of stations and impacts on public space **Advertising** - physical stations provide advertising space, which generates revenue for the system	**Affordability** - typical single-operator system enables annual membership that benefits long-term users **Smartphone alternatives** - stations provide wayfinding, instructions for use, and safety information to users without smartphones **Reliability** - physical stations enable users to find a bike without internet access	**High capital costs** - for station infrastructure and maintenance **High operating costs** - rebalancing accounts for at least 50% of a station-based system's operating costs	**Accessibility** - only a viable option for those who live or work in the service area **Bike/dock not available** - stations may be empty when a user needs a bike or full when a user needs to end their trip
Pedal assist e-bikes with smart or non-smart stations. Zyp (Birmingham, USA), BiciMAD (Madrid), Summit (Park City, USA).	**Longevity** - heavy infrastructure implies permanence and stability **Well-managed public space** - city is directly included in siting of stations and impacts on public space **Advertising** - physical stations provide advertising space, which generates revenue for the system	**Affordability** - typical single-operator system enables annual membership that benefits long-term users **Smartphone alternatives** - stations provide wayfinding, instructions for use, and safety information to users without smartphones **Reliability** - physical stations enable users to find a bike without internet access **Attractive tech** - personal bike riders may be interested to try bikeshare when it offers a different bike type **Comfort** - e-bikes facilitate longer trips in less time and reduce physical exertion	**High capital costs** - for station infrastructure and maintenance; e-bikes are more expensive than manual bikeshare bikes **High operating costs** - rebalancing accounts for at least 50% of a station-based system's operating costs, e-bikes present additional charging costs (hardwired stations or off-site charging)	**Accessibility** - some users may not want to use e-bikes due to concerns about liability for potential damage to the bike **Bike/dock not available** - stations may be empty when a user needs a bike or full when a user needs to end their trip **User confusion** - casual users may be uncertain about extra fees for e-bikes, if they will be able to finish a trip if the battery dies, etc.
Pedal assist e-bikes and manual bikes with smart or non-smart stations. Baltimore Bike Share, Bicing (Barcelona), ECOBICI (Mexico City).	**Longevity** - heavy infrastructure implies permanence and stability **Well-managed public space** - city is directly included in siting of stations and impacts on public space **Advertising** - physical stations provide advertising space, which generates revenue for the system	**Affordability** - typical single-operator system enables annual membership that benefits long-term users **Smartphone alternatives** - stations provide wayfinding, instructions for use, and safety information to users without smartphones **Reliability** - physical stations enable users to find a bike without internet access **Attractive tech** - personal bike riders may be interested to try bikeshare when it offers a different bike type **Rider choice** - rider chooses bike type they are most comfortable riding, or that will work best for their trip	**High capital costs** -for station infrastructure and maintenance; e-bikes are more expensive than manual bikeshare bikes **High operating costs** - rebalancing accounts for at least 50% of a station-based system's operating costs, e-bikes present additional charging costs (hardwired stations or off-site charging)	**Accessibility** - some users may not want to use e-bikes due to concerns about liability for potential damage to the bike **Bike/dock not available** - stations may be empty when a user needs a bike or full when a user needs to end their trip **User confusion** - casual users may be uncertain about extra fees for e-bikes, if they will be able to finish a trip if the battery dies, etc.

Dockless System

	For city	For users	For city	For users
GPS-enabled manual bikes. Seattle, Manchester, Tianjin.	**Low capital costs** - without stations, upfront costs to launch a dockless system are relatively low **Scalability** - more bikes on the ground (due to lower capital costs) can generate more trips made by bike **User-generated rebalancing** - operators can incentivize users to return a "floating" bike to a more preferred location **Robust trip/usage data** - onboard GPS provides trip data that can optimize operations and city planning	**Flexibility** - can end trip anywhere (wheel-lock) or at any bike rack (lock-to) or approved parking zone within the system area **Convenience** - locate and reserve a bike from the app or website; unlock a bike from the app or keypad	**Public space impacts** - without proper regulation on how/where dockless bikes should be parked, bikes may impede sidewalk space **Inconsistent availability** - bikes could end up concentrated in downtown core and around attractions, with fewer available in outer neighborhoods and other less-dense areas	**Expensive for consistent riders** - multiple-operator, per-trip-only pricing model limits provision of annual memberships where the cost per ride declines with each additional trip taken **Accessibility** - depending on fleet size, it may be difficult to find (or unlock) a dockless bike without a smartphone; most operators require a credit card on file to use the system
GPS-enabled pedal assist e-bikes. San Francisco (JUMP).	**User-generated rebalancing** - operators can incentivize users to return a "floating" bike to a more preferred location **Robust trip/usage data** - onboard GPS provides trip data that can optimize operations and city planning	**Flexibility** - can end trip anywhere (wheel-lock) or at any bike rack (lock-to) or approved parking zone within the system area **Convenience** - locate and reserve a bike from the app or website; unlock a bike from the app or keypad **Comfort** - e-bikes facilitate longer trips in less time and reduce physical exertion **Attractive tech** - personal bike riders may be interested to try bikeshare when it offers a different bike type	**Public space impacts** - without proper regulation on how/where dockless bikes should be parked, bikes may impede sidewalk space **Inconsistent availability** - bikes could end up concentrated in downtown core and around attractions, with fewer available in outer neighborhoods and other less-dense areas **High capital costs** - e-bikes are more expensive than manual bikeshare bikes **High operating costs** - without stations, e-bike batteries must be swapped out and charged, or bikes need to be taken off the streets to be charged	**Expensive for consistent riders** - multiple-operator, per-trip-only pricing model limits provision of annual memberships where the cost per ride declines with each additional trip taken **Accessibility** - some users may not want to use e-bikes due to liability concerns about potential damage to the bike **User confusion** - casual users may be uncertain about extra fees for e-bikes, if they will be able to finish a trip if the battery dies, etc.

Hybrid System

	For city	For users	For city	For users
GPS-enabled manual and/or pedal assist e-bikes with some physical and/or geofenced stations. Biketown (Portland), Relay (Atlanta) Healthy Ride (Pittsburgh), Singapore.	**Low capital costs** - all technology needed to reserve and unlock a bike is on the bike; fewer (or no) full-technology stations needed **User-generated rebalancing** - operators can incentivize users to return a "floating" bike to a station or preferred hub **Robust trip/usage data** - onboard GPS provides trip data that can optimize operations and city planning **Advertising** - physical stations provide advertising space, which generates revenue for the system	**Flexibility** - can end trip at a station, or anywhere (wheel-lock) or at any bike rack (lock-to) within the system area **Convenience** - locate and reserve a bike from operator app/website or from a station; unlock a bike through app or keypad **Smartphone alternatives** - stations provide wayfinding, instructions for use, and safety information to users without smartphones	**Public space impacts** - without proper regulation on how/where dockless bikes should be parked, "floating" bikes may impede sidewalk space **Inconsistent availability** - bikes could end up concentrated in downtown core and around attractions, with fewer available in outer neighborhoods and other less-dense areas	**User confusion** - about where they can and cannot end their trip and associated usage fees **Additional usage fees** - typically associated with ending trip outside of station/hub

3.3
DRAFT FINANCIAL PLANNING ESTIMATES

After decisions on system size and type are made, an initial financial analysis can be undertaken. This analysis asks whether the system will be financially sustainable, and usually considers the estimated capital outlay, projected revenue, and operational costs. It should also consider the advantages and disadvantages of different financing mechanisms. The following recommendations assume that some financial cost (and revenue) will fall to the city; however, many private dockless bikeshare operators are able to provide bikeshare services without public funds. Indirect costs to the city to oversee, monitor, and enforce regulations on dockless bikeshare are likely. The city will also not receive a portion of revenues from a fully private system, but may receive some funds from dockless bikeshare operators in the form of permit application, non-compliance, and/or in-lieu fees. It is recommended that cities pursuing a system operated by one or more private companies require those companies to demonstrate their long-term financial sustainability as part of a permit application or MOU process (see section 4.2: Planning & Regulating Dockless Systems for more details about permit requirements).

3.3.1

Estimating Costs and Revenue for Publicly Funded Systems

For station-based systems, an estimation of capital costs and operating costs can be calculated by multiplying the number of bikes, docks, and stations against an average cost for each type of asset. Capital and operating costs are a function of system technology and are straightforward to determine, but revenue depends on usage levels and can only be fully estimated in the infrastructure planning stage. Usually the revenue scenarios are based on expectations of demand using both a conservative estimate (in which demand, and therefore revenue, is low) and an optimistic scenario (in which demand projections are higher, resulting in higher projected revenue).

Capital & Operating Costs per Bike

Useful to estimate costs during system planning
Capital costs are often expressed in terms of the "cost per bike," defined as the total cost of the system—including stations, bikes, rebalancing equipment, the control center, and other equipment—divided by the total number of bikes in the system.

Operating costs vary widely from system to system and from city to city. Operating costs are commonly expressed annually per bike and can vary based on rebalancing mechanisms and needs, maintenance and labor costs, administration, technology servicing, etc. Estimates from 2011 peg operating costs at around US$1,760 per bike per year, but more recent estimates range between US$900-$3,500 annually per bike.

CAPITAL COSTS	OPERATING COSTS
Bikes	Rebalancing
Stations	Maintenance and rebalancing staff
Rebalanacing vehicles/equipment	Call center staff
Control center	IT system fees and servicing

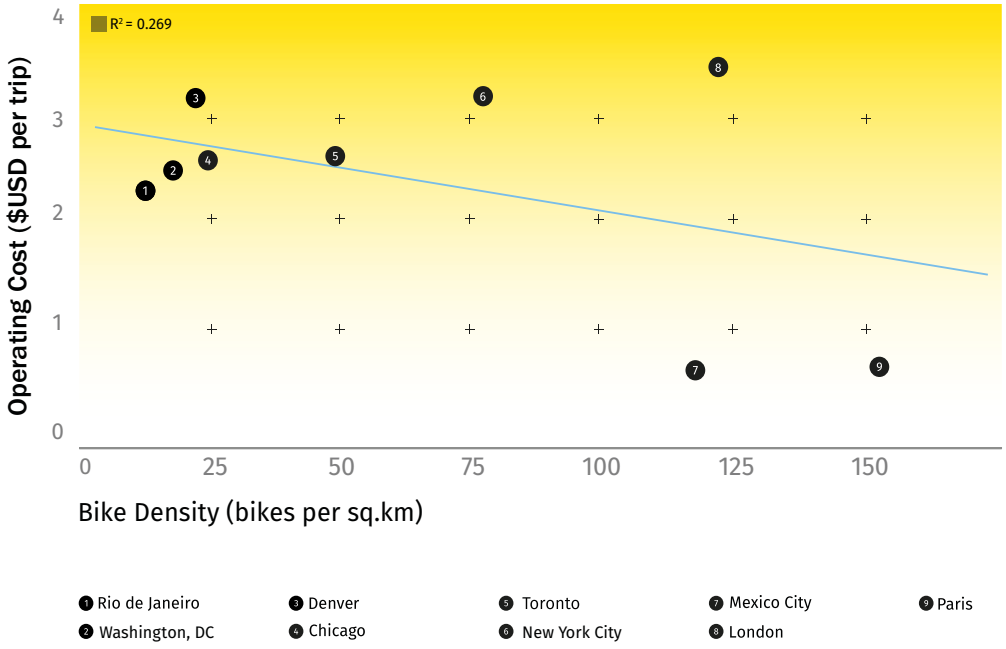
Operating Costs per Trip

Useful to analyze system performance after launch
The cost-per-bike estimate may be useful in the planning stage to size the system financially, but to analyze system performance after the system launches, a per-bike analysis is not recommended because bike fleet size varies from day to day. Some have used the per-dock metric for analyzing annual operating costs as a more stable, and therefore, more comparable basis.[27] However, this guide recommends evaluating the cost efficiency of a system after it opens by looking at operating costs per trip. For example, Washington, DC and Denver have similar operating costs per trip (US$2.55 and US$3.24 respectively), while operating costs per bike are very different (US$3,445 and US$1,560 respectively). Washington, DC has slightly lower

27 "The Future Viability and Pricing Structures of Bike Share in North America," Toole Design Group, July 2013.

per trip costs, but its per bike costs are more than double that of Denver's. Mexico City, on the other hand, has much lower operating costs per trip (US$0.62) and per bike (US$913) than both Washington and Denver. Like other transit systems, the goal of bikeshare is to attract and move as many people as efficiently as possible; therefore, a system's operating expenditure should be based on the number of people—as expressed in the number of trips—using it. Most transit systems express their costs this way.

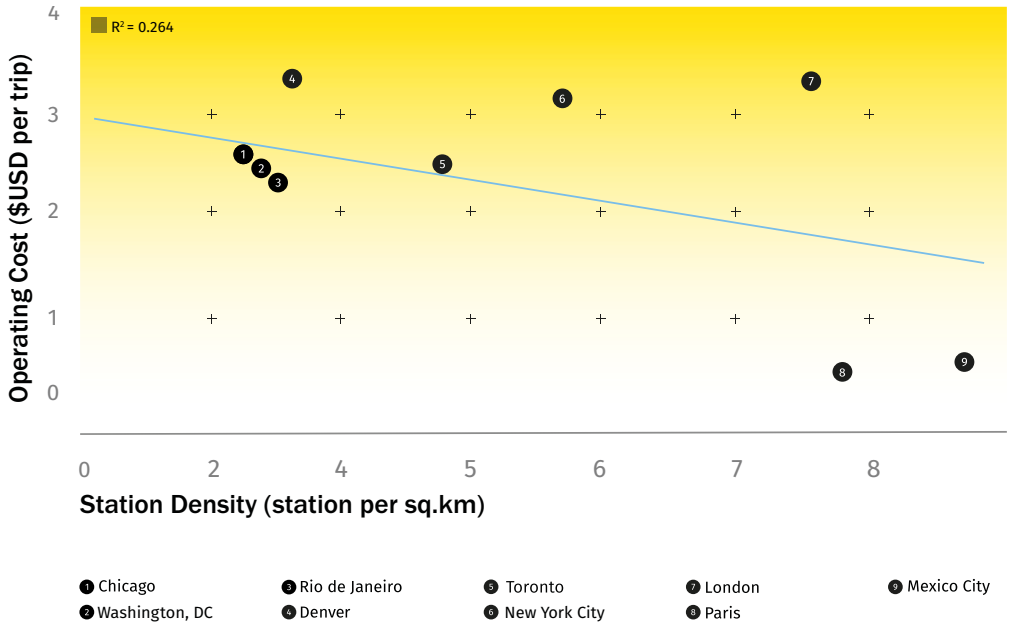
Operating Cost vs. Bike Density



Bikeshare Economic Performance

More dense bikeshare systems (both in terms of stations and bikes) tend to have lower operating costs per trip than less dense systems. Paris and Mexico City are good examples of this trend. London's relatively high station and bike densities and high operating cost per trip may signal higher-than-usual rebalancing needs, labor costs, etc.

Operating Cost vs. Station Density



ESTIMATING REVENUE

Uptake Rate

Used to estimate demand for the system
To estimate revenue, multiply the demand estimations for usage against the proposed revenue structure. Demand is often estimated using an uptake rate, which is an assumption of the percentage of people who will use the system compared to the total population within the service area. Commonly used uptake rate estimates include: a conservative 3% uptake rate, a middle estimate using a 6% uptake rate, and an optimistic scenario of 9%. Washington, DC's Capital Bikeshare has an uptake rate of about 5%. Mexico City's Ecobici is close to 10%, which may be explained by the heavy commuter population that enters the service area (and uses Ecobici) but does not live within that area.

Farebox Recovery

Used to evaluate a system's financial health
The financial health of a system can also be evaluated by the percentage of operating costs that are covered by membership, security deposit and user fees. This metric, known as farebox recovery, measures the degree to which a bikeshare system is self-sustaining. Most publicly-funded station-based systems do not meet their operating costs through membership and user fees alone, although some do come close. This is also the case for most public transit systems. Farebox recovery can be used to determine the degree to which other revenue sources, such as advertising revenue, government subsidies, and system sponsorship, will be needed to cover operating costs.

Trips by Type of User

A financial analysis of a bikeshare system should consider what percentage of total trips will be taken by long-term members, and what percentage by casual members. In most systems, casual users are charged a significantly higher price per trip or per day than annual users, making casual users the source of more revenue per trip even if in numbers they are not the largest user group. Casual users are often less familiar with the bikeshare system and are therefore more likely to accrue fees for exceeding time limits. While the system benefits from overtime charges, customers who inadvertently accrue fees will likely be unhappy and may not use the system again. Typically, as a system grows, the percentage of casual users declines as some casual users purchase annual memberships.

3.3.2 Financial Planning for Privately Funded Systems

ESTIMATING COSTS

For privately funded bikeshare systems, capital costs to the city are nominal. In-kind costs, however—which could include staff time to oversee the permit application review process, attend public meetings on behalf of the city, enforce permit requirements, remove or re-park bikes, etc.—are likely. Some of these costs can be offset if the city decides to charge fees to bikeshare operators, as detailed below.

It is worth noting that privately-funded dockless bikeshare may be more economically scalable compared to station-based systems because of the vastly lower capital costs required. Some dockless bikes only cost about US$200 each, and the most expensive dockless bikes on the market – JUMP's smart pedal assist e-bikes – cost US$1,500 each (compared to approximately US$5,500, which includes bike and station costs, for station-based systems like Citi Bike and Vélib'). Lower capital and operating costs could enable dockless systems to offer coverage to more parts of the city, especially in previously underserved or lower-income neighborhoods.

ESTIMATING REVENUE

Without public investment in bikeshare operations, the city will not receive revenue from traditional streams such as sponsorship or advertising. Instead, limited revenue may be generated from one or more of the following fees. It is highly recommended that, to avoid corruption or improper regulation, bikeshare staff tasked with assessing fines are not compensated with and do not directly benefit from revenue generated from those fines.

Annual permit fee
This fee is paid by the operator to the city as part of the permit application package, and will typically be paid subsequently on an annual basis as part of the permit renewal process. This may also be referred to as an earnest money deposit (EMD).

Permit review fee
This covers staff time for permit review and inspection. Seattle estimates eight hours for each bikeshare permit review, and requires US$1,672 to cover that time.

Administrative fee
Typically assessed at a per-bike rate (generally US$10-$15 per bike), this fee covers administrative staff time to manage a dockless bikeshare pilot program. This may also be referred to as a permit issuance fee.

Performance bond
Once an operator is awarded a permit, the company is required to have a certain amount of funds accessible to the city to cover potential costs incurred from maintenance, removing and storing mis-parked bikes, property repair, or in the case of a company not removing its bikes if its permit is revoked. Performance bonds are typically assessed at a per-bike rate (sometimes with a cap on the total amount), and the total may need to be increased or decreased prior to any changes to an operator's fleet size.

Non-compliance fee
Some cities charge operators a non-compliance fee for violating permit requirements. This may be a flat fee, as is the case in Dublin (€75), or it may differ depending on the severity of the violation. Durham, North Carolina charges operators US$50 for each bike that the city must relocate.

In-lieu fee
An operator has the option to pay an in-lieu fee to the city instead of agreeing to meet a certain permit standard or requirement. For example, if an operator cannot or chooses not to maintain a certain percentage of their fleet in all neighborhoods of the city, they might pay an in-lieu fee, which the city then uses to provide more equitable bikeshare service.

System Planning & Regulation 4

A Citibike bikeshare station with individual docking spaces is installed in New York City. Source: ITDP Global

SYSTEM PLANNING & REGULATION

At this stage, once a decision has been made on whether the city will move forward with a station-based, dockless, or hybrid bikeshare system, either public or privately-run, the city should consider options for the hardware and software of the system, including bike type (standard versus pedal assist) and station design (physical stations with docks. drop zones for dockless bikes, or a combination). It is also important at this stage to analyze the potential for improving bike infrastructure and street efficiency, which not only benefits users of bikeshare but cyclists more generally, as well as pedestrians and transit riders. A bikeshare system can be viewed by some as adding to the competition for sidewalk space, green space, etc. Cities may be able to curb these sentiments by prioritizing the development of streetscapes that maximize space and usability for all sustainable transportation modes.

Station-based bikeshare system design and planning apply the parameters discussed in section 3.2 to determine the exact locations and sizes of stations. Stations should be roughly uniform distance from one another and sized to meet the anticipated demand and attraction of a particular area. The station location will then depend on the actual environment of that area. The station density decided on in the feasibility stage should be more or less adhered to, although some factors may influence this. For example, areas that are more densely populated may require more stations than the stated parameter, while other areas such as large parks or industrial areas, may require fewer because of land use and existing conditions. However, reliable coverage through uniform station density, or at least a minimum station density, is critical to creating a system that users can truly rely on for travel within and around the service area.

Alternatively, the city is less involved in infrastructure planning for a dockless bikeshare system because private operators have already made decisions around the type(s) of bike they offer and where to deploy and rebalance bikes based on demand. Station design is less necessary relative to a station-based bikeshare system, although the city should, at this time, consider whether to create dockless bikeshare parking zones and what those might look like (for example, will bike racks be installed in parking zones to accommodate personal and lock-to bikes?) and/or install additional racks to increase overall bike parking. It should also consider whether to mandate that operators encourage users—perhaps through reduced fare incentives—to park there. Implementing this type of parking system at the outset may help to avoid user confusion and establish habits for users to utilize the designated parking zones.

Despite the system type, knowledge of existing trip patterns can help determine demand for bikeshare. Most cities use local knowledge to estimate demand and how it might vary throughout the day and across days. To get an idea of popular destinations in the area, origin-destination (OD) surveys can be conducted at major public transport terminals and stations, focusing on passengers who transfer to rideshare, taxis, or buses to complete their journey. This can help to determine where the system is most likely to succeed and to anticipate demand. However, this type of survey will not capture potential users who are not currently well served by transit, so complementary outreach to the public should be conducted to assess demand from those populations.

Strategically located bikeshare stations can contribute to placemaking, like here in the Tribeca neighborhood of New York City where an asphalt mural activates the pedestrian plaza outside of a subway station.
Credit: NYC Department of Transportation

4.1
PLANNING
STATION-BASED SYSTEMS

This section focuses exclusively on siting, designing and implementing bikeshare stations, which are directly linked to the reliability and usefulness of the system. Operational aspects required for system implementation such as staffing, customer service, marketing, etc. are discussed in section 7.2.

4.1.1
Station Location

ESTIMATING COSTS

Choosing appropriate station locations is critical to ensuring that the station-based system will have high usage and turnover. Stations should be situated such that they can be found at regular and convenient intervals throughout the service area and are in desirable locations that generate usage throughout the day. Station design and location should consider the surrounding cityscape.

For even more information on bikeshare station siting, consult NACTO's Bike Share Siting guide.

IDEAL STATION LOCATION CHARACTERISTICS

On sidewalk

- Sunny, minimal tree cover
- At least 2 meters of clear walking space
- Close to intersections
- Close to public transit stations
- High-visibility area and street lighting
- Easy access for users, as well as maintenance and rebalancing vehicles
- Close to bicycle infrastructure

On street

- Close to intersections
- Close to public transit stations
- High visibility and street lighting
- Low volume of cars, low speed limits
- Adjacent to bicycle infrastructure
- Not blocking manhole cover, storm drain, etc.

Stations are better located in sunny spaces when possible, rather than under trees, so that the bikes dry off more quickly after it rains. Clear access to the sun is also important if the station is solar-powered. Locations will need to balance visibility of the system with integration into the street environment. Often, larger stations in prominent areas are designed to stand out against their landscape, while stations in residential areas are meant to blend in to the streetscape. Stations should not be placed on footpaths unless there is at least two meters of clear space for pedestrians walking beside the station, and more space should be provided where there is higher pedestrian traffic. At intersections, space is often more readily available on the minor street than on the main thoroughfare.

In general, bikeshare stations should:

Achieve target station density
Defined in the feasibility study (see section 3.2), station density should be used to achieve mostly uniform coverage throughout the service area. This provides a level of redundancy in the system, so that when stations are full or empty, another station is always nearby as a backup. Exceptions to uniform coverage may arise when siting stations in large parks or other recreational settings.

Connect to transit
Bikeshare is inherently complementary to transit, so stations should be sited adjacent to mass transit stops and stations, helping passengers connect more easily and quickly to their destinations while helping to address transit's first-last-kilometer problem.

Support bike infrastructure
Whenever possible, stations should be located along existing bike lanes or on streets that are safe and accessible for cyclists. In some cases, stations can actually be used as a barrier between a bike lane and traffic, offering increased protection for all riders.

Serve mixed-use areas
Ideal station locations are mixed-use areas that generate activity throughout the day and night, ensuring that bikes will be used during peak and off-peak hours. For example, a station that is situated between an office complex and bars and restaurants is likely to be utilized by commuters in the morning and evening, and by the restaurant and bar customers during midday and evening hours.

Avoid physical barriers
Stations should not be placed next to barriers like train tracks or in single-use areas such as a large gated park or factory. Barriers reduce the effectiveness of the bikes by limiting the area that can be reached on a single trip. Stations in single-use areas have lower usage because there are fewer activities to attract a variety of users. Furthermore, underused areas, like underpasses, while interesting in terms of activating underutilized space, should be carefully considered for potential safety concerns.

Offer multiple access points
Stations are best situated on or near corners, so that users can access and egress from multiple directions.

Provide access to the electrical grid (e-bike charging only)
Stations designed to operate as charging locations for pedal assist e-bikes often require a connection to the electrical grid to charge. This may require consultation with the electrical utility.

In the Copacabana neighborhood of Rio de Janeiro, a BikeRio station provides a connection to and from the Cardeal Arcoverde metro stop.
Source: Jakob Baum (Flickr CC)

A Baltimore Bikeshare station extends the physical barrier provided by parked cars between a bike lane and vehicle traffic.
Source: CharmCity123 (Flickr CC)

Previously on-street parking, a Bicing station serves shops, residences, and restaurants on this mixed-use street in Barcelona.
Source: Duan Xiaomei

The city should specify which guidelines it wants to follow as a framework for determining the exact location of each station. Determining ideal station location is a three-step process:

4.1.1.a

Create a first draft of station locations

The idea is to have a roughly even distribution of stations while working within the constraints of the environment. Creating a first draft of station locations can be done in one of two ways:

Grid approach
Stations are mapped out remotely using a grid to ensure even coverage, and then verified with site visits. To map locations remotely, draw a grid of 1-by-1-kilometer squares over a base map of the service area, using either a computer program (Google Maps, GIS, etc.) or a paper map, marker, and ruler. The grid provides a simple foundation for evenly distributed stations. The base map should show transit stations and bicycle lanes, as well as any other important demand generators or facilities. Then, applying the station density parameter and station location guidelines, calculate the number of locations per grid square. This ensures that stations are spaced evenly throughout the service area. For example, if the desired station density is 14 stations per square kilometer, 14 stations should be placed more or less evenly in each grid square. The grid can be subdivided into high station-density and low station-density zones if desired, though a uniformly high-density approach is recommended for most areas.

Field approach
Station locations are identified in the field and then analyzed remotely and adjusted where there is too much or too little coverage. If the planning team starts in the field, it will need to ensure continuous coverage by drawing buffers around each proposed station (using a diameter of 300-500 meters). The areas left without coverage will, then, need to be analyzed to see if a station should be added, and, if so, where. While the goal is to use the station density parameter to ensure uniform coverage, this is rarely achieved across the board because existing infrastructure and land uses often dictate how many and what size stations are needed.

4.1.1.b

Engage community groups to build support and ensure equity

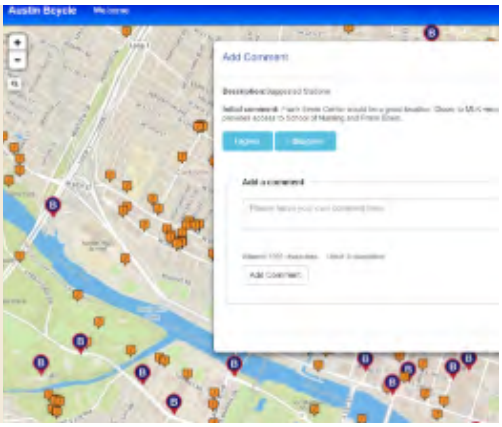
Station locations identified through either the grid or field approach detailed above should be vetted by a team of stakeholders that includes residents, local business owners, operator(s), city officials, etc. to ensure that all considerations are being addressed. Engaging stakeholders in the station location process—especially early enough to actually integrate feedback into the final decision making—is a good way to build support and community buy-in for the project. As part of their initial planning, both New York City and Washington, DC assigned a specific number of stations for given areas to the most local political representatives of those areas, and had citizens from those constituencies select the actual station locations. This transparency and willingness to hear feedback from residents and business owners at the start of (and throughout) the planning process could help to quell fears of bikeshare as a symbol of gentrification, and ensure equitable access to stations across demographic groups.

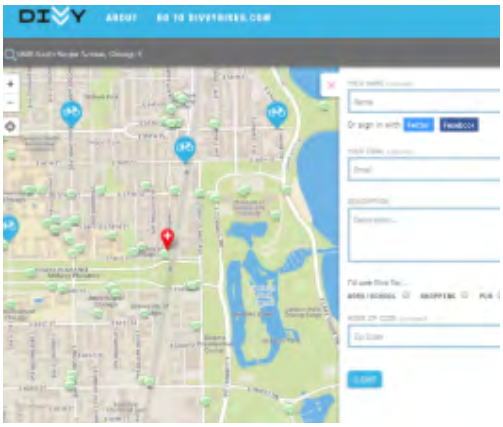
Representatives from New York City DOT met with residents from the Astoria neighborhood of Queens to discuss potential Citi Bike station locations. Source: NYC Department of Transportation

28 http://a841-tfpweb.nyc.gov/bikeshare/
29 http://www.transformca.org/landing-page/community-engagement-brings-equity-east-bay-bike-share

Community workshops to present draft plans and solicit input on station planning provide an opportunity to disseminate information about bikeshare to people living in neighborhoods where the system will be introduced (or expanded into), and will be valuable for finalizing where to place bikeshare stations and understanding demand. Starting in 2015, New York City's Department of Transportation conducted more than 20 community outreach meetings to garner resident input on locations for new Citi Bike stations in Brooklyn, Queens, and Manhattan. Local residents were given the opportunity to discuss potential station locations with their community board, elected officials, and other community organizations.[28] Similarly, Ford GoBike (previously Bay Area Bikeshare) partnered with other shared mobility operators to host community outreach events in Oakland, California at which residents were asked to draw maps of their transportation routines to help inform bikeshare station planning. [29]

Another increasingly popular method—used currently by Chicago, Boston, Austin, and others—is to crowdsource station locations through the system's website and/or mobile app. This can help to identify high-demand areas and, while crowdsourcing will not determine the exact locations of individual stations, it does enable residents to identify proximate areas that they feel should be served by the system. Washington, DC's Capital Bikeshare uses a slightly different approach to solicit input on station locations: including space in the system's biannual survey for members to suggest locations. Despite the outreach approach, exact locations for stations will need to be finalized through analysis done by the planning team.





Chicago's Divvy and Austin's Bcycle system websites allow users to suggest station locations on a common city map. Source: System websites

4.1.1.c

Finalize station locations through site visits

Despite the approach used to generate the first draft of station locations, the exact positioning of each station will require a site visit.

The planning team conducting site visits should be equipped with:

- **A bicycle** to conduct the site visit is recommended because it gives planners a sense of the service area from the perspective of a cyclist.
- **GPS-enabled mapping device** to verify latitude-longitude locations already identified
- **Tape measure** or measuring wheel.
- **Camera** to document potential station locations.

Visit each potential station location and examine the area to determine the specific location that will best accommodate the bikeshare station. Using a tape measure, determine if there is sufficient space for the station; this will depend on how many bikes are projected to be at that station. Depending on the bike docking design, each bike will need a space that is approximately 2 meters long and 0.7–1.5 meters wide. Locations that enable station growth, if warranted, are preferred. In general, stations will have to align with local permitting processes for street furniture, and engineering plans may need to be submitted to city agencies.

30 Rebecca Harshbarger, "350 parking spaces will be converted into Citi Bike stations: DOT," *AM New York*, August 25, 2015.

A variety of options for station locations should be considered:

Source: Luis Tamayo, Flickr CC

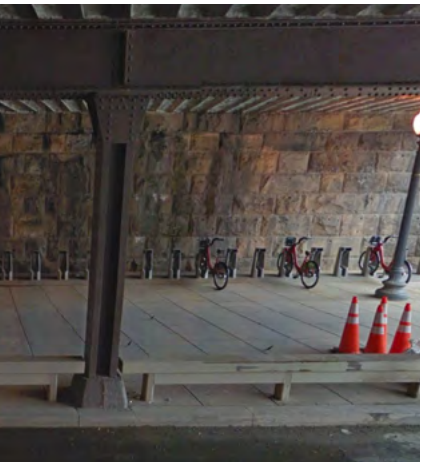
On-street parking spaces

Converted car parking spaces are an ideal location for bikeshare parking stations. Boston recognized the benefits of designating curb space for its Hubway bikeshare stations in its 2016 Future of Parking in Boston report, and New York City committed to replacing 350 parking spaces with bikeshare stations as part of a 2015 expansion in Manhattan, Brooklyn and Queens.[30] Similarly, Barcelona converted nearly 1,200 parking spaces for use by the city's Bicing bikeshare system.

Source: Carlos Felipe Pardo

Sidewalk landscape zone

Space that is not used often by pedestrians, such as in between trees or planter boxes or next to other infrastructure such as pedestrian bridges or utility installations, can be used for bikeshare parking stations without impeding pedestrian flow.



Source: ITDP Global

Dead spaces

While not priority locations, areas beneath flyovers and bridges—which are often underutilized—that are close to destinations and have adequate pedestrian conditions and solar access can serve as locations for stations. These spaces may raise some safety concerns, but these can typically be resolved with proper lighting and other station design interventions. A well-used bikeshare station can help to activate a previously desolate space, improving security.

Once the specific location for each bikeshare station is established, it should be placemarked using a GPS system (or pinpointed on a smartphone) or marked on a physical map. Photos should be taken and precise details noted about the ideal station size, positioning, configuration, given certain surroundings, etc. These coordinates, notes, and photos should then be given to the station installation contractor to safeguard against location or positioning errors, which can be common.

4.1.1.d

Revisit and Analyze Station Performance

After the system launches, the implementing agency should plan to perform regular assessments of station locations, informed by data generated from system users. Underused stations may benefit from resizing (station sizing is discussed in subsection 4.1.2) relocation and/or from additional signage or wayfinding interventions. User surveys (both in-person at stations and online) may also help to optimize station locations.

Wayfinding signs at this Ecobici station direct users to nearby stations, and provide the distance between stations.
Source: ITDP Mexico

4.1.2

Station Sizing

Once the station locations have been chosen, the next decision will be how big those stations should be, including the number of bikes and the number of docking stations. This will depend on the demand of the area, which can be estimated using several different methods:

Identify demand drivers
Understand the variation in population, employment, and building density throughout the service area; high density often indicates high demand. Also consider the station's placement within the context of the overall network. Outlying or edge stations are more difficult to service and may be larger in size to avoid leaving a rider with no alternatives if the station is full or empty. Lastly, evaluate existing mode splits and major attractions or points of interest that may create a high number of trips.

Conduct surveys
Interview transit riders and/or pedestrians to better understand where people are going and if they would consider using a bike for all or part of their trip if the option were available.

Hold community workshops
Consult the public to understand area demand and discuss what size stations fit best in what locations.

To simplify the planning process, stations can be divided into small (5-7 bikes), medium (10-15 bikes) and large (20+ bikes) so that each station size is not overly deterministic. Using modular stations mitigates some of the risk of wrongly sizing stations, as it is easier to add or remove docking spaces once the system opens. This is discussed in greater detail in the next subsection (4.1.3). For systems utilizing virtual stations—geofenced hubs with or without bicycle racks—modifying the station requires adding or removing bicycle racks and/or modifying the geofence boundaries.

4.1.3

Station Type & Design

Station design is a function of the level of demand, the amount of space available, the cityscape, and the desired visual impact on the urban environment. The choice of station type will need to take into account the IT requirements for each option. Stations are composed of bicycles, docking spaces, and terminals, also known as kiosks. Docking spaces are where the bikes are parked and locked when not in use. In some systems, users can check out bikes at the docking space. Docking spaces represent the single largest capital cost in many systems, but a greater number of docking spaces helps cut operating costs by reducing the need for rebalancing of the bikes. This Guide uses terminals to define the places where users can get information about the system, but these can also be called kiosks or totems. Stations can also include advertising boards that can be rented as a source of revenue for the system (see subsection 7.3.6 Advertising Revenue).

There are two main types of bikeshare stations:

Modular

Modular stations are easily moved, usually constructed on a base that is then bolted into the concrete or asphalt. In some cases, these stations are powered by solar power because they do not connect directly to the city's electrical grid. Montreal's BIXI system pioneered this type of powered modular station design, which is now used in many other cities such as New York City and Melbourne. It consists of a heavy base with docking locations and a terminal for information, registration, and payment, all of which can be relocated. In other cases, modular stations are not powered, and simply provide a branded, designated location to which bikeshare bikes can be locked. Social Bicycle-operated systems across several countries, nextbike-operated systems in Europe, and Zagster-operated systems in the US use these non-powered modular stations.

If a station location is found to be inadequate after it is built—as is sometimes discovered after some weeks of operation—modular stations can be fairly easily relocated to a place with better demand. Stations like this are also more easily scaled up or down, adding or removing docking spaces or racks as real usage is determined after opening.

Portland's BIKETOWN uses a less costly model of modular stations where bikes are locked manually to branded racks, and the solar-powered terminal is a separate unit from the docks.
Source: Riley O'Neil

Permanent
These stations require excavation and trenching to reach the power source. This requires a longer time frame to implement and may entail a more onerous approval process. Permanent stations may be preferred for systems with pedal assist e-bikes, so that bikes can be charged while they are checked into a station.

In automated stations, there are two basic types of station design that accommodate check-in and check-out: docking spaces and cycle parking areas. A system may incorporate both station types depending on demand levels, desired street views, and availability of space at a particular station. Whether a system uses docks or parking areas, stations should always have more docking positions or storage space than bikes to accommodate peak demand. This should be reflected in the station's docks-per-bike ratio, discussed in detail in subsection 3.2.2: Determine Station Size.

Docking spaces

Each space docks one bicycle

The number of spaces determines the size of the station's footprint, which means there is a great deal of flexibility to adjust the station size to fit the existing urban landscape. This style takes up more space per bike than cycle parking areas, but blends in better with the urban environment and is popular for roadside stations. Bicycles are checked out by customers either at the terminal or at the actual docking space. Docking spaces can be more user-friendly because a rider simply rolls the bike into and out of the docking space to lock or unlock it.

Docking spaces can be arranged in a variety of styles in order to best match the station's surroundings. In tight spaces, more drastically-angled docks allow for more bikes. Alternatively, in more open spaces, parallel docks help maximize station capacity. Source: William Murphy, Flickr CC

Bike parking areas

Bicycles are stored together, typically on racks, in a secured area

While less common than docking spaces, bike parking areas can be a good option for larger stations—that is, more than 50 bicycles—because parking racks can hold more bikes per square meter than docking spaces. Bicycle parking areas are best utilized in underused spaces, such as those beneath overpasses or in suburban areas, where land space is less scarce than in the downtown core. At stations with cycle parking areas, bicycles are checked in and out through a turnstile or similar mechanism. Because these stations require a secure area that is fenced or walled off, they can be more intrusive in the urban landscape. Additionally, bike parking areas that require a bike be lifted onto the rack could pose barriers to less-able riders.

4.2
PLANNING & REGULATING DOCKLESS SYSTEMS

Over the last several years, a new approach to bikeshare has emerged: dockless bikeshare. While stationless bikeshare systems, such as Call-a-bike and nextbike, have existed for years in Europe, they relied heavily on government support, were not reliant on smartphone technology, and never achieved the levels of growth currently underway. The rise of dockless bikeshare, however, comes as a direct response to some of the challenges that traditional station-based bikeshare systems have faced both in terms of convenience for users and the need for public funding. Dockless bikeshare relies heavily, if not exclusively, on smartphone technology and high speed internet, and operators typically charge very low fees on a per ride basis. Supported almost entirely by venture capital funding, dockless bikeshare companies function without government subsidies, enabling them to avoid the often lengthy government procurement processes associated with traditional single-operator, station-based systems.

Dockless bikeshare became hugely popular in China shortly after it emerged on the scene, and operators responded by flooding unprepared Chinese cities with hundreds of thousands of bikes. Source: ITDP China

Dockless bikeshare in its current form has operated in China since 2014, but was largely unregulated during its infancy. In April 2017, Chinese cities—inundated with millions of dockless bikes and the challenges that came with them—began exploring options for regulating supply, managing public space, and ensuring user safety and privacy. Soon after, in July 2017, Seattle released the first-ever, comprehensive permit structure to manage dockless bikeshare operations before companies dropped bikes on city streets. As other cities emulated this preemptive regulation strategy, many realized that a delicate balance is required. Operators need flexibility to innovate, compete, and improve their service delivery, technology, and business models. Meanwhile, parameters that limit oversupply of bikes, ensure bike safety, and protect users are critical. By passing municipal ordinances, designing pilot programs, and/or using other regulatory mechanisms to oversee how dockless bikeshare is deployed and managed citywide, more and more cities are rightly demanding dockless operators coordinate with them prior to launching operations.

Even though the city does not provide funds to directly support dockless bikeshare, its operation depends on the use of city-owned streets, sidewalks, and other public infrastructure. By establishing a permit system, request for proposals (RFP), memorandum of understanding (MOU), or similar regulatory mechanism, cities are well positioned to:

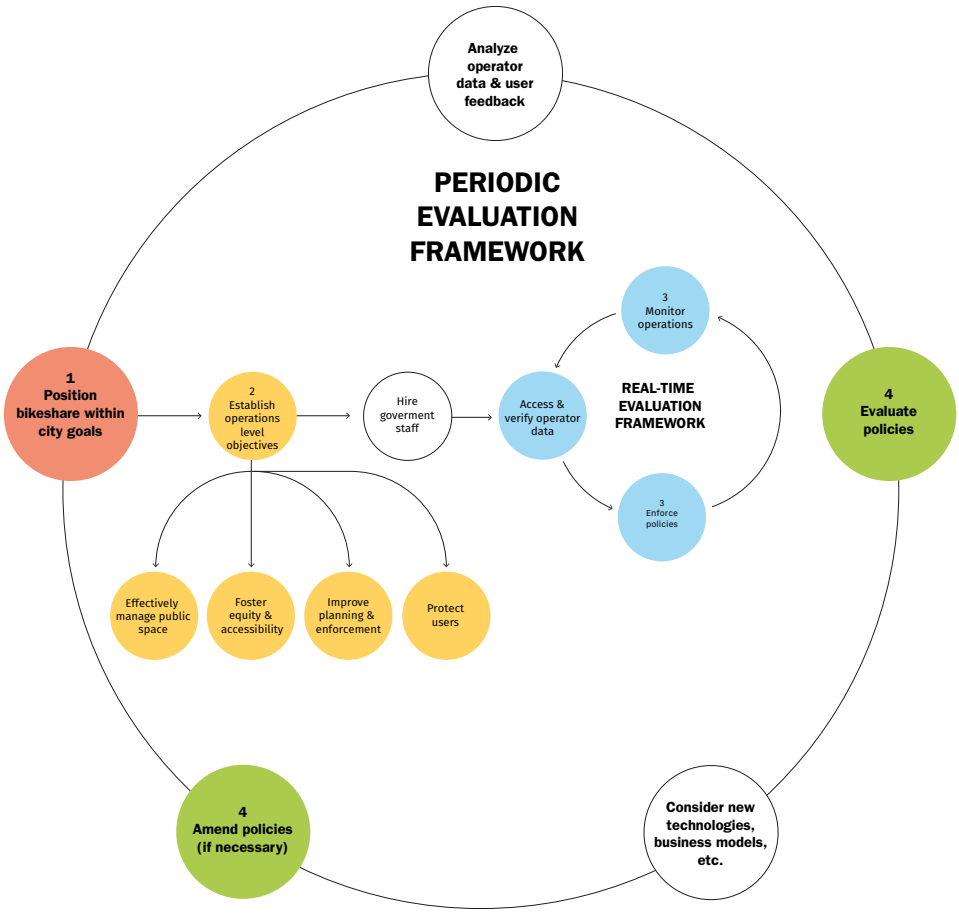
1. **Integrate dockless bikeshare into existing mobility and accessibility goals** and adopt policies that compel operators to help achieve those goals in exchange for their use of public space.

2. **Establish operations objectives for dockless bikeshare and adopt policies that:**
   i. Effectively manage public space
   ii. Foster equity and acc0 essibility
   iii. Improve planning and enforcement
   iv. Protect users.

3. **Monitor operator compliance** using data shared between each operator and trained government staff, and enforce policies through fines or other penalties when necessary.

4. **Evaluate and amend policies** based on how well bikeshare contributes to city goals over time, using operator data and user feedback.

Policy Framework for Regulating Dockless Bikeshare



It is worth noting here that dockless bikeshare and the current operating model is still new and rapidly-evolving. This Guide will not necessarily provide all the answers, but does, in the following sections, offer a framework for cities to experiment with regulatory approaches, while maintaining a strong focus on maximizing public benefits.

4.2.1 Integrate Dockless Bikeshare into City Goals

Bikeshare can be a key component in achieving access, economic development, sustainability, health, and other goals cities are already working toward. For example, the Greater Manchester region of the UK is using dockless bikeshare to help meet existing climate-related goals by increasing bike mode share to 10% of trips by 2025 and reducing vehicle kilometers traveled (VKT) and single-occupancy vehicle trips. Singapore, which is aiming to increase transit ridership to 75% of commuters by 2030, committed to investing in pedestrian and cycling infrastructure so that more people can comfortably access transit. The city's regulated dockless bikeshare system offers an additional first-last-kilometer option to help meet that goal. Bikeshare can also contribute to economic development goals, attracting both tourists and businesses, as well as offer an affordable, sustainable transportation mode for visitors to explore the city and a quality-of-life benefit for potential employees. Identifying how dockless bikeshare can connect with existing goals will help cities decide which policies to prioritize, and how best to track progress and measure success.

4.2.2

Set Policies to Meet Operations Objectives

In addition to contributing to citywide goals, policies should address specific challenges related to dockless bikeshare, including oversupply of bikes, lack of coordination between governments and operators, uncertainty around service delivery, etc. For the purposes of this Guide, these challenges are grouped into four operations-level objectives that cities must achieve:

1. Effectively manage public space
2. Foster equity and accessibility
3. Improve planning and enforcement
4. Protect users.

Conditions and goals undoubtedly differ from city to city, and uncertainty exists in relation to local authorities regulating dockless bikeshare. Given these realities, a menu of policies is suggested that achieves each objective, enabling cities to construct regulatory frameworks that meet their specific needs. In addition, it is important to recognize that goals and objectives may conflict with each other. For example, the operational objective to protect users through more rigorous equipment standards may lead to more expensive bikes and user fees, making it more challenging to meet the citywide goal of providing affordable travel options.

OBJECTIVE 1. EFFECTIVELY MANAGE PUBLIC SPACE

Dockless bikeshare operates under the assumption that public space will be available for bike parking between uses. In some areas, public space may be less contested because of wide sidewalks, low pedestrian flows, etc. But in areas with narrow sidewalks, high pedestrian traffic, street trees or other planters, outdoor restaurant seating, and any number of other uses of public space, parked bikeshare bikes compete for space. It is up to the city to allocate public space for dockless bike parking to avoid negative outcomes such as bike piles and bikes blocking the pedestrian right-of-way. Chinese cities have had to shoulder the enormous cost of removing thousands of bikes because of parking and/or public space violations.

Cities have a number of policies at their disposal to ensure more clearly defined parking habits and orderly public spaces. However, capacity and/or resource constraints may limit what a city can require and enforce. Local authorities will also need to consider tradeoffs—designating space for dockless bikes will likely mean less space for pedestrians (if bikes are parked on the sidewalk) or cars (if street parking is converted to bike parking areas).

Dockless bikeshare users park their bikes in a designated parking area near a BRT station in Guangzhou, China. Source: ITDP China

Fleet Size Cap
The number of bikes operators can have on the street is limited. Without a cap, operators could flood cities with large quantities of bikes to capture market share. However, if the fleet cap is set too low, the system will never achieve reliability because it will be too difficult to find a bike. A balance needs to be struck between providing bikeshare service and overcrowding public space with infrequently used bikes. Fleet size caps could be designed to increase over time—for example, by a percentage each month for the first three months of operation, as is the case in Seattle—or remain static, as in Milan, which restricts each operator to a maximum of 3,000 bikes. Cities should also consider periodic adjustments to caps based on performance and ridership data (i.e., trips per bike per day). See subsection 4.2.3: Monitoring and Enforcing Policies for more.

Time-bound response to parking complaints
Operators are required to respond to complaints about mis-parked bikes within a certain time frame, typically two hours. The city then has the authority to fine the operator or remove the bike from the street at the operator's expense.

User education
Operators must include information on both proper and inappropriate parking locations on their website and on their mobile app, which users must read through and agree to follow to complete the registration process. Cities should also consider mandating that operators include key information—parking rules, customer service phone number, on-board GPS tracking alert, etc.—for users directly on their bikes.

Lock-to requirement
Cities can limit dockless bikeshare operation to companies that can provide bikes that must be locked to existing infrastructure (bike rack, sign post, etc.) for a user to end a ride. This has been shown to substantially reduce instances of tipped-over bikes and bikes blocking rights-of-way and other public spaces, but it requires a robust network of bike racks and other infrastructure fit to lock bikes. Several operators including JUMP, Zagster, nextbike, and BCycle already offer this feature, and others are developing prototypes. If a city requires lock-to, it

should work with operators to invest in additional bike parking given the significant increase in demand for racks this requirement would yield. Origin-destination data could help identify locations where parking is in demand. In addition, since lock-to bikes cannot be easily relocated, cities should consider how to deal with improperly locked bikes (such as those parked on private property, where the city may lack jurisdiction to intervene).

Dockless bike parking areas
Physical parking areas are sited and installed by the city for use by all dockless bikes. Bike racks should be installed so that lock-to dockless bikes and personal bikes can utilize the parking area. Parking areas may be particularly beneficial in more congested areas where competition for sidewalk space is high. City staff will need to work with operators to ensure that: a) the GPS technology on their bikes is accurate enough to recognize bikes parked within the designated areas as complying, and b) parking areas are clearly defined (and users are incentivized to use them) across all real-time service maps. Parking area costs can be offset through operator fees. Refer to section 4.1.1 for guidance on station siting.

OBJECTIVE 2. FOSTER EQUITY AND ACCESSIBILITY

One of the strengths of dockless bikeshare is that it brings fleets of shared bikes into cities, increasing visibility for cycling and creating immediate potential for more trips to be made by bike. Access to transit, jobs, and other destinations could drastically improve—especially in historically disconnected communities—if dockless bikes are consistently available. This will only happen if cities are mindful of the barriers to using bikeshare that can be present in low-income communities and demand that operators meet one or more of the following accessibility requirements. Additionally, cities should develop a comprehensive community outreach strategy for communicating the benefits of bikeshare and encouraging cycling as a cost-effective, sustainable transportation option.

A dockless Limebike and Metro Bikeshare bike outside of a metro station in Los Angeles.
Source: Waltarrrrr, Flickr CC

Bike distribution requirement
An operator can only have a certain number of bikes (cap) in each zone (could be neighborhoods, wards, etc.) or must provide a minimum service level informed by the rate of usage in communities identified as being underserved. This could help to ensure that spatial distribution of bikes across the city is more equitable and that bikes can be more reliably found in less dense or less destination-heavy zones, while making sure that bikes are not oversaturating low-demand areas.

Flexible and reduced payment options
Accessibility to dockless bikeshare can be limited by the need for a smartphone to locate and unlock a bike and a credit card linked to a user's account. Cities could require operators to provide at least one alternative payment option for users to top up their account (cash at local stores, using a prepaid card, etc.). To ensure bikeshare is affordable, San Francisco requires dockless operators to provide a reduced-fare plan to low-income customers that waives the initial deposit and offers unlimited trips less than 30 minutes.

Transit integration
Citywide accessibility rests heavily on the reach of the transit network, and bikeshare has the opportunity to extend that reach if it is well integrated, affordable, and efficient for users. Reduced-fare bikeshare trips that connect to transit (similar to reduced-fare transfers from bus to metro), as well as the ability to access bikeshare and transit using a common radio frequency identification (RFID) card could significantly expand first-last-kilometer connections. Cities could require dockless operators to provide bikes that can be unlocked using an RFID card (preferably the city transit card), or work with operators to develop a payment platform that allows reduced-fare transfers between bikeshare and transit.

OBJECTIVE 3. IMPROVE PLANNING & ENFORCEMENT

Dockless bikes with onboard GPS provide more robust trip data than previously possible with non-smart bikes. This data is particularly valuable to cities for its potential to inform a variety of planning decisions, as well as to shed light on how and why users are riding dockless bikes (perhaps compared to other modes). Real-time, verifiable data from dockless bikeshare operators is also critical for monitoring and enforcing compliance with city policies.

Data collected from dockless bikeshare trips can help planners prioritize bike infrastructure on highly-used routes. Source: Katherine Grifiths/City of Sydney

Establish data reporting standards

Cities should require all operators to provide access to real-time data on the location of every operational bike via a publicly accessible application program interface (API) in a standardized format such as the General Bikeshare Feed Specification (GBFS). Anonymized trip data, maintenance activity data, and crash data should also be shared periodically with the city through a standardized format detailed in the permit. See section 6.5: Data Requirements and Management for more.

User survey requirement

Cities should require operators to distribute an annual survey to their users to collect data on the demographics of dockless bikeshare riders and how and why they use dockless bikes. This data may help analyze progress toward city goals, such as expanding access, and where and to what groups the city should target efforts to encourage bikeshare use.

OBJECTIVE 4. PROTECT USERS

Cities have a responsibility to protect residents and visitors riding dockless bikes on city streets and trails. Cities should establish requirements for operators to educate users, provide equipment that meets industry standards, and take steps to ensure additional user protections.

In Sydney, dockless bikeshare riders utilize a segregated bike lane. Source: Katherine Griffiths/ City of Sydney

Clear safety information

Dockless bikeshare operators should include safety information such as encouraging riders to wear a helmet, inspecting the bike for damage before riding, parking in acceptable locations, how to submit a maintenance report, etc. on their website and in-app (triggered upon registration). Some operators use credit programs to further incentivize responsible use. Especially pertinent information, like the operator's contact number and the fact that bikes are equipped with GPS tracking, should be displayed on each bike for easy communication to users.

Equipment standards

All bikes in an operator's fleet should at least meet ISO 4210-2 standards for safety; however, many experts agree that ISO standards do not adequately cover the safety of shared bicycles. The North American Bikeshare Association (NABSA) is working to develop improved standards. In the meantime, cities should carefully examine each operator's fleet to ensure safety (see section 4:5 Bikes for more). Prior to receiving permission to operate, operators should be required to present proof of a process for users to notify the company of safety or maintenance issues involving their bikes. As standard practice, proof of liability insurance should also be required prior to commencing operation.

User deposit refund protections

While many operators seem to be moving away from requiring user deposits, at least in certain markets, several still require a deposit upon registering. Cities should consider establishing a government or escrow account to house (and protect) user deposits and requiring operators to store user deposits in that account, so that they can be refunded, even if a company suddenly goes out of business. Several dockless bikeshare operators in China were unable to refund user deposits when requested or following bankruptcy filings. In response, Tianjin, Beijing, Shenzhen and other cities established special municipal accounts to safeguard dockless bikeshare user deposits.

4.2.3

Monitor and Enforce Policies

Effective monitoring and enforcement of dockless bikeshare operations requires dedicated government staff capable of validating the data submitted by private operators and a strategy that imposes penalties for non-compliance. A minimum suggested staffing requirement for any jurisdiction is one full-time staff member dedicated exclusively to monitoring dockless bikeshare. The bikeshare staff member should be able to understand and critically evaluate data submitted by operators to ensure compliance with city policies, which would likely

include geographic information system (GIS) skills, an understanding of APIs, and how to field-verify operator data. Because this data will help to inform compliance checks, the position should be housed within or have a direct link to the department tasked with issuing fines to enforce dockless bikeshare policies. It is not recommended, however, that this staff member be directly or solely responsible for issuing fines, thus avoiding the potential for bribery by operators or other corrupt practices. Optimally, an additional staff member would be responsible for community outreach and education to encourage the uptake of bikeshare citywide and to help establish norms of behavior. Cities might consider establishing a staff to bike ratio (i.e., one staff member per 1,000 bikes) that would enable scaling up staff capacity as bikeshare expands.

Compensation for dockless bikeshare monitoring staff may be funded through permit and/or administrative fees paid by the private companies to operate on the public rights-of-way. Channels should be put in place to reduce the ability of bikeshare staff to approve many companies to operate to collect administrative fees. Additionally, given the potential for conflict of interest, funding for monitoring staff should not come from non-compliance fines imposed on companies.

To ensure policies are successfully minimizing operations-level challenges, cities should, as a prerequisite for operation, require operators to provide real-time data that is easy to validate. Verified operator data is critical for an accurate analysis of system performance and for carrying out effective enforcement. Performance analysis will quantify the impact the policies are having in relation to each operations objective, and help track progress toward city goals. Based on this progress, dockless bikeshare policies can be adjusted—for example, re-evaluating fleet maximums—to ensure that goals and operations objectives continue to be met, even as technologies, business models, and/or other changes arise (for more detail, see subsection 4.2.4 below). Consistent, reliable data submitted by operators in a standardized format enables the city to be flexible and responsive to how these changes affect the bikeshare operating environment and to rework policies to stay on track to meet city goals.

A policy enforcement strategy should be implemented from the outset to establish norms that maximize policy compliance and minimize the need for future enforcement. A successful strategy will require: 1) reliable, real-time and historical data from operators and 2) government staff capable of interpreting that data and assessing penalties when appropriate. It is recommended that cities enforce policies through fines or other penalties levied on operators for non-compliance. As necessary, these fines may be passed on to users to establish user norms in addition to operator norms. Revenue generated from fines could be directed to bicycle and pedestrian infrastructure projects, but should not be used to compensate city bikeshare staff, thereby avoiding any appearance of conflict of interest. Specific enforcement approaches are discussed in subsection 6.4.2: Permit Enforcement Mechanisms.

4.2.4

Evaluate and Adjust Policies Over Time

System performance should be periodically evaluated by the city or a third-party managed by the city to ensure that dockless bikeshare policies are effectively meeting established goals. Appropriate data that corresponds to progress toward each goal should be collected for this purpose. For example, to measure equity of the system, an annual, comprehensive survey that each operator distributes to users could help the city understand the demographics and needs of system users. These data could then be combined with data collected by other means, such as modal split, accessibility, and other existing indicators to develop a more complete travel picture.

From this evaluation, policies such as fleet size caps, service area restrictions, equipment standards, etc. can be analyzed and adjusted as needed. Periodic evaluation may also shed light on the need for secondary or follow-up policies to bolster the effects of existing policies, such as adding physically marked dockless bike parking areas if operators are falling short on public space management requirements. It is important, however, to make this process as clear as possible to operators, which may be very sensitive to any significant changes in policy. This longer-term evaluation process should also include a review of technological, business model, and/or other significant changes that have emerged, and how these might impact existing policies.

Funding for this periodic, larger-scale data collection and evaluation could come from permit and/or administrative fees paid by the dockless operators as part of their initial application to operate. See subsection 3.3.2: Financial Planning for Privately Funded Systems for more on permit and administrative fees.

4.3
CYCLING INFRASTRUCTURE NETWORK

Commitments to improve infrastructure and street efficiency benefit users of bikeshare and cyclists more generally, as well as pedestrians and transit riders. Introducing a bikeshare system could be viewed, by some, as increasing competition for public space on the sidewalk, green space, and parking space. Cities can curb these sentiments by developing streetscapes that maximize space and usability for sustainable modes—complete streets—and using bikeshare as a catalyst to improve accessibility. Complete streets have been shown to both encourage cycling and decrease fatal crashes.[31]

While bikeshare can be implemented even if there is little existing cycling infrastructure, pairing the construction of new bike lanes with the opening of a bikeshare system can add to public acceptance and improve safety for users of the new system, as well as personal bike riders. When Seville, Spain launched its Sevici bikeshare system in 2007, the city committed to building hundreds of kilometers of cycle tracks over the next decade. A well-connected network of lanes emerged, and Seville saw a marked increase in bike trips and a decrease in crashes and bike-related injuries. In city after city, building bike lanes has been shown to increase bike ridership, and when integrated with bikeshare, can make a compelling case for additional infrastructure investments that will continue to increase the number of bikes on the road.[32]

Conversely, a large uptick in the number of cyclists on the road because of bikeshare can be a visible reminder of the need for safe, separated bike lanes. The mayor of Chengdu in China committed to building 600 kilometers of bike lanes following the massive increase of bike riders brought about by dockless bikeshare. In that city, the number of daily trips on Mobikes alone have eclipsed the number of daily subway trips.[33] Additionally, data generated from bikeshare trips can provide evidence of the impact of bicycle network improvements, whereas it can be difficult to gather this data from private bike users. This evidence showing that bike infrastructure is being used—and perhaps generating more bike trips and, thus, more data—could even help make the case for more investment in bike infrastructure. In 2017, New York City DOT cited an 80% growth in daily cycling trips from 2010-2015 (which includes Citi Bike trips) as evidence to support building more (and more connected) protected bike lanes.[34]

Sevici bikeshare riders use a protected bike lane in Seville, Spain. Source: BikeTexas (Flickr CC)

31 Stephen Mooney, et al., "Do 'complete streets' policies decrease the risk of fatalities for adult bicyclists?" British Medical Journal, 24, (2017).
32 "A Right to the Road: Understanding & Addressing Bicyclist Safety," Governor's Highway Safety Association, September 2017.
33 Josh Lipton, "Bike-sharing boom in China pedals to new heights," CNBC, July 18, 2017.
34 "Delancey St: Protected Bike Lanes and Safety Improvements." Presentation, *New York City Department of Transportation*, April 5, 2017.

4.4
INFORMATION TECHNOLOGY AND PAYMENT MECHANISMS

Information technology (IT) forms the nervous system for any bikeshare system, connecting bikes, stations, users, and control centers using software and data-transmission mechanisms. In their service levels or permit requirements with operators, cities can require that bikeshare IT systems protect user privacy, allow different types of passes to be purchased, and meet other requirements.

IT software needs to support the front end, or the public side, of the system, including registration of new users, payment and subscriptions, general information about the system, and customer data management. The front end may also include website portals and/or apps for smartphones. On the back end, where the implementing agency and operator receive the information required to run and manage the system, the software needs to support station and bike location monitoring, rebalancing of bikes, defect and maintenance issues, billing, and customer data. The software should also integrate the use of card technology (key fobs, RFID cards, etc.) for long-term users to quickly check bikes in or out.

IT will need to serve two types of users: long-term users—who are usually registered members and use the system with some frequency— and casual users, such as tourists, who use the system infrequently or even just once. Long-term members are typically provided with an access card or key fob, and can pay a membership fee to use the system for an unlimited number of trips. Casual users are not usually given an access card. Most dockless bikes are equipped with a QR code, which is scanned with the user's smartphone to unlock the bike, eliminating the need for a key fob. Some bikeshare bikes also have a keypad and/or RFID card reader onboard that can unlock the bike, offering alternatives for people without smartphones.

Payment systems are very specific to the laws and payment options available in the country in which the bikeshare operates. Different countries have different privacy regulations and laws regarding payment, as well as different requirements for keeping customer information secure.

Integrating bikeshare payment mechanisms into the payment systems used by other local modes of transport should be a high priority (see subsection 1.2.1: Expanding Sustainable Transport through Network Integration).

In addition to the fee to rent a bike, some systems charge casual users a refundable deposit (or hold) on their credit card to identify the user and guarantee the return of the bicycle. While several systems have started moving away from this practice, many still require a guarantee before use to ensure that users will return bikes.

Most station-based systems provide annual membership holders with a key fob, like this one for Citi Bike in New York City, to easily access the system.
Source: Shinya Suzuki (Flickr CC)

In Atlanta, Relay bikeshare bikes are equipped with a solar-powered keypad and RFID card reader, either of which can be used to unlock the bike.
Source: Alta Planning + Design (Flickr CC)

4.5
BIKES

Modern bikeshare systems are typically based on a standardized bicycle with specially designed or proprietary components built solely for the system. This ensures durability and security so that the parts cannot be easily stolen and/or resold. The appearance of the bicycle is a key element in the overall branding of a bikeshare system and the bike should project a sleek, modern image (see section 5.1: Communications and Marketing). Distinctive colors, frame style, molding, and graphics can differentiate the bikeshare fleet from other bicycles in the city. Bikeshare bikes, because they are often used by commuters, also usually have mudguards and chain covers to protect the rider's clothing.

System planners need to establish minimum guidelines for bicycles. The following are some desirable characteristics:

One-size-fits-all
A bikeshare system usually offers one size and style of bike. The bicycle should be comfortable for most users (and should allow for adjustments to the seat height but no ability to remove the seat), but since there is only one size, it will not be adequate for every single user. The city should estimate the average user height and make a recommendation based on that. A step-through frame with long seat post can easily accommodate a wide variety of heights, and is easier to mount for riders wearing skirts or dresses.

Robust
A bikeshare bike has a much higher frequency of use than personal bikes. As discussed in subsection 3.1.1, four to eight trips per bike per day is typical. Bikeshare bikes should have an average life-span of three to five years. Bikes built to operate for a year or two indicate that the operator has minimized capital investment to deploy more bikes and capture market share, and may incentivize complete replacement of broken bikes instead of maintaining and repairing them.

Low-maintenance
Bicycles designed to require less maintenance (i.e., self-powered LED lights, non-puncture airless tires, etc.) typically have lower operating costs and may enable more bikes to stay in service at a time. However, low-maintenance bikes could provide a lower-quality ride, so a balance should be struck between ride quality and maintenance needs.

Secure
To deter theft, the bikes in station-based systems must securely and easily lock into the docking space, and dockless bikes should be equipped with a sturdy wheel lock or built-in lock that attaches them to street furniture. Although it may pose added costs, proprietary tooling that makes it difficult to remove and resell individual parts has become best practice for most bikeshare fleets. Mexico City's Ecobici bikes feature a 20-inch front and 24-inch rear wheel, a unique design aimed at reducing theft and illegal resale. On-board GPS can also help to deter theft (and/or aid in bike recovery).

Ecobici bikes have different sized front and rear wheels, a recognizable design that is intended to reduce theft and resale.
Source: ITDP Mexico

Safe
The color of the bike, appropriate wheel reflectors, bells, brakes (fully enclosed roller or drum type for all-weather use), and front and rear lights for night riding (powered with a dynamo hub or using solar power) all must be considered, and must meet local standards for bike safety.

Identifiable
Each bike should have a human-readable unique ID. All bikes should be clearly marked with the system or operator's name and customer service phone number.

Include storage
A front basket is usually preferred to a rear rack to help users carry their belongings. Many shared-bike designs avoid rear racks to discourage a second person riding on the back or carrying excessively heavy loads, both of which can lead to extra wear and tear as well as safety concerns.

Bikes require ongoing maintenance, both in terms of prevention and new parts. The four major points of maintenance on bicycles are:

- **Tires**
  Tube changes, regular inflation, tread wear
- **Brakes**
  Regular adjustments, replacement when worn
- **Drivetrains**
  Lubrication, adjustment due to chain and shift cable stretch
- **Lighting**
  Regular checks

However, new technologies are continually being developed to address these problems and minimize the need for consistent maintenance. Almost all bikeshare bikes now include enclosed all-weather drum or roller brakes. Dockless bikeshare operator Mobike uses airless tires with no inflatable inner tube and a chainless shaft drive for its bikes in some cities, both of which are intended to reduce regular maintenance needs.[35]

Bandung, Indonesia's Boseh bikeshare uses a navy blue color scheme that is used throughout city marketing, particularly by Bandung's Persib football club.
Source: ITDP Indonesia

Bikes in Bhopal, India's Chartered bikeshare fleet feature large, easy to read identification numbers.
Source: Chartered Bike

Taipei's YouBikes provide riders with a deep front basket that can securely hold riders' belongings during their trip.
Source: Carlos Felipe Pardo

35 "Two Wheels Good as Mobike Arrives in US," *Shanghai Daily*, September 22, 2017.

4.5.1

Types of Bikeshare Bikes

Traditional Bikes

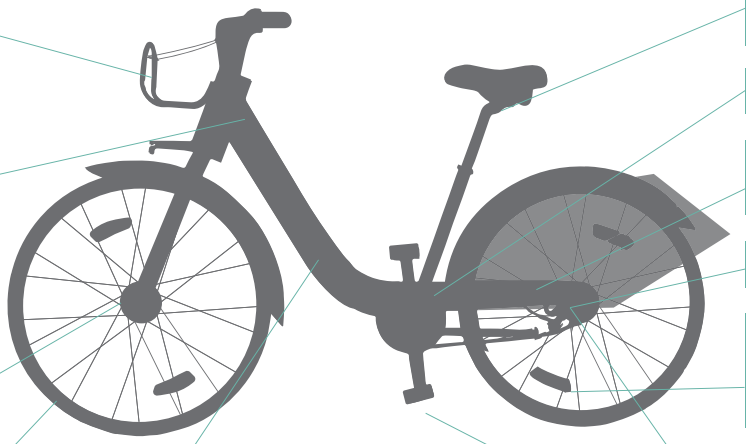
Front basket
The cycle should be designed with a porous front basket for carrying personal items. Rear racks are not advisable as they can be overloaded, causing damage to the cycle. Front baskets are ideal for carrying purses and valuables, which would be subject to theft if carried in a rear rack. The design should prevent the use of the basketry for carrying a second passenger.

Docking mechanism with RFID tag
The RFID device carries the cycle's unique identification number and is read when the cycle is docked at a station. The cycle should be held in a fixed position when docked.

Sturdy Tires
Solid or puncture resistant tires with a wide profile are recommended to reduce the frequency of punctures and increase life expectancy.

Drum brakes
Front and rear drum brakes with internal wires are preferred. Disk, cantilever, and V-brakes should be avoided because they are difficult to maintain.

Protection against theft & vandalism
The cycle should be made from unique parts and sizes to deter theft. Nuts and screws should be designed so that they can only be opened with proprietary tools. Similarly, the standard 26-inch tire size should be avoided. (The tire diameter should not be too small because small tires are prone to getting stuck in potholes.)



Step-through frame
A step-through frame design is required to ensure that the cycle is compatible with all types of clothing. The frame should allow for a comfortable upright riding position.

Safe pedals
Large, flat pedals can help inexperienced riders keep their feet securely on the pedals. Avoid selecting a pedal with sharp barbs, as they can injure the foot and leg of an inexperienced rider.

Adjustable seat post
'Quick release' seat posts can be designed to allow easy height adjustments without making it possible to completely remove the post. A numbering system on the seat post can help frequent users adjust the seat height quickly.

Chain guard
The chain guard protects the user from grease and the chain from damage.

Mudguards and advertisement space
Front and rear mudguards are needed to protect clothing. The cycle should have a provision for the installation of advertisements over the front and rear wheels and in the frame,

Gears
If the city has hilly terrain, a three- or six-speed internal hub can be provided.

Automatic lights
Front and rear LED lights powered by a hub dynamo are needed for visibility at night. In addition, reflectors should be provided on wheels, pedals, and both ends of the cycle. The frame color and branding elements on the cycle should be bright and reflective. A yellow, orange, red, or reflective chrome color is preferable.

Protected components
If the cycle has multiple speeds, these must be provided through an internal hub. External dérailleurs are to be avoided, as they are fragile and difficult to maintain. Wiring fro brakes and gears should be hidden.

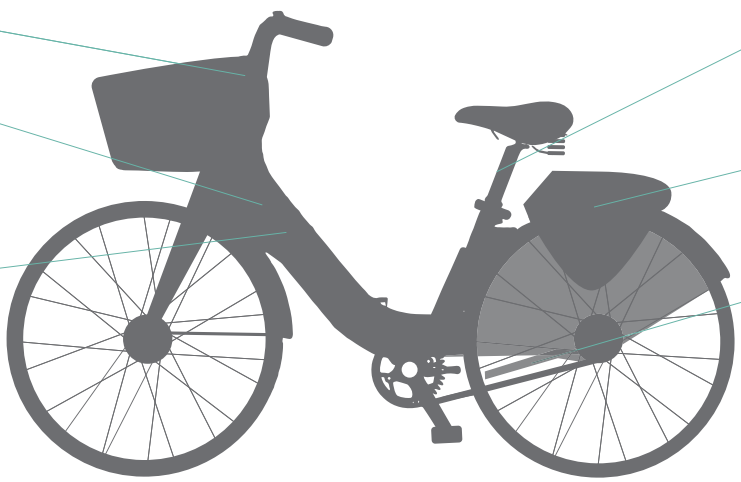
Dockless Bikes

Dockless bike designs typically include the features identified above, but may have additional parts not necessary for bikes used in a station-based system.

Instructions for use and safety
Clear instructions for how to unlock and lock a dockless bike, as well as safety and parking information, may be found on the front basket.

Company branding and contact information
The name and contact information of the company that operates the bike should be clearly visible.

Unique ID number and QR code
Each bike should have a unique identification number that is visible on the bike. Typically, the bike ID is linked to a QR code that users can scan with their smart phones to unlock the bike. The placement of the ID/QR code varies by operator, but is usually found on the wheel lock, beneath the seat, and/or on the front basket.



Lightweight frame
Compared to traditional bike share bike designs, dockless bikes tend to use lighter frames that are less costly to manufacture, but also less sturdy to use.

Lithium-Ion battery (e-bikes)
Pedal assist e-bikes draw power from a battery that is typically located in the frame or between the seat and the rear wheel. The battery's charge level is usually shown in-app and/or on a small LED screen on the handlebars.

Kickstand
Dockless bikes should have a kickstand to help keep the bike upright when parked. Because e-bikes are usually much heavier than other bike share or personal bikes, a dual-sided kickstand is preferred.

Encouraging Ridership Through Community Engagement 5

A group of dockless bikeshare riders enjoy using a protected bike lane in Guangzhou, China Source: ITDP China

ENCOURAGING RIDERSHIP THROUGH COMMUNITY ENGAGEMENT

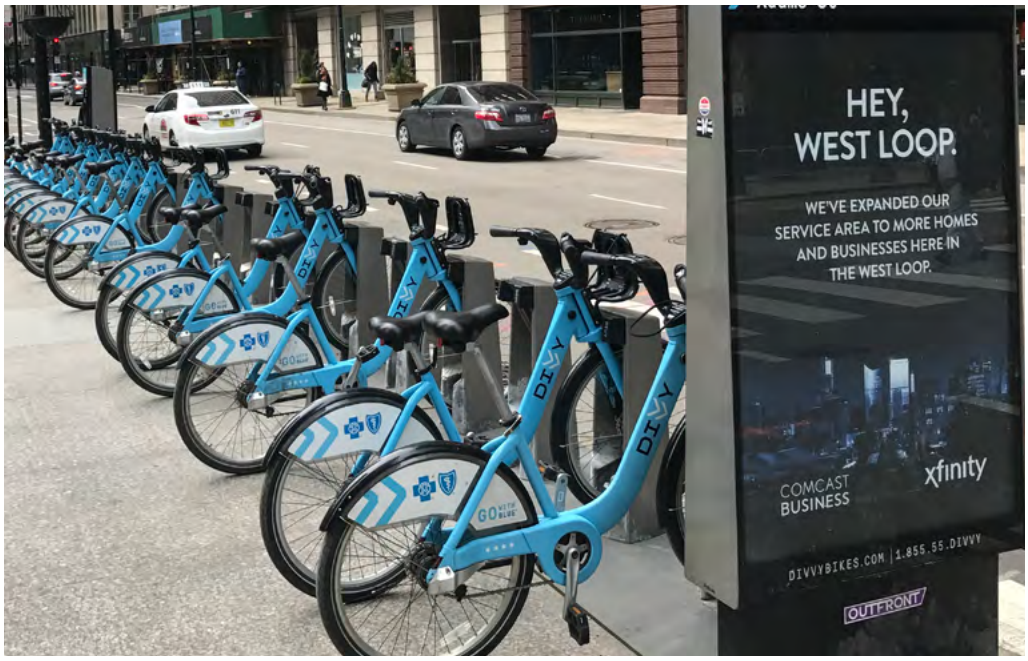
Once the planning and design of the bikeshare system is complete, the city needs to develop a communications plan and marketing strategy, including the brand for the system. A bikeshare system needs a clear, consistent identity—a strong brand—that presents a professional, modern image and distinguishes it from other urban transport options. There are several elements of the identity, including the system's name and logo, that can improve customer identification with and pride in the system. During this stage, the city should also develop a strategy around community outreach and engagement and begin to identify barriers to ridership that should be addressed and reduced.

5.1 COMMUNICATIONS AND MARKETING

5.1.1 System Identity

One of the benefits of a publicly managed system is the ability to brand bikeshare, establishing a strong visual connection between the city and the system. Bikeshare system names are typically one short word, carry a positive and ideally local connotation, and should be easy to pronounce, especially in the local language. The name can either reflect some aspect of the system, or the system can take a positive connotation from the name it is using. A well-thought-out name can be a way for users to identify with a system. City planning staff should set aside time to engage in a brainstorming session about potential names, color schemes, and overall design aesthetics for the system. If a system sponsor has already been secured, they may be guaranteed naming rights and could also want to be involved in making design choices.

In addition to an easily recognizable name, the system should have a logo that is meaningful in the local context. The logo can help create a vibrant, progressive image for the system. A tagline can even more directly link the name to the function of the system. It can ground a name in what bikeshare offers for the individual or the community. For example, the tagline for Chicago's Divvy system is "Divide and Share," explaining the concept of bikeshare and characterizing the system name as related to sharing in just three words.



Chicago's Divvy bikeshare system has a strong identity, with a recognizable logo and color scheme that ties into the city flag. Source: Riley O'Neil

5.1.2

Internal Communications

Internal communication to educate staff and officials from the city, departments within the city (such as parks and recreation, environment, sustainability, or transportation), and other transport operators about the service the system will provide, and its costs and benefits, is critical. The internal campaign is more than a presentation to each relevant department. Most important is a focus on integrating the bikeshare system into the city's overall transport framework and emphasizing the potential for bikeshare to contribute to city sustainability and mobility goals. Advancements in pricing and operational coordination between bikeshare and other modes will depend on solid channels of communication between department staff. For example, if a new protected bike lane is being planned, engineers and/or planning staff should be encouraged to contact the staff overseeing bikeshare implementation who may want to site a new station to coincide with the opening of the protected route.

5.1.3

External Marketing

External campaigns inform the public about the merits of bikeshare, how and where the system works, and benefits to the individual and to the city as a whole. Surveys, focus groups, or direct interviews on the street may help to glean a better understanding of the wants and needs of the population, and could result in a successful marketing campaign. Some cities may be able to use existing transport system survey responses, which typically provide information on the concerns of users (i.e., overcrowding, safety concerns, uncertainty around pricing, etc.) and can inform messaging of promotional campaigns around bikeshare.

External marketing campaigns should make use of all types of media—blogs, social media, bus shelter ads, local newspapers, even the bikes themselves—to reach as many different audiences as possible. Messaging that relates to users' own benefits (lower cost of travel, less travel time than other modes, improved health due to physical activity, more practical and flexible service), rather than solely emphasizing the benefits to society or the world (lower emissions, etc.), can be particularly effective. For the initial launch of the system, the city might consider working proactively with a media consultant to define a public narrative about the system that is cohesive with the branding and system identity.

New and vibrant marketing campaigns should be launched periodically to spark enthusiasm in the system and further entrench it in the city's cultural fabric. Every December, Chicago's Divvy bikeshare runs a "Holidivvy" campaign, deploying one candy-cane striped bike and encouraging riders to snap photos and post them to social media when they see or ride the Holidivvy bike. Vancouver's Mobi bikeshare partnered with local businesses to launch their "Mobi on Over" campaign, in which users who rode bikeshare to participating businesses received special discounts. Berlin's bikeshare system partnered with music streaming service, Deezer, to offer free 30 minute bikeshare rides to Deezer customers in exchange for company advertisements on bikeshare bikes.

All marketing materials should show a diversity of users to underscore that bikeshare is inclusive of and works for all demographic and socioeconomic groups. Bilingual campaigns should also be considered. Furthermore, different messages that promote bikeshare may resonate with certain groups and not others and marketing campaigns should take this into account. For example, lower-income groups tend to value the exercise potential and opportunity to spend time riding with family that bikeshare offers and do not necessarily view bikeshare as a means of saving time on their trip (compared to other modes) or as a means of increasing accessibility to jobs.[36]

Still, while customized, inclusive marketing will help foster community buy-in, it is not enough on its own. Targeted, on-the-ground outreach and education within communities is critical to attracting a larger, more diverse ridership base.

In Chicago, Divvy riders are eligible for prizes—including a free annual Divvy membership—if they post photos of the "Holidivvy" to social media. This type of campaign helps to spur ridership and awareness of the system.
Source: Greg Mittelman (CC)

36 McNeil, "Breaking Barriers to Bike Share: Insights from Residents of Traditionally Underserved Neighborhoods."

5.2
COMMUNITY OUTREACH AND EDUCATION

As part of the marketing campaign around the system's launch, it is important to devise a communications strategy promoting safe cycling aimed at potential new cyclists and car drivers. Community rides, workshops, and learn to bike classes on bikeshare bikes both raise the profile of the system and contribute to overall cyclist safety. Philadelphia's Indego system hosts free "urban riding basics" classes for members and nonmembers using Indego bikes that focus on riding safely in traffic, choosing the best route, and using Indego bikeshare. Indego also offers adult learn to ride classes as well as monthly rides through different Philadelphia neighborhoods.

Community outreach should not be viewed as an afterthought or be conducted solely by volunteer staff. Sustained engagement with residents and local businesses is invaluable to garnering public support for bikeshare. Cities should consider creating at least a part-time staff position dedicated to community engagement around bikeshare, and should work to identify key champions in different communities who are committed to the success of bikeshare and have existing relationships with residents. Shortly before it launched, Atlanta's Relay bikeshare hired 10 "Bikeshare Champions" to conduct outreach at community meetings and local events, both raising awareness and interest in the system and providing workforce training and employment. A few months later, Relay hired a full-time program manager tasked with overseeing bikeshare inclusion and equity efforts. Relay also staffs an Ambassador program in which volunteers go out into their communities to talk with residents about bikeshare, staff tables at community events to help residents become Relay members, organize community rides, and promote the system on social media. Clearly committed to community engagement from the outset, Atlanta's bikeshare system is a model for inclusive bikeshare.

5.3
ENSURING EQUITY BY REDUCING BARRIERS TO ENTRY

One of the most significant outcomes of a bikeshare system is getting more people excited about and comfortable with biking as a mode of transportation. Both prior to and following the launch of a bikeshare system, the city should consider potential barriers to entry that may arise from how the system is designed and operated. Efforts should be made to reduce these barriers in order to expand the overall ridership base. Below is a list of common barriers to entry and suggested approaches to limit their impacts.

A woman rides a dockless bikeshare bike in Mexico City on a road with no cycling infrastructure. Many potential riders will not try bikeshare for fear of riding in the street unprotected from vehicle traffic.
Source: ITDP Mexico

Dangerous roads
Feeling uncomfortable riding in traffic is a commonly cited barrier to entry for many interested bike riders. This extends to bikeshare riders, as well, especially visitors to the city who may not be as familiar with the road network or where existing bike lanes are located. As discussed in section 4.3, cities should explore the potential to integrate bikeshare into existing cycling infrastructure—like siting stations adjacent to protected lanes—or to use trip data collected from GPS-enabled bikes to prioritize building new bike lanes along popular routes. Priority should also be placed on creating a connected network of bike lanes that connect traditionally underserved communities to job centers, transit stations, and other major destinations.

Helmet laws

Cities with mandatory helmet laws have faced challenges managing how bikeshare users can comply without deterring ridership. In accordance with a countywide mandatory helmet law, Seattle's Pronto system, which closed in early 2017, experimented with offering free helmets at each bikeshare station.[37] Helmets were later made available for a small fee which, many argued, hindered the convenience of bikeshare. Making helmets available to every bikeshare user for every trip is challenging from maintenance and hygiene standpoints, requiring additional equipment and infrastructure to store clean and used helmets separately at each station. Private bikeshare operators that contribute to Seattle's dockless fleet, including Limebike, have given away free helmets as promotional items and to encourage bikeshare riders to comply with the county regulation. In Australia, low ridership numbers for Melbourne and Brisbane's bikeshare programs have been partially attributed to those cities' helmet laws, which, like in Seattle, were kept in place despite the launch of bikeshare.

There is little evidence that mandatory helmet laws actually reduce injury rates for cyclists, and prominent cycling advocacy groups in the United States,, such as the Washington Area Bicyclist Association (WABA) and People for Bikes oppose these types of laws because the negative consequences—reducing ridership—outweigh the benefits. [38] Therefore, we recommend eliminating helmet laws, but encouraging helmet use through education and giveaways. Mexico City and Tel Aviv both eliminated helmet laws before launching their respective bikeshare systems.

Stations, like this one in Mexico City, offer an alternative to using a smartphone to access bikeshare. This kiosk provides an on-site credit card payment option and information about how to use the system. Source: ITDP Mexico

Smartphones

New bikeshare models—especially dockless systems—pose a usability challenge for people who do not have access to a smartphone. Unlocking a dockless bike requires a smartphone to scan the QR code, and finding a bike when there is not one in a user's line of sight all but requires consulting a map through the company's or an aggregate mobile app. Further, user-generated access to system information is removed, in dockless systems, from physical stations (most of which include directions for system use, price options, maps, etc.) and placed in a company's smartphone app. This makes it much more difficult for interested users without smartphone access to even understand the basics of how the system works. Station-based systems can be used more easily without smartphones because users can familiarize themselves with where stations are located and have a good chance of finding a bike—as well as detailed system information—there. Station-based systems also do not require a smartphone to unlock a bike; users have the option to swipe their member access card or receive a printed code generated at the station kiosk.

Some dockless operators offer alternatives to using a smartphone to find and unlock their bikes. In addition to an RFID card reader, JUMP pedal assist bikes include a small keypad onto which a code can be entered to unlock and use the bike. This technology is more expensive to install and maintain than the typical QR code unlocking mechanism, and is not offered across all dockless systems. US-based dockless operators, Spin and Limebike, have launched alternative payment programs that enable users to top up their accounts with cash or a prepaid card, and to receive an unlock code, which is then texted to a dedicated number.[39]

37 Josh Cohen, "Did Seattle's mandatory helmet law kill off its bike-share scheme?" *The Guardian,* April 18, 2017.
38 Christie Aschwanden, "Do Bike Helmet Laws Save People?" *The Washington Post,* June 3, 2013
39 Taylor Soper, "Bike-sharing services Spin and LimeBike let riders use bicycles without smartphone or credit card," *Geekwire*, August 23, 2017.

Still, locating a dockless bike without a smartphone poses a challenge since bikes can be locked up virtually anywhere within the city boundaries. Some dockless operators make use of geofencing to encourage users to lock their bikes inside "hubs" where finding a bike is much more likely. Printed maps showing these hubs can then be distributed.

The city may want to consider providing incentives (i.e., reduced permit fees, increased fleet size allocation, etc.) to dockless bikeshare companies that offer alternatives to finding and unlocking bikes using a smartphone.

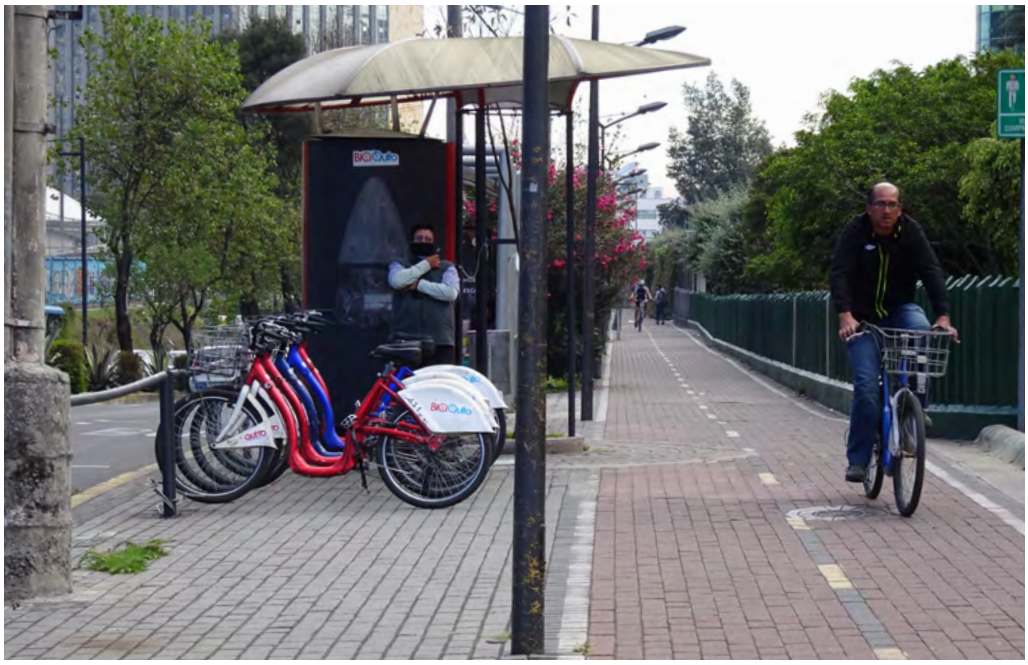
On-board keypads enable users to enter a code to unlock the bike instead of using a smartphone. JUMP keypads also enable users to "pause" their ride mid-trip and report maintenance issues. Source: Carlos Felipe Pardo

High annual membership fees

Annual bikeshare memberships can carry a significant upfront cost—typically between US$70-$120. This poses a significant barrier preventing many low-income residents from trying the system, especially if they are unsure how often they will use it. Some publicly-funded systems in Latin America and China approach this barrier to entry by offering bikeshare for free.

Other cities have developed reduced-fare memberships for those who qualify as a mechanism for expanding access to more users. Common elements of these programs include heavily reduced memberships (typically under US$10 for one year), a cash payment option, qualification tied to receiving other government benefits, and/or extended ride times. Efforts should be made to publicize reduced-fare memberships, especially in neighborhoods with high populations of low-income residents.

In addition to establishing reduced annual membership programs, cities should also consider more flexible payment options for full-priced memberships. A monthly payment option can help make the cost of a membership more palatable, and lessens the commitment to use the system year-round. Offering a per-trip fare may also address these barriers.



Quito's bikeshare system, BiciQuito, is completely free to users. Source: Carlos Felipe Pardo

Examples of equitable pricing programs and the benefits they offer are included in the following table:

Affordable Bikeshare Pricing Strategies

Bikeshare System + City	Program Name	Cost^	Eligibility Requirements and Benefits Offered	Ability to extend past 1 year?
Capital Bikeshare (Washington, DC)	Community Partners Program	$5/year	• Memberships provided through local community groups and social service organizations • Membership fees paid (cash option available) to partner organization • Includes free helmet and Learn to Ride classes • Includes unlimited 60-min rides (instead of 30) to limit additional usage fees	No.
Divvy (Chicago, IL)	Divvy for Everyone (D4E)	$5/year	• Available to residents with an annual household income at or below 300% of the Federal Poverty Level. • Enrollment conducted in person at 1 of 5 financial opportunity centers throughout the city; must provide state-issued ID and recent pay stub (if employed) • Initial membership fee and any additional usage fees can be paid in cash at participating convenience stores	Yes. Discounted membership offered for a D4E member's second year, full-price membership in third year.
Citi Bike (New York, NY)	Reduced Membership	$5/month (with annual commitment)	• NYC & Jersey City Housing Authority residents are eligible • No cash option for payment (unbanked residents encouraged to visit a Community Development Credit Union to open an account)	Yes. Reduced membership can be renewed year to year
Indego (Philadelphia, PA)	Indego30 ACCESS	$5/month	• PA ACCESS cardholders (cash assistance, SNAP, medical assistance benefits) are eligible • Fees can be paid (cash option available) at local convenience stores upon receipt of a membership code sent to a smartphone, or online. • ACCESS card cannot be used to pay for membership fees, only to confirm eligibility	
Ford GoBike (Bay Area, CA)	Bikeshare for All	$5/year	• Residents who receive Calfresh (SNAP), discounted transit passes, or utility discounts are eligible • Program enrollment and payment (cash option available) done in person at 4 locations	Yes. Membership fee increases to US$5/month in second year, full-price membership in third year.
Hubway (Boston, MA)	Low-income Program	$5/year	• Residents who receive certain public benefits or qualify as "low income" are eligible. • Includes free helmet • Includes unlimited 60-min rides (instead of 30) • Enrollment can be done online, by email, or at 7 locations throughout the city	
BIKETOWN (Portland, OR)	BIKETOWN for All	$9 for 3 months (or $3/month)	• Members of participating affordable housing, social service and community organizations are eligible; if not, must attend a 3-hour workshop to be eligible • Enrollment and payment (cash option available) done at the workshop • Includes 90 min in daily ride time	
Hangzhou Public Bike Share (Hangzhou, CHN)	N/A	Free	• All trips under 60 min are free to users	N/A
BiciQuito (Quito, ECU)	N/A	Free	• All trips are free to users	N/A
Mi Bici Tu Bici (Rosario, ARG)	Young Workers Franchise	$27.50/year	• 50% discounted daily, monthly or annual memberships available to employed residents under age 35 with salary below an established threshold	Yes
Vélib' (Paris, FR)	Vélib' Solidarity*	$23/year	• 50% discounted annual memberships available to residents who qualify for free access to public transportation	Yes

*** Vélib' Solidarity program as of December 2017**
^All prices listed in USD

Liability Deposits and Holds

To guarantee the return of bikeshare bikes at the end of a non-member's trip, many systems place a hold on the user's credit card that is released after the bike is checked back in. If the bike is not returned, the system is authorized to charge the user the full cost of the bike, which is often cited as a means to deter vandalism and theft. Montreal's BIXI system immediately places a US$100 hold on the user's credit card, which can remain for up to 10 days after returning a bike. This can be problematic for debit card users, too, who may be charged overdraft fees if the full amount of the hold is not available in the account. In a survey conducted by Portland State University about equity in cycling and bikeshare, 69% of low-income respondents identified the potential for being charged for damages to a bikeshare bike as a significant barrier to trying the system.[40]

Cities should weigh the benefits of deposits—namely, fostering a sense of ownership over shared bikes—against the barriers they pose to low-income riders. Not requiring a deposit could result in greater instances of theft or vandalism of bikes, thereby reducing the number of bikes available and challenging an operator's profit margin and long-term financial viability. Still, several systems have begun to shy away from charging users an upfront deposit. Many dockless operators, in particular, are eliminating user deposit requirements in certain markets to stay competitive with each other. Although it charges users a deposit in other European cities, dockless operator oBike chose not to require a deposit when it launched in Oxford, UK, since ofo and Mobike were already operating there without charging deposits.[41] Additionally, concerns have arisen in China and elsewhere about the lack of transparency around how dockless bikeshare companies are using user deposits, and the unwillingness or inability of several companies to refund to users after ceasing operations.

Age Minimums

While many cities' insurance policies for bikeshare restrict use to anyone under a certain age (usually 16), bikeshare could be an attractive option for high school-aged children traveling to and from school. Reduced or free memberships for high school students—much like passes offered by many transit agencies—may help expand mobility options, and could serve to alleviate some of the burden that falls on the city to transport students over long distances to school. Introducing high school students to bikeshare could encourage continued use, and adoption of cycling more broadly, after graduation.

Limitations for the Disabled

Most bikeshare bikes are not designed to be ridden by people with mobility challenges or sensory impairments. Unlike other public transit modes, which must meet government standards for use by people with disabilities, bikeshare remains largely inaccessible to this group.

A few cities, however, have begun to explore alternative options, such as Portland's Adaptive BIKETOWN pilot program. While the program does not offer the point-to-point pickup and dropoff option that is integral to bikeshare (instead requiring users to start and end their trip at the partner bike shop providing the adapted bikes), it represents a step toward greater inclusivity.[42] After conducting focus groups on how best to implement an adaptive bike program, Detroit's MoGo system plans to offer handcycles, tricycles and tandems as part of a pilot program in 2018. [43] In Argentina, Rosario's Mi Bici Tu Bici program offers a tandem bike, intended for visually impaired riders but can be ridden by any user, at each of its 22 stations.[44] Even with these options, the ability to use bikeshare for spontaneous trips, or for commuting, is reduced for the mobility-impaired since wheelchairs or other mobility aids will likely not be available at the end of a point-to-point trip. Engagement to better understand demand for adaptive bikes will be critical, and may help identify alternative options for meeting needs outside of point-to-point bikeshare.

In Rosario's Mi Bici Tu Bici system, orange baskets indicate tandem bikes which are intended to serve disabled users. Source: Municipalidad de Rosario.

40 McNeil, "Breaking Barriers to Bike Share: Insights from Residents of Traditionally Underserved Neighborhoods."
41 Interview with Annebeth Wijtenburg, December 6, 2017.
42 "Adaptive Biketown FAQ," Portland Bureau of Transportation.
43 Robin Runyan, "MoGo racks up 100K rides; plans adaptive bike share in 2018," Curbed Detroit, October 17, 2017.
44 "Mi Bici Tu Bici," Municipalidad de Rosario.

System Operations 6

A Velib' bikeshare station in Paris provides connections to a variety of destination types
Source: ITDP

SYSTEM OPERATIONS

In the past, many bikeshare system operations were defined by asset ownership and revenue flow between the city government and the operator. The goal was to balance service provision with resource allocation. This is still the case for many station-based systems. However, the business model of private dockless bikeshare companies presents a shift in how city governments approach bikeshare operations.

As part of the larger public transport system, bikeshare should be organized similarly to other public transportation systems. Despite the system type, the government agency responsible for overseeing bikeshare will need to identify or hire staff members responsible for managing system implementation. For public systems, this includes design, tendering and contracting, outreach, and launching the system. For single or multi-operator private systems, city staff will be responsible for overseeing the MOU or permitting process, monitoring and enforcement, and engaging with operators.

A bikeshare system can be completely public, completely private, or some combination of the two. Bikeshare can also be operated by a single operator or multiple operators. The decision regarding which aspects should be public or private and how many operators are appropriate depends on the environment in which the system operates. Different cities will require different structures to meet their specific needs, and this should be informed by the feasibility analysis.

6.1 ORGANIZATIONAL STRUCTURE

The organizational structure establishes the relationship between the implementing agency, other key departments and officials in the government, and contractors or partners involved in the ownership, oversight, financing, operation, and management of the bikeshare system.

Examples of Bikeshare System Structures:

Publicly Procured & Permitted Systems

City	Country	System Name	Implementing Agency	Operators	System Type
Milan	Italy	Bike Mi	Azienda Trasporti Milanesi (ATM)	Clear Channel	Station-based
		N/A	Comune di Milano	Mobike, ofo	Dockless
Dublin	Ireland	Dublin Bikes	Dublin City Council	JCDecaux	Station-based
		N/A	Dublin City Council	BleeperBike	Dockless
San Francisco, CA	USA	Ford GoBike	Metropolitan Transportation Commission	Motivate	Station-based
		N/A	San Francisco Municipal Transportation Agency	JUMP	Dockless
Washington, DC	USA	Capital Bikeshare	District Department of Transportation	Motivate	Station-based
		N/A	District Department of Transportation	JUMP, Limebike, Mobike, ofo, Spin	Dockless

Publicly Procured Systems

City	Country	System Name	Implementing Agency	Operators	Operator Type
Rosario	Argentina	Mi Bici Tu Bici	City of Rosario	Empresa Mixta de Transporte Rosario (EMTR)	Public
Rio de Janeiro	Brazil	Bike Rio	Rio Prefeitura	Tembici	Private
Montreal	Canada	BIXI	City of Montreal	BIXI Montreal	Public
Vancouver	Canada	Mobi	City of Vancouver	Vancouver Bike Share (subsidiary of CycleHop)	Private
Hangzhou	China	Hangzhou Public Bicycle	Municipal Government of Hangzhou	Hangzhou Public Bicycle Transportation Service Development Co.	Public
Lyon	France	Vélo'v	City of Lyon	JCDecaux	Private
Paris	France	Vélib'	Syndicat Vélib' et Autolib' Métropol	JCDecaux	Private
Mexico City	Mexico	Ecobici	Ministry of the Environment (Federal District)	Clear Channel	Private
Barcelona	Spain	Bicing	City Council of Barcelona	Clear Channel	Private
London	United Kingdom	Santander Cycles	Transport for London	Serco	Private
Manchester	United Kingdom	N/A	Transport for Greater Manchester	Mobike	Private
Los Angeles, CA	USA	Metro Bike Share	LA Metro	Bicycle Transit Systems	Private
Madison, WI	USA	Madison Bcycle	City of Madison	Trek Bicycle Corporation	Private
Atlanta, GA	USA	Relay	City of Atlanta	CycleHop	Private
Miami Beach, FL	USA	DECOBIKE	City of Miami Beach	DecoBike LLC	Private
New York City, NY	USA	Citi Bike	NYC Department of Transportation	Motivate	Private
Boulder, CO	USA	Boulder B-cycle	Boulder B-cycle	Boulder B-cycle	Public
Minneapolis, MN	USA	Nice Ride	Nice Ride Minnesota	Nice Ride Minnesota	Public

Permitted Systems

City	Country	System Name	Implementing Agency	Operators	Operator Type
Sydney	Australia	N/A	City of Sydney	Mobike, oBike, ofo, Reddy Go	Private
Pune	India	N/A	Pune Smart City Development Corporation	ofo, PEDL (Zoomcar)	Private
Singapore	Singapore	N/A	Land Transport Authority (LTA)	GBikes, Mobike, oBike, ofo, SG Bikes	Private
Seattle, WA	USA	N/A	Seattle Department of Transportation	Limebike, ofo, Spin	Private

Note:
Data as of december 2017

6.1.1

Implementing Agency

Publicly Procured Systems

In publicly-procured bikeshare systems, the implementing agency is the government entity that oversees the planning, implementation, and operations of the system. Ideally, this entity will be located within the agency that has the authority to build out the stations—that is, the authority that has control over the roadbeds and sidewalks. As the system grows across political boundaries and integrates with other transport systems, however, this structure could hinder expansion. In some cases, for example in Indian cities Kochi and Chennai, a special-purpose vehicle (SPV) for metro rail implemented bikeshare stations at metro stops. SPVs can also be incorporated at the city or state level to implement a bikeshare system, facilitating inter-departmental coordination. It may be helpful to consider what a system might look like in five or ten years, and place the agency accordingly. This will streamline decision making, growth, and general administrative processes.

Outside of the transport department, other departments that can house the implementing agency include the departments of urban development, environment, and parks and recreation, as well as public transport agencies and regional planning authorities. The implementing agency should be staffed with people familiar with implementing urban transportation projects, as well as those who specialize in bikeshare. In Mexico City, Ecobici is overseen by the city's Environment Ministry. The implementing agency will be responsible for system design (siting stations or parking areas), tendering and contracting, developing the financial model, and infrastructure implementation. For tendering and developing the contract, the agency will need to include performance criteria and service-level expectations for the contracted entities. This agency will also make decisions about the fees to be charged and the revenue model, and it will take the lead on community outreach and promotion.

Permitted Systems

Because the government is not responsible for the day-to-day operations of a privately-run bikeshare system, the implementing agency is largely responsible for planning, implementation, and enforcement of a permit or other regulatory scheme that ensures optimal bikeshare delivery by all operators. In Seattle, the dockless bikeshare permitting program is housed in the city Department of Transportation's Transit and Mobility Division and is directly overseen by a full-time bikeshare program manager.

Once the system has been launched, the implementing agency will need to monitor it and evaluate the operator's performance according to defined service levels or permit or other regulatory requirements. See section 6.4: Enforcement for more. The agency will need to develop a strategy for carrying out compliance checks, and communicating non-compliance with operators. Annually, or at another regular interval established in the contract or permit, the implementing agency should re-evaluate performance requirements and make any necessary changes.

Despite the bikeshare system type, the implementing agency plays the role of referee, keeping the best interests of the city and customers in mind, while also considering the financial interest of the operator. To avoid conflicts of interest, the agency should be fully independent of the contractor or companies operating the system. The implementing agency will also be in charge of coordinating any system-wide promotional activities following implementation, as well as planning for expansion. Evaluation of the current situation and planning for the future are ideally done in tandem.

6.1.2

Operator(s)

Operators can be public or private, and there may be more than one providing bikeshare to a city at one time. Unlike the implementing agency, which is largely responsible for planning and expanding the system (although some expansion decisions fall to the operator under a permit system), the operator handles day-to-day bikeshare operations. Rebalancing is, by far, operators' most significant and costly responsibility, with additional duties being to manage the maintenance and general cleanliness of the bicycle fleet (and stations in station-based systems). Except in special circumstances, the operator also handles the customer service, payment processing, marketing, advertising (in some cases), and general brand management of the system.

This section will cover the differences between bikeshare systems operated by a single or multiple operators (section 6.3: Contracting Structures details different contracting structures for public versus private operators). Conventional, publicly-procured bikeshare systems have typically had a single operator that is either a private company or nonprofit entity selected by the city using a request for proposals (RFP) process, or is the transit agency itself.
Systems operated by private bikeshare companies under a permit or MOU process can result in a multi-operator environment that generates competition and, hopefully, a higher level of service that attracts users and maximizes revenues.

Single Operator

The first decision when selecting an operator is determining whether the operator will be part of the government, such as the implementing agency, or an external operator, such as a for-profit or nonprofit entity. A parastatal agency or quasi-governmental operator, such as a transit agency, that is close to the implementing agency brings with it access to the government and the benefits of a cooperative relationship. The drawback to such a situation is that public operators typically lack the incentives to expand and grow the bikeshare system, tending to focus exclusively on day-to-day operations. Private operators, however, generally bring more cost efficiency, but their primary objective is profitability, and that does not always align with providing a useful bikeshare system. When working with a private operator, a well-written contract and oversight are essential to ensure that the operator meets its obligations to the implementing agency.

Sometimes, governments prefer turnkey projects in which the private operator can set up the whole project by itself in one large contract, providing both the assets and the operation. Other times, the government prefers to separate the contracts for the operations and for hardware and software procurement. This mitigates the risk involved with having just one company that the government is wholly dependent upon, but it increases the risk of the different pieces not working well together.

The city should also consider the benefits and challenges of offering exclusivity to a single operator. For example, a city may offer an exclusive franchise to an operator in return for higher levels of service or guarantees of multi-year continuity of service, pricing caps or more equitable service. The operator will likely be attracted by exclusivity because of the potential for additional revenue, perhaps through naming rights or other benefits. The downsides of offering exclusivity are that new technologies may take longer to be implemented, enforcement (keeping other operators out) is complex, and/or that consumers have less choice in the market.

While not as common, some single-operator bikeshare systems are operated by one dockless operator (as opposed to providing station-based service), under an MOU or contract. This is the case in Manchester, UK, where the regional transport agency entered into an MOU with dockless operator, Mobike, to provide bikeshare service as part of a six-month Smart City demonstrator.

Multiple Operators
A multi-operator bikeshare environment can take two forms: 1) one operator manages an existing station-based or hybrid system, and another (or many other) operator offers a dockless service or 2) two or more private operators provide dockless bikeshare within a common service area. In either case, cities should establish a permit or similar process that requires operators to provide a base level of service while still enabling them the flexibility to be innovative and, ultimately, to compete to improve service quality.

Using multiple operators increases the oversight capacity required by the city to ensure compliance, process and renew applications, and communicate policy changes. Cities are providing the rights of way and public space these operators need to do business, and should use this position to set operational standards (in an effort to avoid a race to the bottom) that protect users and ensure progress toward stated goals.

Comparing Bikeshare Operator Scenarios

	Financing	Coordination with city	Service delivery	Weaknesses
SINGLE OPERATOR (PPP) Barcelona, London, Manchester, New York City, Rio de Janeiro	Long-term contract between a private operator and the city establishes a long-term commitment to financial sustainability. Goals of both parties align through revenue-sharing agreements.	Often responding to an RFP, operator understands and agrees to meet city demands to secure a contract. City has significant involvement in major decisions, i.e., station locations, data sharing.	A contracted operator is expected to meet service-levels for maintenance, rebalancing, marketing, customer service, etc set by the city. Failure to do so results in penalties. Thus, operators are financially incentivized to provide quality service.	Traditional single-operator bikeshare contracts are multi-year (sometimes 10 or more), which may not encourage innovation or incorporation of new technologies that would improve service delivery.
MULTIPLE PRIVATE OPERATORS Seattle, Singapore, Tianjin	Requiring no upfront costs to the city for bikeshare assets reduces the time needed for planning and implementation, and can be more politically palatable than the city providing funding to start a bikeshare program.	Cities that demand certain operating standards using a regulatory framework (permit, MOU, code of conduct, etc.) can achieve optimal outcomes including public space management, equitable access to bikeshare, data sharing and transit integration, etc.	Competition between operators for rides encourages constant improvement on and responsiveness to the user experience.	The city relegates routine operational decisions to private companies. Without regulation, dockless bikeshare will neither be thoughtfully integrated into city goals nor connected with the transportation network. Oversupply leading to negative outcomes, such as bike piles and underutilized bikes, could occur.
SINGLE (PPP) OPERATOR & PRIVATE OPERATOR(S) Guangzhou, Washington, DC	Service area expansion becomes fiscally viable if private operators are able to "fill in the gaps," providing service in areas where the PPP operator could not afford to expand into.	City staff and processes already in place to coordinate with an existing bikeshare operator will likely provide capacity and support when drafting and implementing new policies that allow for a multi-operator system.	Different systems (i.e., station-based, dockless) and bike types (i.e., e-bikes, lightweight models) can be provided, offering a range of choices to riders that may encourage more trips made by bike.	Requires users to navigate multiple platforms to find and rent a bike, and may present additional coordination challenges between the city, PPP operator and private companies.

6.2
ASSET OWNERSHIP

For station-based systems, the ownership of the assets—primarily the stations, terminals, docks, bicycles, and IT system—as well as the permanency of the assets in the streetscape, is usually determined by the implementing agency. Different system assets can have various owners, and the assets may be shared, transferred, or licensed. For example, the operator might own, supply, and operate all of the infrastructure and the city provides the space for the stations. This arrangement is the case for many nonprofit-run systems and most private dockless operators, which source (or manufacture) their own model of bike and provide it to the city in exchange for using public space and the public rights-of-way.

Control of the bikeshare system is closely bound to asset ownership: ownership ultimately determines the quality of the system. If a city government cannot or does not want to make a significant capital outlay, it often means ceding control over the quality (life-span) of the bikes to their owner. In this case, the city should set strict permit requirements that ensure a baseline asset and service quality.

Decisions about asset ownership and about who should make the initial investment should be guided by the lifetime of the asset, as that typically guides the contracting period. For bikeshare systems, the average life-span of a bike is three to five years, while stations typically last more than 10 years. Bikes could be considered part of the operational costs instead of assets, but this will have consequences for the financial model. Most agencies and companies consider the bicycles as fixed assets.

The Magistroni Bicycle Factory, founded in Mexico City in 1970, produces bicycles for the Ecobici bikeshare system. Source: Enrique Abe, Mexico City's Ministry of Environment Department of Cycling Culture and Infrastructure

6.3
CONTRACTING STRUCTURE

Decisions about the operating environment and asset ownership will ultimately shape the bikeshare system's contracting structure. For publicly procured systems, there may be separate contracts with the suppliers of each of the various components of the system, including bikes (and stations), software, operations, advertising, and marketing. For privately-operated systems, each operator (in a multi-operator system) is expected to provide all of these components to the level required by the city through permitting requirements.

Systems Operated Through Public-Private Partnership (PPP)
Bundling of contracts can bring simplicity, with the government having to manage only one contract, thus focusing accountability on a single entity. For Mexico City's publicly-funded system, contracting is essentially a complete concession of the entire system to a single contractor. For station-based systems, the initial provision of infrastructure can either be packaged with the operations contract or carried out separately. Combining infrastructure and

operations provides an incentive for the contractor to supply high quality infrastructure so as to minimize maintenance costs over the life of the contract. This can also help to minimize challenges that may arise in transitioning the system from the designer/infrastructure implementer to the operator (as was the case in Bandung, Indonesia where the implementer, Banopolis, does not operate the system).

However, in some situations, signing separate contracts can be a better choice. Given the large variation in the depreciation time of hardware—stations, terminals, and the control center—it often makes sense for the city to procure these systems and issue a separate contract for operations. Creating separate contracts for infrastructure and operations also can reduce implementation time and enable smaller budget packages that may be financed separately. The latter was the case in Bandung, which leveraged full city funding for procurement and a revenue-sharing agreement for operations. Furthermore, separate contracts help mitigate the risk that may come with relying on a single entity and enable the government to contract with an entity that specializes in the requested service. For instance, if a smart-card system and payment mechanism are integrated into the city's larger public transport system, that operator could be contracted to expand into bikeshare and be responsible for payment and customer tracking, while another entity would be contracted for operations.

The duration of the contracts that require investment into infrastructure are usually tied to the life-span of that infrastructure to allow for depreciation of the asset and a chance to obtain a return on the investment before having to invest in recapitalization. In London, the contract for the Santander Cycles bikeshare system runs for five years, with the potential for an additional five-year extension. Paris' contract with Smovengo to operate the new Vélib' Metropole system began in 2018 and runs through 2032.[45] While long contracts like these tend to be attractive to operators because they reduce risk, they can also stifle innovation. Shorter contracts, such as those that coincide with the three to five year lifespan of a high-quality bikeshare bicycle, give more flexibility to the implementing agency and offer greater opportunities to adapt the system to emerging technologies and operating models.

Since the station and IT infrastructure are expected to last beyond the initial operations contract, the implementing agency should ensure that all the pieces of the bikeshare system work together, especially the software, bikes and stations. In the case of software, usage rights and the data should be retained by the city after the operating contract is over.
It is worth nothing that, while PPP arrangements have been widely used to implement station-based systems, cities may enter into an exclusive agreement with a dockless operator. This is the case in Manchester, which established an MOU with Mobike to provide dockless bikeshare service in the city. The regional transportation agency, Transport for Greater Manchester, chairs an operations group that consists of members from Mobike and the city councils of Manchester and nearby Salford to discuss topics related to rebalancing, parking, and data sharing.

Privately-Operated (Non-PPP) Systems
Because private bikeshare companies operate within the public realm, they should be required to apply for a municipal permit to operate, similar to businesses or restaurants that place merchandise or outdoor seating on the sidewalk. In addition to the permit itself, several cities, including Seattle, San Francisco, Charlotte, Oxford, and Dublin, require private bikeshare operators to agree to abide by additional rules to be approved to operate. See section 4.2: Planning & Regulating Dockless Systems for more.

Regardless of the structure, the city government should maintain oversight of the system and responsibility for managing the contracts and monitoring the level of service (see subsection 6.1.2: Operator(s) for more on single versus multi-operator systems). There are three main types of contracting structures, defined by the ownership of assets and provision of service:

- **Publicly Owned And Operated (6.3.1)**
  The government owns the assets and provides the services.

- **Publicly Owned And Privately Operated (6.3.2)**
  The government owns the assets but contracts with a private entity to run the service.

- **Privately Owned And Operated (6.3.3)**
  One or more private entities own the assets and provide the services, guided to some degree by government regulation.

45 Geert de Clercq, "Velib bike-sharing scheme hits road bump in French capital," *Reuters*, January 8, 2018.

6.3.1 Publicly Owned and Operated

Under this type of contracting structure, the government plans, designs, implements, and operates the bikeshare system. The government also owns all the assets of the system and the financial risk lies entirely with the city. The implementing agency would then most likely become the operator, or operations could be contracted out to a parastatal or another government agency. The greatest advantage to this structure is that one entity is responsible for the planning, procurement, implementation, operations, and future expansion of the system. Additionally, the public authority is able to prioritize the desired goals of the system—ideally, that it supports the larger public transportation system—over other incentives, such as profitability. The downsides to this type of business model include the need for, and risks associated with, public funding, as well as disincentives to improve service because of a lack of competition and innovation typically generated by the private sector. In Germany, Deutsche Bahn Connect (a subsidiary of the national train system, Deutsche Bahn) operates the Call-a-Bike system in cooperation with each city, and the system operates in more than 50 cities across the country. In this model, the public authority usually creates an internal entity to manage the entire project, including station siting and details of network development, operational planning, fee structuring, and collection and marketing.

6.3.2 Publicly Owned and Privately Operated

This type of contracting structure means that the government owns the assets and a private entity provides the services. This can be a simple fee-for-service model, like in Barcelona or in Shanghai's station-based system, where the fee is based on the number of bikes in the system. The procurement of bicycles for the system can be done by the government or it may be the responsibility of the operator. All other assets—software, control center, stations—are owned by the government.

Portland's BIKETOWN is a good example of this model: It is owned by the city, which allocated US$2 million in federal funding to cover the system's startup costs. Public funding, however, ends there, since the system is operated by a private bikeshare company. The city's contract with the operator includes few specific requirements for rebalancing or maintaining certain capacities at each station. This flexibility is designed to encourage the operator to run bikeshare like a business—as efficiently and cost-effectively as possible—and this notion is further incentivized through a requirement that the operator cover any financial losses the system generates in its first three years of operation. However, the company will receive 60% of any program surplus (with the rest going back to the city).

The advantage of this model is that the private operator manages all logistics, and the city has some control during key phases of the project, while not assuming financial responsibility for day-to-day operating details or system risk. In some cases, shorter contracts can be negotiated if the operator has no investment in the infrastructure. This offers more flexibility for the city, but also requires more staff time for planning (issuing tenders, negotiating, signing a contract every year).

6.3.3 Privately Owned and Operated

Under this type of contracting structure, one or more private entities own the assets and provide the service, while the government grants access to public space and the rights-of-way. In privately owned and operated system arrangements, the city should be sure to set clear standards for the system that are communicated through a tender, permit, or code of conduct. Ultimately, the government grants the rights, in the form of legislation and street space, to operate, but the capital assets are owned and the operational costs are borne by the private operator(s). This approach avoids the need for cities to budget public funds to bikeshare and, in some cases, cities can actually generate revenue by requiring operators to pay a fee to apply for a permit.

Privately owned and operated systems do have some risks associated with them, particularly regarding conflicts of interest and balancing the city's goals for widespread distribution against the private operator's desire to optimize revenue. Normally, the private operator is interested in the most dense, high-revenue-producing areas or neighborhoods, while the city may have a greater interest in making sure the system is equitable across the city, covering areas that may produce relatively low revenue. In the operational agreement, the city should be sure to include safeguards to ensure assets are maintained by operators in low-density, low-income communities of concern, either through establishing geofenced hubs or fleet minimums in these areas or through in-lieu fees. These approaches are explained in detail in subsection 4.2.1.

Privately owned and operated systems are very attractive to cities that have struggled—or completely failed—to raise enough funds to support bikeshare. This was the case in St. Louis, Missouri, which has been trying to fund a station-based bikeshare system estimated to cost as much as US$3.3 million to implement since 2014. Following another failed funding attempt in 2016, city officials pivoted, drafting and—in early 2018—passing detailed permit regulations that will allow private dockless bikeshare operators that comply to provide service to the city.[46]

46 Maddox, Teri. "Want to ride but don't own a bike? Then this new service could be for you," *Belleville News-Democrat,* February 9, 2018.

6.4 ENFORCEMENT

6.4.1 Managing Contracts through Service Levels

Once the city establishes the organizational and operating structure for its bikeshare system, a mechanism for enforcement—namely, ensuring the operator(s) is running the system in line with the city's overall goals—must be established. Traditionally, service levels have been used to enforce the quality and service standards agreed to in the contract. If the city is pursuing a private, multi-operator system that grants permits to operate instead of a formal contract, enforcement should be included in the permit language. It is recommended that, particularly for privately-operated systems, at least one full-time staff person (either within the city government structure or a consultant) is responsible for overseeing bikeshare enforcement. Additional details on staffing are included in subsection 7.2.1.

Service levels ensure a baseline of quality in system operations (hardware and software), customer service, maintenance, redistribution, marketing, and reporting. Each service level normally identifies an optimal level, and then a variance within which performance is acceptable. The operator is then penalized if varying from the service level negatively affects the system, and rewarded if it positively affects the system. Offering rewards as well as penalties enables flexibility in how an operator can make revenue from the system.

For example, an operator of a recently launched system is having a hard time keeping the system online in accordance with the software service level agreement because of initial glitches in the system. This causes the operator to fail to meet the service level in this category. The operator does, however, far exceed the service level for membership. Between the service level for software, which the operator does not meet, and for membership, which it exceeds, the operator is able to secure a decent revenue while working on the service levels where there are problems. Service levels should be designed to create incentives for an operator to increase its revenue while doing an outstanding job. They should not bankrupt the company.

While the government sets the quality and service standards when the contract is signed, it should work with the private sector on the best way to achieve the desired service level. It is important to look at the capabilities and limitations of the system and set the service levels realistically. When planning a system, many service levels will be estimates or best guesses, and will likely need to be re-evaluated using performance data from the initial year of operation. Identifying what data to collect from the outset to assess performance will help to inform and adjust service levels. Service levels that prove to be unreasonably high should be lowered to be more realistic, while those that are being vastly exceeded should be adjusted, or should include ceilings regarding compensation. Service levels should act as an evolving matrix of give-and-take between the operator and the authority or governing body.

There are two basic principles regarding monitoring service levels:

Easy & Cost-Effective
Realistic service levels should be monitored at little expense to the city government. Setting service levels that cannot be monitored easily leads to difficulty calculating the compensation to the operator, and can result in non-enforcement. This ambiguity starts off small but will over time create problems in the relationship between the operator and the city.

Transparent
The authority should have access to all data collected and transmitted by the system, and should know how much revenue comes from the different sources. Audited financials should be shared by the operator with the city so there is a clear picture of excessive profit or loss.

The contractual relationship between the operator and the governing body with the associated service levels creates the performance-management system. The performance-management system is usually based on a weighted points system whereby service levels that are very important, like the system's being online, are weighted more heavily than those that are desirable but not essential, such as marketing efforts. By weighting the service levels, the governing body can create an incentive to the operator to put resources toward meeting service levels that the governing body feels are most important to serve the user.

6.4.2

Permit Enforcement Mechanisms

Similar to service levels, permits enable cities to establish system-wide standards that operators must meet continue operating. Having mechanisms in place to enforce these requirements is critical to achieving optimal service quality. This can be done in a variety of ways:

Non-Compliance Fees
If an operator violates operational permit requirements, such as not removing broken bikes from the street or rebalancing bikes that have not been ridden in the time frame expressed in the permit, they may be required to pay a non-compliance fee. If possible, the city may want to divert these fees into a fund used to support bike parking infrastructure or providing reduced cost rides to low-income residents.

Assessing compliance falls to city staff, and it is unlikely they will have the capacity to monitor every operator's fleet at all hours of the day. However, city bikeshare staff should field-verify operator data on real-time bike locations, and take test trips that can be identified in submitted trip history data. Once staff has verified an operator's data, they should begin checking for operational compliance both on the ground (conducting "sweeps" of the city) and using real time data from operators. Permit language should reflect that if a certain percentage of any operator's fleet is not meeting the requirements when city staff completes a sweep, they may be subject to a non-compliance fee.

Relocating Bikes
Many permits give the city authority to relocate or remove bikes from the street that do not comply with permit requirements, such as those that have been reported as broken but have not been maintenanced within the permit time frame, or those that are blocking the public right of way. Seattle's permit requires operators to pay a fee equal to 115% of the city staff member's hourly rate for the city having to relocate or remove non-compliant bicycles.

Permit Freeze & Revocation
If an operator fails to meet major permit requirements like not providing safety information to users or exceeding fleet maximums set by the city, a temporary freeze may be initiated on the operator's permit as an intermediate step while the operator makes adjustments necessary to comply with the permit. Failure to do so within a certain time frame will lead to revocation of the operator's permit. In Indonesia, governments have undertaken this strategy in cases of serious non-compliance. Permit freezes (and revocations) should only be initiated in extreme circumstances, since reducing the availability of bikes would be counterproductive to most citywide mobility goals.

6.5 DATA REQUIREMENTS AND MANAGEMENT

Contracts and permits with bikeshare operators should require them to share real-time data with the city (ideally through an API key provided by the city) that will better inform system-level operation, infrastructure, and integration with public transit. Furthermore, bikes with onboard GPS not only help to facilitate more robust data on trip characteristics and ridership, but it is also beneficial for locating "lost" bikes and performing maintenance. This data is invaluable as cities and operators work to expand accessibility and efficiency of the bikeshare system, and efforts should be made to make anonymized data publicly available for broader analysis. Two-way data sharing between city transportation departments and mobility providers will also be key toward eventually achieving mobility as a service (MAAS).

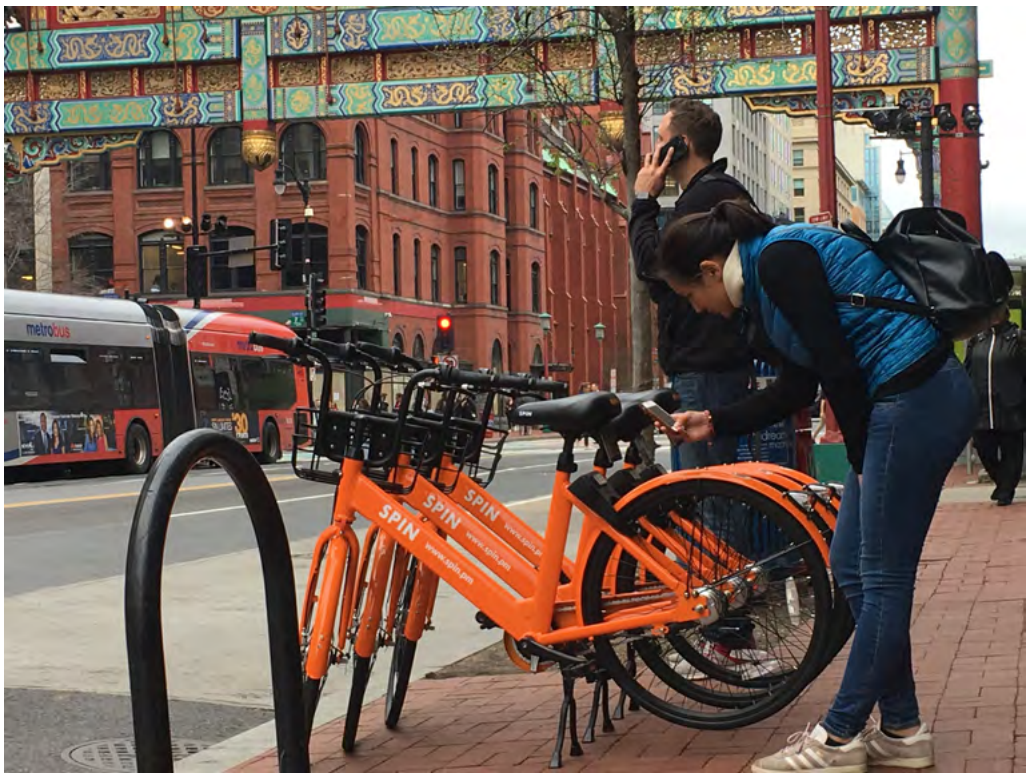
At the very least, cities should require real-time data for every bike in operation, including an identification number, location, bike type (if more than one in operation), and fuel level (if electric assist). This should be publicly available in a uniform format—the General Bikeshare Feed Specification (GBFS) is recommended. In order to minimize the need for city staff to standardize data prior to conducting compliance monitoring and enforcement, operators

should also be required to submit additional data such as trip duration, trip distance, origin and destination locations, maintenance activities, collision reports, etc. using GBFS or another common format. A common format will also make aggregation easier, so that trip planning apps can display bike locations for all operators.

Use of private user data by city governments and operators should align with established legislation on privacy and data security. Protection of user data is paramount, and mechanisms should be put in place to anonymize and aggregate bikeshare user data to minimize the potential to identify individual users based on their usage habits.

Private bikeshare operators are often hesitant to share data on trip history and users with the city for fear of opening the door to competitors being able to access their data. For example, in the state of Washington in the United States, city departments of transportation have lower standing to deny freedom of infor mation act (FOIA) requests than, say, a university, which has a more protected standing. This potential lack of data protection can be problematic not only for private operators worried about competitors submitting public data requests, but also for users of the system who may be at risk of being identified based on their travel patterns. Seattle has had success allowing dockless bikeshare companies to submit their data to the University of Washington's Transportation Data Collaborative, which the Seattle Department of Transportation has access to at any time but does not physically house on its servers.[47]

To improve service delivery, cities may also require operators to send out an annual or biannual user survey as another method for collecting data on how, where, and by whom bikeshare is used. Surveying may also help to identify and address barriers to using bikeshare, and cities and operators should work together to survey non-bikeshare members in addition to members. Capital Bikeshare's biannual user survey sheds light on the demographics of its user base, as well as offering users the chance to suggest locations for new stations. San Francisco requires, as part of the data-sharing requirements in its permitting process, dockless operators to distribute an annual survey to customers. Bikeplus, [48] UK publishes an annual survey of users from 18 Hourbike, nextbike and Smoove/ITS bikeshare schemes across the United Kingdom, which analyzes health benefits and travel choice impacts. [49]



A Spin dockless bike is unlocked by its QR code in the Chinatown neighborhood of Washington, DC. Source: ITDP Global

47 Interview with Kyle Rowe, September 13, 2017.
48 "Stationless Bikeshare Program Permit Application," *San Francisco Municipal Transportation Agency.*
49 Public Bike Share Users Survey Results 2017," *BikePlus CarPlus*, September 2017.

Financial Model 7

A woman in Kaohsiung uses a station kiosk to rent a bikeshare bike. Source: Carlos Felipe Pardo

FINANCIAL MODEL

The financial model assigns dollar amounts to both the responsibilities (expenses) and rights (revenue) of each of the entities in the business model, including the government. The expectations enumerated in the financial model must also be written into the contract or permit. The financial model for a bikeshare system typically includes capital costs (bikes, stations, IT systems, maintenance and rebalancing equipment, etc.), operating costs (rebalancing bikes, staffing, maintenance, customer service), and revenue streams, and will be important for predicting and maximizing the long-term financial sustainability of the system.

7.1 CAPITAL COSTS AND FINANCING

A bikeshare system's capital costs include the assets, such as bicycles, stations (if using), IT system components, control center, maintenance equipment, and service and rebalancing vehicles. Working capital, the costs of running the entity before revenue starts coming in—including pre-launch staffing, installation, marketing, website creation, and launch expenses—can also be capitalized. Capital costs are important to calculate if the city plans to manage the system through a public-private partnership with an operator because some of these costs will be paid for by the city. If the city has chosen to move forward with one or more permitted private operators, capital costs will fall to the operators as opposed to the city itself.

7.1.1 Bicycles

For station-based systems, the bicycles themselves are a relatively small component of capital costs compared to the cost of stations. Bicycle costs vary immensely around the world. Some systems use bicycles that are almost off-the-shelf, with a locking mechanism attached, while others use specialty bicycles with proprietary parts, GPS tracking, and/or other "smart" onboard technology. Pedal-assist bikes also typically carry a higher price tag than traditional bikes and present additional costs for charging infrastructure. The cost of a single bike can range from as little as US$100 in Asian systems to as much as US$2,000 for bikes with higher-quality technology and equipment. Portland's BIKETOWN bikes, designed with input from the system's sponsor, Nike, feature an on-board solar-powered LCD screen that allows users to pause their ride or report issues, as well as automatic lights and a chainless shaft drive and cost about US$1,500 each.

Since dockless systems do not utilize docking stations, bikes are a larger component of their capital costs compared to station-based systems. On-board GPS, RFID card unlocking capabilities, built-in locks, electric pedal-assist and other technology can significantly drive up the cost per bike. See section 4.5: Bikes for more on desirable characteristics of shared bikes.

Smart bikes with on-board technology, like the ones used in Portland's BIKETOWN system, are typically more expensive compared to traditional technology-free bikeshare bikes.
Source: TriMet (Flickr CC)

7.1.2

Stations

Stations, specifically the docking spaces, often represent the single largest capital cost in many station-based systems. Estimates range from US$40,000-$50,000 per station. However, a greater number of docking spaces helps reduce operating costs by alleviating some of the need for rebalancing. High-tech terminals are not required at every station in most system designs where the customer can directly check out bikes from the docking space, but should be included in medium and large stations. Non-interactive terminals should still provide signage and static information. Small stations in residential areas can consist simply of docks, foregoing some of the customer services in favor of decreased costs and a smaller visual impact on the cityscape. Geofenced stations or hubs, as part of a dockless or hub-centric system, require less infrastructure than docking stations and carry lower capital costs. Depending on permit requirements, cities and/or operators may shoulder the cost of painting parking areas on streets or sidewalks and installing additional bike racks. The on-board technology that recognizes a bike as being accurately parked within a geofenced station or hub will present additional costs to operators.

Left: A full-service Citi Bike station with wayfinding maps and the ability to check out bikes on the opposite side of the terminal.
Source: ITDP Global

Right: In Kuala Lumpur, a painted area on the sidewalk functions as a dockless bikeshare parking station for operator oBike. Signage offers potential users information about how to use the system.
Source: ITDP China

7.1.3

Software

For public and publicly-procured systems, software can be purchased outright, developed, or licensed, and each option will have a different impact on the capital costs and the longer-term operational costs. Developing software is the most expensive option, though the intellectual property can often bring medium-term return on investment through the sale or licensing of the software to other systems. Buying off-the-shelf software has become popular at a regional level. Although this is initially more expensive, it is a one-time cost, with perhaps an annual service cost. 8D Technologies, which is now part of bikeshare operator Motivate, provides Motivate-operated systems with their software. Montreal's and Minneapolis' systems, while not operated by Motivate, license 8D software through a software as a service (SAS) agreement. Noa Technologies, another software company, offers a cloud-based platform to better manage bikeshare fleets and reduce operational and logistics costs.

Another option is licensing software. Licensing software can be a good initial solution to help offset capital costs, but can be a cost burden on the system down the line. The Medellín bikeshare system used software licensed from Santiago, Chile's bikeshare for a year before developing its own software. With licensed software, the software company is responsible for making sure that the software continues to be updated with the latest security and advances in technology. Sometimes the software is bundled into the cost of the hardware, as is often the case in China.

Decisions about software in privately-operated systems will be made by the operator(s). In these cases, cities should establish baseline requirements for software security.

7.1.4

Control Center, Depot, and Maintenance and Redistribution Units

The control center is where the central management of the bikeshare system is housed, the depot is where bikes are held while being serviced or stored, and the mobile maintenance unit is the unit responsible for responding to requests for repairs. Bikeshare depots and mobile maintenance units present an opportunity for cost sharing, as most communities have depots for buses or other public goods and services, as well as maintenance staff. The City of Milwaukee, for example, is evaluating the potential for joint agreements to clear snow and perform other maintenance tasks at bus stops and nearby bikeshare stations at the same time. Cost sharing can greatly decrease capital investment in such facilities and personnel.

Depots and maintenance areas, however, need to be completely secure to prevent loss of inventory, such as bikes, parts, and tools. Rebalancing vehicles—often flatbed trucks or trailers carried behind vans—are a significant investment, and efforts should be made for these to be low- or no-emission vehicles where possible. In Portland, a portion of bikeshare bikes are rebalanced using pedal-assist cargo trikes attached to flatbed trailers. As part of their permit requirements, cities should consider establishing and enforcing standards limiting rebalancing vehicle emissions.

Left: Control center staff for Mexico City's Ecobici monitor the system using open data shared by operator, Clear Channel. Source: Enrique Abe, Mexico City's Ministry of Environment Department of Cycling Culture and Infrastructure

Right: An Ecobici mechanic repairs a bike at a depot. Source: Enrique Abe, Mexico City's Ministry of Environment Department of Cycling Culture and Infrastructure

7.2 OPERATING COSTS

A bikeshare system's operating costs reflect its size and sophistication. The city will need to estimate (and work to minimize) operating costs if it plans to manage the system through a public-private partnership that includes some cost-sharing. Otherwise, operating costs fall completely to the operator(s), and the level of transparency around those costs will vary. As part of an MOU or permit application process, cities should require operators to provide estimated operating costs and proof of financial ability to shoulder those costs.

Rebalancing is by far the most significant operating cost, but others include staffing, replacement parts, fuel for service vehicles, marketing, website hosting and maintenance, electricity and/or Internet connectivity for stations, membership keys, warehouse and storage insurance, and administrative costs. Depending on the contracting structure, the operating costs may also include debt service.

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Comparing Bikeshare Operating Costs Per Trip

City	Country	Operating Cost Per Trip
Paris	France	$0.55
Mexico City	Mexico	$0.62
Rio de Janeiro	Brazil	$2.22
Washington, DC	USA	$2.55
Toronto	Canada	$2.58
Chicago	USA	$2.59
New York City	USA	$3.14
Denver	USA	$3.24
London	United Kingdom	$3.40

7.2.1 Staffing

Staffing needs include administration and management, maintenance, rebalancing, and customer service. Staffing costs are often heavily dependent on local norms and the cost of employment in a city or country. Mechanics, rebalancing staff and station technicians for station-based systems in major US cities such as New York, Chicago, Boston and Washington, DC are part of the Transportation Workers Union, which establishes protections around safety and scheduling predictability, as well as higher wages and an elected workers' council. Cities should consider establishing standards for bikeshare staff compensation in their permit requirements, MOUs, or contracts with private operators.

At least one full-time staff person (or contractor) should be hired by the implementing agency to manage the bikeshare system (i.e., communicate with operator(s), monitor permit, MOU or service-level compliance, attend public meetings and events, etc.). Optimally, an additional staff member would be responsible for community outreach and education to encourage the uptake of bikeshare citywide and to help establish norms of behavior.

A mechanic for the Encicla system in Medellín, Colombia provides preventative service at the depot.
Source: Jesus D. Acero

7.2.2

Rebalancing

Rebalancing is broadly defined as the relocating of bicycles from stations that are near or at capacity to stations that are close to empty. Successful rebalancing is critical to the viability of the system from the customer's perspective, and is one of the greatest logistical challenges of operating a bikeshare system. Rebalancing can account for anywhere from 30% to over 50% of operating costs. If an operator has an adequate IT system, rebalancing becomes predictive, and is better thought of as pre-distribution—the movement of bicycles to areas where users will need them and away from areas where users will be dropping them off.

Onboard GPS technology and machine learning capabilities have been introduced to try to more accurately predict demand and reduce the logistical and financial challenges of system rebalancing. Pricing incentives, such as free rides, credit points, or even credit balance, can also be used to incentivize users to help rebalance bikes. This is typically marketed as a "challenge" or other promotional event to users, with certain bikes identified in-app as being free or a reduced fare if they are ridden to a specified area. Stations may also carry price incentives (e.g., ending a trip at a station far outside of the downtown core during the weekday to help rebalance bikes from stations heavily used during the morning rush hour).

While a bikeshare system may operate 24 hours a day, most trips occur between 7:00 a.m. and 9:00 p.m. During those periods, rebalancing may be necessary, especially for stations that experience high peak-demand. For example, most systems have found that stations at the tops of hills are often empty, as people will check out a bike and ride down the hill, but will rarely ride up the hill to park at that station. A similar phenomenon occurs with dockless bikes gathering at the bottom of hills. Many systems, however, try to do most of the rebalancing at night, when less traffic makes moving around the city more efficient. Regardless, a system for rebalancing bikes to the locations of greatest use is essential, taking into consideration initial data and modeling and expectations of ridership. The operator should not expect to rebalance the system perfectly from the start, but rather should make the best plan according to generated trip data and refine that plan after the system is implemented, as well as following any significant expansions. Targets for rebalancing and bike (and dock) availability should be included in contract service levels, MOUs, or permit requirements. See section 6.4: Enforcement for more on setting and adjusting levels of service to yield desirable operations outcomes.

Rebalancing bikes from full stations to available ones, as shown here with BikeMi bikes in Milan, is often a system's most significant operating cost.
Source: Andrew Bossi (Flickr CC)

Rebalancing needs are highest at stations that experience peak demand, like those in residential areas during morning rush hour.
Source: Carlos F. Pardo

7.2.3

Maintenance

Maintenance is another large line item under operational costs. Maintenance includes the bicycles and stations (if used), and covers both preventative and repair activities. This can be as simple as wiping down bikes and sweeping around stations, or as complex as lubricating the hubs of the bicycles and fixing the electrical equipment in the station terminal. General repairs to docks and terminals include replacing torn decals or removing graffiti, while bicycle repairs include fixing tire punctures, broken chains, and faulty brakes.

50 Josh Cohen, "How Soon Till a National Bike-Share Workers Union?" *Next City,* January 19, 2016.
51 "Optimising Bikesharing in European Cities," Obis, June 2011; Jonathan Maus, "Portland now using pedal-powered trikes to help rebalance bike share stations," *BikePortland*, September 7, 2016.

Simple repairs are usually done at the station, as seen here in Bhopal, India. Source: Chartered Bike

Safe, high-quality bicycle maintenance and repair are critical to the reliability and image of a bikeshare system. For that reason, repair centers must be located strategically within the city, and there must be a strong logistical plan for quickly moving bikes to and from those centers. Mobile maintenance units can also be incorporated into rebalancing efforts to carry out simple repairs. At one time, Paris used a barge to fix and maintain bicycles while rebalancing them from the lower end of the city to the higher end. Founded in 2008 in Montreal, social enterprise company Cyclochrome maintains BIXI bicycles and also provides accredited technical training in bike mechanics to teens.

Maintenance protocols—including penalties for noncompliance—should be spelled out in the service-level agreements in the contract between the implementing agency and the operator, or in the permit requirements for operators.Generally, the implementing agency will ask the operator(s) to develop or meet a maintenance and repair protocol that ensures that users only experience bikes in top form no matter where they begin their trip. For example, the contract or permit language should stipulate how long a broken bicycle may be left at a station or on the street, how long a terminal or docking space can be out of commission before the operator faces a penalty (for station-based systems), or how long a bike can be parked without being ridden (i.e., due to malfunction or low demand) before the operator has to relocate it (for dockless systems). Contracts or permits should also require the operator(s) to provide data on maintenance requests and actual repairs. For broken bicycles, six to twelve hours is usually an appropriate time frame to expect the operator to address the issue.

A maintenance crew for Capital Bikeshare pumps bike tires at a station. Source: MV Jantzen

Prompt response to maintenance requests can be facilitated in a variety of ways, from high-tech to low. These approaches have associated costs, as well. Most station-based systems' kiosk screens enable users to alert the system that there is a problem with a bicycle at that station. Once a user reports a faulty bicycle, it is taken offline (meaning it cannot be checked out) and the operator is notified. Some systems ask users to turn the seat around on the bike that needs repair so that the maintenance or rebalancing vehicle can easily identify it, as is done in Seville, Spain. While more costly, technology-based notification portals used by most dockless bikeshare operators that enable users to report broken or mis-parked bikes, along with the bike's GPS location, can be more effective.

A backwards seat indicates the bike in need of maintenance at a Sevici station in Seville, Spain. Source: Carlos Felipe Pardo

7.2.4

Control and Customer Service Center

For public and publicly-procured systems, software can be purchased outright, developed, or licensed, and each option will have a different impact on the capital costs and the longer-term operational costs. Developing software is the most expensive option, though the intellectual property can often bring medium-term return on investment through the sale or licensing of the software to other systems. Buying off-the-shelf software has become popular at a regional level. Although this is initially more expensive, it is a one-time cost, with perhaps an annual service cost. 8D Technologies, which is now part of bikeshare operator Motivate, provides Motivate-operated systems with their software. Montreal's and Minneapolis' systems, while not operated by Motivate, license 8D software through a software as a service (SAS) agreement. Noa Technologies, another software company, offers a cloud-based platform to better manage bikeshare fleets and reduce operational and logistics costs.

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Decisions about software in privately-operated systems will be made by the operator(s). In these cases, cities should establish baseline requirements for software security.

7.2.5

Marketing and Customer Information

Another important operational cost to consider is promotional material and marketing activities associated with running the system. These can range from simple printed information to elaborate campaigns across various media (see subsection 5.1.3: External Marketing). This component is particularly important during the first six months (defined as the two months prior to launch and four months after launch) and whenever there are any changes to operation or expansions of the system. For publicly-operated systems, sustained membership campaigns—specific initiatives to attract new members—also pose costs, especially when led by an outreach coordinator or other relevant city staff member. Operators of privately-operated systems assume the bulk of marketing costs to promote their service and attract new users, however, in these cases, cities should budget for periodic promotions to encourage cycling in general, and bikeshare in particular.

7.2.6

Insurance (Anti-Theft, Accidents, Vandalism)

Riding a bike presents a level of risk to the rider, and the user of a bikeshare system has engaged in an implied contractual relationship with the system (and/or the operator), putting the system/operator at potential risk of legal liability in the case of harm. For that reason, it is strongly advised that a carefully crafted conditions-of-use document be included in the contract or permit requirements for the system. However, accident insurance is also important, and some level of anti-theft insurance is also advisable. For city-owned/operated systems, the cost of this insurance must be part of the operating budget, and system planners should seek advice from trusted legal counsel to decide what coverage and at what levels is necessary. Private operators should be required to show proof of insurance to the city before being granted a permit to operate. Insurance varies from country to country, and someone with local knowledge on this issue should be consulted.

Some operators estimate a 10% annual theft rate, and integrate the costs of replacement bikes into their financial models. In some systems, deposits or liability holds are placed on a user's credit card to encourage the proper use and return of a bike. This has not shown to be very effective in deterring irresponsible behavior, however, and poses a significant accessibility challenge to low-income riders (see subsection 5.3: Ensuring Equity by Reducing Barriers to Entry).

System planners and operators should also take steps to reduce instances of vandalism. Perhaps the best insurance is a strong communications and marketing plan that generates widespread public acceptance of the system and encourages residents to take true ownership of and pride in the system. Framing bikeshare as an extension of transit that is available to and used by residents and visitors alike reduces the notion that the system is primarily designed for certain privileged groups. Many private dockless companies including Mobike, oBike, and ofo disincentivize destructive user behavior through a scoring system linked to each user's account. Users are rewarded for "good" behavior like parking a bike correctly, and consistent use. Violations such as incorrectly parking a bike, using a private lock, taking a bike into a residence or office, and theft reduce a user's score, and falling below a certain threshold substantially increases the user's price per trip (from US$1 to US$20 per trip for Mobike users) until the user's score improves. Serious vandalism, such as damage or graffiti, can often be difficult to attribute to a specific user, so this type of penalization strategy likely would not deter such activity. Cities in which graffitti is widespread should expect that bikeshare assets will not be immune. Thus, cities should have a plan in place to deal with vandalism as soon as possible, or have clear permit requirements for operators
to act within a certain time frame to address vandalised or damaged bikes. In addition, private operators should be motivated to protect their brand and will likely benefit from addressing these issues as soon as possible.

7.3 REVENUE STREAMS

The final component of creating the financial model is determining the revenue streams, namely, defining membership fees and user pricing. Most publicly funded systems require some combination of advertising, sponsorship, membership fees, and tax revenues to cover their operating costs. In this case, the general recommendation is that operators be paid by the government, based on service-level agreements, and not directly from revenue streams, as it helps with transparency of the system and gives the government some control over performance. Private operators providing bikeshare outside of a public-private partnership (i.e., permit program, MOU, etc.) cover their operating costs through trip fares, user deposits, and investment funding from venture capital and other private firms. The long-term profitability of this approach has yet to be proven.

For publicly funded systems, the utility bikeshare provides is often more important than its revenue potential. Government funding for capital costs and operations makes sense in light of the fact that bikeshare is part of the larger public transport network. In Europe, the US, and many other cities in the developed world, public transport is generally subsidized.

What the city invests, the city has a chance to receive a return on; but for private operators running bikeshare as a business, their revenues are typically theirs to keep. The financial model for a publicly-funded system, however, must be clear on where any revenue generated through the system will go, and this must be defined in the contract. In Chicago, revenue generated from advertising and sponsorship of the Divvy bikeshare system is invested into cycling infrastructure projects, Divvy community ambassadors, staffing for Vision Zero initiatives, and other areas and projects related to active transportation that benefit more than just Divvy users.[52]

52 Interview with Sean Wiedel, December 1, 2017.

While annual membership and user fees provide a stable revenue source, they rarely generate enough revenue to ensure that the system is financially self-sustaining. Capital Bikeshare comes close, with an approximate 97% farebox recovery, and Chicago's Divvy system recovers 80% of its costs from user fares. Smaller cities like Boulder, Colorado and San Antonio, Texas recover closer to 35% of their costs at the farebox. The gap between system revenues and operating costs is covered in different ways, and often depends on the structure of operations. Nonprofit systems are typically sustained through sponsorships, federal and local grants, and advertising. Private operators (as part of a public-private partnership) fill the gap with public funding, sponsorships and/or advertising, or with investment funding from private firms, a source which has been prevalent among startup dockless operators. Several publicly-procured station-based bikeshare systems—including New York City, Tampa, and Phoenix—have been able to operate on private funding and earnings, without any public funding.

7.3.1 Government Funding

Government funding can be used to cover capital costs—which means the government owns the assets—and is sometimes used for operating costs. Not unlike many public transportation systems, bikeshare systems often have difficulty covering operating expenses from membership and usage fees alone. Because of this, subsidies may be necessary to cover operational expenses and can come in the form of earmarked funds for sustainable development, innovative initiatives, or even specifically for bikeshare.

Earmarked funds from specific revenue sources, such as parking fees or congestion charges, are preferable to general operating budgets of the department managing the program. Parking fees and congestion charges monetize the negative impacts that cars have on the city, from the road space they take up to the air and noise pollution they cause. Redirecting that money to support a sustainable transport option seems logical as a cross subsidy to the system. Barcelona is notable for being the first city to use 100% of the net revenue from on-street parking fees to finance its public bikeshare system, Bicing.

Governments can, however, choose to use the general budget or specific transportation budget to fund the capital investment in bikeshare. This was the case in Mexico City, where 100% of the capital investment for Ecobici came from the city's general budget. Given the level of political will needed to make this happen, the bikeshare system gained legitimacy inside the government. General tax revenues may be needed if earmarked funds are not an option. Most station-based systems in China are supported completely by government funds, while a private sector company serves as the operator.

Barcelona's Bicing system is supported financially by revenues generated from on-street parking. Source: Karl Fjellstrom

7.3.2

Sponsorship

Sponsorship—sharing the system's image and brand with a sponsoring entity, as with Ford GoBike (in the Bay Area of California) and Santander Cycles (in London)—can help provide funding to cover investment costs. In most cases, sponsorship includes some degree of branding or naming rights, such as with Citibike in New York and Miami or Just Eat Dublinbikes (sponsored by mobile ordering app Just Eat), or having the company's logo placed on the stations and bikes, such as with Bike Rio in Rio de Janeiro (sponsored by bank Itaú) or Divvy in Chicago (sponsored by healthcare provider BlueCross BlueShield). Different parts of the system can be valued separately for sponsorship. In Taiwan, Taipei's YouBike and Kaohsiung's Cbike systems have sponsors, bicycle companies Giant and Merida, for the bikes themselves. Rio Tinto sponsors the BIXI system in Montreal and only has a small logo on the map boards. Even if a sponsor actually pays for the assets, the sponsor does not retain ownership. Usually, the entity responsible for securing the sponsorship will own the assets.

Citibank is the title sponsor for bikeshare systems in Miami, pictured here, and New York City. Source: Carlos Felipe Pardo

Sponsorship can offset capital costs, operational costs, or both. However, sponsorship can limit the advertising potential of the bikeshare system, so the implementing agency should assess which is a more favorable investment. Bikeshare operator Zagster touts the benefits of collaborative sponsorship—which provides branding opportunities in exchange for financial support from community businesses, nonprofits, developers, etc.—for small and mid-size cities that may not otherwise be able to afford a bikeshare system. Sponsorship agreements should consider the future expansion of the bikeshare system and the long-term vision. New phases could either build on the sponsorship of the first phase or try to package sponsorships in terms of phases. Future deals tend to be less valuable than the initial, or opening, sponsorship.

Finally, with sponsorship comes the risk of affiliation with a private entity. If the sponsoring entity has image problems during the sponsorship period, then the bikeshare might suffer from the association. The long-term risks of such an agreement need to be evaluated before entering a sponsorship deal, and a risk mitigation plan should be developed.

BlueCross BlueShield sponsors Chicago's bikeshare system, Divvy. The company's logo is displayed on the wheel cover of every bike. Source: Tony Webster (Flickr CC)

Bike manufacturer, Giant, provides bikes for Taipei's YouBike. Source: Carlos Felipe Pardo

7.3.3

Private Investment

Massive private investment completely upended the global bikeshare landscape starting in late 2016. Chinese internet giants Alibaba and Tencent, as well as Silicon Valley venture capital firms like Sequoia Capital and Accel Partners invested heavily in private dockless bikeshare companies. Mobike and ofo reached "unicorn" status in 2017, each valued at over US$1 billion. While this level of investment allows dockless bikeshare companies to provide bikeshare to cities without requiring any public funding, the long-term viability of their business model has yet to be shown. For this reason, cities should plan for how to handle private bikeshare operators not being able to continue operating, and should include language in the permit that requires companies to alert the city prior to ceasing operations.

Alternatively, private entities, such as universities or developers, may be willing to contribute directly to the capital cost of bikeshare stations on or near their premises, and possibly pay annual operating costs over a set period. This type of investment would probably happen in later phases, after the success of the system has been shown, but it can occur where there is high demand already. Property developers may be enticed to invest in bikeshare to get stations built in their area first, if they think it will increase the marketability of the development. The implementing agency should either proactively approach developers and other entities in areas it has identified for implementation or expansion—and not let developer interest dictate expansion—or give the authority to the operator to do so. In Boston, the Hubway bikeshare system has a handful of "Champion Partners", including New Balance, Biogen, and Harvard University, that sponsor a station and are advertised on the system's website. In its zoning code, Arlington, Virginia, offers private sponsorship opportunities that include advertising on Capital Bikeshare bikes and/or stations under their jurisdiction. While developers can negotiate with county officials to include full or partial station funding as part of a transit-related improvement package, officials have the right to decline if they think the station will not be well used.[53]

7.3.4

Loan Financing

Taking out a loan from a bank to cover the investment in capital costs is an option. If bank loans are a source of financing, then the financial model needs to include debt servicing in the operational costs. The revenue model will need to be able to cover those expenses, which can be quite high. Loan financing is usually reserved for the private sector, but can be a last resort option for publicly-operated systems.

7.3.5

User Fees

The traditional bikeshare payment structure, established by the Lyon and Paris bikeshare systems in the mid 2000s, features a membership fee paid up-front guaranteeing unlimited rides of a certain duration (usually 30 minutes). Longer trips are assessed an additional fee per designated increment of time. This pricing model is effective for encouraging ridership—especially short trips—but is not typically able to sustain the system. More flexible pricing structures, including those that reduce operating costs by encouraging system rebalancing, as well as peak/off-peak fees could help make bikeshare more financially sustainable.

Ecobici users can choose between a one-day, three-day, or seven-day subscription to the system. Source: Enrique Abe, Mexico City's Ministry of Environment Department of Cycling Culture and Infrastructure

53 Christine MacDonald, "The Bike Share Station Sponsorship Dance," *City Lab*, November 29, 2011.

There are two types of fees charged to the user, which can be levied on their own or in combination:

- **Subscription Fee**
  The customer registers with the system and is granted unlimited access for a certain time period—a day, week, month, or year. Typically, shorter-term subscription fees generate the most revenue. In an analysis of US systems, annual members took a large majority of trips, but casual users provide roughly two-thirds of the revenue for the system.[54]

- **Usage Fees**
  Usage fees are charged during the time the bike is in use. Most systems include a set increment of time in the price—normally 30 or 45 minutes. After that, usage fees can increase exponentially as a way to encourage short trips, and thus higher bike turnover. They can also be a flat rate—and, therefore, less punitive—tied to each additional increment of time. Often, usage fees are accrued because casual members may not understand they will be charged for exceeding the ride time limit included in the base price. For hybrid systems, usage fees include time overages and any charges to the user for parking a bike outside of a hub or preferred station. Dockless systems only assess usage fees and typically do not offer a "free" ride period.

System planners must consider the service-fee structure carefully, since a significant post-implementation change to the price structure is likely to cause public backlash or, at the very least, confusion. Some cities and academics have conducted studies to better understand the effect of various price structures on usage and revenue generation. One such study finds that, unlike private cyclists who place heavy value on parking availability at their destination, bikeshare riders will make decisions related to their trip based on costs. Thus, increasing the number of stations in already well-covered neighborhoods may be less effective in generating uptake than siting new stations outside of the service area that allow more trips to and from existing stations within the "free" ride period.[55] Many cities try to keep the price of bikeshare lower than that of mass transit and personal vehicles make it competitive with those forms of transportation and accessible to lower-income users.

Setting user fees requires knowledge of the habits and average routes that may be used by casual users versus long-term members, as well as of the city's own criteria, policies, and objectives for the bikeshare system. For example, Barcelona's Bicing system is available only to residents, as users are required to register for an annual membership, and the system offers no daily or weekly passes. This decision was made in part so that the bikeshare would not compete with the multiple bike rental operations already in existence in the city. Bicing is also a hybrid system—traditional bikes and pedal assist—and offers different pricing schemes for each bike type. Alternatively, Pittsburgh's Healthy Ride system modeled its fares after transit, offering a US$2 single trip option, as well as "standard" and "deluxe" monthly options. No annual subscription is offered.

Pricing models vary widely, and should incentivize the types of trips the system will serve. Contract or permit language should require each operator to provide a pricing strategy, and should incentivize operators that enable bikes to be unlocked using a linked city public transit card. Below are some examples of pricing strategies:

Pay Per Trip (Usage Fee)
Transit-focused bikeshare systems such as Germany's Call-a-Bike have been using the pay-per-trip model for some time. These systems almost exclusively serve first-last-kilometer connections, which makes their low per-trip price appropriate. Call-a-Bike charges €1 for 30 minutes, but also offers a monthly price.

Dockless bikeshare systems are characterized by low per-trip pricing as well (usually around US$1 per 30 minutes in the United States, and sometimes prorated by the minute), which tends to benefit occasional users more than regular commuters. However, station-based systems are also begining to offer a relatively low ($3 or less) per trip fare. This model encourages the operator to maximize user trips (each trip generates revenue) and the user to minimize trips because they are paying at the time of each trip. Per trip pricing may serve to lower barriers to accessing bikeshare for some groups that may not be able to make a more costly investment in a monthly or annual membership. However, without a discounted monthly or annual membership option, commuters who take dockless bikeshare to and from work three times per week would spend about US$24 per month on bikeshare, compared to annual memberships which tend to range from US$60-$120 for the entire year.

54 "The Future Viability and Pricing Structures of Bike Share in North America," *Toole Design Group*, July 2013.
55 Raja Jurdak, "The Impact of Cost and Network Topology on Urban Mobility: A Study of Public Bicycle Usage in 2 U.S. Cities," *PLOS One*, (2013).

Annual Subscription + Usage Fees
Most station-based systems charge a flat subscription fee and usage fees only if the user exceeds the ride time limit. The subscription fee buys the user a specified amount of riding time, and then usage fees are charged once that period elapses and the bike has not been returned. Minneapolis, Atlanta, Vancouver, and several other North American systems reward annual members with double the "free" riding time (60 minutes) compared to casual members (who receive 30 minutes). Mexico City and Rio de Janeiro offer all users 45 and 60 minutes of included riding time, respectively.

Long-term subscriptions, usually called memberships, offer a stable revenue stream for the system, and the registration process plays a secondary role of verifying customers' personal and payment information on a regular basis. To make membership more attractive, most systems offer either discounted usage fees or slightly longer included ride times. This model tends to incentivize the user to maximize trips (i.e., each additional trip lowers the cost per trip) and the operator to minimize trips. Membership allows the system to keep track of active users more accurately by requiring them to update their user profiles and payment details on a regular basis. Members also may enjoy perks—like contributing ideas for new station locations—in annual user surveys. Strong long-term membership numbers may also help to attract sponsors (see subsection 7.3.2) and/or advertisers (see subsection 7.3.6).

Low Annual Subscription Pay Per Trip
A less common pricing structure, this option best serves people who use bikeshare occasionally, but not on a regular basis. Madrid's all pedal-assist BiciMad system uses this unique membership type, requiring users to pay a relatively low annual subscription fee (€15 with a city transit card, €25 without one) and then pay €0.50 per 30 minute trip. BiciMad also offers a flat €2 per-trip option with no annual subscription required. Barcelona Bicing's pedal-assist membership follows this structure as well: €14 for an annual subscription and €0.45 for each 30 minute trip taken, compared to €47 for an annual membership that includes unlimited 30 minute trips using standard bikes.

Madrid's BiciMad offers a flat €2 per trip fare for casual users, or a €15 annual subscription with an additional €0.50 charged per 30 minute trip. Source: Microsiervos (Flickr CC)

Pay Per Day (Usage Fee)
This pricing option is rare, but is used by OV-Fiets, a transit-focused bikeshare system in the Netherlands. Users pay €3.85 for a 24-hour rental period and are encouraged (by way of a €10 fee) to return the bike to the station it was checked out from. This is mainly used by commuters who use bikeshare to travel home from the train station in the evening, and back to the same station in the morning. Compared to the above pricing schemes, this fee structure will likely result in far lower daily usage per bike

Examples of Bikeshare System Fee Structures By Region

North America

City	Operator(s)	Usage Fees					Time included (minutes)	Deposit/Hold Amount	Notes
		Annual	Monthly	Daily	Per Trip	Other			
New York City	Motivate	$163.00	$14.95	$12.00	--	$24.0 3-day pass 0	45 (Annual/Monthly) 30 (3-day/Daily)	$101.00	
Portland	Motivate	$144.00	$12.00	$12.00	$2.50	--	90 (Annual/Monthly) 30 (Per Trip)	--	
Vancouver	CycleHop	$125.61/ $101.91	--	$7.70	--	$59.25 3-month pass	60 (Annual Plus) 30 (Annual, Daily)	--	Two annual membership types: annual and annual plus, which allows for 60 minutes of included ride time per trip instead of 30
Atlanta	CycleHop	$120.00	$15.00	$24.00	$3.50	--	90 (Annual/Monthly) 30 (Per Trip)	--	
Seattle	LimeBike, ofo, Spin	$99.00	$29.00	--	$1.00	--	30 (Spin/Limebike) 60 (ofo)	--	
Dallas	LimeBike, ofo, Spin, VBikes	$99.00	$29.00 (Spin), 14.95 (Vbikes)	--	$1.00	--	30 (Spin/Limebike) 60 (Vbikes)	--	
Chicago	Motivate	$99.00	--	$15.00	$3.00	--	180 (Daily) 45 (Annual) 30 (Per Trip)	$1.00	
Boston	Motivate	$99.00	$20.00	$8.00	--	$15.00	3-day pass	30	--
Washing-ton, DC	Motivate/ Multiple dockless operators	$85.00	--	$8.00	$2.00 Capital Bikeshare, JUMP (e-bi-kes) $1.00 Limebike, Mobike, ofo, Spin	$28.00 30-day pass	60 (ofo) 30 (all other ope-rators)	$101.00	30-day pass is not mon-th-to-month
Boulder	Bcycle	$80.00	$11.00	$8.00	$2.00	--	60 (Annual) 30 (Monthly/Daily/ Per Trip)	--	
Minnea-polis	CycleHop	$75.00	$18.00	$6.00	$3.00	--	60 (Annual/Monthly) 30 (Daily/Per Trip)	--	
Montreal	BIXI Montreal	$70.00	$23.75	$3.95	$2.30	$43.50 90-day pass $11.00 3-day pass	45 (Annual/90-day/ Monthly) 30 (3-day, Daily, Per Trip)	$100.00	
Madison	Bcycle	$65.00	$15.00	$6.00	--	--	60 (Monthly)	30 (Annual/Daily)	$40.00
Mexico City	Clear Channel	$21.80	--	$5.00	--	$16.50 7-day pass $9.75 3-day pass	45	--	

South America

City	Operator(s)	Usage Fees					Time included (minutes)	Deposit/Hold Amount	Notes
		Annual	Monthly	Daily	Per Trip	Other			
Rio de Janeiro	tembici	--	$3.00	$1.5	--	--	60	$150.00	
Buenos Aires	City of Buenos Aires	--	--	--	--	--	60 (Weekdays) 120 (Weekends	--	
Quito	Agencia Metropolitana de Tránsito	--	--	--	--	--	45	--	
Santiago	Municipalidad de Santiago	$237.00/ $158.00	--	$8.25	--	$16.50 3-day pass	60 (“Black”) 30 (“Orange”, daily, per-trip)	--	Two annual membership types: “orange” and “black,” which allows for 60 minutes of included ride time per trip instead of 30

Europe

City	Operator(s)	Usage Fees					Time included (minutes)	Deposit/Hold Amount	Notes
		Annual	Monthly	Daily	Per Trip	Other			
London	Serco	$119.00	--	$2.60	--	--	30	--	
Cologne	nextbike	$56.50	--	--	$1.20	--	30	$1.20	
Barcelona	Clear Channel	$55.50/ $16.50	--	--	$0.50	--	30	--	Annual membership allows for unlimited 30 minute trips and annual e-bike access for a base price plus $0.50 per trip
Paris	Smovengo	$46.00/ $34.00	--	$2.00	--	$9.50 7-day pass	45 (Annual Plus) 30 (Annual/Weekly/ Daily)	--	Two annual membership types: annual, and annual plus, which allows for 45 minutes of included ride time per trip instead of 30
MilanV	Clear Channel/ Mobike	$42.50		$5.00	$0.29 e-bike surcharge $0.18 Mobike	$10.50 7-day pass	30	--	
Dublin	JC Decaux	$29.00	--	--	--	$6.00 3-day pass	30	$174.00	
Manchester	Mobike	--	--	--	$0.66	--	30	$65.00	

Asia

City	Operator(s)	Usage Fees					Time included (minutes)	Deposit/Hold Amount	Notes
		Annual	Monthly	Daily	Per Trip	Other			
Guangzhou	Mobike, ofo	--	--	--	$0.16	--	30 (Mobike) 60 (ofo)	$40.00 (Mobike) $15.00 (ofo)	
Shanghai	Mobike, ofo	--	--	--	$0.16	--	30 (Mobike) 60 (ofo)	$40.00 (Mobike) $15.00 (ofo)	
Tianjin	Mobike, ofo	--	--	--	$0.16	--	30 (Mobike) 60 (ofo)	$40.00 (Mobike) $15.00 (ofo)	
Hangzhou	Hangzhou Public Bicycle Transportation Service Development Co.	--	--	--	--	--	60 ($0.16 for each additional 60 min)	$47.00	Deposit made on Transportation Smart Card
Singapore	Mobike, oBike, ofo	--	--	--	$0.37 oBike $0.74 Mobike, ofo	--	15 (oBike) 30 (Mobike, ofo)	$39 (ofo) $49 (Mobike, oBike)	
Gurugram	Mobycy, PEDL	--	$1.50	--	$0.08 Mobycy $0.02 PEDL	--	30	$15.50 (Mobycy)	Monthly pass includes two 60 minute rides per day

7.3.6

Advertising Revenue

There are two main forms of advertising revenue:

General Outdoor Advertising

Advertisements can be placed in public spaces, such as on bus shelters, benches, or billboards. Many systems contract all or part of the city's outdoor advertising to the company implementing the bikeshare system. Estimates indicate that JCDecaux in Paris generated revenues of up to €60 million (US$80 million) annually from advertising. Linking bikeshare operations to the general outdoor advertising revenue means that operational expenses will be subsidized by the advertising revenue without directly touching city revenue sources. The problem with this arrangement can be the lack of clarity between the costs reported and the advertising revenue taken in by the firm. The lesson learned from Vélib' in Paris and other systems with outdoor advertising revenue contracts is that separate contracts should be drafted for outdoor advertising and for operating the bikeshare system, even if both contracts are awarded to the same company. The revenue from all sources should go into a government or escrow account, and the operator should be paid based on service levels. While advertising often comes under criticism, many systems create very good contractual arrangements that utilize outdoor advertising.

Advertising on Bikeshare Assets

The bikeshare assets themselves—bikes, stations, kiosks, etc.—can also serve as advertising platforms. Boston's Hubway bikes have sponsor New Balance's logo on the rear wheel cover, as do Dublin's "Just Eat" bikes. Santa Monica's Breeze bikes feature advertisements for online streaming service Hulu, the system's presenting sponsor, on the rear wheel cover and basket. Music streaming service, Deezer, advertises on bikes in Berlin's station-based system, which offers free 30 minute bikeshare rides to Deezer customers.

While most users refer to them simply as Dublinbikes, mobile ordering app, Just Eat, is the system's title sponsor.
Source: William Murphy (Flickr CC)

Berlin's station-based bikeshare system is sponsored by Deezer, a music streaming service. Deezer customers can access free bikeshare rides by linking their account with nextbike.
Source: ITDP Global

Implementation 8

Mexico City's network of bike lanes help private bike riders and bikeshare users feel safer riding on the street.

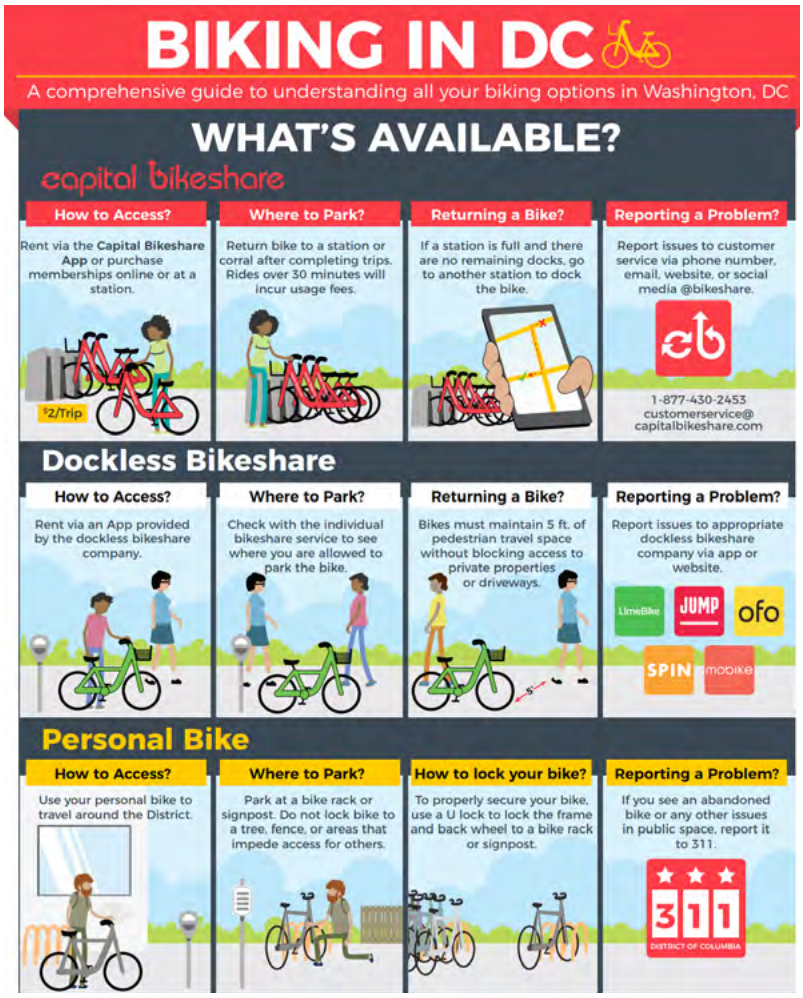
8.1
IMPLEMENTING A PRIVATELY-OPERATED SYSTEM

For systems operated by one or more private companies under a permit or other regulatory structure, implementation can begin once the written requirements have been approved by the relevant governing bodies and staff is prepared to begin processing permit applications. Seattle's permit requirements went into effect on June 30, 2017 and the first two approved operators had bikes on the ground two weeks later—not even three months after Seattle's station-based system ceased operations.

Prior to implementation, bikeshare management staff should be hired and briefed on permit application requirements, and strategize about how best to field-verify operator data. Systems should also be in place to begin monitoring approved operator compliance, and staff should consider enacting a warning or probationary period that allows operators to adjust to meet requirements, if necessary, before being fined for non-compliance.

As city staff processes and approves permits, staff members responsible for bikeshare outreach should simultaneously conduct educational campaigns about how bikeshare works and the new mobility options it provides to the local community. As operators are awarded permits, they may launch social media campaigns or test-ride events that the city should support and promote, when appropriate, to encourage bikeshare ridership.

Following the official launch of bikes on the street (or launches, in the case of multiple private operators), city staff should consistently monitor operations and enforce requirements (see subsection 4.2.3: Monitoring and Enforcing Policies for more) to minimize negative outcomes. Collection of data on how bikeshare is benefiting the city (explained in greater detail in subsection 8.3.1: Key Performance Indicators) and to analyze the effectiveness of current regulations (see subsection 4.2.4: Evaluate and Adjust Policies over Time) should also be coordinated. Any major adjustments to permit requirements should be clearly communicated to all operators with sufficient notice about when the requirement will go into effect and time given to meet new standards without being penalized.



Washington, DC's Department of Transportation released this educational infographic comparing using Capital Bikeshare, dockless bikeshare, or a personal bike in the city. Credit: District Department of Transportation (DDOT)

8.2
IMPLEMENTING A PUBLIC- OR PPP-OPERATED SYSTEM

For systems operated by a public agency or public-private partnership, once the contracts are signed, the timeline for implementation will be contingent on procurement and installation of the hardware and the procurement or development of the software. Vélib' and Ecobici took six months to implement. New York City's bikeshare took two years, in part because of a contractual problem between the system's operator and the subcontractor developing the software.

8.2.1 Soft Launch

Two to three months prior to the official launch, the city should begin conducting community outreach and membership drives to help educate customers on how to use the system and to prepare drivers to be aware of these new users. A good communications strategy that builds excitement and support prior to the system's opening will help mitigate problems during the launch. For example, prior to launching in 2015, Philadelphia's bikeshare system laid "coming soon" stickers on the sidewalk where stations were going to be placed. Similarly, Atlanta's Relay system set up virtual hubs where users could return bikes before all of the stations were implemented.

A soft launch or demonstration period of the bikeshare system can be invaluable in generating:

User Feedback
Users can see first-hand how the system will work and get a feel for the process of checking a bicycle in and out. Soft launch users can also identify potential usability issues or common questions the city should address prior to the actual launch.

Test Run of Hardware and Software
The operator has an opportunity to try out the hardware and software, with informed personnel from each system on hand to answer questions and work out any potential issues.

Media Coverage
A soft launch serves as a positive media event that could generate continued coverage leading up to the actual launch.

8.2.2 The Launch

The official system launch should be a high-profile event framed to the press and the public as a victory for the city, and featuring appearances by important city officials and even local celebrities. The goal of the event should be to make potential new customers aware of the program and should underscore the idea that bikeshare is available to and can work for all city residents.

The 2016 launch event for Atlanta's Relay bikeshare included speeches from Mayor Kasim Reed and key members of the Planning and Community Development department, as well as a two mile inaugural ride on the system's 100 bikes. Source: Alta Planning + Design (Flickr CC)

Customer service, before and after opening, will be critical to the success of the system. The system will need to have ways for users to register, make payments, and issue complaints or notices of defective equipment, and it must have a point of sales for buying subscriptions and a hotline for user inquiries.[56] Following the launch of Atlanta's Relay bikeshare, volunteer ambassadors set up tables at community events to encourage registration and help users navigate the system's mobile app.

From the day the bikeshare system is launched, it will be evaluated on whether it is meeting, exceeding, or falling below the goals it promised to achieve. Those goals should have been articulated in service-levels agreements between the implementing agency and the operator. As described in subsection 6.4.1, the service levels need to be realistic at the outset, and if the operator is not achieving them, it must be determined whether the operator is failing to meet the service levels because of negligence or unrealistic expectations.

Flexibility and communication between the operator and the city are essential. While the main operational measures will be established in the tender and contract, service levels may need to be readjusted or refined so the operator is continuously incentivized to innovate and excel in areas where resources can create the greatest change or benefit to the user and the system as a whole. If this does not happen, the operator may focus limited resources on service levels that are impossible to achieve, minimizing loss instead of creating potential growth. Open communication is critical.

This is a complicated matter to handle contractually, as any leeway in the written agreement could be exploited by either party. One recommendation is to agree to a mediated review of the service levels six months into the operator's contract. This mandates that the two parties sit down and discuss the service levels, while a third party makes sure the outcome is fair.

Nearly eight years after its initial launch, Ecobici held a high-profile event in 2018 to launch the addition of pedal assist e-bikes with electric charging stations to the system. Source: Enrique Abe, Mexico City´s Ministry of Environment Department of Cycling Culture and Infrastructure.

8.3 ANALYZING SUCCESS & SYSTEM EXPANSION POTENTIAL

Many bikeshare systems have been operating for several years now. But even for newer systems, the benefits that bikeshare provides to the city can actually be quantified according to several key performance indicators: climate, health, economy, safety, equity and access. Cities can use these (and other) indicators to evaluate the success of their bikeshare systems and to assess impacts over time. At this stage, the city should review the goals it originally established for bikeshare, and begin to analyze system data and user feedback to track progress toward those goals. Analyzing success using a set of indicators can also provide empirical evidence for continued funding, expanding across jurisdictional boundaries, or other system-level decisionmaking.

Areas in which the system is currently falling short on ridership numbers could help to inform a strategy for expansion. Developing a plan that includes goals, measurable targets, and financial projections for the coming years is recommended for systems considering expansion.

57 "Optimising Bikesharing in European Cities," *Obis*, June 2011.

8.3.1

Key Performance Indicators

Climate

Metric: reductions in greenhouse gas emissions

Encouraging mode shift away from private vehicles—especially for trips between two and five kilometers—is a critical benefit of bikeshare. Fewer personal vehicle trips means less harmful pollutants emitted into the air, improving air quality and reducing the city's contribution to climate change. Many cities have vehicle kilometers traveled (VKT) reduction goals included in their citywide sustainability goals, and bikeshare can be an important intervention towards achieving those VKT reduction targets. Bikeplus, UK's 2017 user survey found that 23% of bikeshare users chose bikeshare instead of a car to complete their most recent trip.[57]

Emissions reductions as a result of modal shift do not have to be difficult or costly to measure. The Transport Emissions Evaluation Model for Projects (TEEMP), developed by the Clean Air Asia partnership, allows for measurement of CO2 (and other) impacts of transportation interventions compared to the "business-as-usual" scenario. [58] Cities should collect the data necessary to run the TEEMP model for bikeshare, including average trip length, average trips per day, and number of bikes in operation, to quantify the climate benefits of the system.

Health

Metric: improving air quality, increasing physical activity

The health benefits of bikeshare are twofold: improved air quality as a result of traffic congestion reduction due to mode shift away from personal vehicles, and physical activity. Exposure to particulate matter from vehicle emissions has been linked to serious respiratory health problems, and concentrations of particulate matter are higher around high-traffic roadways. Bikeshare offers an alternative to vehicle travel—especially for short trips—and can help reduce local traffic by taking cars off the road. A study of Washington, DC's Capital Bikeshare system found that up to a 4% reduction in neighborhood traffic congestion could be attributed to the availability of bikeshare in that neighborhood.[59] Less traffic congestion translates to reduced air pollution, which benefits not only bikeshare users, but all city residents.

The physical activity offered by biking compared to other sedentary transport modes should also be captured when valuing the health benefits of bikeshare. Quality-adjusted life years (QALY) is an index used to quantify the impact of health-related interventions, and can be calculated for the bikeshare service area population before and after the system launch. Surveys such as the International Physical Activity Questionnaire (IPAQ) can be used to monitor actual physical activity across a sample of users.

Economy

Metric: time and cost savings compared to other modes, increasing local economic activity

Compared to other modes, bikeshare trips tend to be shorter (in travel time) and less expensive. Thus, surveying bikeshare users to estimate time savings and monetary savings (as a percent of individual income) compared to other modes can be used to estimate the economic benefit of a bikeshare system. A 2017 study showed taking bikeshare in New York City to be faster than taking a taxicab on short trips (up to 3 km) during high congestion times such as weekday rush hours.[60] Similarly, analysis of bikeshare trips in San Francisco's Bayview neighborhood shows that short, non-highway trips made by pedal assist e-bike are faster and less expensive than other available modes.[61]

In addition to saving time, bikeshare's per-trip price is highly economical for users, with annual bikeshare subscriptions in the US costing about the same as a monthly transit pass. An analysis conducted by Value Penguin, an organization focused on personal finance, found that the average commuter would save US$76 per month using an annual bikeshare membership instead of transit, with that number soaring over US$100 in cities like Washington, DC, Los Angeles, and New York.[62]

Studies show that bikeshare also has the potential to generate local economic activity. A 2013 analysis of Washington, DC's Capital Bikeshare found that significant economic activity was generated by bikeshare users within four blocks of the bikeshare stations included in the analysis, and that surveyed users intended to return to the area in subsequent weeks indicating

57 "Public Bike Share Users Survey Results 2017," *BikePlus CarPlus*, September 2017.
58 "Transport Emissions Evaluation Model for Projects (TEEMP)," *Clean Air Asia.*
59 Hamilton and Wichman, "Bicycle Infrastructure and Traffic Congestion: Evidence from DC's Capital Bikeshare," *Journal of Environmental Economics and Management*, 87 (2018): 72-93.
60 Ahmadreza Faghih-Imania, et al., "Hail a cab or ride a bike? A travel time comparison of taxi and bicycle-sharing systems in New York City," *Transportation Research Part A: Policy and Practice*, 101, (2017): 11-21.
61 Interview with Colin Hughes, August 7, 2017.
62 Katherine Ross, et al., "How Much You Can Save If You Commute By Bike," *ValuePenguin.*

a consistent customer base. Findings also showed that 16% of trips taken by bikeshare would not otherwise have been made if a bikeshare station were not available nearby, and more than three-quarters of those trips were made by people intending to spend money.[63] Bikeshare stations enable more potential consumers to access a commercial area compared to vehicle parking, as shown in NACTO's analysis of the economic impact of 20 feet of curb space—the size of an average car parking spot. A parking space would have to turn over 10.3 times per day to generate the same amount of revenue generated by a seven-dock bikeshare station.[64]

Safety

Metric: reducing road fatalities and serious injuries

Bikeshare safety can be evaluated broadly by calculating the number of fatalities out of the total number of trips taken, compared to the same ratio for vehicle trips. With available data, further evaluation should include the total number of cyclists killed or seriously injured (KSI) in years prior to the bikeshare system launch compared to cyclist KSI after the launch, as well as comparing these numbers inside and outside of the bikeshare service area (if the system is station-based). New York City utilized this metric to analyze the influence of bikeshare on overall cyclist KSI, and found a 17% reduction within the system's original service area compared to before the system launched.[65]

Bikeshare is a relatively safe transportation option, especially compared to car travel or even riding a personal bike. Studies show that collisions and injuries occur less often for bikeshare riders than personal bike riders, perhaps due to the heavier, limited-speed design of most bikeshare bikes.[66] The US saw 28 million bikeshare trips taken in 2016, and only one fatality that year (.0000036%).[67]

Access

Metric: people near bikeshare

Measuring access to bikeshare is key to building an equitable system, one that functions as an affordable, reliable transportation mode for all city residents and visitors. A broad measure of accessibility is the percent of the city population living within 500 meters of a bikeshare station compared to the entire city area. If adequate GIS (geographic information system) layers (e.g., population by census tract or similar geographic area) are available for a city and stations are georeferenced, this analysis can be done with minimal effort.

Many cities improve access to and from transit by siting bikeshare stations at or in close proximity to bus and rail stations to provide commuters with a seamless connection to their final destination. Both Germany and the Netherlands have nationwide bikeshare systems aimed at addressing the first-last-kilometer challenge, with bikeshare stations located at train stations, bus and metro stops and 24-hour rental options.[68] Fortaleza, Brazil offers free 12-hour bikeshare rentals on a first-come first-served basis from certain train stations, enabling commuters to bike home in the evening and back to the station in the morning. Chinese dockless bikeshare operator Mobike reports that in Beijing, 81% of trips using their bikes start within 300 meters of a bus station and 44% start within 500 meters of a metro station.[69] Limebike, another dockless operator, estimates that 40% of trips in its large US markets connect to transit.[70] Similarly, Bikeplus UK found that 65% of all bikeshare trips in the country were taken in combination with a bus or train.[71] Additional accessibility gains can be captured through fare integration with transit, reducing the cost of a bike-to-bus or bike-to-metro trip.

Bikeshare has also proven critical in helping to offset congestion during transit construction or improvements, offering an alternative, affordable mode when rail service is significantly interrupted . In the early 2000s, as Bordeaux began construction on a new tram line, the city simultaneously launched a free bikeshare program as a transportation alternative. Because of increased congestion from the construction, Bordeaux saw a steep decline in vehicle trips from 64% to 40% during the building of the tramway. During this time, the share of trips by bike increased from less than 2% to 9%. The bikeshare system was made permanent and now offers access to 1,800 bikes at 174 stations, many of which are located at bus and tram stops and train stations.[72] Similarly, in June 2016, Capital Bikeshare in Washington, DC debuted a new fare option—US$2 per trip—just before the city's Metrorail system underwent significant track improvement work. Record high bikeshare ridership—6% higher than the previous record high—was reported during this time.[73]

63 "Economic Impact & Operational Efficiency for Bikeshare Systems," *Virginia Tech*, January 2014.
64 Jonathan R. Peters, et al., " The Economic Impacts of Transferring Curb Space from Car Parking to Bike Share Docks," *The CUNY Social Policy Simulation Center,* November 2013.
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69 "Bike-Sharing and the City: 2017 White Paper," *Mobike*, April 12, 2017.
70 "The Year End Report," *Limebike*, December 19, 2017.
71 "Public Bike Share Users Survey Results 2017," *BikePlus CarPlus,* September 2017.
72 Koska and Rudolph, "The Role of Walking and Cycling in Reducing Congestion: A Portfolio of Measures," *FLOW Project,* July 2016.
73 "Capital Bikeshare Ridership Soars During First Week of SafeTrack," *District Department of Transportation,* June 15, 2016.

Planning For An Unknown Future 9

In 2018, Mexico City approved dockless bikeshare companies to operate in the city alongside its successful Ecobici system. Source: ITDP Mexico

PLANNING FOR AN UNKNOWN FUTURE

Ofo bikes line a bike lane in Guangzhou, China.
Source: ITDP China

Emphasized again and again throughout this Guide, cities should position bikeshare as a mechanism to help achieve large-scale goals, adopt policies that align with those goals, and monitor and evaluate system performance and progress. This cyclical process enables cities to integrate yet-to-be-known changes into the evaluation of their bikeshare systems to decide if policies, regulations, business models or operating approaches should be adjusted. Planning for an unknown future rests on the ability to be flexible and responsive to unforeseen developments and having mechanisms in place to measure their impact on existing policies and procedures. The bikeshare landscape is constantly changing; now, cities have the opportunity to capitalize on these new applications of technology to facilitate a more sustainable transportation network.

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APPENDIX

Bikeshare System Information & Performance Metrics

City	Region	System Type	Operator(s)	Bike Type	Service Area (km²)	Service Area Population	City	Service Area Population as % of City Population	City Area (km²)	Population Density (persons/km)	Total Bikes	Total Stations (docked)	Station Density (per SA km²)	Total Dock (docked)	Docks per Bike	Bike Density (bikes per SA km2)	Bikes per 1,000 Residents (in SA)	Average Daily Trips (peak month)	Dil Trips per Bike	Trips per 1,000 Residents (in SA)
Guangzhou	AS	Dockless	Mobike, ofo, Unibicycle	Smart Bike	3,843	14,043,500	14,043,500	100%	3,843	3,654	800,000	--	--	--	--	208	57	4,000,000	5	285
		Docked	Guangzhou Public Bicycle Operation Management Co	Traditional																
Shanghai	AS	Dockless	Dockless Mobike, oBike, ofo	Smart Bike	6,341	24,152,700	24,152,700	100%	6,341	3,809	1,500,000	--	--	--	--	237	62	1,000,000	0.7	41
		Docked	Shanghai Forever Bicycle Co.	Traditionalz																
Tianjin	AS	Dockless	Mobike, ofo	Smart Bike	2,771	13,245,000	13,245,000	100%	2,771	4,780	300,000	--	--	--	--	108	23	N/A	N/A	N/A
Singapore	AS	Dockless	Mobike, oBike, ofo	Smart Bike	720	5,612,300	5,612,300	100%	720	7,796	30,000	--	--	--	--	42	5	N/A	N/A	N/A
London	EU	Docked	Serco	Traditional	111	1,287,842	8,787,892	15%	1,572	5,590	13,850	839	7.6	20,439	1.5	125	11	36,511	2.6	28
		Dockless	Mobike, oBike, ofo	Smart Bike																
Barcelona	EU	Docked	Clear Channel	Traditional & E-b	53	1,421,573	1,604,555	89%	101	15,824	6,000	465	8.8	10,240	1.7	113	4	38,230	6.4	27
Paris*	EU	Docked	Smoovengo	Traditional	155	3,117,628	4,146,722	75%	268	15,473	23,600	1,197	7.7	N/A	N/A	N/A	N/A	108,117	4.6	35
		Dockless	Mobike, Bike, ofo	Smart Bike																
Manchester	EU	Dockless	Mobike	Smart Bike	116	541,300	541,300	100%	116	4,678	2,500	--	--	--	--	22	5	N/A	N/A	N/A
Cologne	EU	Hybrid	nextbike	SmartBike	405	1,060,582	1,060,582	100%	405	2,618	1,450	23	0.1	36	0	4	1	3,700	2.6	3
Milan	EU	Docked	Clear Channel	Traditional & E-bike	53	1,368,590	1,368,590	100%	182	7,530	4,650	268	5	N/A	N/A	87	3	6,000	1.3	4
		Dockless	Mobike	Smart Bike																
Dublin	EU	Docked	JC Decaux	Traditional	15	120,598	553,165	22%	115	4,811	1,600	100	6.8	3,131	2	109	13	9,000	5.6	75
		Dockless	Bleeperbike	Smart Bike																
Minneapolis	NA	Docked	CycleHop	Traditional	82	239,744	716,049	33%	140	5,123	1,833	197	2.4	3,541	1.9	22	8	2,927	1.6	12
Washington, DC	NA	Docked	Motivate	Traditional	175	687,928	1,401,661	49%	444	3,157	3,700	440	2.5	8,169	2.2	21	5	13,291	3.6	19
		Dockless	JUMP, Limebike, Mobike eBike, ofo, Spin	SmartBike & E-bike																
Chicago	NA	Docked	Motivate	Traditional	238	1,433,915	2,821,962	51%	606	4,653	5,800	582	2.4	10,000	1.7	24	4	18,287	3.2	13
Boston	NA	Docked	Motivate	Traditional	77	535,586	912,832	59%	125	7,300	1,600	180	2.3	2,999	1.9	21	3	6,150	11	3.8
Boulder	NA	Docked	Bcycle	Traditional	18	37,810	108,090	35%	67	1,614	305	43	2.4	576	1.9	17	8	450	1.5	12
Madison	NA	Docked	Bcycle	Traditional	19	57,886	252,551	23%	244	1,037	350	44	2.3	493	1.4	18	6	600	1.7	10
Mexico City	NA	Docked	Clear Channel	Traditional & E-bike	54	334,806	8,918,653	4%	1,485	6,006	6,500	480	8.9	11,304	1.7	120	19	35,000	4.6	105
		Dockless	Mobike	Smart Bike																
Montreal	NA	Docked	BIXI Montreal	Traditional	213	801,877	1,944,394	41%	432	4,506	6,250	540	2.5	N/A	N/A	29	8	22,595	3.6	28
New York City	NA	Docked	Motivate	Traditional	129	1,771,173	8,537,673	21%	1,213	7,036	9,789	751	5.8	23,339	2.4	76	6	62,516	6.4	35
Atlanta	NA	Hybrid	CycleHop	Smart Bike	32	84,423	472,522	18%	347	1,361	500	75	2.4	709	1.4	16	6	464	0.9	5
Portland	NA	Hybrid	Motivate	Smart Bike	34	137,671	639,863	22%	376	1,702	1,000	119	3.5	2,050	2.1	29	7	1510	1.5	11
Seattle	NA	Dockless	LimeBike, ofo, Spin	Smart Bike	217	704,352	704,352	100%	369	1,908	8,000	--	--	612	0	37	11	2,711	0.3	4
Vancouver	NA	Docked	CycleHop	Traditional	22	175,154	631,486	28%	115	5,493	1,200	123	5.6	2,464	2.1	54	7	3,900	3.3	22
Dallas	NA	Dockless	LimeBike, ofo, Spin, VBikes	Smart Bike	999	1,317,929	1,317,929	100%	999	1,319	20,000	--	--	--	--	20	15	N/A	N/A	N/A
Rio de Janeiro	SA	Docked	tembici	Traditional	80	440,394	6,453,682	7%	1,221	5,286	1,100	239	3	3,300	3	14	2	4,065	3.7	9
Buenos Aires	SA	Docked	City of Buenos Aires	Traditional	50	945,636	2,890,151	33%	203	14,237	3,000	198	4	N/A	N/A	60	3	6,300	2.1	7

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