Data Analytics Bootcamp

CDMX MOBILITY

ECOBICI as the solution to mobility

- **PYTHEAM**
- Blanca Chavarría
- Diana Pardo
- Lizette González
- Martha Meses
- Ricardo Moreno

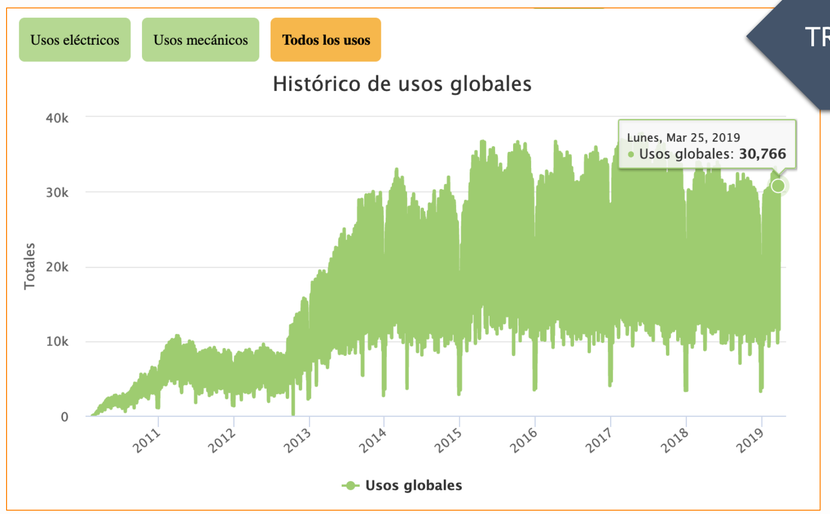
ECOBICI OVERVIEW

ECOBICI is a public bikeshare system that allows the user to pick up a bike in one place and return it to another, making point-to-point, human-powered transportation practical.

USERS

Source: https://www.ecobici.cdmx.gob.mx/es/estadisticas

TRIPS



Source: https://www.ecobici.cdmx.gob.mx/es/estadisticas

GOAL

Integrate ECOBICI with pubic transit, playing a key role in the mobility for CDMX

HISTORY

The system was launched on February 2010 with 84 stations and 1,200 bicycles

GROWTH

In 8 years the system has growth 400% to 480 stations, >6,000 bicycles and 170k active users

HYPOTESIS

$H_0 = ECOBICI\ is\ a\ mobility\ solution\ for\ Mexico\ City$

Scope: Assess whether public bikeshare system (ECOBICI) is a mobility solution for Mexico City, through the analysis of several data sources.

Efficacy

Service area coverage

Operating indicators

Accessible

Subscription and payment mechanisms

Accessibility by low income users

Complement Public Transportation

Bicycle station location

Availability

Number of bicycles and docks

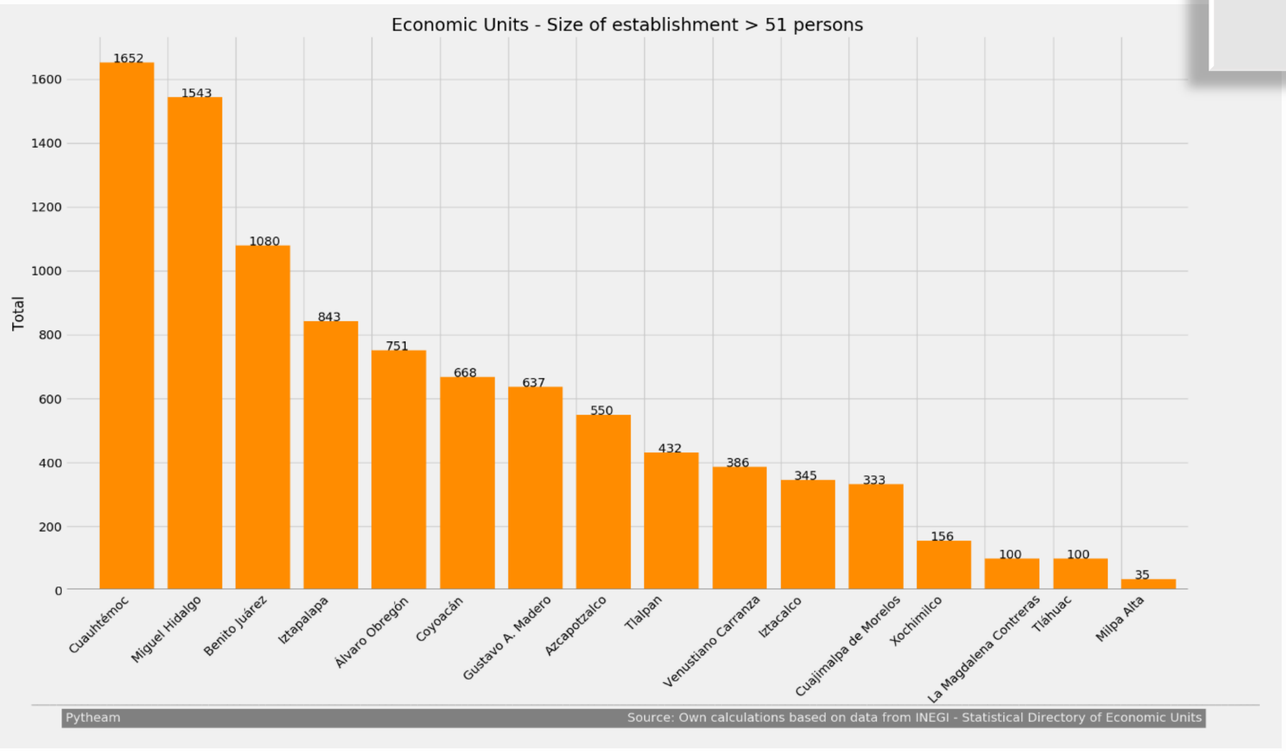
Availability in peak hours

> Mobility is the ability to move or be moved freely and easily. However, mobility pursues a bigger goal: accessibility. Accessibility to places, services and other options to reach certain areas in big cities.
>
> *Definition by Oxford Dictionary*

EFFICACY

Service Area Coverage

Municipality	Ecobici stations
Benito Juárez	168
Cuauhtémoc	199
Miguel Hidalgo	113
Total	**480**



01.Service Area

ECOBICI stations are located in 3 of the 16 municipalities

02.Coverage (economical dynamics)

According to the Statistical Directory of Economic Units (INEGI), these 3 municipalities hold 44% of the economic units with more than 51 employees which represents 45% of the occupied persons in the city (formal economy)

03.Coverage (demographics)

The combining area of these 3 municipalities represents 7% of territorial surface of the city and 15% of the population

How ECOBICI complements Public Transportation System

Municipality	Ecobici stations
Benito Juárez	168
Cuauhtémoc	199
Miguel Hidalgo	113
Total	**480**

System	Stops
Transporte Colectivo - Metro	195
Metrobus	234
Transporte Eléctrico – Trolebus	596
Other	4,996
Transporte Unificado de la Ciudad de México	**6,021**

Statistics

Density

ECOBICI stations connect with 8% of the pubic transportation stops

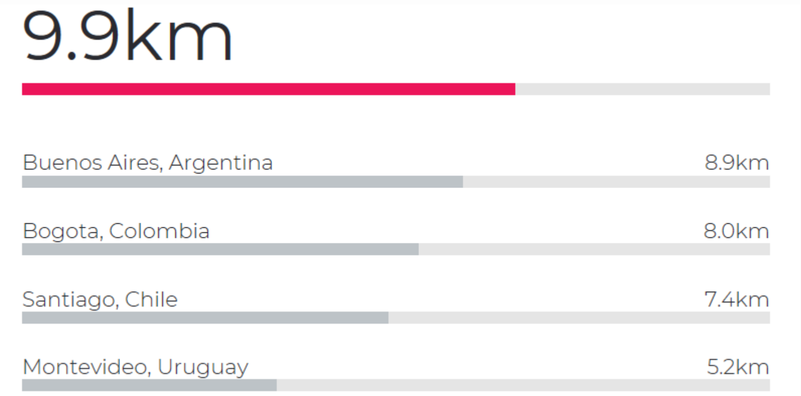
People with long trips

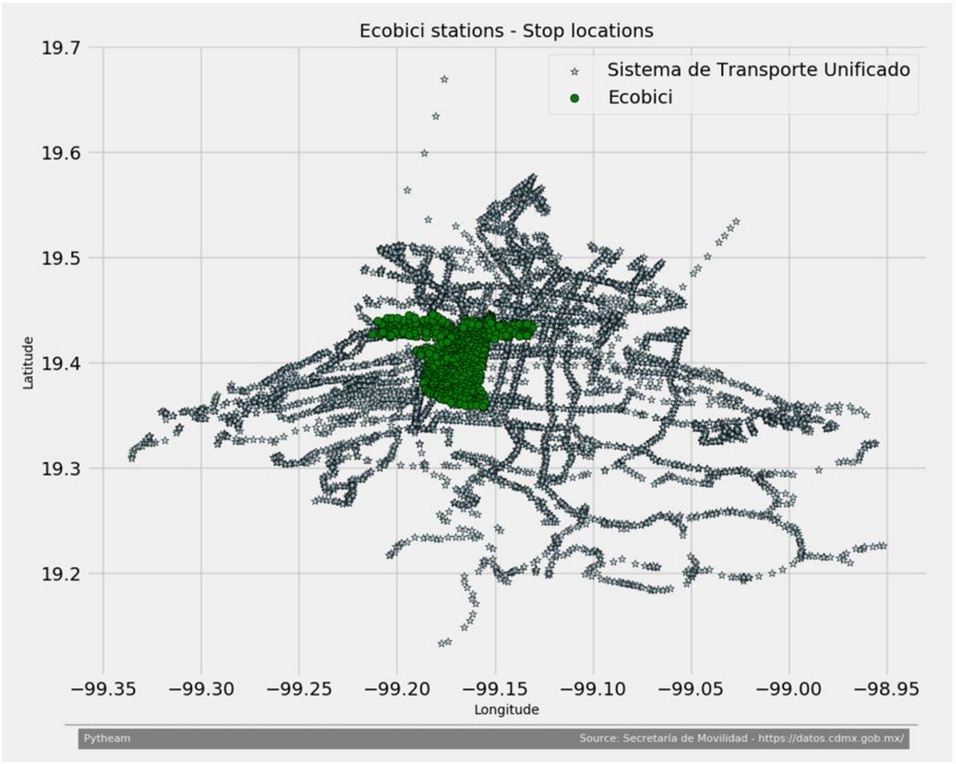
Long trip = more than 2 hrs daily in public Transportation

Daily average distance travelled in public transportation

One direction (i.e. from home to work)

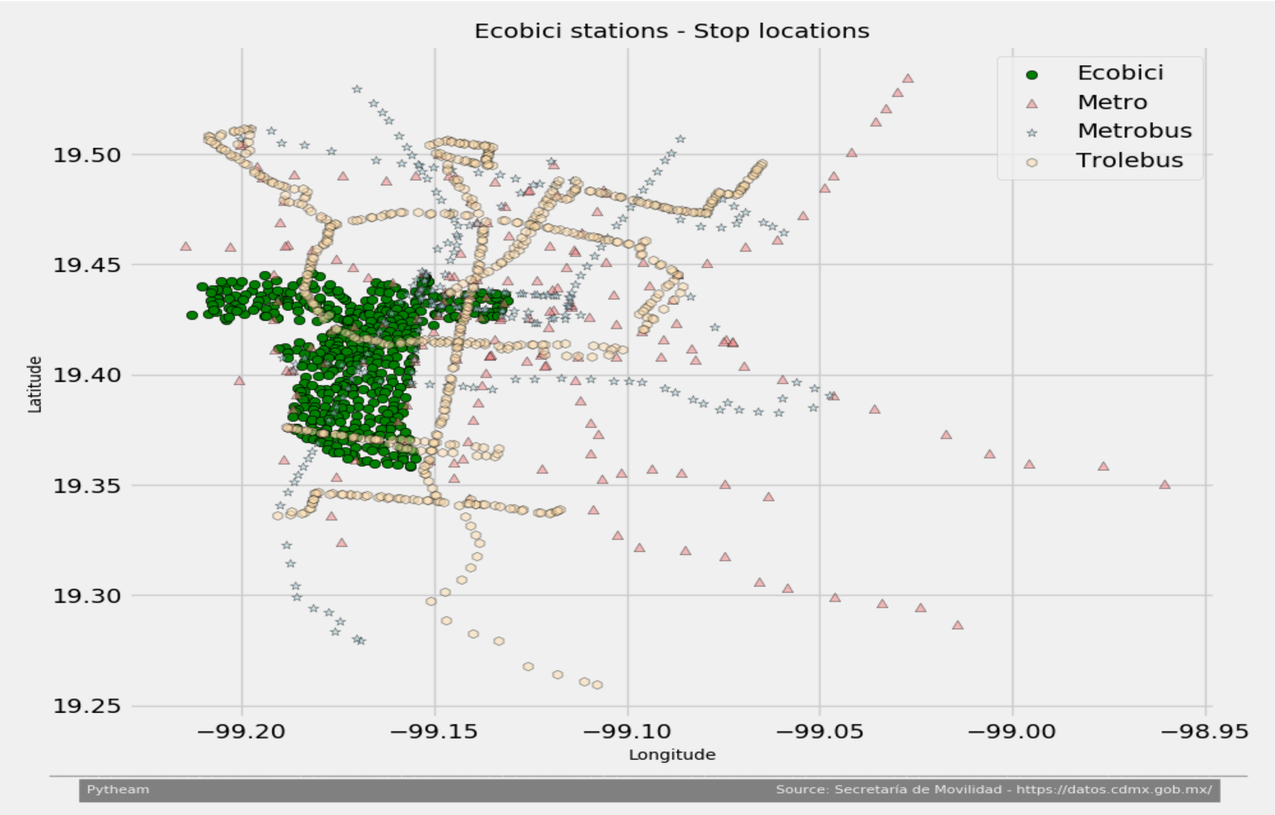
Source: https://moovitapp.com/insights





How ECOBICI complements Public Transportation System

Walking distance from bike stations to public transportation stops



Municipality	Approx. walking distance 100 meters from	Ecobici stations
Benito Juárez	Metro stop	6
	Metrobus stop	3
	Trolebus stop	18
	Subtotal	**27**
Cuauhtémoc	Metro stop	7
	Metrobus stop	26
	Trolebus stop	4
	Subtotal	**37**
Miguel Hidalgo	Metro stop	1
	Metrobus stop	1
	Trolebus stop	3
	Subtotal	**5**
Total		**69**

14%

Municipality	Approx. walking distance between 100 and 200 meters from	Ecobici stations
Benito Juárez	Metro stop	13
	Metrobus stop	22
	Trolebus stop	39
	Subtotal	**74**
Cuauhtémoc	Metro stop	26
	Metrobus stop	69
	Trolebus stop	30
	Subtotal	**125**
Miguel Hidalgo	Metro stop	5
	Metrobus stop	3
	Trolebus stop	19
	Subtotal	**27**
Total		**226**

47%

1.01km

Buenos Aires, Argentina	0.79km
Bogota, Colombia	0.72km
Santiago, Chile	0.60km
Montevideo, Uruguay	0.48km

Daily average distance people walk by trip

Source: https://moovitapp.com/insights

AVAILABILITY

February 2019 data

User age	
mean	35.12
min	16
Max	92

Gender	Trips	%
Male	510,546	75
Female	173,469	25
Total	**684,015**	

Trips	684,015
Bicycles used	6,073
Departure from	477 stations
Return to	477 stations
The departure station with more trips was	271 Av. Jesús García - J. Meneses, Located in Buenavista, Cuauhtémoc with 7,232 trips. 25% of those trips to stations located in Juárez suburb, 16% to stations located in Cuauhtémoc suburb, and 9% to stations loc ated in Tabacalera suburb

Departure from	Trips	%
Cuauhtémoc	**404,216**	**59**
Peak Hours: 6-10	119,991	
Peak hours: 12-16	119,118	
Peak hours: 18-22	112,604	
Non Peak hours	52,503	
Benito Juárez	**140,397**	**21**
Peak Hours: 6-10	43,285	
Peak hours: 12-16	38,373	
Peak hours: 18-22	40,999	
Non Peak hours	17,740	
Miguel Hidalgo	**139,402**	**20**
Peak Hours: 6-10	37,870	
Peak hours: 12-16	39,824	
Peak hours: 18-22	41,104	
Non Peak hours	20,604	
Total	**684,015**	

3.75

trips per bike daily

19

Bikes per 1000 residents

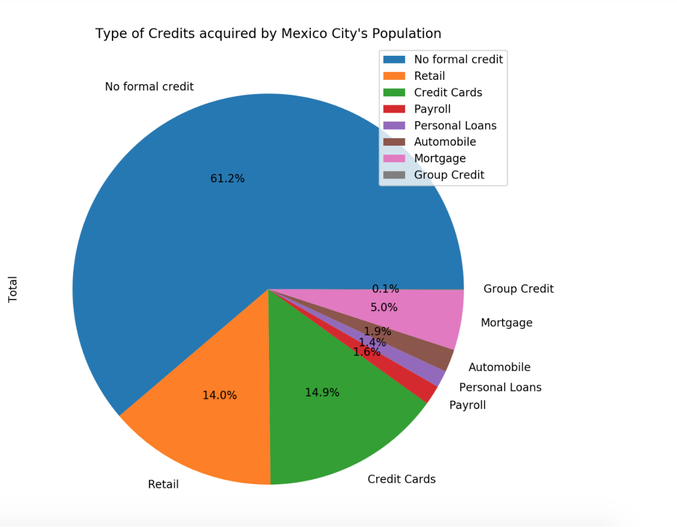
In service area

87%

Trips in peak hours

Is ECOBICI an accessible system?

- Easy enrollment?
- Methods of payment – accessible for low income population?
- Inclusive?



Source Encuesta Nacional de Inclusión Financiera (ENIF) 2018INEGI

Sources
United Nations Development Program/ INEGI / Lamudi catalog

Subscription Requirements

Valid ID (national and international)

Credit/debit Card

WEB or In-Person enrollment

Price

Annual = $24 usd

7 days = $18 usd

3 days = $11 usd

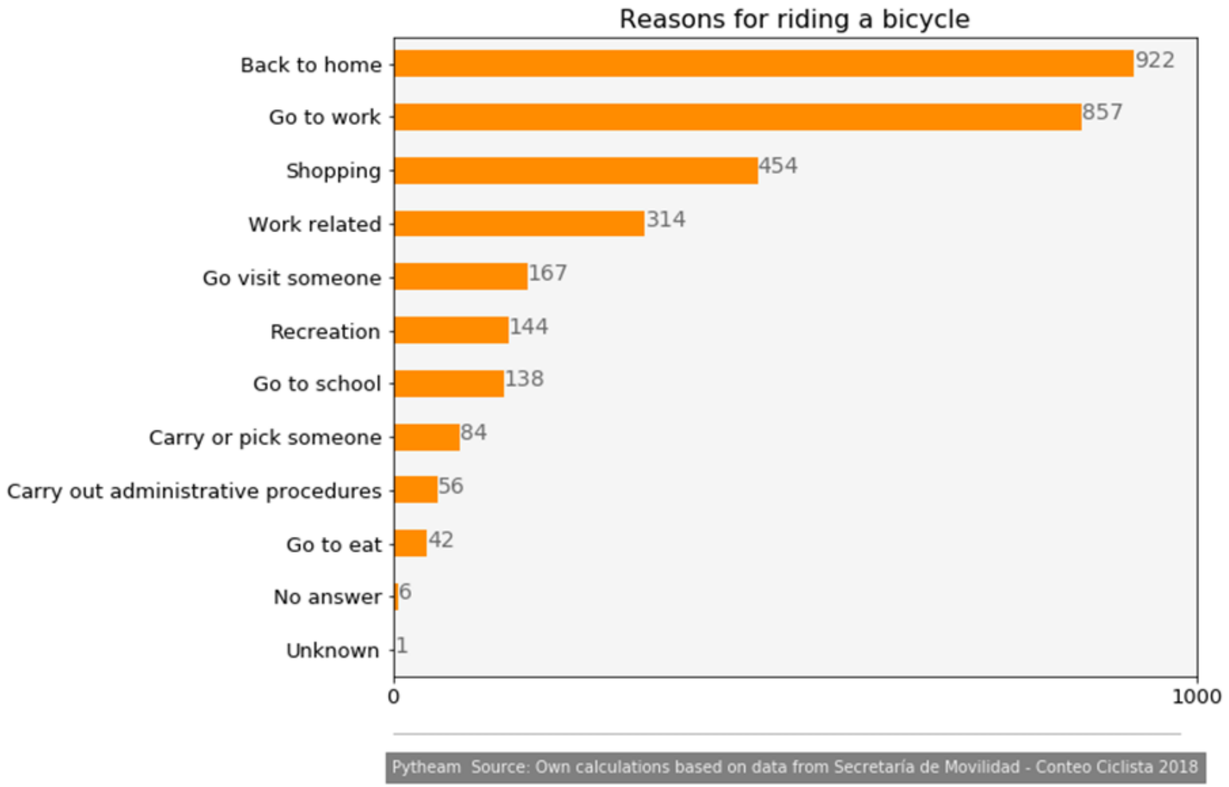
1 day = $5.5 usd

Inclusion

No gender restriction

No maximum age restriction

Available in zones in the list of the top 5 municipalities with the highest income in Mexico



Cyclist Count Research

Source: Bicycle Mobility Study 2018

Riding own bike 9/10

Work/business related trips 6/10

Gender mix 83%Male/17% Female

From	To	Count
Home	Work	761
Work	Home	573
Work	Work	181
Work	Mall, store, market	84
Work	Other	82
Work	Another house	29
Other	Work	27
Work	School	19
Mall, store, market	Work	18
Work	Restaurant, bar, coffee shop	14
Another house	Work	11
Restaurant, bar, coffee shop	Work	9
School	Work	9
Work	Unknown	2
	Total	**1,819**

The 57.11% of 3,185 persons used the bicycle for work related activities

Bicycle type	n
Own	2,968
Other	91
Ecobici	65
Mobike	39
V-Bike	20
Dezba	1
Unknown	1
Total	**3,185**

Conclusions

Public Transportation

The installed bicycle infrastructure complements the existing public transportation network, but the coverage is vey limited and centralized in only 7% of the total CDMX area

Support to Economy

Efficacy was proved for the users in the service area. Although it benefits to the people employed by the 45% of the formal companies, it is necessary to extend the benefit to the whole population

For the city residents Peak hours demand

The information shows that the main part of the trips are done in peak hours, however there is not information about the unsatisfied demand

For the whole population

Requirements allow to access only to a minimum portion of the population.
2 of the 3 he municipalities where ECOBICI is located are in the list of the high income of the country

APPENDIX

DATA ANALYZED

Our Data Sets and Data Bases

Transit Oriented Development

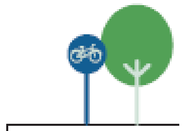
IN CDMX		
SOURCE	**DATABASES**	**LINK**
ECOBICI	Datos Abiertos, Estadísticas	https://www.ecobici.cdmx.gob.mx/es
DATOS ABIERTOS (CDMX)	Cicloestaciones	https://datos.cdmx.gob.mx/explore/dataset/estaciones-de-ecobici/export/
INEGI	Directorio Estadístico de Unidades Económicas	https://www.inegi.org.mx/app/mapa/denue/
DATOS ABIERTOS (CDMX	Conteo ciclista	https://datos.cdmx.gob.mx/explore/dataset/estudio-de-conteo-ciclista-2018/information/

AS A COMPARISSON-OTHER COUNTRIES		
SOURCE	**DATABASES**	**LINK**
CITI BIKE NYC	Citi Bike System Data | Citi Bike NYC	https://www.citibikenyc.com/system-data
ECOBICI-BUENOS AIRES	Recorridos realizados	https://datos.cdmx.gob.mx/explore/dataset/estaciones-de-ecobici/export/

Evaluating Performance

TOD Standards

Transit Oriented Development



CYCLE NETWORK

Maximum walking distance to the safe cycling network is:

Less than 100 m	2 POINTS
Less than 200 m	1 POINT
200 m or more	0 POINTS

CYCLE NETWORK

100% of street and path segments are open and safe for cycling	2 POINTS
No building entrance is more than a 200 m walking distance from a safe cycling network segment	1 POINT
One or more building entrance are more than a 200 m walking distance from a safe cycling network segment	0 POINTS

Key features of cycle sharing systems

- A dense network of stations across the coverage area, with a spacing of approximately 300 m between stations
- Cycles with specially designed parts and sizes to discourage theft
- A fully automated locking system at stations that allows users to check cycles in or out without the need for staffing at the station
- Electronic tags to track where a cycle is picked up, the identity of the user, and the station where it is returned. The identity of the user is associated with that of the cycle to ensure security
- Redistribution of cycles to ensure availability of cycles and empty docking points
- Real-time monitoring of station occupancy rates through information technology (IT) systems, used to guide the redistribution and provide user information through the web, mobile phones, on-site terminals, and other platforms
- Pricing structures that incentivise short trips, helping to maximize the number of trips per cycle per day

Evaluating Performance

System Information and Performance Metrics

Institute for Transportation and Development Policy

City	Region	System_Type	Operators	Bike_Type	Service_Area_Km2	City_Area_Km2	SA/City_Area	Service_Area_Population	City_Population	SA_Population_Coverage	Population_Density_(persons/Km2)	Total_Bikes	Total_Stations_(docked)	Stations_density_(per_SA_Km2)	Total_Dock_(docked)	Docks_per_Bike	Bikes_Density_(per_SA_Km2)	Bikes_per_1000_Residents_SA	Average_Daily_Trips_(peak_month)	Daily_Trips_per_Bike	Trips_per_1000_residents_in_SA
Guangzhou	AS	Dockless	Mobike, Ofo, Unit	Smart Bike	3,843	3,843	100%	14,043,500	14,043,500	100%	3,654	800,000	0	0.0	0	0.0	208	57.0	4,000,000	5.0	285
Guangzhou	AS	Docked	Guangzhou Public	Traditional	3,843	3,843	100%	14,043,500	14,043,500	100%	3,654	800,000	NA	0.0	0	0.0	208	57.0	4,000,000	5.0	285
Shanghai	AS	Dockless	Mobike, Ofo, Unit	Smart Bike	6,341	6,341	100%	24,152,700	24,152,700	100%	3,809	1,500,000	0	0.0	0	0.0	237	62.1	1,000,000	0.7	41
Shanghai	AS	Docked	Shanghai Forever	Traditional	6,341	6,341	100%	24,152,700	24,152,700	100%	3,809	1,500,000	NA	0.0	0	0.0	237	62.1	1,000,000	0.7	41
Tianjin	AS	Dockless	Mobike, Ofo	Smart Bike	2,771	2,771	100%	13,245,000	13,245,000	100%	4,780	300,000	0	0.0	0	0.0	108	22.7	NA	0.0	0
Singapore	AS	Dockless	Mobike, oBike, Of	Smart Bike	720	720	100%	5,612,300	5,612,300	100%	7,795	30,000	0	0.0	0	0.0	42	5.3	NA	0.0	0
London	EU	Docked	Serco	Traditional	111	1,572	7%	1,287,842	8,787,892	15%	5,590	13,850	839	7.6	20,439	1.5	125	10.8	36,511	2.6	28
London	EU	Dockless	Mobike, oBike, Of	Smart Bike	111	1,572	7%	1,287,842	8,787,892	15%	5,590	13,850	0	0.0	0	0.0	125	10.8	36,511	2.6	28
Barcelona	EU	Docked	Clear Channel	Traditional & E-bil	53	101	52%	1,421,573	1,604,555	89%	15,887	6,000	465	8.8	10,240	1.7	113	4.2	38,230	6.4	27
Paris	EU	Docked	Smoovengo	Traditional	155	268	58%	3,117,628	4,146,722	75%	15,473	23,600	1,197	7.7	0	0.0	152	7.6	108,117	4.6	35
Paris	EU	Dockless	Mobike, oBike, Of	Smart Bike	155	268	58%	3,117,628	4,146,722	75%	15,473	23,600	0	0.0	0	0.0	152	7.6	108,117	4.6	35
Manchester	EU	Dockless	Mobike	Smart Bike	116	116	100%	541,300	541,300	100%	4,666	2,500	0	0.0	0	0.0	22	4.6	NA	0.0	0
Cologne	EU	Hybrid	Nextbike	Smart Bike	405	405	100%	1,060,582	1,060,582	100%	2,619	1,450	23	0.1	36	0.0	4	1.4	3,700	2.6	3
Milan	EU	Docked	Clear Channel	Traditional & E-bil	53	182	29%	1,368,590	1,368,590	100%	7,520	4,650	268	5.1	NA	0.0	88	3.4	6,000	1.3	4
Milan	EU	Dockless	Mobike	Smart Bike	53	182	29%	1,368,590	1,368,590	100%	7,520	4,650	0	0.0	0	0.0	88	3.4	6,000	1.3	4
Dublin	EU	Docked	JC Decaux	Traditional	15	115	13%	120,598	553,165	22%	4,810	1,600	100	6.7	3,131	2.0	107	13.3	9,000	5.6	75
Dublin	EU	Dockless	Bleeperbike	Smart Bike	15	115	13%	120,598	553,165	22%	4,810	1,600	0	0.0	0	0.0	107	13.3	9,000	5.6	75
Minneapolis	NA	Docked	CycleHop	Traditional	82	140	59%	239,744	716,049	33%	5,115	1,833	197	2.4	3,541	1.9	22	7.6	2,927	1.6	12
Washington, DC	NA	Docked	Motivate	Traditional	175	444	39%	687,928	1,401,661	49%	3,157	3,700	440	2.5	8,169	2.2	21	5.4	13,291	3.6	19
Washington, DC	NA	Dockless	JUMP, Limebike, M	Traditional & E-bil	175	444	39%	687,928	1,401,661	49%	3,157	3,700	0	0.0	0	0.0	21	5.4	13,291	3.6	19
Chicago	NA	Docked	Motivate	Traditional	238	606	39%	1,433,915	2,821,962	51%	4,657	5,800	582	2.4	10,000	1.7	24	4.0	18,287	3.2	13
Boston	NA	Docked	Motivate	Traditional	77	125	62%	535,586	912,832	59%	7,303	1,600	180	2.3	2,999	1.9	21	3.0	6,150	3.8	11
Boulder	NA	Docked	Bcycle	Traditional	18	67	27%	37,810	108,090	35%	1,613	305	43	2.4	576	1.9	17	8.1	450	1.5	12
Madison	NA	Docked	Bcycle	Traditional	19	244	8%	57,886	252,551	23%	1,035	350	44	2.3	493	1.4	18	6.0	600	1.7	10
Mexico City	NA	Docked	Clear Channel	Traditional & E-bil	54	1,485	4%	334,806	8,918,653	4%	6,006	6,500	480	8.9	11,304	1.7	120	19.4	35,000	5.4	105
Mexico City	NA	Dockless	Mobike	Smart Bike	54	1,485	4%	334,806	8,918,653	4%	6,006	6,500	0	0.0	0	0.0	120	19.4	35,000	5.4	105
Montreal	NA	Docked	BIXI Montreal	Traditional	213	432	49%	801,877	1,944,394	41%	4,501	6,250	540	2.5	NA	0.0	29	7.8	22,595	3.6	28
New York City	NA	Docked	Motivate	Traditional	129	1,213	11%	1,771,173	8,537,673	21%	7,038	9,789	751	5.8	23,339	2.4	76	5.5	62,516	6.4	35
Atlanta	NA	Hybrid	CycleHop	Smart Bike	32	347	9%	84,423	472,522	18%	1,362	500	75	2.3	709	1.4	16	5.9	464	0.9	5
Portland	NA	Hybrid	Motivate	Smart Bike	34	376	9%	137,671	639,863	22%	1,702	1,000	119	3.5	2,050	2.1	29	7.3	1,510	1.5	11
Seattle	NA	Dockless	LimeBike, Ofo, Sp	Smart Bike	217	369	59%	704,352	704,352	100%	1,909	8,000	0	0.0	612	0.1	37	11.4	2,711	0.3	4
Vancouver	NA	Docked	CycleHop	Traditional	22	115	19%	175,154	631,486	28%	5,491	1,200	123	5.6	2,464	2.1	55	6.9	3,900	3.3	22
Dallas	NA	Dockless	LimeBike, Ofo, Sp	Smart Bike	999	999	100%	1,317,929	1,317,929	100%	1,319	20,000	0	0.0	0	0.0	20	15.2	NA	0.0	0
Rio de Janeiro	SA	Docked	tembici	Traditional	80	1,221	7%	440,394	6,453,682	7%	5,286	1,100	239	3.0	3,300	3.0	14	2.5	4,065	3.7	9
Buenos Aires	SA	Docked	City of Buenos Air	Traditional	50	203	25%	945,636	2,890,151	33%	14,237	3,000	198	4.0	NA	0.0	60	3.2	6,300	2.1	7