INSIGHTS ON HOW BIKESHARING SUPPORTS URBAN DEVELOPMENT

JAN.12, 2018
Recent advances in mobile technology and big data analysis have enabled new opportunities to rethink how people live in and move through cities. Smart bikesharing is one new business model that helps solve the last-mile challenge by leveraging big data insights to maximize efficiency in both its own systems and operations, as well as in those of cities.

Insights from smart bike data can inform city mobility planning and encourage a culture of responsible shared usage, to fill a gap in current urban transportation infrastructure.

This innovation comes at a critical time, as urbanization continues to pose sustainability challenges. The fundamental shift in mobility patterns smart bikeshare brings is already furthering the UN Sustainable Development Goals—#11: making cities inclusive, safe, resilient and sustainable; and #13: taking urgent action to combat climate change and its impacts.

As the world’s first and largest smart bikesharing company, Mobike seeks to make cycling a more convenient and sustainable transport choice for urban residents through technology innovation. In line with the Shared Mobility Principles
for Liveable Cities, the company collaborates with municipal governments and other stakeholders to fully integrate its operations with the unique characteristics of each city’s broader transportation system. With growing support for this model from city officials all round the world, an era of “new mobility” is emerging.

This report is based on analysis of Mobike’s bike trip data, spanning the entirety of the company’s nearly 2-year operational history. Currently, the system gathers over 30TB of data daily from over 8 million smart bikes equipped with GPS and IoT connected devices. Analysis focused on 12 major cities: Beijing, Shanghai, Guangzhou, Shenzhen, Chengdu, London, Singapore, Milan, Washington D.C., Sapporo, Berlin, and Sydney. Through analysis of this wealth of data, we can understand each city’s unique cycling habits and needs, and reveal opportunities for economic, social, and infrastructure development.
CITY CHARACTERISTICS
CITY CHARACTERISTICS

MOBIKE STUDIED CITIES

Timeline

- **2016.4** Shanghai
- **2016.9** Beijing
- **2016.10** Guangzhou, Shenzhen
- **2016.11** Chengdu
- **2017.3** Singapore
- **2017.7** London, Milan
- **2017.8** Sapporo
- **2017.9** Washington D.C.
- **2017.11** Sydney, Berlin
CITY CHARACTERISTICS
HOW CITIES RIDE

Cities have distinct riding styles

General

Users in all cities ride slower and longer on weekends compared to weekdays.
People enjoy more leisure time on weekends.

Highest average cycling speed

<table>
<thead>
<tr>
<th>Weekday</th>
<th>Weekend</th>
</tr>
</thead>
<tbody>
<tr>
<td>London</td>
<td>9.5 km/h</td>
</tr>
<tr>
<td>Sapporo</td>
<td>8.3 km/h</td>
</tr>
</tbody>
</table>

Lowest average cycling speed

<table>
<thead>
<tr>
<th>Weekday</th>
<th>Weekend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>7.2 km/h</td>
</tr>
<tr>
<td>Berlin</td>
<td>5.2 km/h</td>
</tr>
</tbody>
</table>

Shortest average trip duration

Sapporo 6.9 min

Longest average trip duration

Sydney 23 min

In Chinese cities like Beijing / Shanghai / Guangzhou / Shenzhen / Chengdu - Cycling has become a new lifestyle, Average ride time does not vary significantly between weekdays and weekends.
CITY CHARACTERISTICS

DAILY CYCLING PATTERNS

<table>
<thead>
<tr>
<th>General</th>
</tr>
</thead>
<tbody>
<tr>
<td>- 9 cities use Mobike as daily commuting transportation means</td>
</tr>
<tr>
<td>- 5 Chinese cities travel more in morning peak than afternoon peak</td>
</tr>
</tbody>
</table>

- **EARLY BIRD CITIES**
  
  Earliest morning peak
  
  Beijing and Shanghai

- **NIGHT OWL CITIES**
  
  More people travel in the late night (0-2 AM) than in other cities
  
  Guangzhou and Shenzhen

- **WORK–LIFE BALANCE CITY**
  
  Earliest evening peak: 17:00
  
  Chengdu

- **EVENING CYCLERS**
  
  More trips in evening peak than morning peak
  
  Milan and Singapore

- **STEADY CYCLERS**
  
  no big differences between daytime peak and off-peak hours
  
  Washington D.C., Sapporo and Sydney
CITY CHARACTERISTICS
HOW WEATHER AND AIR QUALITY IMPACT CYCLING

Temperature

In cities with four distinct seasons (Shanghai and Beijing), people take more trips in mild temperature weather.

16°C-21°C
THE CYCLING “COMFORT ZONE”

In Guangzhou, Chengdu and Shenzhen, cycling trips are not significantly related to changes in temperature.

Average Trips and Temperature in Beijing and Shanghai

Average Monthly Trips per User

Temperature (°C)
In Shanghai, people tend to cycle less on days with high PM$_{2.5}$ air pollution.

In other Chinese cities, there is no statistically significant relationship between number of cycling trips and PM$_{2.5}$ concentrations.
From 12 AM to 2 AM in Shenzhen and Guangzhou, where many e-commerce companies are based, areas close to both offices and pubs become hot cycling destinations. Mobikers can decompress there after work and be back home with only about 20 minutes of cycling.

After public transportation closes for the night, Mobike is the best way to get to and from the nightlife.
Height of bar indicates greater popularity of destination

Very high usage in central areas and main transportation hubs like train stations and bus stops.

The most demands for Mobike are near universities. Students in universities use Mobike to commute to lecture halls, head to lunch and return to dorms.

Central Business District (CBD) is one of the hotspots as working adults cycle to work, go for lunch and Train (MRT) stations. There is also great demand for Mobike in East Coast Park as more and more citizens are adopting a healthier lifestyle.
HOW CYCLING IMPROVES CITIES
Encouraging people to use cycling for daily commuting (Singapore example)

Comparing travel patterns between the first weeks of May and October, the percentage of trips taken on weekdays has been increasing.

Shared bikes encourage people to cycle as a means of daily commuting, rather than just for leisure.
Incorporating cycling into commutes increases access to job opportunities; more jobs can be reached within a 30-minute commute.

HOW CYCLING IMPROVES CITIES

JOB ACCESSIBILITY

Cycling improves accessibility to jobs (Washington D.C. example)

Incorporating cycling into commutes increases access to job opportunities; more jobs can be reached within a 30-minute commute.

**Walk + Public Transport + Walk**

Job Opportunities: **468,140**

**Bike + Public Transport + Walk**

Job Opportunities: **520,305**

**Bike + Public Transport + Bike**

**Job Opportunities: 638,922**

Job opportunities accessible within a 30-minute commute from a sample single point, using walking and biking as the first/last-mile option.
Comparison of total job opportunities in Washington D.C.

This map shows the number of additional job opportunities accessible from each location within 30 minutes of travel, by replacing walking with cycling as the first leg of the commute.

Sources
- Single-point and regional analyses are performed using the Conveyal Accessibility Tool.
- Street network maps for Washington DC and Berlin: www.openstreetmap.com
- Transit network data: GTFS data from www.transitfeeds.com
- Bike speed data: provided by Mobike
Cycling improves accessibility to schools (Berlin example)

Cycling increases access to schools; more schools are reachable in under 30 minutes.

**Total Number of Accessible Schools:**

- **Walk + Public Transport + Walk:** 138
- **Bike + Public Transport + Walk:** 210
- **Bike + Public Transport + Bike:** 325
Comparison of access to schools in Berlin

Cycling can increase access to schools the most in red regions.

Sources
- Single-point and regional analyses are performed using the Conveyal Accessibility Tool.
- Street network maps for Washington DC and Berlin: www.openstreetmap.com
- Transit network data: GTFS data from www.transitfeeds.com
- Bike speed data: provided by Mobike
- School data for Berlin: http://opendata-esri-de.opendata.arcgis.com/datasets/osm-de-schulen
Bikesharing provides equal opportunity

Gender Ratio (China)

51% male, 49% female

Compared to licensed motor vehicle drivers in China:
73% male and 27% female

(source: Ministry of Public Security of China)

Age

Mobike is most popular among users aged 25 to 40.
Also has large segment of users aged 40 to 65.

- 12-24: 15%
- 25-40: 34%
- 40-65: 33%
- 65: 18%
As of December 2017, Mobike users had collectively cycled over 18.2 billion kilometers, equivalent to:

- **Total CO₂ emissions avoided worldwide**: 4.4 million tonnes
- **Total economic benefits from avoided CO₂ emissions**: more than US $194 million

**CO₂ avoided in Chinese cities (tonne)**

- Beijing: 73,158
- Guangzhou: 72,988
- Chengdu: 68,474
- Shenzhen: 62,266
- Shanghai: 48,272

(source: http://www.euro.who.int/__data/assets/pdf_file/0010/352963/Heat.pdf?ua=1)
### CO₂ avoided in international cities (kg)

#### Based on the assumption that 15% of Mobike trips replaced car trips.

<table>
<thead>
<tr>
<th>City</th>
<th>CO₂ Avoided (kg/day)</th>
<th>Days Old</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>879</td>
<td>279</td>
</tr>
<tr>
<td>Milan</td>
<td>647</td>
<td>153</td>
</tr>
<tr>
<td>Washington D.C</td>
<td>505</td>
<td>96</td>
</tr>
<tr>
<td>Sydney</td>
<td>424</td>
<td>40</td>
</tr>
<tr>
<td>London</td>
<td>395</td>
<td>146</td>
</tr>
<tr>
<td>Sapporo</td>
<td>246</td>
<td>185</td>
</tr>
<tr>
<td>Berlin</td>
<td>217</td>
<td>33</td>
</tr>
</tbody>
</table>

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**Beijing leads in CO₂ reductions in Chinese cities**

73,000+ tonnes

**Singapore leads in CO₂ reduction in international cities**

245+ tonnes
How Cycling Improves Cities

Total calories burned for a typical week (total for 12 cities):

890 Million Kcal

12 Cities in Total

Burn 3 million cheeseburgers

Average equivalent number of potato chips burned per trip on weekends:

<table>
<thead>
<tr>
<th>City</th>
<th>Chips Burned per Trip</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>5.50</td>
</tr>
<tr>
<td>Milan</td>
<td>4.26</td>
</tr>
<tr>
<td>Berlin</td>
<td>4.83</td>
</tr>
<tr>
<td>Singapore</td>
<td>3.10</td>
</tr>
<tr>
<td>Chengdu</td>
<td>2.81</td>
</tr>
<tr>
<td>Shanghai</td>
<td>2.56</td>
</tr>
<tr>
<td>Guangzhou</td>
<td>2.38</td>
</tr>
<tr>
<td>Sapporo</td>
<td>1.65</td>
</tr>
<tr>
<td>Beijing</td>
<td>2.11</td>
</tr>
<tr>
<td>Washington D.C</td>
<td>4.10</td>
</tr>
<tr>
<td>London</td>
<td>2.63</td>
</tr>
<tr>
<td>Shenzhen</td>
<td>2.21</td>
</tr>
</tbody>
</table>
In a future bikesharing system serving 500 million people in 500 cities around the world...

If every person cycled for 30 minutes a day (about two average trips)...

If 10-20% of bikesharing trips replaced short car trips...

If city governments planned user-friendly and safe cycling infrastructure to encourage cycling culture...

### FUTURE WORLD SCENARIO

- **CO\textsubscript{2}** avoided per year
  - 30–60 million tonnes

- Economic savings from CO\textsubscript{2} reduction
  - $1.3–2.6 billion USD

but you can’t put a price on increases in health and happiness.
HOW CITIES IMPROVE CYCLING
HOW CITIES IMPROVE CYCLING
EFFECTIVE BIKE PARKING MANAGEMENT

Tokyo

Improving bike parking near public transportation stations

- Enhances integrated transportation
- Saves time and fuel searching for auto parking facilities
- Saves public space on streets

(Sources: https://weburbanist.com/2015/03/26/invisible-bicycles-tokyo-soft-tact-tech-underground-bike-parking/)

Seattle Department of Transportation

Regulating for proper parking on streets

- Designates specific areas for bikeshare parking
- Strictly enforces the law

(Sources: https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/BikeSharePermitRequirements.pdf)
HOW CITIES IMPROVE CYCLING

EFFECTIVE BIKE PARKING MANAGEMENT

--- Jinan, China ---

- Policy requirements for bikeshare:
  GPS tracking & big data capabilities
- **6,000** bike parking spots pre-designated prior to Mobike launch
- **10,000** additional parking spots provided within one year based on Mobike big data analysis

--- Singapore ---

- Provided hundreds of bikeshare parking areas within a few months.
- Located parking areas at subway stations, bus stations and residential areas based on big data analysis of actual supply & demand.
HOW CYCLING IMPROVES CITIES
PROVIDING SAFE BIKE LANES AND INFORMATION

New York City Department of Transportation
Bike Map for Cyclists & Route Planning

Displays:
- different types of cycling lanes
- bike shop locations
- points of interest for tourists

WRI Cities Safer by Design
better cycling lanes

- Protected cycling lane
- Visible bicycle signals
- Proper markings at intersections
Community-building events can improve neighborhood livability

Pablo Celis, Experiences of Cycling Development from Denmark, Sept. 13th, 2017

City of Aarhus

“Bike library” makes cycling more fun

- People can borrow different types of bikes
- Provides more choices and helps promote the joy of cycling

India Raahgiri Day

Open street events for all

- A part of the road is closed off for cars and residents are given access to these open spaces
- Community-building events can improve neighborhood livability
Mobike initiated “World Cycling Day” with UN Environment, UN Habitat, WHO, WRI and WWF on September 17, 2017.

- The event will be held annually.

- World Cycling Day centers on the concept that “cycling changes cities”, and aims to improve traffic conditions and quality of life, as well as furthering sustainable urban development.
HOW CYCLING IMPROVES CITIES
TOWARDS LIVABLE CITIES THROUGH
SHARED MOBILITY PRINCIPLES

Shared Mobility Principles for Livable Cities

The future of mobility in cities is multimodal and integrated. When vehicles are used, they will be right-sized, shared, and zero emission. These principles guide urban decision-makers and stakeholders toward the best outcomes for all.

1. Plan cities and mobility together
2. Focus on moving people, not cars
3. Encourage efficient use of space and assets
4. Engage stakeholders in decision making
5. Design for equitable access
6. Transition towards zero emissions
7. Seek fair user fees
8. Deliver public benefits via open data
9. Promote integration and seamless connectivity
10. Automated vehicles must be shared

*Shared vehicles include all those used for trips to transport people (mass transit, private shuttles, buses, taxis, auto ridesharing, car and bike-sharing) and urban delivery vehicles.

SharedMobilityPrinciples.org
#LivableCities
#10principles
Mobike is working with global NGOs to reach SDGs of sustainable cities & communities (goal 11), climate action (goal 13), and social equality (goal 5, 10), in some specific areas:

- Providing safe, affordable, accessible and sustainable bike-sharing system for all.

- Integrating first and last mile cycling with expanded public transportation networks to support inclusive urban development, link travel between urban, peri-urban and rural areas, and reach more economic opportunities.

- Reducing air pollution and contribute to climate change mitigation by providing green commuting.

- Supplying an equal-access bikesharing system affordable to women, children and the poor, especially in developing and the least developed counties.
No matter how varied cities are around the globe, cycling and city planning can make them better. In some cities, smart bikesharing and its big data insights are already initiating change by making cycling an integrated part of urban transportation systems.

Shared bikes encourage people to cycle as a part of their daily life, rather than just for leisure. Combining cycling with public transportation can increase the number of job opportunities and education options within a 30-minute commute. Cities are planning better infrastructure, with assistance from bikesharing big data. Importantly, replacing car trips with cycling has reduced harmful emissions.

We are only just beginning to see the benefits and improvements to our quality of life, made by integrating cycling infrastructure to our cities. Through continued collaboration with public institutions, businesses, communities and individuals, smart bikesharing has great potential to make our future cities more live-able for everyone.