HOW TO IMPROVE MICROMOBILITY IN YOUR CITY

eit Urban Mobility

Co-funded by the European Union

Insights from the pilot testing in Prague and Madrid

www.parkedbyme.com

Parked ByMe

THE SOLUTION FOR PRECISE PARKING OF SHARED BICYCLES AND KICKSCOOTERS ALREADY EXISTS.

eit Urban Mobility

Co-funded by the European Union

Parked ByMe

ParkedByMe

uses extremely precise Bluetooth sensors to **delineate a particular parking space** for shared bicycles, e-bikes, and e-scooters.

ParkedByMe is a **one-year project co-funded by the EIT Urban Mobility** and led by PowerHUB (CZ), SparkPark (NO), FACTUAL (ES), Prague 7 (CZ) and Madrid (ES).

PowerHUB Power for Ventures

SparkPARK

FACTUAL

PRAHA 7

madrid

eit Urban Mobility

Co-funded by the European Union

How does ParkedByMe work?

Shared mobility services often rely on **GPS to verify vehicle parking.** In dense areas or near tall buildings, **accuracy can suffer**. **ParkedByMe** solves this by using **high-precision sensors to ensure shared bikes, e-bikes, and e-scooters are parked accurately** within designated zones, keeping city streets organized and safe.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Who can benefit from ParkedByMe?

Cities and towns

- A significant **reduction in improperly parked** shared e-bicycles and e-scooters
- Supporting the use of **environmentally friendly** transport
- **Improved use of public space** for people with disabilities

Operators

- **Saving the cost** of searching for discharged or mis-parked e-bicycles and e-scooters
- **Improved relationships with cities and towns** through precise parking of shared e-bicycles and e-scooters
- An enhanced **positive image** of shared urban micro-mobility

Other use cases

- Create stations for the parking of shared bikes, e-bikes or e-scooters **without the need to install docks**
- Usage in **self-driving vehicles** and delivery robots
- **Geofencing** of parking spaces
- **Improved logistics accuracy** in road and sea transport

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

We bring benefits to the city, its citizens and the operators

SAFETY

Ensure safe streets for people with disabilities, for whom poorly parked bicycles/scooters make it difficult to move.

POSITIVE PERCEPTION

Positive perception of micromobility and thus its use.

REPORTING

Better overview of the use of parking spaces.

BETTER RELATIONSHIPS

with residents.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Comparison of Digital vs. Alternative Solutions

Digital solution

Software and sensors for tracking the parking

- ⊕ Lower investment, quick deployment, costs can be born by either municipality or operators, real-time data monitoring,easy data sharing via API or front-end
- ⊖ Requires permits for installation from the city,atypical parking spots require adjusted calibration

Docking stations

Physical parking racks built in the streets

- ⊕ Playing on people's parking behaviour - ensuring parking only up-to the capacity of the dock
- ⊖ Costly, requiring investment and longer delivery, limited capacity of vehicles parked

Regulation

Municipal or country-wide legislation, licenses or permits establishing rules and fees.

- ⊕ Provides city with enforcement power, enables collecting fees for parking micromobility vehices
- ⊖ Requires political will to adopt the regulation and consensus over its rules, lacks verification of compliance and requires cooperation with other dpts. for enforement

On-site Service

24/7 available service to remove all reported mis-parke vehicles within a specified timeframe.

- ⊕ Good efficiency in smaller towns, no investment for Docks or HW
- ⊖ Requires 24/7 availability of personnel to remove mis-parked vehicles, difficult to maintain in larger cities due to large areas

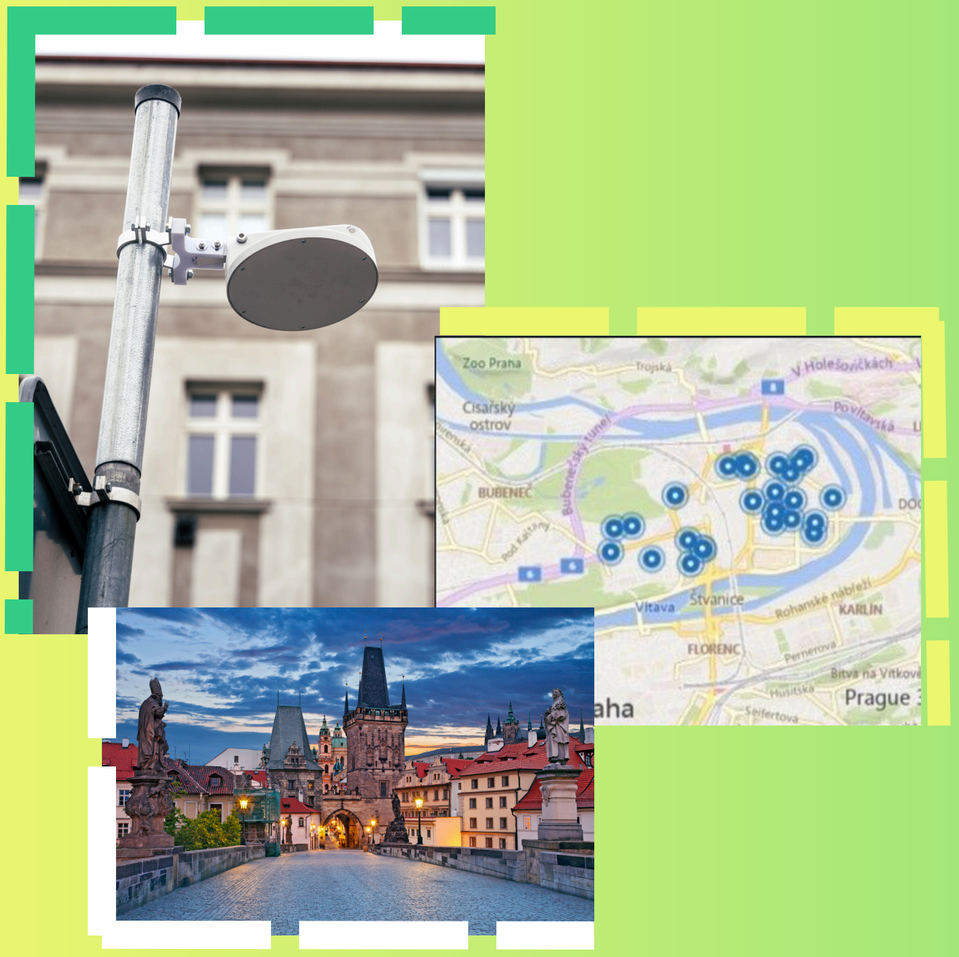
eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Real-life testing of the ParkedByMe solution

We tested the ParkedByMe solution for high-precision parking of shared micro-mobility vehicles in two European cities: Prague and Madrid.

eit Urban Mobility
Co-funded by the European Union
ParkedByMe

Prague 7 and Madrid pioneered the solution



- We cooperated with **Prague and Madrid** municipalities on a **12-month** project.
- We deployed sensors at **25 parking spots** in each city to test the difference between parking with SparkPark **Bluetooth-based** sensors vs. stations using **GPS**.
- We **analysed** the data on parking events and the precise position of parked vehicles to operators and cities.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Overview of the pilot operations in Prague

CONNECTED OPERATORS

We integrated the bike rental application Kolem Plzne.
We tracked the accuracy of GPS positioning vs. Bluetooth based positioning via SparkPark sensors and app back-end intergation.

OBSERVATION STATUS

We also see positioning of the vehicles of other operators in Prague. Upon request, we are analysing also the volume of the mis-parked vehicles in the 25 locations.

DATA COLLECTION SCOPE

Bluetooth-based antennas were installed at 25 parking stations in Prague 7.
We collected data about active rides and parking events from 4 October - 10 November.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

PRAGUE

JANUARY 2024
Project Start - R&D

JUNE 2024
Installation of sensors

AUGUST - SEPTEMBER 2024
Integration and testing

OCTOBER 2024
Live Demo

www.parkedbyme.com

eit Urban Mobility

Co-funded by the European Union

Parked ByMe

Overview of the pilot operations in Madrid

INSTALLATION

The Bluetooth sensors were installed on the vertical signage. The locations with horizontal and vertical signage were preferred.

OBSERVATION STATUS

The Mayor of Madrid decided to ban kick-scooters from the city in the midst of pilot implementation. The reasons being lack of data sharing, mis-parking and disproportionate positioning.(1)

DATA COLLECTION SCOPE

As a complementary analysis, we tracked traffic of shared bikes from biciMAD municipal company.

Source: Official press release from Madrid city council on the e-scooter ban https://www.madrid.es/portales/munimadrid/es/Inicio/Actualidad/Noticias/Madrid-revoca-las-autorizaciones-de-patinetes-de-alquiler-y-ya-no-podran-circular-por-sus-calles/?vgnextfmt=default&vgnextoid=27c2dbbe991c1910VgnVCM1000001d4a900aRCRD&vgnextchannel=a12149fa40ec9410VgnVCM100000171f5a0aRCRD

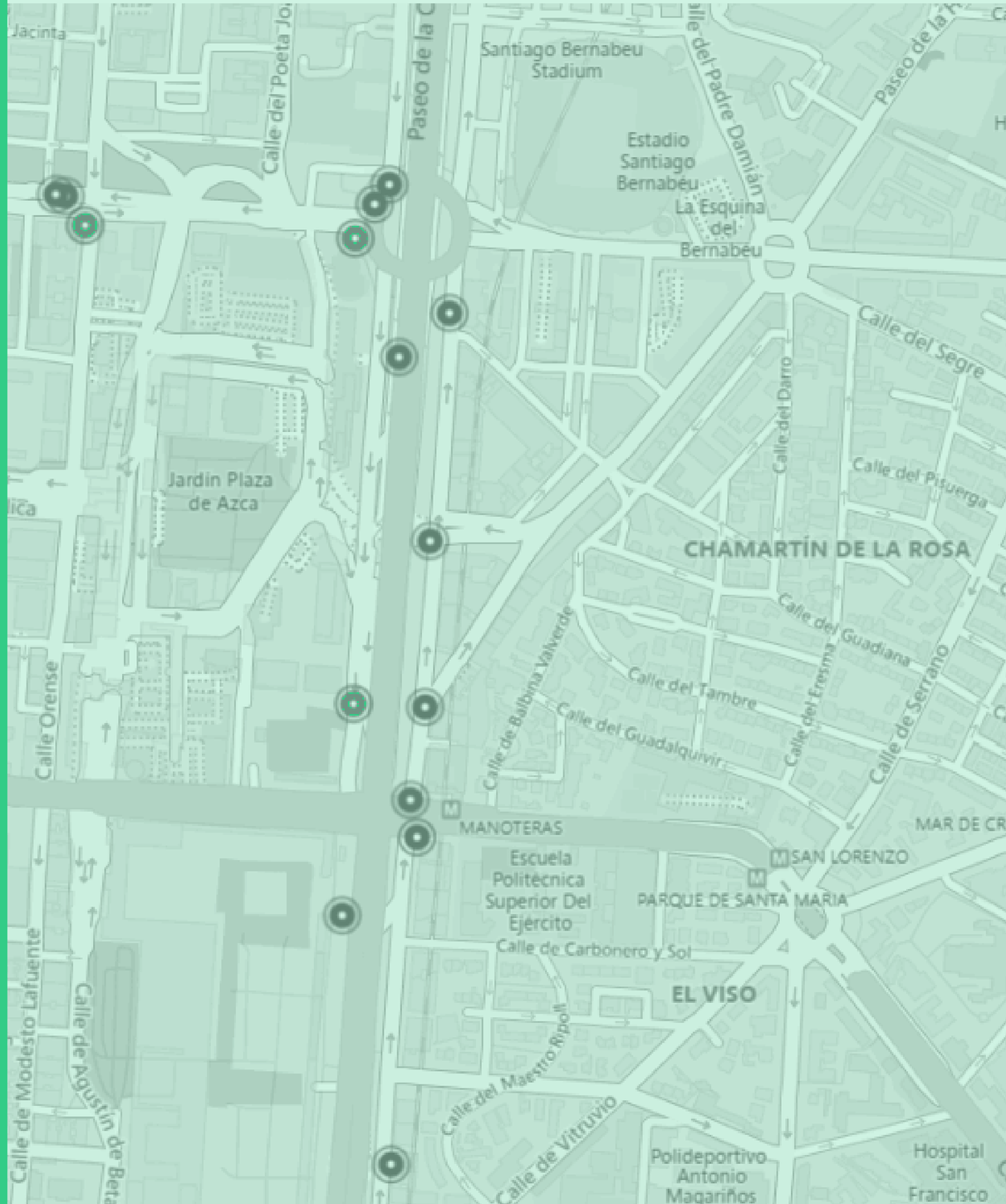
eit Urban Mobility
Co-funded by the European Union
Parked ByMe

MADRID

JANUARY 2024
Analysis of locations

AUGUST 2024
Installation and callibration of sensors

OCTOBER 2024
Collection of data

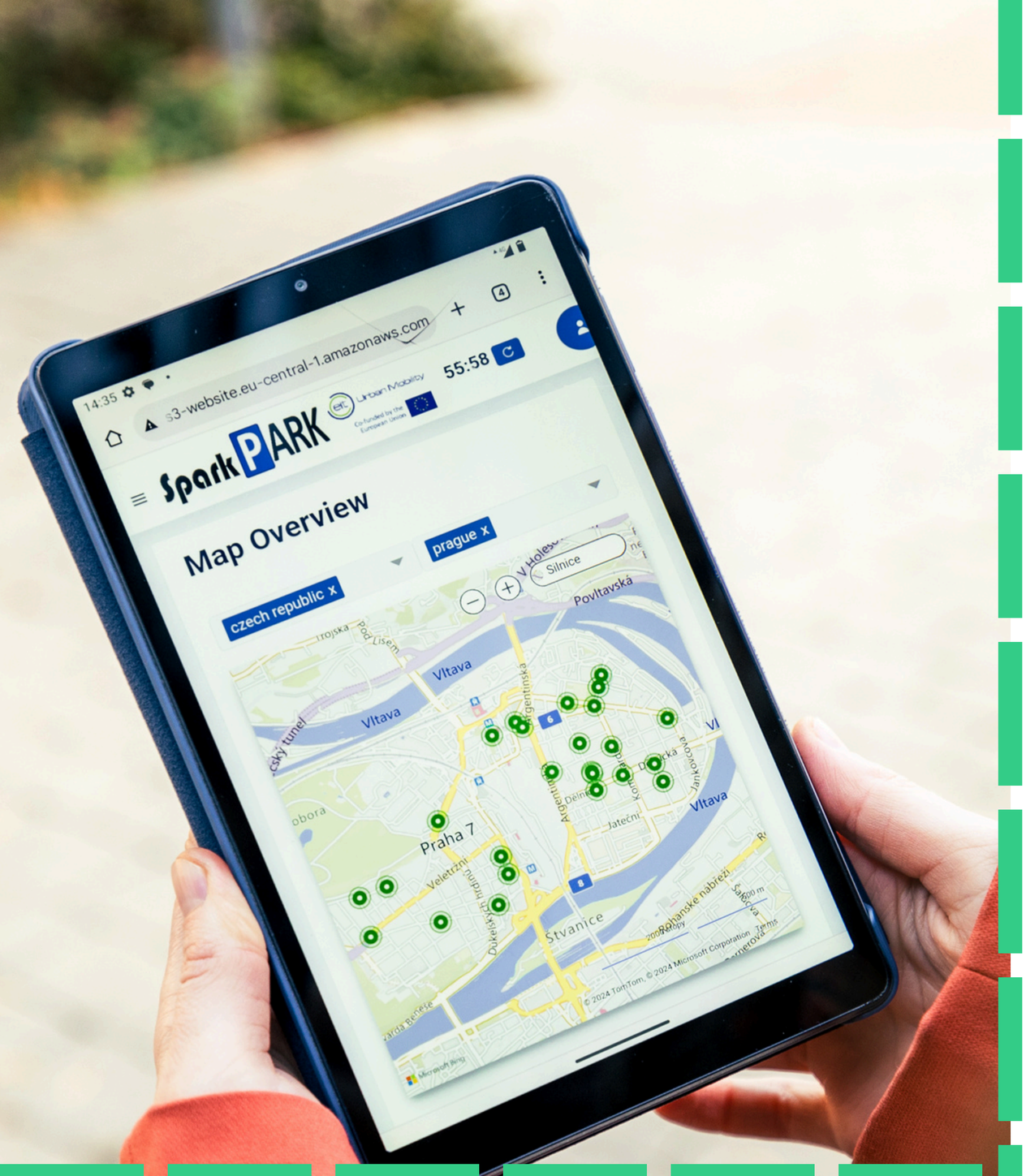


www.parkedbyme.com

eit Urban Mobility

Co-funded by the European Union

Parked ByMe

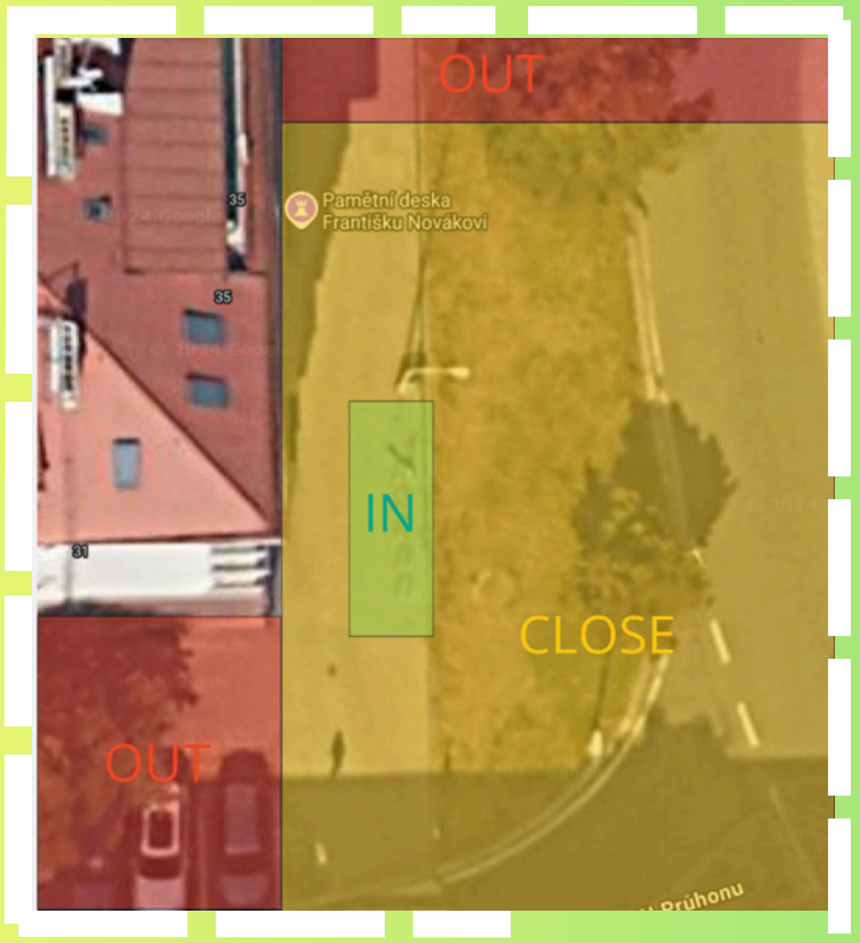


Data analysis & evaluation

As part of the project, we conducted:

1. Comparison of Bluetooth vs GPS positioning **accuracy**
2. Vehicle **mis-parking statistics** across Prague operators
3. Shared-bicycle **traffic** for EMT Madrid

Methodology and collected data



SparkPark's system tracks parking spots across three different vehicle states:

OUT - The vehicle is no longer detected on the parking spot and after a timeout this message is reported.

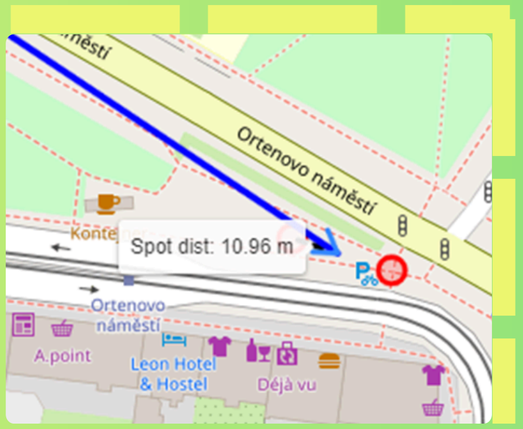
CLOSE - The vehicle is located close to the parking spot but are but within the boundaries of the parking spot.

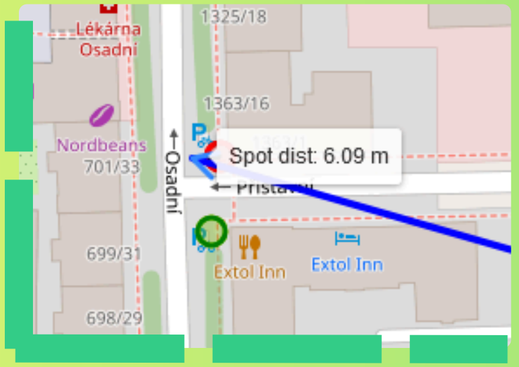
IN - The vehicle is inside the designated parking spot.

We have analysed the Bluetooth-based positioning of the parked vehicle vs. recorded GPS positioning.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Examples of Innacuracy of GPS





- The GPS position gets inaccurate in areas with high buildings.
- This means that very frequently the GPS records false negative parking, i.e. the vehicle is tracked outside the designated parking zone although the vehicle is factually in the zone.
- SparkPark has a closer proximity to the vehicles and thus would have a higher expectancy to outperform GPS/GNSS in these use cases.

NOTE: The positioning used as GPS in these tests relies on a device that is more advanced than typical bike GPS units. It is also likely to utilize WiFi and LTE positioning in addition to GPS/GNSS. In the Android version of the app, users can override the GPS settings.

www.parkedbyme.com

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

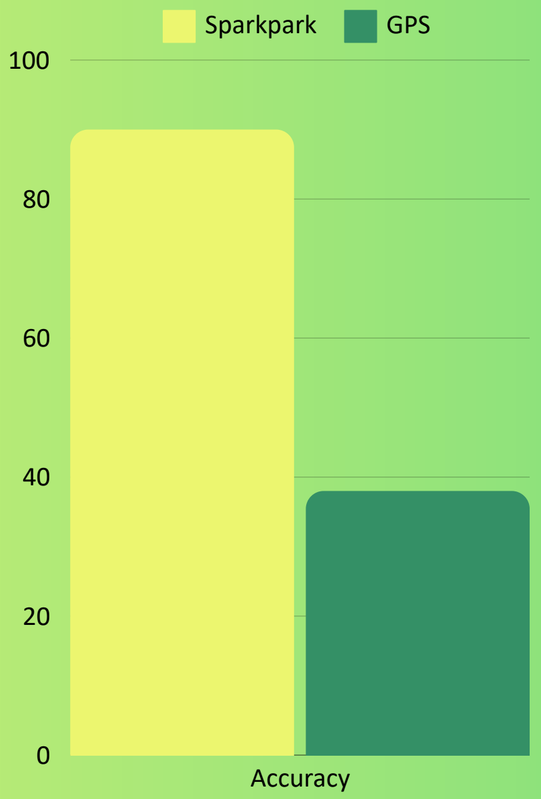
1. Comparison of GPS/GNSS vs. Bluetooth-based positioning

SparkPark consistently demonstrated high accuracy in detecting parking events across all dates, with success rates close to or at 100%. GPS/GNSS Performance varied significantly, with success rates ranging from 30.4% to 66.7%, often indicating deviations in precise positioning when compared to SparkPark's positioning accuracy.

638

Analyzed parking events

Out of the total of 664 parking events, we analysed 638.



Average positioning success rate:

90,6 %
Bluetooth-based

578 parking events tracked in the designated parking zone by Bluetooth-based antenna.

vs.

38,4 %
GPS/GNSS-based

245 parking events tracked in the designated parking zone by GPS/GNSS based positioning.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

2. Correct or Mis-parking?

We are also able to see the Bluetooth signal of all vehicles which transmit it. Therefore, we can determine whether shared micromobility vehicles are parked inside or in a proximity of the designated parking zones. We conducted such analysis in Prague 7 upon request.

7

day analysis

covering 24h periods was conducted to determine **how often** and for **how long time** the micromobility vehicles park outside the designated zone.

20-25

minutes

is the **average duration** in which the vehicles were **parked outside** the designated parking zone.

42-56 %

of vehicles

from the 3 operators observed were parked **outside** the designated parking zone (CLOSE status) during the analysed days.

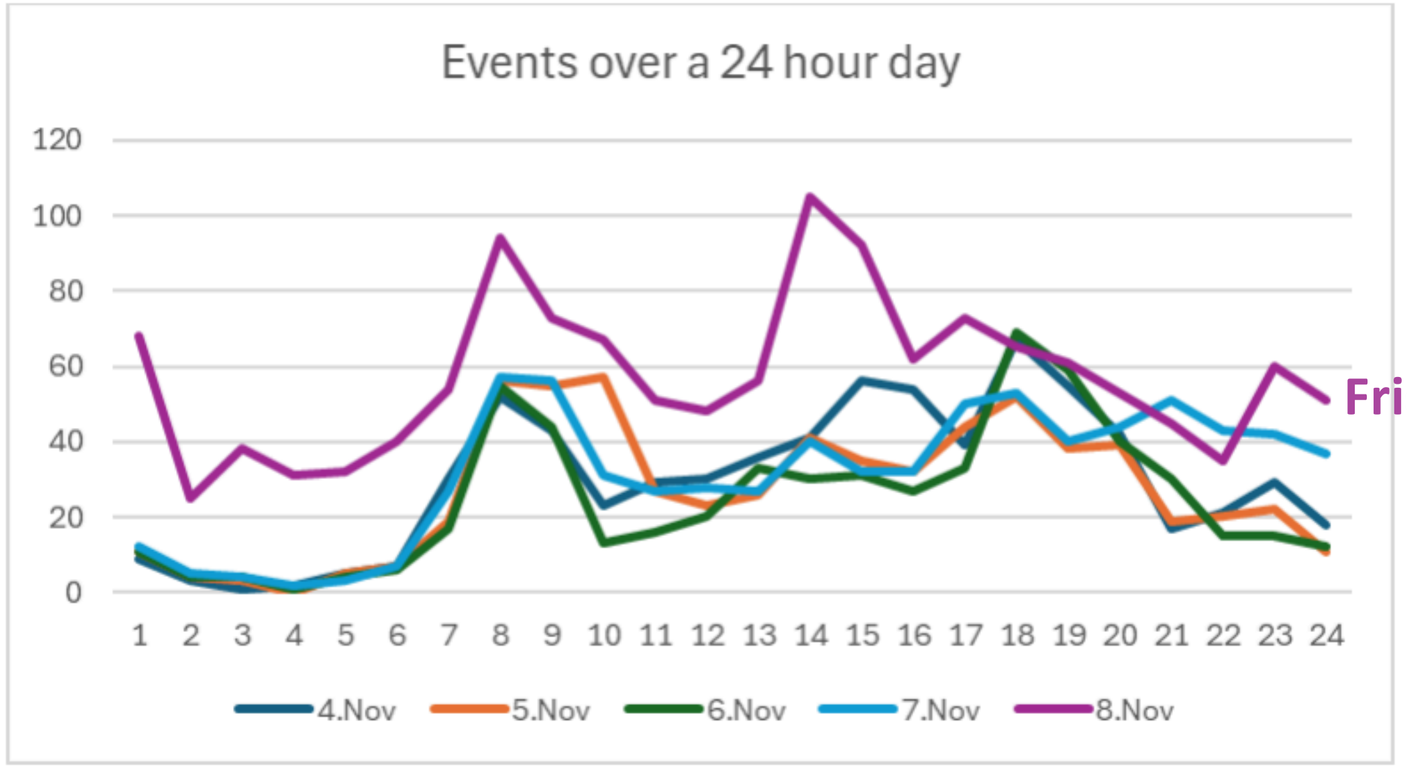
This is the first independent source of data available to record and validate the parking of shared micromobility vehicles, additionally to data provided by operators themselves.

www.parkedbyme.com

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

3. Traffic analysis results from Madrid

Figure A1: Number of shared bikes (biciMAD) passing by the ParkedbyMe sensors per hour in Madrid on five indicative days



You can see the statistics from the traffic in the proximity of 25 SparkPark Bluetooth antennas in Madrid, demonstrating significantly **higher** number of rides on **Friday** compared to other weekdays, and **peaks** in traffic corresponding with citizens **commuting** time **to/from work.**

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Key takeaways and results of analysis

- **Bluetooth**-based potisioning significantly **outperforms** GPS/GNSS technology (90% vs. 38% success rate).
- Despite high fluctation of shared micromobility vehicles, still **around 50%** of them are **parked outside** designated parking zones.
- The **traffic** of shared micromobility vehicles demonstrates **connection** with **work commute**.
- The **cities** often **lack data** on parking accuracy and distribution of vehicles at each parking spot.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

How cities manage and/or regulate shared micromobility?

We conducted a research on how European cities approached management of shared micromobility. Did they impose regulation and permits or licenses to operators?

eit Urban Mobility
Co-funded by the European Union
Parked Me

Regulation in Spain

- E-scooters and bikes regulated under **national traffic laws**, but local authorities have **autonomy** to enforce stricter measures.
- Cities like Madrid allocated operating **permits** through competitive **tenders**, limiting the number of operators (e.g., Tier, Dott, Lime in Madrid).
- **Banning of dockless services and designated parking zones (docks) for bike-sharing mandated** in many cities (e.g., Barcelona, Valencia).
- **Geofencing** technology often required for **compliance**.
- Operators face **penalties** for non-compliance; **fines** are common for mis-parked vehicles.
- **Real-time monitoring** and rapid response **expected from operators.**

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Regulation in Czechia

- **No** unified national **regulation**; municipalities manage shared micromobility independently.
- Cities lack consistent rules for parking and operations, leading to varied enforcement.
- Some cities impose **obligations for quick removal** of mis-parked vehicles (within 24 hours).
- The cooperation between cities and operators is often based on **memoranda**/gentleman agreement, challenging any **enforecement** measure.
- **No cities** impose **fines** for **mis-parking** directly on operators. **1 city** identified collects **fees for renting parking areas** by operators.
- Operators implement **internal measures** (e.g., GPS-based tracking, user penalties) to manage parking **compliance**.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Opinions on shared micromobility

We have inquired stakeholders for which the shared micromobility is relevant, about their experience with **mis-parking and shared micromobility in general**:

- operators
- municipalities
- organisations for people with disabilities
- people with disabilities

eit Urban Mobility
Co-funded by the European Union
Parked Me

Municipalities' view and experience

Respondents: 1 Spanish and 7 Czech municipalities/public institutions, managing shared micromobility

- Respondents advocate for a hybrid approach combining **digital** solutions (cost-effective) and **physical** infrastructure (e.g., racks and zones) to influence user behavior and improve visibility.
- **Parking areas** should **prioritize roads** over pedestrian zones to minimize disruption.

- Most frequently, the **parking areas** are **selected** by the district municipalities **in cooperation** with micromobility operators, taking into account the requirements from the police or other public administration institutions.

- **The key challenges:**
  - clear and enforceable parking rules, alongside infrastructural measures for cyclist and scooter safety on roads
  - effective coordination between providers and city representatives
  - integration into urban transport systems
  - ensuring user convenience through tools like integration with navigation platforms (e.g., Google Maps)
  - fostering public acceptance and cooperation among users requires time and visible regulation

- In Spain, we observe a greater focus on **bike-sharing than kick-scooters.**
- It has been noted the **digital** solution considered a better **cost-efficient** alternative compared to building parking docks/racks.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

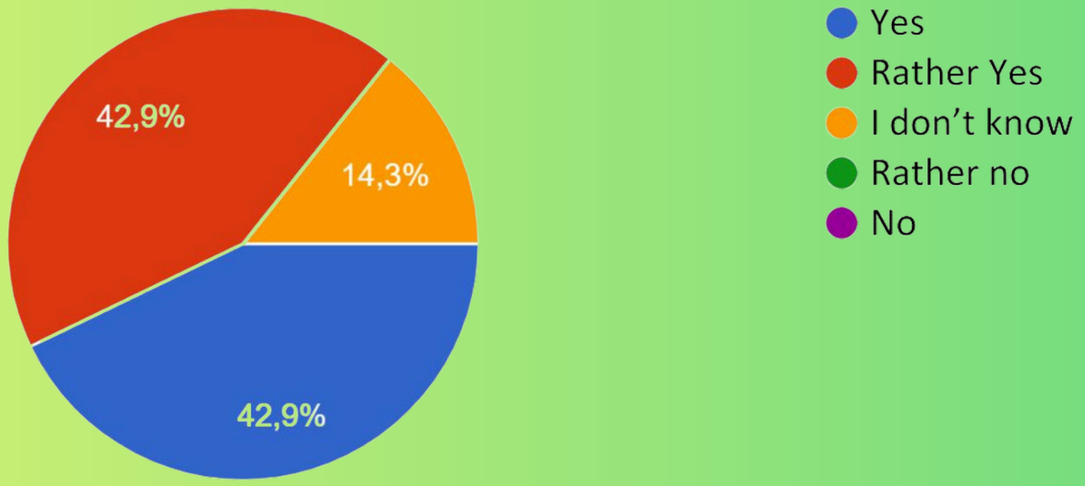
Municipalities outside the project.

Excl. municipalities involved in the project as partners.

Czech Republic

Are shared micromobility services anticipated to grow in your city/district?

7 responses



eit Urban Mobility
Co-funded by the European Union
Parked ByMe

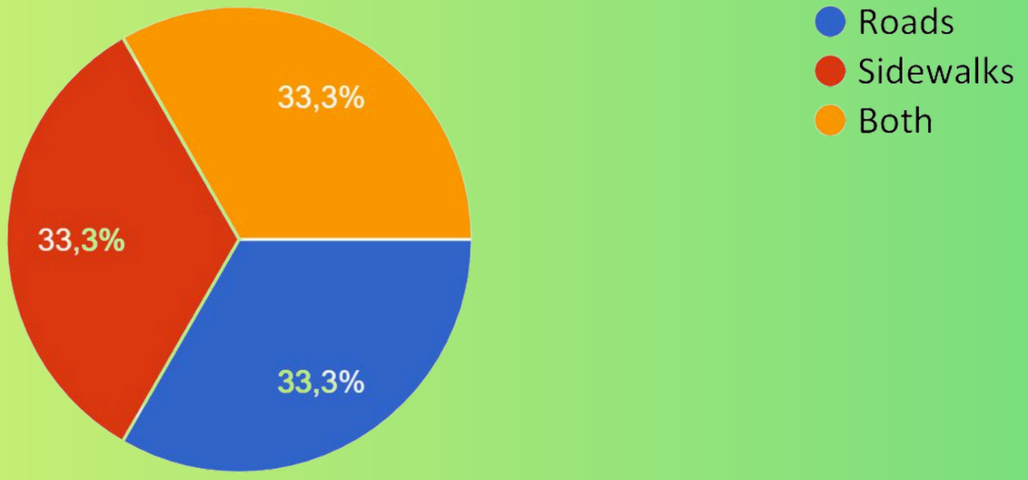
Municipalities outside the project.

Excl. municipalities involved in the project as partners.

Czech Republic

When planning the parking spots, are you allocating spots to roads or sidewalks?

6 responses



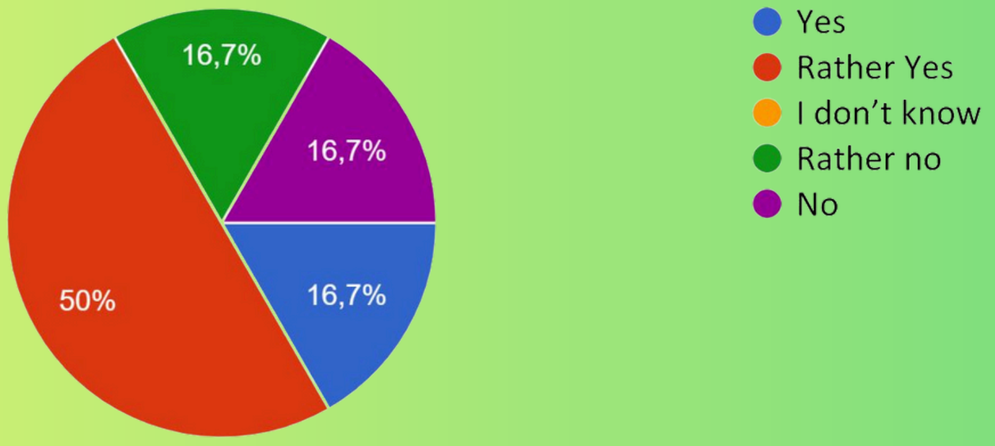
Municipalities outside the project.

Excl. municipalities involved in the project as partners.

Czech Republic

If the ParkedByMe solution works well, would you consider increasing the number of micromobility vehicles and parking spots in the city?

6 responses



eit Urban Mobility
Co-funded by the European Union
Parked ByMe

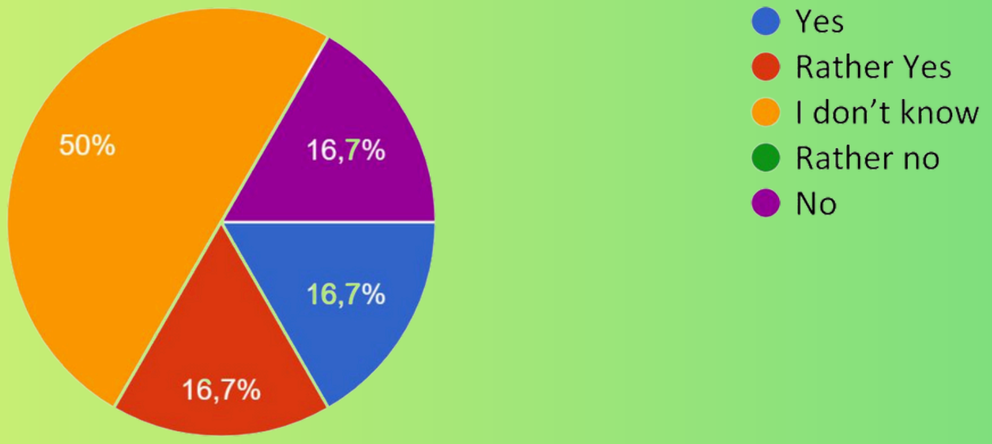
Municipalities outside the project.

Excl. municipalities involved in the project as partners.

Czech Republic

Would you consider the ParkedByMe solution as an obligation for operators to be compliant with the regulation in Prague?

6 responses



eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Operators' view

2 operators from Czechia, 1 from Spain

	SPAIN	CZECHIA
CHALLENGES AND INFRASTRUCTURE	**Political** delays in regulations, limited **tenders**, and inadequate **infrastructure** like bike lanes and parking spaces	Insufficient **infrastructure**, GPS inaccuracy, vehicle **theft**, and mis-parking were common challenges.
COLLABORATION WITH MUNICIPALITIES	Operators work **closely with municipalities** to decide parking spots based on infrastructure, usage, and location criteria.	Operators **collaborate** with cities for parking zones

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Operators' view

2 operators from Czechia, 1 from Spain

	SPAIN	CZECHIA
FINES AND ENFORCEMENT	**Municipalities impose fines** on operators, but operator **does not fine users** directly.	**Municipalities did not imposed fines** on the operators. The operators **impose fines** against users **rarely**, or rather used **strike-ban** policy.
PUBLIC PERCEPTION	Mis-parking contributes to **negative** public perception, impacting the image of micromobility services.	**Public opinion varies**, with mixed responses influenced by user behavior. Proactive maintenance of bicycle parking helps mitigate backlash.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

NGOs, and people with disabilities

NEGATIVE IMPACTS ON ACCESSIBILITY

Perceived as hazards due to improper parking and unsafe usage. These create significant obstacles for individuals with disabilities, particularly on sidewalks, crossings, and metro stations.

SAFETY CONCERNS

Dangerous behaviors like speeding on pedestrian pathways and lack of clarity on operational zones increase risks for pedestrians, especially visually impaired individuals.

REGULATORY AND ENFORCEMENT NEEDS

Respondents emphasize the need for stricter enforcement of parking and traffic rules. Suggestions include treating mis-parked vehicles like cars (towing, high storage fees), creating citywide regulations, and establishing clear contracts with operators to ensure fleet management.

INFRASTRUCTURE PROPOSALS

Designated parking areas, scooter and bike stands, and barrier-free infrastructure (e.g., accessible toilets and elevators) are essential to reduce disruptions and enhance accessibility.

UNIFIED APPROACH

Municipalities must collaborate across districts to create consistent policies, improve oversight, and hold operators accountable for improper parking and unsafe practices.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Key messages

The challenge of mis-parking is differently perceived by different stakeholders:

- people **with disabilities** consider serious danger **risk**
- municipalities emphasize the need for **hybrid approach** - digital + intrastructural solutions
- operators **do not** consider **parking** as the **key issue**

There is usually cooperation established between the operators and the municipalities to select the parking spots.

None of the repospondents from the Czechia were able to report specific **statistics** on improperly parked vehicles, implying the **lack of access to the data** by municipalities from the operators.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Trends in shared micromobility

- We have analysed academic studies and grey literature from expert networks to identify the key trends in shared micromobility and the challenge of mis-parking.

eit Urban Mobility
Co-funded by the European Union
Parked Me

Insights from Expert Organisations

Focus on funding **infrastructure** and **integrating** shared mobility with **public transport**. Advocate for increased fleet sizes to meet demand and climate goals (Cycling Industry Europe, 2024).

Support for stronger **regulation** to ensure safety (POLIS Network, 2023) and increase positive perception of shared micromobility (Gössling, 2020). Cities often regulate reactively, leading to inconsistent frameworks. Operators are frequently non-compliant with parking and usage rules, necessitating stricter enforcement (Fuss e.V., 2024).

Fixed parking stations can reduce chaos significantly, lowering improper parking incidents to below 10% in areas with stations (Fuss e.V., 2024).

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Insights from Academic Research and Policy Reports

Different **cities** have **different rules** on where / how **kick-scooters** riders can **park**. 22% of US cities prohibit e-scooter parking on bike racks and corrals (Brown, 2021), in Madrid these are typical locations where kick-scooter riders were allowed to park.

The users **do not mis-park** vehicles **intentionally** (Brown et al., 2021), noting the confusing rules for parking as the reason (Klein et al., 2023).

The **non-users** are more **likely** to report the sidewalks as **obstructed by mis-parked** e-scooters than users, suggesting some misalignment in the **perceptions** of the two groups (Buehler et al., 2021).

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Insights from Academic Research and Policy Reports

Neither vertical nor horizontal signage (parking corrals or striped stalls) were observed to have significant **impact** on improved parking (Brown et al.,2024).

Over 30% decrease in non-compliant parking recorded by using **lock-to requirement** (Klein et al., 2023)) or, presumably, by enforcing **mandatory parking areas** (Brown et al.,2024).

There is **lack of research on the effectiveness of fines**, but we hypothesise fines are more useful to “push” operators to work with cities on solutions and a way for cities to acquire data on improper parking, rather than to ensure proper parking.

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Key recommendations and lessons learnt about shared micromobility in general

- **Ban of kick-scooter** in EU cities shows the **trend** negatively impacting shared micromobility operators.
- Shared micromobility is not used only by tourists, but to greater extent **by local citizens.**
- **Municipalities** often **lack data** from operators.
- **Regulation** of/rules for shared micromobility provides municipalities with power to enforce neat parking and introduce obligation to receive data from operators.
- **Behavioural** aspect (educating the users) and **clear rules** is important for correct parking.
- **Digital** solutions can bring **cost-effective** and **faster** solution to the challenge of mis-parking than **fixed parking** docks, which we also note as an **impactful** mesaure for correct parking.
- Coexistence of shared micromobility in cities works better when municipalities and operators build **cooperative relationships.**

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

Interested? Reach out to us

Marie Koflák
PowerHUB
marie@powerhub.cz

Marc Figuls
FACTUAL
marc@factual-consulting.com

Igor Pancevski
SparkPark AB
Igor@sparkpark.no

eit Urban Mobility
Co-funded by the European Union
Parked ByMe

PowerHUB is a technology transfer organisation focused on innovation and research. Since 2017, they have sought to **make the world more sustainable, equitable, and connected** by helping big ideas become a reality.

Born in Oslo in 2020, SparkPark helps **cities empower micromobility shared services by offering centimeter-level precision parking**. By providing this solution, SparkPark enables cities to optimize space management, reduce clutter, and improve the overall efficiency and safety of shared transportation services.

FACTUAL is a foresight strategy and innovation consultancy focused on **transforming mobility through cutting-edge solutions**. By leveraging a global network of experts and a unique blend of strategic foresight, R&D collaboration, and disruptive technology, FACTUAL tailors adaptable, customer-centered solutions that drive innovation in the mobility sector.

Prague 7, a district of the Czech capital and Madrid, Spain's capital, are the **two pilot cities** where ParkedByMe technology is being tested.

Co-funded by the European Union

Founded in 2019 as an initiative of the European Institute of Innovation and Technology (EIT), a body of the European Union, EIT Urban Mobility is **committed to accelerating the transition to sustainable mobility.**

References

- Brown, A., Klein, N. J., Thigpen, C., & Williams, N. (2020). Impeding access: The frequency and characteristics of improper scooter, bike, and car parking. Transportation Research Interdisciplinary Perspectives, 4, 100099.
- Brown, A, Klein, NJ and Thigpen, C. (2021). Can you park your scooter there? Why scooter riders mispark and what to do about it. Findings. DOI: https://doi.org/10.32866/001c.19537
- Brown, Anne, Calvin Thigpen, and Nicholas J Klein. 2024. “Scooting around the Margins: Testing Scooter Parking Design Pilots.” Findings, December. https:/ / doi.org/ 10.32866/ 001c.127199.
- Buehler, R, et al. (2021). Changes in travel behavior, attitudes, and preferences among e-scooter riders and nonriders: first look at results from pre and post e-scooter system launch surveys at Virginia Tech. Transportation Research Record, 2675 (9), 335–345. DOI: https://doi.org/10.1177/03611981211002213
- Chen, Z., van Lierop, D., & Ettema, D. (2020). Dockless bike-sharing systems: what are the implications? Transport Reviews, 40(3), 333–353. https://doi.org/10.1080/01441647.2019.1710306
- Dunn, PT. (2020). Participatory infrastructures: the politics of mobility platforms. Urban Planning, 5 (4), 335–346. DOI: https://doi.org/10.17645/up.v5i4.3483
- Fuss e.V. (2024). Scooterstudie 2024 and 2023 final oA.
- Gössling, S. (2020). Integrating e-scooters in urban transportation: problems, policies, and the prospect of system change. Transportation Research Part D: Transport and Environment, 79, 102230. DOI: https://doi.org/10.1016/j.trd.2020.102230
- Klein et al. 2023. Clutter and Compliance: Scooter Parking Interventions and Perceptions. Active Travel Studies: An Interdisciplinary Journal, 3(1): 1, 1–21. DOI: https://doi.org/10.16997/ats.1196
- POLIS Network. (2023). Shared-micromobility-report. November 2023. https://www.polisnetwork.eu/wp-content/uploads/2023/11/SHARED-MICROMOBILITY-REPORT.pdf
- Cycling Industry Europe. (2024). CIE Bike Sharing 2024 Report. https://cyclingindustries.com/fileadmin/CIE_Bike_Sharing_2024_Report.pdf

eit Urban Mobility

Co-funded by the European Union

Parked ByMe

ParkedByMe

www.parkedbyme.com

eit Urban Mobility

Co-funded by the European Union