



The bike-sharing (bike hire) concept has been available for decades, but since the turn of the millennium such systems have spread across the globe and have become part of the sustainable mobility offer for many cities. These schemes traditionally provide public hire bikes at bike ‘docking stations’ throughout the city. With the rapid development of technology and new business models, dockless bike-sharing<sup>1</sup> providers have emerged and boomed in the second half of the 2010s, with especially high penetration in China. However, their rise in cities globally did not exploit the full potential of the concept in improving mobility, and has also caused negative externalities, which made necessary for cities to develop regulations.

#### Problem description

While the bike-sharing concept has been known for decades (with WhiteBikes launched in Amsterdam in 1965), ‘traditional’ bike-sharing schemes based on docking stations spread across the globe and have become part of the sustainable mobility offer of many cities since the turn of the millennium (e.g. Citybike, Vienna 2003; Velo’v, Lyon 2005; Bicing, Barcelona 2007; Barclays Cycle Hire (later Santander Cycles), London 2010; Citi Bike, New York 2013; and MOL Bubi, Budapest 2014).

Since then, technology has been developing rapidly, including the penetration of smartphones and the appearance of low-consumption GPS units. As a consequence, investment-heavy fixed infrastructure (docking stations, electric charging at docking stations) are substituted

by solutions allowing flexible parking of bikes at public spaces and relocating them, while access is offered more and more via the users’ own smartphones (most commonly apps).

As technology made so called ‘dockless’ (or ‘freefloating’) solutions possible, such bike-sharing providers have emerged and boomed in the second half of the 2010s, with especially high penetration in China. Their business model was based on introducing much larger bicycle fleets at a much quicker pace, allowed by free-floating technology (as there was no need to deploy expensive docking stations) and making use of the unclear regulation of the use of public space. Ofo started in October 2015 in Beijing with 2,000 bikes, while at the end of 2016 it had 85,000 bikes in China, and in 2017 it deployed more than 10 million bikes in 250 cities globally. Mobike, founded in 2016, started its international expansion in 2017, and by mid-2018 it operates in around 200 cities in 15 countries. oBike started in 2017 in Singapore and expanded to over 15 countries during the same year. American Jump Bikes (former Social Bicycles, acquired in April 2018 by Uber) started operation with e-bikes in Washington, D.C. in September 2017. In 2018 it extended to other US cities and launched its European operations in Berlin. This boom has been fuelled by capital raised from investors including technology giants as Xiaomi, Alibaba or Tencent whose main interest is the data generated by users (Griffith, 2017).

<sup>1</sup> bike-sharing systems allowing flexible parking of bikes at public spaces and relocating them, instead of using fixed docking stations



Image 1: oBike shared bicycles locked to public bicycle racks in Vienna (photo: András Ekés, Mobilissimus)

Dockless bike-sharing can offer the following benefits for users and cities (while its privately initiated model lacks the complex approach of public bike-sharing systems offering many of these benefits and also some others):

- offering new, sustainable mobility options for users (with additional benefits such as reduced travel time);
- offering affordable transport in areas where ‘traditional’ bike-sharing schemes and/or intensive public transport were not viable (this may not work out where other conditions, e.g. bicycle-friendly conditions are missing);
- providing a last mile solution connecting to public transport;

- ultimately contributing to a more competitive sustainable mobility, and thus reducing car use; and
- providing mobility data to transport planners to support the planning of cycling infrastructure.

They can be a profitable investment for the operators, with incomes not only from user fees, but also from potentially selling the generated data to providers of other services. However, the European data protection regulations (GDPR) are relatively strict regarding personal data.

Initially, their rise in cities globally often missed any contact with city authorities (NACTO Policy, 2018), and has also caused negative externalities and controversies, including:

- public spaces overcrowded with parking bicycles, especially in pedestrian zones and at transport nodes, often blocking the way (of pedestrians, especially of those with reduced mobility and visually impairment);
- overcrowding of existing bicycle parking;
- messy streetscape due to bicycles left around randomly;
- lack of proper maintenance;
- visual ‘pollution’ in case of third party advertisements on bikes; and
- endangering the market of existing (often public) bike-sharing schemes.



Image 2,3: Dockless shared bicycles lying around in Vienna/blocking the sidewalk in Beijing (photo: HerziPinki / 螺钉, Wikimedia Commons)

Also, in many cases the extremely quick expansion did not prove financially sustainable. In 2018, problems caused by high operational costs and controversies became visible, which led to a market consolidation process, with bankruptcies and mergers of several smaller providers, as well as withdrawals from markets. This included oBike ceasing operations on its home market, Singapore, due to strict regulation and also having financial problems (Der Standard, 2018), and Ofo announcing its withdrawal from several countries (including Australia, Austria, Germany and Spain) and focusing on just a few cities in others (including the US and the UK).

### How it works and policy options for cities

Based on initial experiences, developing regulations and guidelines may be necessary for cities

to integrate dockless bike-sharing services into the local sustainable mobility offer, and to maximize their potential while minimising the negative externalities.

Cities have pursued different approach towards dock-less bike-sharing providers. These policy options vary to some extent from country to country depending on the regulatory and legislative framework and the degree to which the city administration itself has any regulatory autonomy over such issues. These are not necessarily either-or options: combinations or stepwise evolution (e.g. moving from hands-off approach towards more regulation, or starting with a pilot and deciding on the approach based on the results) are also possible. A more careful approach is especially advisable to cities with already established public/PPP-based bike-sharing schemes.

### 1. Hands-off approach

In some cases it may not be necessary to regulate dockless bike-sharing services, due to the low market interest or other reasons. However, this approach can make cities exposed to the negative externalities listed above.

### 2. Providing regulative ground rules

Generic regulations can be set for bike-sharing services, while leaving the market open for any operator. This may include e.g. parking/public space use regulations.

### 3. Requiring operational permits

The enforcement of regulations can make it necessary to prescribe a permit for operators wishing to provide service in the city. A permit can be obtained by meeting transparent criteria, however, the number of permits issued can be limited. It is advisable to offer permits for fixed term periods.

### 4. Contracts for Concessions

Concessions are usually awarded based on a tender/competition, resulting in a contract between the city and the operators laying down the rules of operation and the requirements to be met. A concession can offer a more protected market for the operator, where the tender ensures that the best offer (from the point of view of the city) gets the contract.

### 5. Pilots/demonstrations

Pilots or demonstrations allow service providers and city authorities to get to know each other, and test and discuss the operation of bike-sharing systems and/or different sets of regulations for a specific time period, and decide on regulations based on the results. The requirement of operators to share usage data with city authorities can support this decision (Gutman, 2017).

### 6. Banning/not allowing operation

While strict regulations can themselves lead to some operator(s) leaving the market, in extreme cases cities can decide that they do not wish to have such services operating in the city and ban them altogether.



Image 4 Mobike hub designated by a painted box on the sidewalk in Huangzhou (photo: そらみみ, Wikimedia Commons)

Where requirements have been introduced (either as regulations, or as prerequisites for a permit / concession), they usually cover a subset of the following requirements (based primarily on Bordenkircher and O’Neil (2018) and NACTO Policy (2018)).

Requirement	Considerations	V	NY
Right of removal/ termination	The city should have the right to remove a bike or even terminate the bike-sharing service (remove permit), in case of specific violations of rules.	X	X
Cooperation with authorities	The operators should have to cooperate with city authorities to solve the arising issues in partnership. Especially, they have to be reachable by city authorities in 7/24.	X	
Fees of operators	Generic fees can apply to cover the costs of regulating, overseeing, and managing the bike share operations. If operators do not solve issues on time, and the city has to do it instead, the operator has to bear the costs (e.g. as fixed fees for specific types of issues).	X	X
Hours of operation	Hours of operation have to be set clearly, in order to make it clear if users can rely on the service (relocation of bikes) on public holidays or not. The city can also require operators to have procedures and protocol for extreme weather, special events, etc.		
Operation area	The city can define areas where dockless bike-sharing services are or are not allowed to operate. It may exclude the operation area of the existing public bike-sharing scheme, or offer licenses/permits for underserved areas.		X
Parking regulations	Parking regulations include the rule that bikes have to be parked upright; the operator has to pick up knocked over bikes. It can also include the limitation of parking at certain places (e.g. sidewalks), – at least in some denser areas – only allowing the parking of shared bikes at dedicated areas (painted boxes, ‘hubs’), or requiring to lock them to a fixed object. The operator has to remove improperly placed bikes within a fixed time frame.	X	X
Geofencing	Keeping the service at the designated areas, as well as monitoring and enforcing parking areas can be done by geofencing, i.e. defining virtual boundaries of the service area and the parking hubs.		X
Fleet size	In order to prevent problems arising from too large fleets (initially or generally), cities can maximize the number of bicycles allowed per system. This can also include a smaller allowed initial fleet and step-by-step extension, allowing for a feedback on the operation of the system, or prescribing to meet specific objectives before further expansion is allowed.	X	X
Reallocating bikes	In order to provide an accessible service, operators can be requested to meet certain standards in terms of rebalancing their fleet across the operation area.		

Safety standards	All vehicles have to adhere to the safety standards relevant to that specific type of vehicle. This may include local rules, e.g. limitation of the motor-assist speed of e-bikes, or a unique identifier of each vehicle.	X	
Maintenance requirements	Broken bicycles have to be removed from public spaces for maintenance within a fixed time frame. In case of concessions, the city can specify stricter requirements (minimum number of bikes in service, maintenance cycle, etc.)	X	X
Customer service	Contact information of the operator and/or city authorities has to be displayed on the bikes and/or at an up-to-date website. Operators have to solve the reported issues within a specified time limit (may differ for business hours and outside business hours).	X	X
Insurance	Prescribing insurance and setting minimum amounts of liability insurance are aiming to indemnify parties suffering damage (including users and also the city). In addition, some cities require a security deposit by the operators, which is utilized if the city has to terminate the system and take care of cleaning up the bikes.		X
Access for non-smartphone users	For equity reasons, cities may prescribe a non-smartphone access option for those who do not have a smartphone.		X
Considering people with reduced mobility	While private bike-sharing providers usually don't target people with reduced mobility, the common use of public space has to be taken into account, e.g. by regulating the parking of bicycles and educating users. In some cases, special bicycles accessible by people with different cycling abilities or limitations are offered.		X
Education of users	Some cities require operators to educate users regarding the applicable laws and regulations, as well as safety instructions. In many cases users have to agree to follow the rules before they can unlock a bike. This issue is even more important in the case of e-bikes. Gamification can be used to reward positive behaviour among users.		X
Sharing data	Bike-sharing systems generate a large amount of data on mobility habits. Anonymised usage data can be helpful for city officials e.g. to improve bicycle-friendly infrastructure, thus requiring the sharing of data (ex post or even real time) is beneficial. Some of the data can also be made public (open data). Specific formats (e.g. in the US, General Bike Share Feed Specification, GBFS) can be prescribed.		X

The National Association of City Transportation Officials published more detailed recommendations for US cities in July 2018 (NACTO Policy, 2018). ITDP (ITDP, 2018), as well as UITP, EFC and PEBSS together (UITP, 2017) also published policy recommendations for dockless bike-sharing.

The effectiveness of these requirements depends on their legal status and on the city's ability to enforce them. With a lack of city enforcement staff, operators may simply ignore the regulations. Such staff could be e.g. employed

via an existing car parking enforcement contract or department.

### Benefits - and for whom they are

Residents: become aware of the variety of mobility choices they have, but also of the possible options regarding the use of public space. They may discover new hobbies and get to learn more about their cities. These initiatives are Developing regulations and guidelines may be necessary for cities to integrate dockless bike-sharing services into the local sustainable mobility offer,

and to maximize their potential while minimising the negative externalities.

However, regulation can also have dangers if excessive and/or not taking into account the real needs and market characteristics:

- making the service impossible ('killing the market');
- limiting competition and leading to monopolistic situations; and
- limiting innovation.

### Stakeholder analysis - who are drivers, who are opponents

Those who are in favour of regulating the dockless bikes are usually the groups that are affected negatively by the operation of the service. These include the operators of traditional bike-sharing systems and other transport services (as competitors); pedestrians (especially people with reduced mobility and visually impairment if pedestrian areas/sidewalks are cluttered by bikes); and drivers if their way or parking spots are blocked by bikes.

The initial approach of some operators (build their business model on pouring a large amount of bikes on cities, instead of negotiating a sustainable model with the city authorities) would imply operators opposing regulation (Griffith, 2017); however, this approach is losing ground.

### Legal framework

The legal framework can vary from country to country, with city administrations having more or less regulatory autonomy over such issues. As traditional bike-sharing schemes are available in many countries for several years, bike-sharing as such would be to some extent covered by existing legislation. However, public policy and legislation is often car-oriented (e.g. subsidising car use by allowing the overuse of public space for parking). Affected areas include national or local regulations on:

- traffic rules;
- traffic safety regulations;
- use of public space or pedestrian areas (including for bicycle parking; including for for-profit services);
- on-street parking;
- liability insurance (in the case of such services);
- consumer rights protection;
- data protection (including GDPR);
- integration with traditional public transport services and other public/private shared mobility services;
- financial incentives for public/shared mobility.;

### Good/bad practice (short examples)

#### Vienna

In Vienna, station-based Citybike has been in operation since 2003. In 2017, dockless providers arrived to the market, with oBike deploying 800 bikes in the inner areas and ofo 200 bikes in district 2, joined by Donkey Republic later that year (Ivancsits, 2017). At the peak, ofo had 1800 and oBike 700 bikes on the streets in parallel (France24, 2018). When parking problems arose, the city administration took a position resulting from its strategy supporting sustainable modes, recommending to park freefloating shared bikes in the parking lanes on the street or in bike racks, without obstructing traffic (Ivancsits, 2017). The city also published parking recommendations supported by easily understandable drawings (Fahrrad Wien 2018a), as well as customer service information (Fahrrad Wien 2018b).

As the recommendations proved insufficient to solve the problems, the city introduced stricter regulations from the 1st August 2018 via a local police order. Dockless bike-share operators have to be registered in Vienna, and can



Image 5: oBike shared bicycle in Vienna (photo: András Ekés, Mobilissimus)

operate a maximum of 1500 bikes each with unique identification numbers, also featuring the customer service phone number of the operator. They have to comply with data protection requirements. Parking in green areas (parks) is forbidden, except for dedicated bicycle parking places; parked bikes also cannot block pedestrian or vehicle traffic. The operators have to remove wrongly placed bikes within 4 hours from the first notice during working time (within 12 hours at night and weekends), risking a 700 EUR penalty if not meeting the deadlines (Fahrrad Wien, 2018).

By the summer of 2018, oBike closed its Vienna office due to financial problems, leaving about 1000 bikes still in operation without proper control (Der Standard, 2018a). ofo also decided to close its Vienna operations in July, blaming ‘high regulatory requirements’, including the fleet size limit, which do not make a profitable operation possi-

ble (Georg Pichler, 2018). During the first week of August, city authorities seized the 780 remaining bikes of the two operators (France24, 2018). Donkey Republic, the only remaining private operator – with about 230 bikes currently – is less affected, as it operates in a hub-based model instead of free floating (Der Standard, 2018b).

## New York

In New York City, the traditional dock-based Citi Bike service is based on a contract, which gives exclusivity to the operator Motivate in its Phase I and Phase II areas (Flamm, 2017).

The city has consciously decided to follow a cautious approach to dockless bike-sharing, including a warning letter sent to an operator planning to launch its service without consultation with the authorities. This cautiousness was based on the fact that the streets in central areas are already heavily congested and messy



(Surico, 2018). The Department of Transportation (DOT) has been discussing with interested dockless system operators and also with Motivate for a year about their intentions and what they could offer for the city (Flamm, 2017). This resulted in a formal 'Request for Expressions of Interest' for a new dockless bike share program in December 2017. In order to not compete with Citi Bike services, the companies shall concentrate on the outer boroughs not served by the incumbent system, including parts of the Bronx and Staten Island (Warekar, 2017).

From the 12 companies showing interest, 5 have been selected for the pilot programme, which kicked off in July 2018. They can operate in four dedicated areas, which are neighbourhoods outside of the central areas and the coverage of Citi Bike, with relatively weak public transport service, thus specifically targeting transit gaps, instead of adding one more option to areas already overcrowded (Surico, 2018). Each area will be served by at least 200 bikes, including pedal-assist ones. According to the plans, the pilot ends in Autumn 2018 (NACTO Policy 2018).

With the pilot, the city aims to evaluate if dockless systems are indeed more cost-effective and faster to implement in outer areas (Warekar, 2017). Evaluation criteria will include compliance with requirements around data accessibility and user privacy, and also safety, availability and durability of the bikes themselves. DOT will determine the next steps of the process based on the pilot results (New York City DOT, 2018).

## Time frame

Private dockless bike-sharing services are an existing reality in hundreds of cities worldwide. The approach of cities is evolving constantly; cities with no such systems operating yet have the advantage that they can initiate and guide the market development themselves by shaping the framework conditions. The new technologies are also available for public/PPP-based bike-sharing services, allowing to integrate dockless solutions (in either hub-based, freefloating or 'hybrid' model) into their services.

## Costs

In most cases, dockless bike-sharing is seen as a sector which should not induce direct costs for the public sector. Bicycles, an IT system behind and operations are covered by the operators on a market basis.

Where the technology or the regulations make it necessary to create bicycle parking racks and/or designated parking hubs, the sharing of costs is up to the regulator (the city) to decide, depending on its priorities (pushing all costs on the operators, or trying to catalyse the market development in general or in some preferential areas). Developments contributing to a bicycle mobility attractive to a broad range of users (including bicycle-friendly infrastructure) remain with the city, while they are a key success factor of any kind of bike sharing service.

If the city has to act instead of the operator due to its failure (operators do not solve specific issues on time, and the city has to do it instead), ideally the city can shift the costs on the operators, via predefined fees and/or safety deposits (see above in more detail). Enforcement costs can be covered by the city or born by the operators e.g. via a generic fee paid for the permit of operation.

There may be an opportunity cost in lost advertising revenue that could be otherwise earned through docked schemes and from advertisements at bus shelters.

## Open questions

As the dockless bike-sharing phenomenon is quite new and the sector is changing rapidly, new challenges, problems and questions arise often. It is globally unclear yet, what kind of business model will be sustainable financially, and in what kind of cities (markets) it can be utilised on a longer term.

## Possible future developments

Bike-sharing schemes and also dockless bike-sharing providers started largely by offering normal bicycles; however, e-bikes also started to gain ground. While this Innovation Brief does not target them, it is also worth to note that many other new ‘small vehicles’ (scooters, e-scooters etc.) can be and are operated in similar systems, with similar regulatory challenges (NACTO Policy, 2018).

## How and where does it fit into a SUMP

As presented above, private dockless bike-sharing services can be a useful part of the sustainable mobility offer and has many possible benefits, but can also cause negative externalities, which can be weighted differently in different areas. It can be a great last mile solution or offer new mobility opportunities in areas underserved by ‘traditional’ bike-sharing and public transport services, but can also obstruct the movement of pedestrians (including people with reduced mobility and visually impairment) or other vehicles if not regulated properly.

Ultimately, it is up to cities to consider if, and under what conditions this tool fits to their goals and contributes to the benefit of the public (NACTO Policy, 2018). This includes the consideration of connected public investments (especially into bicycle-friendly infrastructure) and of the reallocation of public space from overly space-consuming cars to the sustainable modes in general.

Sustainable Urban Mobility Planning (SUMP) is a strategic process which allows to define the vision of the city and clearly set its goals with the involvement of all relevant stakeholders. The SUMP process and methodology also offer the right opportunity to consider the place of dockless bike-sharing in the system of tools contributing to the goals, thus enabling to create the right framework for such systems.

## References

1. Brandon Bordenkircher, Riley L. O’Neil (2018): Dockless Bikes: Regulation Breakdown. Twelve Tone Consulting <https://nabsa.net/wp-content/uploads/2017/09/Dockless-Bike-Regulation-Breakdown-12-Tone-Consulting-1.pdf>, (accessed 12 September 2018)
2. Fahrrad Wien (2018a): Fahrrad richtig abstellen, <https://www.fahrradwien.at/tipps-und-regeln/abstellen-des-fahrrads/>, (accessed 12 September 2018)
3. Fahrrad Wien (2018b): Leihräder: Infos und Kontakte, <https://www.fahrradwien.at/tipps-und-regeln/leihraeder/>, (accessed 12 September 2018)
4. Fahrrad Wien (2018): Strenge Regeln für Leihräder treten in Kraft <https://www.fahrradwien.at/news/strenge-regeln-fuer-leihraeder-treten-in-kraft/>, (accessed 12 September 2018)
5. Matthew Flamm (2017): Could dockless cycles make city’s bike sharing more egalitarian? Crain’s New York, <http://www.crainsnewyork.com/article/20171127/TRANSPORTATION/171129942>, (accessed 12 September 2018)
6. France24 (2018): Vienna declares victory in war on dockless bikes. France24, <https://www.france24.com/en/20180807-vienna-declares-victory-war-dockless-bikes>, (accessed 12 September 2018)
7. Erin Griffith (2017): Why investors are betting that bike sharing is the next Uber. Wired, <https://www.wired.com/story/why-investors-are-betting-that-bike-sharing-is-the-next-uber/>, (accessed 12 September 2018)
8. David Gutman (2017): Seattle’s bike-share pilot program ends this month, but the bikes are staying. The Seattle Times, <https://www.seattletimes.com/seattle-news/transportation/seattles-bike-share-pilot-program-ends-this-month-but-the-bikes-are-staying/>, (accessed 12 September 2018)

9. ITDP 2018: Optimizing Dockless Bikes for Cities. Institute for Transportation & Development Policy, <https://www.itdp.org/publication/optimizing-dockless-bikeshare-cities/>, (accessed 12 September 2018)
10. Kathrin Ivancsits (2017): Status Quo: Leihräder aus Fernost, Fahrrad Wien <https://www.fahrradwien.at/2017/09/29/status-quo-leihraeder-aus-fernost/>, (accessed 12 September 2018)
11. NACTO Policy 2018: Guidelines for the Regulation and Management of Shared Active Transportation, Version 1: July 2018. National Association of City Transportation Officials, <https://nacto.org/wp-content/uploads/2018/07/NACTO-Shared-Active-Transportation-Guidelines.pdf>, (accessed 12 September 2018)
12. New York City DOT (2018): Five-Borough Bike Share: DOT Names Five Dockless Bike Share Companies Assigned to Four Neighborhoods for Pilot. New York City DOT press release, <http://www.nyc.gov/html/dot/html/pr2018/pr18-039.shtml>, (accessed 12 September 2018)
13. Georg Pichler (2018): Nach Obike zieht sich auch Fahrrad-Start-up Ofo aus Wien zurück. Der Standard, <https://derstandard.at/2000083194335/Nach-Obike-Fahrrad-Start-up-Ofo-verlaesst-Wien>, (accessed 12 September 2018)
14. Der Standard (2018a): Obike angeblich vor Pleite, tausend „herrenlose“ Fahrräder in Wien, Der Standard, <https://derstandard.at/2000083096681/Obike-angeblich-vor-Pleite-tausend-herrenlose-Fahrraeder-in-Wien>, (accessed 12 September 2018)
15. Der Standard (2018b): Donkey Republic: Ein Fahrrad-Start-up bleibt in Wien. Der Standard, <https://derstandard.at/2000083354950/Donkey-Republic-Ein-Fahrrad-Start-up-bleibt-in-Wien>
16. John Surico (2018): Dockless Bikes Hitting New York City's Transit-Hungry Fringes. CityLab, <https://www.citylab.com/transportation/2018/07/dockless-bikes-arrive-in-new-york-citys-transit-hungry-fringes/565391/>, (accessed 12 September 2018)
17. Tanay Warekar (2017): NYC takes strides toward making dockless bike share a reality. Curbed New York, <https://ny.curbed.com/2017/12/15/16781206/nyc-dockless-bike-share-rfe/>, (accessed 12 September 2018)
18. UITP (2017): Unlicensed dockless bike sharing – common position paper. UITP, ECF and PEBSS, [http://www.uitp.org/sites/default/files/cck-focus-papers-files/Dockless\\_bike-sharing\\_position\\_ECF\\_UITP\\_.pdf](http://www.uitp.org/sites/default/files/cck-focus-papers-files/Dockless_bike-sharing_position_ECF_UITP_.pdf), (accessed 12 September 2018)

**Author**

**Antal Gertheis**

Mobilissimus Ltd.

E-mail: [gertheis@mobilissimus.hu](mailto:gertheis@mobilissimus.hu)  
[mobilissimus.hu](http://mobilissimus.hu)

Acknowledgements to Péter Dalos, Head of Operations of MOL Bubi at BKK Centre for Budapest Transport for his valuable insights

[www.sump-network.eu](http://www.sump-network.eu)

**LEGAL DISCLAIMER:** The sole responsibility for the content of this publication lies with the authors. It does not necessarily reflect the opinion of the European Union. The European Commission is not responsible for any use that may be made of the information contained therein. All images are provided by the respective partners (unless otherwise noted) and are approved for reproduction in this publication.



CIVITAS PROSPERITY has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement N° 690636.