

Regulatory proposal for bikesharing and scooter sharing in the cities of Brazil

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Abstract. With the fast population growth, lack of urban planning and climate change challenges, the need for more sustainable and efficient transport systems has been created, where shared vehicle modes are one of the possible solutions. They are means of transportation that allow users short-term access according to their needs, without having to have them. The modal showed a high growth in its use, especially the micromobility vehicles, such as scooters and electric bicycles, which exposed the need to develop policies to regulate its use. It also demonstrated the need to re-evaluate existing definitions. Based on this, the present work seeks to analyze Decree 58.750 of 2019, São Paulo, as well as international examples, in order to use them to elaborate an alternative of regulation proposal for the cities of Brazil.

Keywords: Mobility. Micromobility. Shared vehicles. Regulation.

1 Introduction

Mobility in society is a component that, in addition to being fundamental to urban life, undergoes several changes, from the most established and current way of walking, through animal traction, to vehicles powered by internal combustion and electrified engines.

The development in displacements was influenced by the development of urban life, since performance plays a crucial role in its functioning.

Shared modes present itself as one of the possible alternatives to mitigate intense congestion in cities and emerges as alternatives for new businesses. Currently, real-time data flows are used to facilitate communication between the user and the means of transport, optimizing its operation.

The theme of shared modes represents only a portion of the economy, which, as described by Thomas Mourey and Dagmar Köhler [1], can be defined as a variety of business models where activities are facilitated by platforms that create a open market for the temporary use of goods or services generally provided by private individuals. In other words, the focus of the shared economy is to use goods instead of owning them.

Public transport is not part of the shared vehicle modal, even though both can be integrated. According to Thomas Mourey and Dagmar Köhler [1], the biggest difference between shared vehicles for the other two modes is the need for an intermediary platform between user and vehicle. In general, the platform is presented in the form of a website or an application for mobile devices using the Internet of Things (IoT) concepts, which allows registered users to schedule times to use the vehicle and payment of user fees.

Vehicle sharing systems (SCV) deployments are currently based on kiosk stations or parking spaces, possibly equipped with electric vehicle charging facilities. Another operational model that is gaining speed and popularity is in the condition of having the free float of vehicles, where the user can start and end the rental of the vehicle in a location within an area designated as allowed parking. This model helps to combat one of the great barriers of shared vehicles, the implementation of a station-based infrastructure.

The mode of stations, according to Silva [2], is also known as Round trip (round trip), where the user picks up the vehicle at a fixed and pre-defined station and must return it to the same station where the

vehicle was withdrawn. It is worth mentioning that the station can be a spot on the street or even a central point in the neighborhood. This modal can have the following characteristics:

• Scheduled time (round trip): user schedules the rental time of the vehicle through the application, where he also makes the payment for the reserved time.

• Open end (with undetermined end): the user only sets the start time of use, but without a defined end time. The charge is based on the time the vehicle is used.

• On demand (according to need): No scheduled start or end time. The charge is based on the vehicle's usage time.

The floating mode, also known as One way + open end, is characterized, according to Silva [2] by the removal of the vehicle in a non-fixed location. The user has the option to finalize the rental of the vehicle in any public space, including paid ones, within a large area. This model facilitates the implementation of special vehicles, such as electric cars.

For Silva [2], one of the biggest difficulties of the fluctuating model is to keep the fleet distributed so that users can easily find available vehicles near their location.

The modal of shared vehicles presents a great diversity of vehicles, from individual, collective vehicles, powered by user traction, electric, internal combustion, two-wheel, four-wheel, among others, and represents an emerging mode of transport that can be an important link in the green mobility of mobility environments. One of the examples of modal most used by shared services are those of micromobility, these individual vehicles having a maximum speed of 20 km / h.

Assessing the market for shared vehicles in Brazil, the country presents a considerable variety of transport modes and applications that provide such services. Some examples of applications are: Fleety, Scoo, Pegcar, Green and Zazcar. Large companies in other areas of activity are also investing in shared vehicle modalities, such as Itaú, Bradesco and Uber. The companies mentioned are just a few examples of the national range, which has vehicles such as: traditional bicycles, electrified bicycles, traditional scooters, electrified scooters, scooters, electric cars and fossil fuels.

Even if shared transport is presented as one of the possible solutions to mitigate the impacts generated by the high volume of private vehicles, such as environmental and infrastructure problems, the modal presents a need for development in the legal and financial scope. One of the greatest examples of the need for legislative development is China, where there was a widespread popularization of the "dockless" bicycle model (with no specific place to return the bicycle) in 2016 and, where companies invested heavily in the number of vehicles available and low cost to the user.

The Chinese business model has worked for a period of time, but today it shows the results of an aggressive and unregulated economy. With a large investment in vehicles, low tariff and high competition, the scenario of shared bicycles has changed from a promising future to outdoor bicycle cemeteries and failed companies.

In São Paulo, two shared car companies have closed their activities in recent years, namely Fleety and Zascar. According to the founders of the companies, the bankruptcy was realized by a lack of investment and high costs of introducing the vehicles in the market. But is this the only problem that the modal can face in Brazilian cities? With the high number of companies competing to gain market share, would it be possible to face the same Chinese scenario?

In the bicycle segment, Yellow and Grin, which became very popular, including the availability of electric scooters, also had their operations closed in 2019.

This study aims to analyze the regulation of shared vehicles with the most successful implantation around the world and, from that point on, make a proposal on the introduction of shared vehicles, focusing on the country Brazil. The proposed regulation has social, commercial and infrastructure aspects linked to shared vehicles.

2 The shared economy

The shared economy is a relatively new business model that presents different definitions among the authors of the area. This research will use as a main theoretical basis the definition [1], who describe the shared economy as a variety of business models where activities are facilitated by platforms that create an open market for use goods or services usually provided by private individuals.

Shared economy is understood as a variety of business models that, with the support of technologies, provide the user with the possibility of using a good, tangible or not, without the need to own it.

The shared vehicle modal represents one of the existing business models in the shared economy.

The modal can be understood as the shared use of a means of transport that allows the user to have short-term access as needed, without the imposition of having it. For such activity, a means of communication should act as an intermediary between the vehicle and the user, which is usually a smartphone application or a website.

According to [3], shared mobility plays a critical role in the development of Mobility as a Service (McS), especially in multimodal sharing. The shared vehicle modal has emerged due to the digital technology revolution, being made possible by massive information flows, improved online security and ubiquitous smart devices.

3 International examples of modal sharing

Some countries like China, India, Singapore and the United States of America, like Brazil, seek to better understand shared vehicle services in order to regulate them. Some examples found were used as a basis for the preparation of the proposal for a Brazilian regulation.

3.1 São Paulo

Decree No. 5,750 of the São Paulo city regulation encompasses the shared vehicle models studied in this research. However, a point that deserves revision is the replacement of the term "self-propelled individual mobility scooters, cycles and the like" with "micro-mobility shared vehicles and parked on public sidewalks", since the vehicles are electric, or not and, with a maximum speed of 20 km / h.

In general terms, the municipality held companies responsible for shared modals responsible, such as training in the use of transport and safety in terms of routes, including investing in aid. These measures, among other points such as financial resources, made the implementation of new urban mobility projects unfeasible.

3.2 Singapore

A model to be based is in the city of Singapore, where the LTA (Land Transport Authority) is responsible for regulating shared vehicle services, in this case, bicycles. As discussed by the local newspaper The Straits Times [4], one of the clauses of the regulation is related to the deposit of vehicles, where users who park in improper places may be blocked from using the services for a certain period.

Another possible measure is the geographic block, where only certain regions can be considered as "stationable". With this, the user can only finalize his service contract when parking in one of the defined regions, being taxed until they park in the appropriate place.

Also in relation to Singapore, companies providing the service will have to apply licenses for vehicles that will be made available on the streets. From that moment on, stationable regions and maximum population density per region will be defined. If the company does not comply with the rules, it will be taxed with a fine and will have a reduction in the maximum demographic density by region, making it have fewer vehicles available on the streets.

3.3 Seattle – United States of America

In the United States, the international regulation that best represents the needs of Brazil is in the Bike Share Permit Requirements [5], in the city of Seattle. The regulations developed by the Seattle Department of Transportation (SDoT), which are maximum volume of vehicles added to the city, the regulation presents the maximum value of new vehicles by companies, being:

- the company's 1st month of operation: 500 bicycles.
- the company's 2nd month of operation: 1000 bicycles.
- the 3rd month in which the company operates: 2000 bicycles if the company meets all city regulations, respecting the definition of density less than 340 bicycles per square mile.

Regarding the parking, when the service model is not in the dock system, bicycles must be parked on the sidewalks and supported by buildings or landscapes, respecting the following situations:

1. Bicycles must not be parked in the corners of the sidewalks.

2. Bicycles must not be parked in blocks where the sidewalks are less than 1.5 meters wide or where there are no sidewalks.

3. In blocks without sidewalks, bicycles can be parked if the travel lane (s) and the 6-foot pedestrian zone are not impeded.

4. The city reserves the right to determine certain sides of the block where the parking of floating bicycles is prohibited. A. Bicycles must not be parked in the adjacent landscape / furniture zone or within. Parklets; B. Transit zones, including bus stops, shelters, passenger waiting areas bus stop and stop zones, except for existing bike racks; C. Loading zones; D. Parking area for the disabled; and Street furniture that requires pedestrian access (for example - banks, parking spaces, bus shelters, traffic information signs, etc.); E. Sidewalk ramps; F. Appetizer; and G. Street [6].

In addition, service operators must inform customers about the correct places to park the bicycle and how to park them correctly. Finally, the State has the power to create virtual parking zones, to create geographic parking blocks.

Any floating bicycle parked in a location for more than 7 consecutive days without movement can be removed by Seattle city teams and taken to a city facility for storage at the expense of the bicycle operator.

Any bicycle parked incorrectly must be parked correctly again or removed by the operator based on these times: from 6:00 am to 6:00 pm during the week, excluding holidays - within two hours of receiving notice. All other times within 10 hours of receiving notification.

Still in the United States, regarding the use of protective equipment, such as helmets, it was something that generated repercussions and was a reason for blocking the service across the country. Currently the service is legalized and the definitions of the mandatory use of the helmet vary from state to state.

As discussed at the Public Health Law Center in 2013, faced with the question "Should shared vehicle programs compel users to wear helmets"?

The institute responded that some bicycle-sharing programs require users to wear helmets, especially in places where helmet laws are in effect. It also informs that a helmet can protect against some injuries or reduce the severity of an injury caused by impact on the head. As a result, a bicycle-sharing program should recommend that cyclists wear a helmet, even if it is not legally required. It is worth mentioning that helmets are not 100% effective in protecting against head injuries and do not offer protection against other types of injuries.

With that, it is important to reaffirm that the need to use helmets is a matter of public safety and that it covers all users of the service, not just users of shared vehicles. Therefore, the topic can be addressed by the service providers, but it must be studied and regulated by the state.

Still in the United States, one of the major difficulties in implementing vehicles as electrified scooters, as described in the CityLab newspaper [7], was the understanding of the population. While bicycles already had better structured regulations and with their information more present in the general knowledge of the population, vehicles such as scooters, skateboards and other micro mobility vehicles, which have a maximum speed of 20km / h, had regulations and their knowledge less present in knowledge. popular.

With the lack of popular knowledge of the laws on micromobility vehicles, exemplified in Figure 1, great doubts hung over the growing public of users of these modes, such as: Where am I allowed to transit? Is helmet use mandatory? What maximum speed is allowed at each location? What are the correct places to park the vehicle? The population's lack of knowledge is still being addressed through popular education on the modal of micromobility vehicles, in addition to the improvement and refinement of the laws that govern its guidelines.



Figure 1: Micromobility vehicles [8].

3.4 China

The modal of shared vehicles grew with great speed in China and faced several problems. According to the web magazine "South China Morning Post" [9], the primary cause of the problems was in the Chinese shared vehicle service industry, described as immature and irrational, mainly due to the aggressive initial investments and the availability of a large number vehicles on the streets.

Due to the rapid inclusion of several vehicles on the streets by several companies providing the shared vehicle service, the Chinese population faced great competition for spaces on the sidewalks, in addition to several bicycle cemeteries from companies that declared bankruptcy. Still according to the "South China Morning Post", much is due to the lack of legislation for the new service.

Official Chinese government websites are blocked (Error 403 - Forbidden) preventing access to original documents, but, according to the "World Resources Institute" [10], the Chinese government has implemented new policies to regulate shared vehicle services, acting mainly in the control of bicycle fleets in the city, which must be done by the government and the traffic safety agencies. This will be done through registration plates requirements for bicycles, banning electric bicycles and ensuring more standardized parking using Geo-fence technology, which uses a Bluetooth-based sensor to detect whether bicycles are parked in the appropriate area.

4 Results and analysis

The proposal seeks the lessons learned in the cities of the main countries that have introduced new transport alternatives in an environment in which traditional modes are the most usual.

The sharing service and the use of vehicles aimed at micromobility, these vehicles being for individual use and which must have a speed limit of 20 km / h. In line with these new modalities, the use of complete streets, which allow routes for micromobility.

The digital platform as a means of intermediating micro-mobility vehicles such as bicycles, scooters, unicycles and other equipment, electric or not, for individual mobility must have this feature.

Companies that manifest themselves offering this service must have an operational structure that covers employees according to the number of vehicles offered.

Public authorities, on the other hand, have an obligation to adapt the signs in accordance with the National Traffic System. And the duty to apprehend irregularly parked or abandoned vehicles, for a period of one week.

The seized vehicles will be used exclusively in traffic education projects or sold at auctions. If their use is not possible, they will be taken to places with approved certification for disposal by public agencies.

Geo-defense must be agreed between service providers and the government so that vehicles are parked in places permitted by a digital perimeter, using the cyber-phisic system.

The number of vehicles per company must not exceed 20% of the amount relative to 20% of the density defined for each city to be introduced.

Companies that propose to offer this service must have completed the licensing process with the local city hall in accordance with local laws.

On the other hand, the government has duties to sanction tax incentive policies for users who use vehicles shared during peak hours, depending on regionality and defined by each municipality.

Traffic authorities and city hall agents have a duty to supervise compliance with established rules

The companies providing the service must manage the concentration of vehicles and avoid the concentration of equipment, such as scooters, unicycles and their electric counterparts, parked in public places.

The obligations of companies that provide sharing services are as follows:

I - provide users or drivers with an application / program (software) for cell phones with the purpose of using the service;

II - provide fixed and mobile rental points that can be identified through the application or website;

III - ensure geo-defense locks on all micromobility equipment stationary on sidewalks.

IV - prove the contracting of civil liability insurance to cover any damages caused to third parties or to public assets resulting from the use of individual mobility equipment;

V - collect the individual mobility equipment that is parked irregularly, under penalty of apprehension by city hall agents. The company will have a period of 2 hours to collect and relocate the equipment, from the moment of notification by third parties or agents of the sub-prefecture.

VI - bear all the damages resulting from the provision of the service, even if they are caused by acts of God, force majeure, fraud or guilt of users. If the user's guilt is legally proven within a period of 30 days, the company will have the option to pass on the insurance costs contracted to the user, in whole or in part.

VII - maintain the confidentiality of users' data under the general data protection law (LGPD);

VIII - provide user / driver data to municipal or public security agencies, whenever requested due to issues involving crimes, misdemeanors or accidents;

IX - share the equipment's geolocation data with the Municipal Mobility and Transport Secretariats and the city halls in order to improve the most used roads;

X - inform the Municipal Mobility and Transport Secretariat, monthly, with the number of accidents registered in the system (Brazil, 2019);

XI - transfer the rights and security locks of the micromobility equipment to the city hall in cases of abandonment of vehicles on sidewalks or seized after the 30-day notice period;

XII - to guarantee physical and / or virtual locks that limit the vehicle speed to 20km / h;

XIII - ensure visual and audible signs to inform vehicle users who are traveling in prohibited regions.

As for the vehicles offered for sharing, they must follow the main rules:

a) The equipment must be equipped with a speed indicator, with an option in the smartphone application depending on the size of the vehicle. In addition, provide bell, night, front, rear and side signaling, as well as dimensions of width and length equal to or less than those of a wheelchair.

b) The equipment must have its own visual characteristic that facilitates the identification of the operator by the public authority in general.

c) The equipment is intended for individual use only, and it is forbidden to drive passengers, animals or cargo [9].

d) Repairs for possible damages, of any nature, to the municipality, users or third parties, except in the event of their exclusive fault; will be supported by the providing company, which must obey the relevant rules and precautions, especially those related to traffic safety, and it is up to it to guide users on their compliance.

e) To conclude, it will be mandatory to inform the user, in a clear way, at the time of contracting the services, the amount and coverages stipulated in the contracted insurance policy and other clarifications regarding civil liability.

As for the obligation of users, they must follow the following rules:

1. Drivers or users of cycles, scooters and other equipment, electric or not, that disrespect the relevant legislation will be fully responsible civilly, criminally and administratively for any moral, physical or material damage caused, subjecting the equipment to seizure.

2. In the event of irregular use of individual equipment, such as scooters, unicycles and the like, electric or not, the application of the penalties provided for in the Brazilian Traffic Code, as well as the application of other applicable measures, will be applicable. The seizure of the vehicle will also be contemplated in this item.

The implementation of the system is one of the points that generates, in general, the greatest challenges of the public power and must be inspected and monitored. The following proposal aims at a gradual and structured implementation, as follows:

A1) Services after the acquisition of the license must respect the following order of maximum volume of vehicles added to the city, respecting the local density of the city:

- first month: maximum of 500 units of each type of vehicle.
- second month of implementation: 1000 units of each type of vehicle.

• third month of implementation and later: 2000 units of each type of vehicle if the company meets all city regulations.

The use of the modes of transport treated will only be allowed on public roads, bike lanes and cycle lanes, where the vehicle has a maximum speed of 20 km/h, and may be more restrictive according to the route offered.

5 Conclusions

Shared vehicles were presented as possible solutions to existing improvement opportunities, such as, for example, the pollution generated by engines fueled by fossil fuels. In contrast to the positive expectations that these vehicles brought with them, there was structural unpreparedness in the cities for their inclusion, being them in the political, educational and infrastructure areas.

The great sudden growth of the modal brought with it the need to regulate its use. Contrary to what was believed, the initial legislation acted to slow down / prevent its implementation with punitive actions, instead of encouraging them. This goes against the idea of technological development and preservation of the environment, in addition, in Brazil, it goes against Law 12,587 of 2012, known as the Urban Mobility Law.

The first rules had a way of acting in order to punish the suppliers and users of the services, hindering their growth. It contained information that contradicted itself, such as information that went against existing laws and legislation, transferring government responsibilities to companies that provide services, defining issues related to the vehicle in the decree that, in theory, is aimed at the exclusivity of sharing services. vehicles, which means that only service users are regulated, excluding obligations on users of private vehicles.

The regulations must have the exclusive needs of the services and act in a way that allows and encourages the growth of the modal. This can bring several positive points for the population and for the country, such as reducing the emission of polluting gases, vehicle accessibility to the public, reducing the number of vehicles in congestion, generating jobs, and economic movement, among others.

It is worth mentioning that safety issues, such as the use of helmets, should not be defined in an exclusive regulation for vehicles sharing services, but in a general regulation related to the vehicle. Thus, it is believed that the need for its use should be studied by government agencies in order to define its need or not, linked to the vehicle.

In addition, the monitoring of the modal is another topic that presents the need for further studies, since there are still great technological and precise difficulties for monitoring the modal, making it difficult to identify the vehicle / user and, consequently, creating obstacles to the correct application of penalties.

One of the ways that was found in the elaboration of the proposal of alternatives to the current rules, was in the search for good practices in the use of international and national examples, in order to learn from the failures and successes of other countries. In addition, the practice of technology was seen as an ally in the necessary controls and present in the regulation, such as the creation of geo-defense.

Countries such as the United States, China, India and Singapore were the main ones surveyed and used, since these have already suffered the impacts of the accelerated growth of the modal and have applied policies that they believed to be appropriate, whether they were effective or not. From this, we approached the reality of these countries to Brazil, adapting their regulations and creating ways to mitigate / avoid problems that have not yet been solved, such as the disposal of vehicles that are no longer used.

As in Brazil the sharing modality is still far from reaching maturity, it is expected that discussions will be held before a new wave of offering vehicles aimed at micromobility.

Much remains to be improved also in terms of users, service providers, infrastructure, education, legislation, among others.

In any case, it is necessary to guarantee incentives for development and regulations in order to encourage and encourage new ways of driving on a daily basis and with clarity and responsibility to the population.

References

[1] MOUREY, T.; KÖHLER, D. EUROPEAN MOBILITYWEEK: CLEAN, SHARED AND INTELLIGENT MOBILITY. Available in <u>http://www.mobilityweek.eu/fileadmin/user_upload/</u> materials/participation_resources/2017/2017_EMW_Thematic_Guidelines.pdf>. Europa, 2017. Acess in may, 2019.

[2] SILVA, L. P. INTEGRAÇÃO ENTRE O SISTEMA DE CARRO COMPARTILHADO E POLÍTICAS PÚBLICAS DE PLANEJAMENTO URBANO. Available in <u>http://files-</u> server.antp.org.br/_5dotSystem/download/dcmDocument/2013/10/07/8F0C3760-9914-45B8-B0AE-D758E535AE15.pdf. Brasil: Curitiba, 2013. Acess in April, 2024.

[3] MENG, L., BERRY, S., SOMENAHALLI, S., ALLAN A. IDENTIFYING BARRIERS IN SHARED MOBILITY IMPLEMENTATION, A REVIEW. Disponível em: https://www.attf.info/papers/2018/files/ATRF2018_Abridged_Paper_42.pdf>. Austrália, 2018. Acess in: april 2019.

[4] LIM. NEW RULES PASSED TO CURB ABUSE OF BIKE-SHARING. Available in: <https://www.straitstimes.com/singapore/transport/new-rules-passed-to-curb-abuse-of-bike-sharing>. Access in: september 2024.

[5] SEATTLE. BIKE SHARE PERMIT REQUIREMENTS. Available in: <https://www.seattle.gov/Documents/Departments/SDOT/BikeProgram/BicycleSharePermitRequirements.pdf>. Acess in september 2024.

[6] NAMIOT, Dmitry. GeoFence Service. Available in < http://injoit.org/index.php/j1/article/download/51/48>. Internacional, 2019. Access december 2019.

[7] HALFON, Jesse. A LAWYER EXPLAINS WHY ELECTRIC SCOOTER LAWS DON'T WORK. Available in https://www.citylab.com/perspective/2019/06/electric-scooters-dockless-regulations-liability-helmet-laws/592861/. Access: september 2024.

[8] LOPEZ, G. MICROMOBILITY IS THE FUTURE OF VEHICLES. Available in: <https://medium.com/datadriveninvestor/micromobility-is-the-future-of-vehicles-220c2c0c9b0>. Acess: september 2024.

[9] BRASIL. CÓDIGO DE TRÂNSITO BRASILEIRO, 23 DE SETEMBRO DE 1997. Available in < https://www.jusbrasil.com.br/topicos/10621021/artigo-54-da-lei-n-9503-de-23-de-setembro-de-1997>. Brasil, 2009. Access september 2024.

[10] YANG, Yingzhi. CHINA'S BIKE-SHARING INDUSTRY IS 'IMMATURE AND UNREASONABLE', NEEDS REGULATION, SAYS STATE MEDIA COMMENTARY. Disponível em: https://www.scmp.com/tech/apps-social/article/2163172/chinas-bike-sharing-immature-and-unreasonable-needs-regulation-says). Access september 2024.