



STUDY OF ELECTRIC SCOOTERS

Markets, cases and analyses



STUDY OF ELECTRIC SCOOTERS

Markets, cases and analyses

Study prepared by Sidera Consult at the request of the German Cooperation, through the GIZ (Deutsche Gesellschaft für Internationale Zusammenarbeit GmbH) and the Ministry of Economy (ME).

Authors:
Carolina Ures
Daniel Guth
Diego Ures
Victor Andrade

Ministry of Economy
January 2020

FEDERATIVE REPUBLIC OF BRAZIL

Presidency of the Republic

Jair Messias Bolsonaro

Minister of Economy

Paulo Roberto Nunes Guedes

Special Secretary for Productivity, Employment and Competitiveness

Carlos Alexandre da Costa

Secretary for Development of Industry, Trade, Services and Innovation

Gustavo Leipnitz Ene

Technical support

Cooperação Alemã para o Desenvolvimento Sustentável por meio da Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

National Director

Michael Rosenauer

Project director

Jens Giersdorf

COORDINATION AND IMPLEMENTATION

Coordination and operation staff

ME - André Sequeira Tabuquini, Bruno de Almeida Ribeiro, Gustavo Duarte Victer, Marcelo Vasconcellos de Araújo Lima, Ricardo Zomer e Thomas Paris Caldellas

GIZ - Anna Palmeira, Bruno Carvalho, Fernando Sources, Marcus Regis e Jens Giersdorf

Authors

Carolina Ures, Daniel Guth, Diego Ures e Victor Andrade

Technical coordination

Carolina Ures (Sidera) e Fernando Sources (GIZ)

Technical review

Fernando Sources (GIZ)

Proofreading

Ana Terra

Layout design

Barbara Miranda

Translation

Enrique Villamil

PUBLICADO POR

Efficient Propulsion Systems Project – PROMOB-e (Bilateral Technical Cooperation Project between the Secretariat of Development of the Industry, Trade, Services and Innovation - SDIC and the German Cooperation for Sustainable Development (GIZ)

CONTACTS

SDCI/Ministry of Economy

Esplanada dos Ministérios BL J - Zona Cívico-Administrativa,
CEP: 70053-900, Brasília - DF, Brasil.

Telefone: +55 (61) 2027 - 7293

www.economia.gov.br

Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

SCN Quadra 1 Bloco C Sala 1501 - 15º andar Ed. Brasília Trade Center, CEP: 70711-902, Brasília-DF, Brasil.

+55 (61) 2101-2170

www.giz.de/brasil

DISCLAIMER

The ideas and opinions expressed in this book are those of the authors and do not necessarily reflect the position of the Ministry of Economy or Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH. Duplication or reproduction of all or parts and distribution for non-commercial purposes is permitted, provided that the PROMOB-e project is cited as the source of the information. For other commercial uses, including duplication, reproduction or distribution of all or parts of this study, written consent from the Ministry of Economy and the GIZ is required.

TABLE OF CONTENTS

I MARKET MAPPING	10
A. INTRODUCTION TO MARKET MAPPING	11
B. THE SECTOR OF ELECTRIC SCOOTERS	12
1 The Global Market	12
2 Brief Regional Analysis / Latin America	13
2.1 Argentina	13
2.2 Paraguay	14
2.3 Uruguay	14
2.4 Bolivia	15
2.5 Chile	15
2.6 Colombia	16
2.7 Costa Rica	17
2.8 Ecuador	18
2.9 Mexico	19
2.10 Overview and Conclusions	19
C. REGULATORY FRAMEWORK	21
1 Circulation	21
2 Import of Electric Scooters	22
D. MANUFACTURERS OF E-SCOOTERS, CHARGING INFRASTRUCTURE AND MAINTENANCE	23
1 Charging types	23
2 Corrective and Preventive Maintenance	23
II CASE STUDIES OF USE OF ELECTRIC SCOOTERS	25
A. CONTEXTUALIZATION	26
B. METHODOLOGY	27
C. USES OF ELECTRIC SCOOTERS	28
1 Case Study No. 1 / Sharing Services	28
1.1 The Electric Scooter Sharing Market	28
1.2 Electric Scooter Sharing Companies	30
1.3 Additional Notes on the Sharing Market Potential in Brazil	35
2 Case Study No. 2 / Food Delivery Service	37
2.1 Delivery Operators Worldwide and in Brazil	37
2.2 Food Delivery at Events	39
2.3 Conclusions	40



3 Case Study No. 3 / Integrated Solutions: From Production to Aggregate Services	40
3.1 The Use of Electric Scooters in the Netherlands.....	40
3.2 Electric Dutchman / SPECS e-Mobility	42
4 Case Study No. 4 / Postal Delivery Services.....	44
4.1 Fleet Description.....	46
4.2 Taiwan Post Office	46
4.3 Austrian Post Office	47
4.4 Spanish Post Office	48
4.5 Concluding Notes on Postal Delivery Services	49
4.6 Notas Conclusivas Acerca dos Serviços de Entregas Postais	50
5 Case Study No. 5 / Municipal Services.....	50
5.1 First Service	51
5.2 Security and Support	52
5.3 Miscellaneous Services in Madrid	53
5.4 Concluding Notes on Municipal Services	54
III SWOT ANALYSIS.....	55
A. STRENGTHS.....	57
1 Sustainability Aspects	57
1.1 Reduction of GHG Emission	57
1.2 Reduction of Noise Pollution.....	59
2 Reduction of Operating Costs.....	59
2.1 Energy Efficiency	60
2.2 Energy Expenditure	61
2.3 Maintenance Costs.....	61
3 Mobility versus Traffic	62
4 Integrated Fleet Management Systems.....	63
5 More Efficient Batteries.....	65
6 Diversity of Applications.....	65
7 Reduction of Accidents.....	66
B. WEAKNESSES	67
1 Initial Investment	67
2 Lack of Battery Charging Structure	68
3 Lack of Skilled Labor-force	69
C. OPPORTUNITIES.....	70
1 Low Competition	70
2 Global Growth	70
3 Possibility of Fleet Rental	71
4 Possibility of Reducing the Tax Burden.....	71
5 Energy Sustainability in Brazil.....	73

D. THREATS	74
1 Tax Burden	74
2 Generic Classifications and Regulatory Uncertainty	75
3 Lack of Knowledge and Cultural Barriers	77
4 Competition with Other Ultralights	78
5 Recycling and Disposal of Batteries	79
E. FINAL CONSIDERATIONS	80
Conclusion 1: Financing Possibilities for Brazilians	80
Conclusion 2: Alternative with Higher Quality and Lower Cost	82
Conclusion 3. Factors that Can Be Reduced, Making the Final Price More Competitive.....	83
IV APPENDIXES	84
A. LIST OF MANUFACTURERS AND AUTOMAKERS OF E-SCOOTERS	85
1 Australia	85
1.1 Vmoto.....	85
2 Germany	85
2.1 GOVECS	86
2.2 Emco.....	86
2.3 Unu	86
3 Brazil.....	86
3.1 Riba Brasil	86
3.2 Sousa Motos	87
3.3 Wind do Brasil.....	87
4 China.....	87
4.1 Niu.....	87
4.2 Luyuan.....	88
4.3 Sunra.....	88
4.4 Yadea	88
5 Colombia	88
5.1 Electrika.....	88
5.2 Auteco	89
6 Spain	89
6.1 Bultaco	89
6.2 Next Electric Motors	89
6.3 Nuuk	89
6.4 Silence	89
6.5 Torrot	90
6.6 Volta Motor Company, S.L	90
6.7 e-Broh	90
6.8 Going Green	90
6.9 Lem Ev.....	90

7 United States	90
7.1 GenZe	90
8 France	91
8.1 Peugeot	91
8.2 RedE	91
9 Netherlands	91
9.1 Iva Mobility	91
10 India	91
10.1 Ather Energy	91
10.2 Hero Electric	92
10.3 Twenty-Two Motors	92
10.4 Okinawa Autotech	92
11 Italy	92
11.1 Piaggio	92
11.2 Askoll	92
11.3 Megroup	93
12 Luxembourg	93
12.1 Ujet	93
13 Israel	94
13.1 Blitz Motors	94
14 Poland	94
14.1 Vectrix	94
15 United Kingdom	94
15.1 E-Rider	94
16 Taiwan	94
16.1 Gogoro	94
B. CHARGING POINTS	96
1 BeCharged	96
2 iONEX	96
3 Bloova	96
4 ChargePoint	96
C. ELECTRIC SCOOTER MAINTENANCE COMPANIES	97
1 Auteco	97
2 MyMobility Veículos Elétricos	97
3 Norauto	97
D. COMPARATIVE ANALYSIS OF MODELS OF ELECTRIC SCOOTERS	98
E. ELECTRIC SCOOTER SHARING COMPANIES	99



F. INTERNATIONAL GOVERNMENT INCENTIVES TO ELECTRIC SCOOTERS 101

1 Innovation and Technology Cooperation Projects	101
1.1 Planning	101
1.2 Implementation	102
1.3 Financing	102
1.4 Procedure	103
2 Italy	103
3 Denmark	103
4 Norway	103
5 Netherlands	103
6 Spain	103
7 Portugal	104
8 Austria	104
9 Switzerland	104
10 France	104
11 Belgium	105
12 United Kingdom	105
13 Taiwan	105
14 Australia	106
15 United States	106
16 Germany	106

G. BILLS IN PROCESS IN BRAZIL 107

1 Federal Senate	107
1.1 Bill 3.986/2019	107
1.2 Bill 5.590/2019	107
1.3 Senate Bill 340/2016	107
2 Chamber of Deputies	107
2.1 Bill 5.272/2019	107
2.2 Bill 3.435/2019	107
2.3 Bill 9.616/2018	107
2.4 Bill 1.967/2019	107
2.5 Bill 7.582/2017	107
2.6 Bill 3.948/2015	107
2.7 Bill 3.412/2015	108
2.8 Bill 1.964/2019	108
2.9 Bill 1.371/2015	108
2.10 Bill 8.291/2017	108
2.11 Bill 7.167/2014	108
2.12 Bill 1.618/2019	108

2.13 Bill 1.410/2015.....	108
2.14 Bill 156/2015	108
2.15 Bill 3.197/2019.....	108
2.16 Bill 6.503/2016	108
2.17 Bill 874/2019	109
2.18 Bill 4.106/2015.....	109
2.19 Bill 7.262/2017.....	109
2.20 Bill 3.339/2019	109
2.21 Bill 4.086/2012	109
2.22 Bill 4.825/2019	109
2.23 Bill 8.402/2017	109
2.24 Bill 8.630/2017	109
2.25 Complementary Bill 560/2018.....	109
2.26 Bill 9.393/2017	109
2.27 Bill 902/2015	110
2.28 Bill 6.954/2017	110
2.29 Bill 7.785/2017.....	110
2.30 Bill 7.342/2014.....	110
2.31 Bill 2.145/2015.....	110
2.32 Bill 7.344/2014.....	110
2.33 Bill 2.226/2019	110
2.34 Bill 3.274/2019	110
2.35 Bill 3.242/2019	110
2.36 Bill 349/2019	110
2.37 Bill 4.507/2012	110



A. INTRODUCTION TO MARKET MAPPING

Electric mobility (e-Mobility) is a term related to the development of electric powered vehicles. In response to a demand for more sustainable alternatives, electric vehicles can represent, for companies and individuals, both the first acquisition and an option for the partial or total replacement of fleets that operate on the basis of fossil fuels and emit so-called greenhouse gases (GHG).

This market study addresses topics applicable to all electric vehicles, but is focused on the particularities of electric scooters, with three main objectives:

1. present the specificities of electric scooters or scooters ("electric scooters" or "e-scooters") to potential users;¹
2. clarify and demystify doubts inherent in its use in public and private fleets.
3. and serve as a tool for decision makers of Brazilian public and private companies in assessing the replacement, expansion or maintenance of their contingent of combustion vehicles.

The first part of this study explains key aspects and provides an overview of the electric scooter sector. Next, a brief description of the regulatory framework currently in force in Brazil is offered. In the following chapters, we discuss case studies whose applications could be adapted to the Brazilian context and, next, we bring a SWOT analysis (strengths, weaknesses, opportunities, and threats), i.e., listing the main strengths, weaknesses, opportunities and threats of the potential use of electric scooters in public or private corporate fleets in the country.



A comfortable, easy-to-handle and inexpensive two-wheeled motor vehicle, in which the driver conditions his legs forward of his trunk, on a platform, rather than to the sides, as occurs on motorcycles.

Finally, appendixes I, II and III present the world's leading manufacturers of electric scooters, charging infrastructures and their maintenance, while Appendix IV provides a comparative table of specifications between selected models in order to help operators start assessing what is on the market and what model to look for to create possible fleets. Appendix V lists the relevant sharing companies in the international market, the multiplicity and scope of which demonstrate that major European cities have incorporated this type of vehicle as one of the mobility alternatives with the greatest potential for growth and adherence, especially of the young public. Appendix VI provides a brief account of international incentives that directly or indirectly benefit the electric scooter segment, and Appendix VII indicates the bills that may impact the segment, with their menus and other details.

It is clarified that the central scope of the study is the use of electric scooters as members of corporate fleets. Thus, the material is not aimed at models developed for acquisition by the individual end-user, as a means of transport or for sports activities, but rather for companies that mainly use scooters or motorcycles as an instrument in the provision of their services.

¹ Scooter is a term that defines two types of product: 1. open two-wheeled light vehicle, in which the driver sits on a closed engine with his legs together and his feet resting on a floor board; or 2. vehicle normally mounted for recreation, consisting of a stirrup mounted on two wheels and a long steering lever, driven by one foot resting on the stirrup and the other pushing against the ground, designated in Brazil as "scooter". In this study, the focus is type 1. Source: <https://dictionary.cambridge.org/us/dictionary/english/scooter>, accessed 17 June 2019.

The global market for electric vehicles has been growing exponentially. The electric scooters, specifically, was valued at 17.630 billion dollars in 2017, with a compound annual growth rate (CAGR)² predicted at 12.8% between 2017 and 2026.³

This is a segment whose technology has more than 110 years⁴ and that has been developing for decades but has experienced abrupt growth in the last 10 years, mainly due to the technological development of a central component: the battery.

In important European cities, several municipal services today are provided by electric scooters, such as postal

delivery, traffic control, maintenance of dealership services and defense. Since 2008, citizens in Madrid, Barcelona and other Spanish urban centers use these vehicles in an increasing and positive way, which explains the existence, even, of local manufacturers. And this trend is not exclusive to Spain, but widespread in Europe, Latin America and Asia.

In all the cases analyzed in this study, common elements are noted: the very low maintenance cost, the practicality of the supply - i.e., the charging of the battery at considerably lower costs than those similar to combustion - and the absence of local noise and atmospheric pollution in its use. All these elements are welcome in Brazilian urban centers and indicated as of absolute relevance by potential users.

B. THE SECTOR OF ELECTRIC SCOOTERS

1 THE GLOBAL MARKET

HS is the condensed acronym for Harmonized Commodity Description and Coding System, an internationally standardized coding of goods, developed and maintained by the World Customs Organization. The HS has numerous functions, among which stand out:

- determine the tax rates of the good;
- define its administrative treatment.
- enable foreign trade statistical calculations.
- determine export or import tax rates.
- and check approving bodies, for example, the Ministry of the Environment and Inmetro.

The MERCOSUR Common Nomenclature (MCN)⁵ is a convention for the categorization of goods adopted since 1995 by Uruguay, Paraguay, Brazil and Argentina, based on the HS.

Electric scooters are marketed under the MCN 8711.60.00 ("motorcycles, incl. mopeds and cycles equipped with an auxiliary engine, with or without side cars - with electric motor for propulsion"), a rating created in 2017, whose code is in force since January 1, 2018. Although recent, it is still a generic tariff classification, in the same MCN as mopeds, i.e., also applicable to electric bicycles and electric kick-scooters.

This overlap prevents a clear analysis on the import data of electric scooters in Brazil because the import data under this MCN are agglutinated with other products. Because of this, it is difficult to get longer and more detailed historical series that allow electric scooter import volume and value statistics, as well as accurate demand projections.

It is noticeable, however, that the supply in Brazil is currently quite small. Despite the growth and positive prospects for the electric scooter market, it is still an immature segment, and large companies are only emerging in the sector. The companies Asians, however, have strong consolidation and

² CAGR refers to the rate of return required for an investment to grow from its initial balance to its final balance. Thus, the magnitude of the CAGR is considered one of the main indicators to analyze the viability of an investment.

³ Source: <https://www.polarismarketresearch.com/industry-analysis/electric-scooter-market>.

⁴ Source: <https://www.ultimatecarpage.com/car/3456/Lohner-Porsche-Mixte-Voiturette.html> ⁵ The MCN represents the specific tariff classification system for the Mercosur block. It is an eight-digit code established to identify the nature of goods and promote the development of international trade, as well as facilitate the collection and analysis of foreign trade statistics.

⁵ The NCM represents the specific tariff classification system for the Mercosur block. It is an eight-digit code established to identify the nature of goods and promote the development of international trade, as well as facilitate the collection and analysis of foreign trade statistics.

prominence: it is estimated that 40 million motorcycles were sold and electric bicycles, among which between 30 and 35 million for the Chinese domestic market, as early as 2015⁶.

Surprisingly, the Japanese giants of the motorcycle sector – **Honda, Yamaha, Suzuki and Kawasaki** – have not released, so far, products of global relevance in the electric segment. In order to change this scenario and identifying the potential of the market, these companies recently announced the joint development of standardized removable batteries, which can be used indistinctly in the models of the four manufacturers. The goal is to lower their development costs, making electric vehicles also more economically viable and thus expand their performance in the market of electric mopeds. **Suzuki and Kawasaki** have not yet publicly revealed their electric scooter designs. Already **Honda** and **Yamaha** showed, at the last Tokyo Motor Show 2019, models that will sell initially in Asia and subsequently in the rest of the world.⁷

Despite the absence of traditional manufacturers of mopeds, the segment of electric scooters advances around the world, with greater or lesser speed, developed mainly by small and medium-sized companies, unknown to the public.

According to the study presented here and experts and companies in the sector interviewed, the deployment of electric scooter assembly lines on a commercial scale in Brazil and the development of the market as a whole would proceed in a more accelerated way, provided that present some factors:

- feasibility of the cost of assembly or production;
- compatibility of the sale price of electric scooters with the income of Brazilians.
- modernization of the regulatory framework to deal specifically with electric scooters and allow appropriate industrial policies.
- definition of tax policies and incentives that reduce the cost of imported and domestically assembled products.
- running autonomy adjusted to the needs of different applications.
- adaptation of user habits to the particularities of the electric model.

- offering an efficient infrastructure for quick and practical charging of scooters, or allowing the swift exchange of batteries (in stations, for example).
- training of labor-force for the assembly of scooters locally.
- identification of maintenance centers to support user companies in their initial difficulties with their respective fleets, training of additional units, as well as prompt replacement service of defective parts by manufacturers; and
- design of a sustainable and complete after-use solution, including reuse, disposal and recycling of batteries and other components of the electrical system, compatible with Brazilian legislation.

2 BRIEF REGIONAL ANALYSIS / LATIN AMERICA

Although the Latin American market for electric scooters is incipient, at least 45% of the countries in the region have already adopted measures that favor its development. In addition, some local and global companies have decided regionally for the partial replacement of their fleets in order to adapt to GHG reduction targets, as well as to reduce their costs.

The Latin American region can particularly benefit from the accelerated transition to electric mobility, considering that it has one of the electricity generation matrices with lower GHG emissions, due to the high participation of hydroelectric generation and the progressive evolution in the market of other renewable energy sources.

Among the Latin economies, some examples stand out, including public policies, which had a clear positive and accelerating effect on the market of electric vehicles and, consequently, electric scooters.

2.1 ARGENTINA

Argentina currently has bills with incentives to increase the supply of electric mobility, working on specific regulations on electric vehicles, establishing the conditions for the installation or operation of centers for their charging and, at the same time, exploring options for the local development of the electric mobility industry.

⁶ http://movelatam.org/Movilidad%20Electrica_%20Oportunidades%20para%20AL.pdf

⁷ Honda's Benly e: and Gyro e: models reach the Japanese market in 2020, joining the electric version of the PCX. In the case of Yamaha, the presented models are still conceptual: E01 and E02 should expand the line of electric scooters of the brand, which already sells the EC-05 in the Asian market. This model also works with shared batteries.

The country faces, however, obstacles such as the lack of industrialization in the area and the high cost of electricity after the removal of subsidies from the federal government, as well as a regulatory issue regarding the registration of scooters as vehicles.

Previously, some companies started importing vehicles of this type, framing them as bicycles or toys that would therefore not be subject to registration or licensing. The controversy was resolved in November 2018 by stating of the Registry of Motor Vehicle Property and Pledge Credits (DNRPA, in Spanish):

All motor vehicles in Argentina must be licensed, regardless of the type of propulsion they have (gasoline or electric power).⁸

The text includes motorcycles, trikes, scooters, tricycles and motor quadricycles in the category "vehicles" and clarifies that the standard would have been in force since 1988. Due to widespread non-compliance with the regulations, there is still no critical volume of registers, so the DNRPA reports that it cannot estimate the number of electric scooters in circulation.⁹

Such difficulties did not prevent the creation, in 2007, of Lucky Lion,¹⁰ first Argentine operator of 100% electric vehicles (although with Chinese capital), which already has about 40 dealerships.¹¹ Companies such as Spanish Movo, Cabify,¹² and Mexican Grin are preparing to enter the market.¹³

2.2 PARAGUAY

Although a tax incentive law for the import of electric cars was passed in 2012, Paraguayan entrepreneurs in the sector

report that the legal device has undergone several changes, losing its effectiveness.¹⁴

On the other hand, a new national policy is being developed, the so-called National Electromobility Strategy, with the support of the Inter-American Development Bank (IADB), the Ministry of Information Technology and Communication of Paraguay, the International Automobile Federation (FIA) and the Paraguayan Touring and Automobile Club. This policy aims to transform local transport and seek sustainable and electric alternatives.¹⁵ In May 2019, the Electric Mobility and Smart Cities Fair took place, which was attended by major industries and the IADB.¹⁶ And even without a structured charging network, since 2018 electric scooters are seen most often in Ciudad del Este.¹⁷

2.3 URUGUAY

Uruguay stands out as an example of attention to the sector, with regulation and incentive policies already in place,¹⁸ charging network and awareness campaigns.¹⁹ In 2014, the government created an inter-institutional alliance to carry out strategic actions aimed at developing regulatory, technical and fiscal instruments that stimulate the gradual electrification of the vehicle fleet. This is because, in addition to the objectives commonly associated with the electrification of the fleet, the country aims, for sovereignty issues, to reduce its dependence on fossil fuels by migrating to electricity, which not only produces, but also exports.

As a result, the Ministry of Economy and Finance and the Ministry of Industry, Energy and Mining of Uruguay approved tax reductions for electric vehicles – for example, the internal specific tax (IMESI), which, by decree 246/012, it began to tax such vehicles by 5.75%, while combustion

⁸ Source: <https://exclusivomotos.com/fin-de-un-mito-las-motos-el-C3%A9ctricas-deben-patentarse>.

⁹ Source: https://tn.com.ar/autos/lo-ultimo/motos-electricas-el-gobierno-alerto-que-muchas-circulan-de-manera-irregular_911123.

¹⁰ Source: <https://luckylion.com.ar/index.html>.

¹¹ Source: <https://www.evwind.com/2011/01/31/lucky-lion-lider-de-bicicletas-y-motos-electricas-de-china/>.

¹² Source: <https://www.iproup.com/innovacion/4876-tecnologia-inventos-tecnologicos-autos-electricos-Cabify-integra-alquiler-de-motos-y-monopatines-en-su-aplicacion>.

¹³ Source: <https://www.iproup.com/innovacion/5871-cabify-toyota-mobility-services-lime-Movo-trae-sus-monopatines-a-la-Argentina-y-alquilara-motos>.

¹⁴ Source: <https://www.portafolio.co/economia/asi-esta-avanzando-la-movilidad-electrica-en-america-latina-524234>.

¹⁵ Source: <http://www.revistafoco.com.py/2019/02/19/paraguay-apunta-a-ser-un-pais-con-movilidad-sustentable/>.

¹⁶ Source: <https://www.tacpy.com.py/blog/3129/paraguay-apunta-a-la-movilidad-electrica>.

¹⁷ Source: <https://www.ultimahora.com/motos-electricas-empiezan-tomar-las-calles-paraguayas-n1700703.html>.

¹⁸ Source: <http://www.eficienciaenergetica.gub.uy/>.

¹⁹ Source: <https://movilidad.ute.com.uy/vehiculos.html?tab=legislacion>.

vehicles pay from 23% to 46%.²⁰ On the other hand, electric utility transport pays only 2.3%, lower than other vehicles. Thus, electric vehicles are taxed in IMESI at a rate 75% to 95% lower than that of the others.

In turn, the Investment Promotion Law (Decree 02/12) offers incentives for projects related to attracting financial resources to projects that include electric vehicles.

The country also inaugurated, in 2017, the first electric route in Latin America, going from Colonia to Punta del Este, with charging points every 60 km.²¹

According to the Uruguayan edition of the newspaper *El País*, electric vehicles are increasingly conquering Uruguayans and, according to information from Sibilas Soto Consultores, the sale of these vehicles grew 133% in 2018, including bicycles, scooters, motorcycles, tricycles and others,²² as a reflection of incentive policies and demand growth.

2.4 BOLIVIA

By holding the largest lithium reserve in the world,²³ the volatile metal that is the main component of batteries today considered more energy efficient from an energy point of view, Bolivia stands out in the electrical market.

Although it does not have the technology, knowledge or capital necessary to exploit it, the country has already entered partnerships with Germany and China²⁴ in this regard and has been reaping the benefits. In September 2019, then-President Evo Morales drove the first 100% manufactured electric car in Bolivia, and Quantum's plant in Llajta, Cochabamba, has already launched its first vehicles.

No specific information on scooters or other vehicles is yet available, but the Bolivian government promises to fill the regulatory gap for all segments.

2.5 CHILE

The understanding of Chile is to opt for a long-term vision, oriented to prioritize public transport and non-motorized modes. The country also believes that generating a critical mass of electric vehicles brings several benefits, including services and experiences.²⁵

In sign of the opening of the Chilean government to electric vehicles, in 2017 arrived in Santiago the first electric buses for the public transport system.²⁶

Already in 2018, the National Electromobility Strategy was launched, a joint effort of the Ministry of Energy, the Ministry of Transport and Telecommunications and the Ministry of Environment.²⁷ The policy recognizes that the country is not a major global player in the market, for not producing vehicles and consuming them on a low scale, but highlights it as one of the largest lithium reserves in the world (to better understand the subject, see section 2.4 Bolivia). The capacity of this reserve, by itself, changes Chile's place on the map of electric mobility, giving it relevance in the interaction with other global players in the face of the potential power of attraction for battery cell manufacturers from this input.

With a target of 40% of private vehicles and 100% of public transport vehicles being electric by 2050, Chile has established the following implementation guidelines:²⁸

1. Establish necessary regulations and standards for components that promote the efficient development of electromobility from an energy, environmental and mobility point of view.

²⁰ The IMESI is a type of indirect and selective tax for certain types of consumption, such as beverages, cosmetics, tobacco, vehicles and fuels, which can be charged once at the first marketing or at the time of importation of the good. In this sense, it is like the Brazilian Tax on Industrialized Products (IPI).

²¹ Source: https://turismo.gub.uy/blog/conoce-la-primera-ruta-electrica-de-latinoam%C3%A9rica.html?utm_source=programatica&utm_medium=nativa&utm_campaign=made-in-uruguay&utm_content=ruta-electrica.

²² Source: <https://www.elpais.com.uy/vida-actual/vehiculos-electricos-quieren-conquistar-ciudad.html>.

²³ Source: <https://larepublica.pe/economia/1418572-bolivia-mayor-reserva-litio-mundo-informe/>; <https://www.americaeconomia.com/negocios-industrias/bolivia-consolida-su-posicion-como-la-mayor-reserva-de-litio-del-mundo>.

²⁴ Source: <https://www.dw.com/pt-br/parceria-com-empresa-alem%C3%A3-em-explora%C3%A7%C3%A3o-de-l%C3%ADtio-gera-protestos-na-bol%C3%ADvia/a-50740838>.

²⁵ Source: http://www.minenergia.cl/archivos_bajar/2018/electromovilidad/estrategia_electromovilidad-27dic.pdf.

²⁶ Source: <https://www.enelx.com/cl/es/movilidad-electrica/productos/administracion-publica/bus-electrico>.

²⁷ Idem.

²⁸ Source: http://www.minenergia.cl/archivos_bajar/2018/electromovilidad/estrategia_electromovilidad-27dic.pdf.

2. Strongly increase the entry of electric vehicles in public transport larger and smaller in the different cities of the country.
3. Support the research and development of electromobility and enhance the formation of human capital at its different levels, to allow the progress of the segment.
4. Promote the development of electromobility, generating new possibilities that allow the market to sustain itself.
5. Create space for knowledge transfer and dissemination of information necessary for the different parties to make the ideal decisions regarding electromobility.

It is undeniable that mopeds and, of course, electric scooters will be a particularly important part of the goal of private transport. There are already on the market players like **Citycoco**, **Egomoto Movo** and **Super Soco**.

In early 2018, the Superintendence of Electricity and Fuels of Chile (SEC) issued an official statement that allows any commercial establishment to install public charging stations for electric vehicles, opening the field for new companies, electricity distributors and retail companies.²⁹

With its actions in development, and despite the specific incentives not yet fully outlined, Chile remains strong in its goal of being a reference in electric mobility in South America.

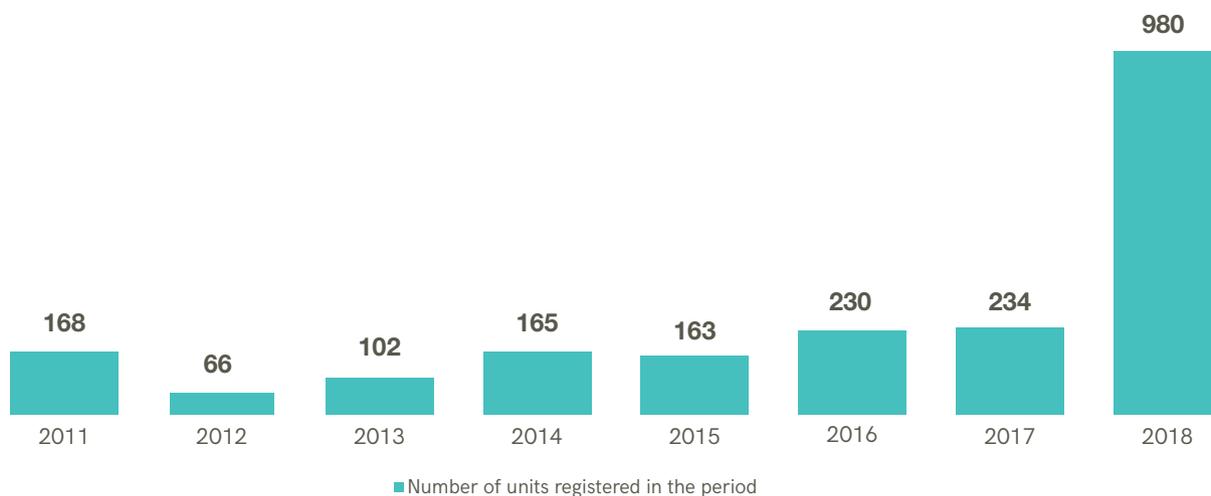
2.6 COLOMBIA

Colombia has shown significant growth in electric vehicle licensing in general in recent years, having even broken a register, with more than a thousand electric vehicles circulating.³⁰ In the words of the president of the National Association of Sustainable Mobility (Andemos),

throughout 2018, Colombia led sales of electric vehicles in Latin America, with 390 units, followed by Mexico, with 201 registers, and Ecuador, with 130 units.³¹

The graph below shows the progress of scooter and electric motorcycle registrations in Colombia from 2011 to 2018. It is worth noting that the data of electric mopeds include the fleet of various products, such as sports motorcycles and kick-scooters.

Graph - Sales of Electric Scooters and Motorcycles in Colombia



Source: MOVE-2018.³²

²⁹ Source: Electric mobility: advances in Latin America and the Caribbean and opportunities for regional collaboration. 2018. Available at: <http://movelatam.org/informe-regional-2018/>. Accessed 21 Oct. 2019.

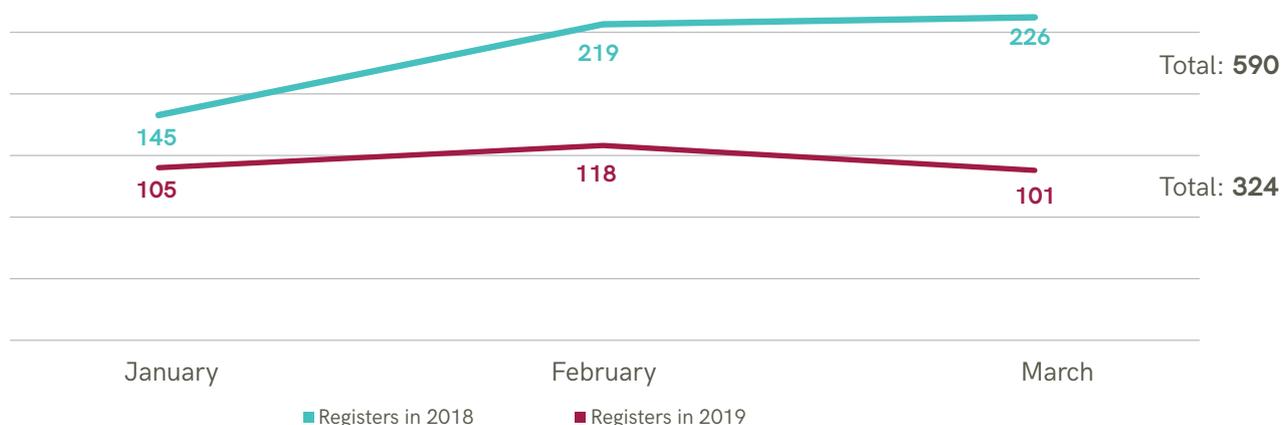
³⁰ Idem.

³¹ Source: <https://www.larepublica.co/empresas/las-ventas-de-hibridos-y-electricos-fueron-las-que-mas-crecieron-a-marzo-2846607>.

³² Idem.

Already in the first three months of 2019, there was an expressive growth of 82% in the licensing of electric motorcycles and electric scooters compared to the same period of 2018: from 324 units, it jumped to 590, as shown in the chart below.³³

**Graph - Sales of Electric Scooters and Motorcycles in Colombia
1st quarter of 2018 and 2019**



Source: Andemos.³⁴

Regarding tax incentives, Law 1.819/2016 provides a differentiated value-added tax (VAT), of 5%, for parts and charging centers of electric and hybrid vehicles. Executive Decree 1.116/2017, promulgated by the Colombian Ministry of Commerce, Industry and Tourism, establishes tax benefits of 0% and 5% import tax for electric and hybrid vehicles, respectively. It also grants 0% import tax for electric vehicle charging stations.

In March 2018, the text of the Law for Electric Mobility was approved in the Senate (Bill 75) to promote electric vehicles. It includes a definition of electric vehicle and sets the amount of applicable fees, so that taxes may not exceed 1% of the commercial value of the vehicle. The same bill proposes the creation of a discount on the periodic or technical-mechanical review of the vehicle and emissions assessments. The government also proposed to issue compulsory insurance policies for electric vehicles with a lower rate than that of regular vehicles. In addition, public

institutions and commercial establishments offering parking must allocate at least 2% of the spaces for electric vehicles.³⁵

2.7 COSTA RICA

Costa Rica also aspires to play a relevant role in the world's decarbonization goals, an expectation that is justified by the 2019 Champions of the Earth Awards, awarded by the United Nations (UN).³⁶

The country has almost 100% of its demand for energy supplied by renewable and own sources³⁷ and plans to lead the decarbonization of the economy, becoming one of the first countries to free itself from fossil fuels. At the heart of this agenda is the electrification of transport to take advantage of this capacity.³⁸

Recently, in 2019, was promulgated by Executive Decree 41.561-MR-MINAE the National Plan of Decarbonization, in

³³ Source: <https://www.vehiculoselectricos.co/4-de-cada-1-000-motos-vendidas-en-colombia-son-electricas/>, Accessed June 2019.

³⁴ Source: <https://www.larepublica.co/empresas/las-ventas-de-hibridos-y-electricos-fueron-las-que-mas-crecieron-a-marzo-2846607>. Accessed 21 Oct. 2019.

³⁵ Idem.

³⁶ Source: <https://nacoesunidas.org/costa-rica-recebe-premio-ambiental-da-onu-por-combate-as-mudancas-climaticas/7>.

³⁷ Idem.

³⁸ Source: <http://movelatam.org/wp-content/uploads/2019/06/MOVE-Regional-Report-2018-ES.pdf>.

line with the objectives of the Paris Agreement.³⁹ The goal of the plan is that by 2035, 70% of buses and taxis will be zero emission (to reach 100% by 2050), while the fast passenger train operates 100% with electricity.

Without losing sight of the electrification of the private fleet, Costa Rica encourages the market by exempting the selective consumption rate - which represents between 30% and 53% of the total value of vehicles - while hybrids pay a fee equivalent to 10% of the total price of the vehicle. The exemption applies to all new electric and rechargeable hybrid vehicles, including hybrid and electric scooters and motorcycles imported into the country.⁴⁰

In November 2018, as part of the national goal, the country's National Postal Service announced the plan to electrify its delivery fleet, which involves the introduction of 348 electric mopeds in the medium term. In addition, the measure represents a drastic reduction in spending on the distance traveled, from € 28.8/km, with fuel, to € 1.37/km, with electricity.⁴¹

Also, in 2017, the Costa Rican Congress passed Law 9,518, which provides tax incentives for private and public electric vehicles and institutional fleets. The law encourages the purchase of electric vehicles in public tenders and sets the goal to electrify at least 5% of the bus fleet every two years.

Also opens doors for public-private partnerships for the deployment of charging points, with the aim of reaching 100% of the fleet consisting of electric vehicles.

2.8 ECUADOR

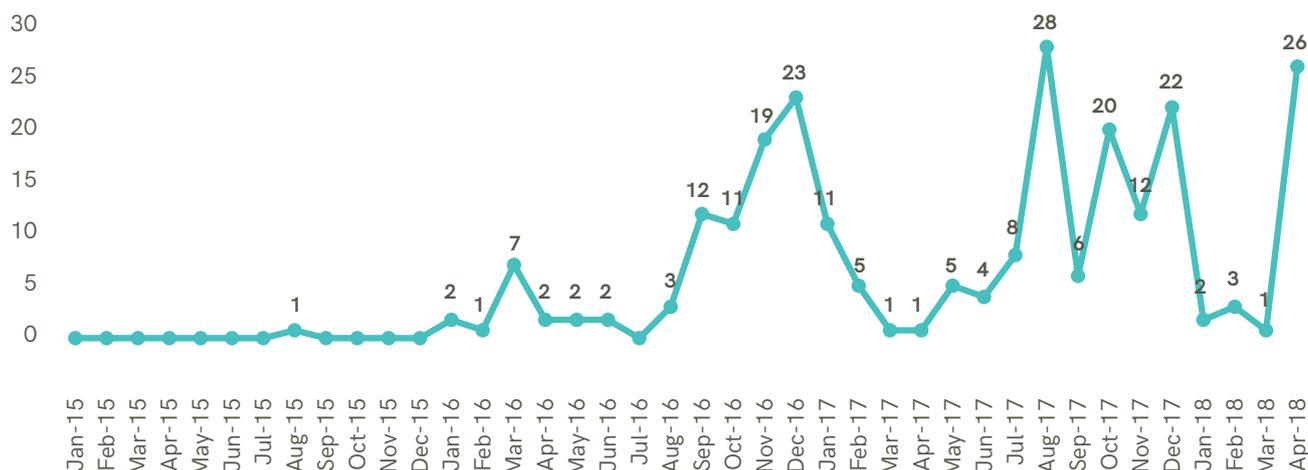
All electric vehicles, including scooters, are exempt from the environmental tax on vehicle pollution, which stimulates companies to act with mobility in a sustainable way.⁴²

In Ecuador, unlike Brazil, these types of scooters are still cataloged by the National Transit Agency (NTA) as bicycles and, for this reason, do not require licensing, license plates or rating, as long as they do not exceed the speed of 35 km/h.

In 2018, 70 electric mopeds were sold in Ecuador, with an average value of US\$ 2,300, with another 120 imported and distributed in the country.

As for charging, Ecuador has concluded an international agreement between the Universidad Salesiana, Deea Solutions GmbH and Tratural Co. Ltd., from Germany, responsible for the design and installation of a power plant, in which mechanisms were developed with the energy of solar panels at charging stations to stimulate the use of electric vehicles.

Figure - Monthly Sales of Electric Vehicles in Ecuador between 2015 and 2018



Source: AEADE, Autoplus 2018

³⁹ Source: <https://www.minae.go.cr/images/pdf/Publicacion-del-Plan-Descarbonizacion.pdf>.

⁴⁰ <http://movelatam.org/wp-content/uploads/2019/01/MOVE-2018-Informe-regional-sobre-movilidad-electrica.pdf>.

⁴¹ Source: <https://presidencia.go.cr/comunicados/2018/11/correos-de-costa-rica-anuncia-transformacion-electrica-de-su-flota-de-motocicletas/>.

⁴² Source: <https://www.eltelegrafo.com.ec/noticias/economia/1/una-marca-ecuatoriana-fabrica-motos-electricas>.

2.9 MEXICO

Mexico is cited as a success story by Jorge Barrigh, president of the Latin American and Caribbean Council on Renewable Energy⁴³, thanks to the regulatory opening in the area of renewable energies initiated by its Legal Framework of Renewable Energies in Mexico.⁴⁴

Among the measures adopted for the benefit of electric vehicles are exemption from the new vehicle tax, exemption from the annual vehicle property tax (tenure payment) by most Mexican States and exemption from the restriction and environmental verification in Mexico City.

Mexico's National Electric Mobility Strategy was launched in September 2018, led by the Secretariat of Environment and Natural Resources (SEMARNAT), in collaboration with the Secretariat of Energy, the Ministry of Finance and Public Credit, the Ministry of Economy and the Mexican Association of Automotive Industry (AMIA), as well as representatives of the electric vehicle industry. With short-term actions, some of its goals are to promote the production of electric vehicles, increase the charging infrastructure and gradually electrify vehicle sales in the country. The goal is to electrify 5% of new vehicle sales by 2030, 50% by 2040 and 100% by 2050.

The country already has the largest network of charging centers in Latin America, with 2,000 stations (the result of collaborations with major automakers),⁴⁵ and the largest number of licensed electric vehicles.⁴⁶

In addition, Mexico City already has several sharing companies, renting bicycles, scooters and electric bikes.⁴⁷

Finally, Mexico's robust vehicle industrial park, currently the sixth largest powerhouse in the manufacture of these goods,⁴⁸ also leaves it ahead of most of its competitors - including in Latin America - in the race for the manufacture of electric vehicles.

2.10 OVERVIEW AND CONCLUSIONS

According to the UN Environment, the environmental situation in Latin America is expected to worsen in the coming years due to the excessive increase of its vehicle fleet. In the words of Leo Heileman, regional director of the entity, the fleet of combustion vehicles in Latin America

"it is expanding faster than in any other area of the World"⁴⁹, putting even the Paris Agreement on Climate Change at risk, since "the region alone contributes about 10% of the greenhouse gases emitted in the world".⁵⁰

The region, however, has the cleanest energy matrix in the world, with a 25% share of renewable sources.⁵¹ Some countries, such as Uruguay⁵² and Costa Rica,⁵³ already have their demand for electricity met by more than 90% by renewable sources.

In this sense, the Development Bank of Latin American (CAF) indicates that the region needs to improve its energy production processes and the use of energy to achieve energy efficiency and improve its population's access to such resources as its global competitiveness.⁵⁴ It is also a fact that the region holds the largest lithium reserves on the planet.⁵⁵

⁴³ Source: https://brasil.elpais.com/brasil/2018/11/15/economia/1542293699_535260.html.

⁴⁴ Source: https://www.cemda.org.mx/wp-content/uploads/2016/06/Marco-jur%C3%ADdico-de-las-energ%C3%ADas-renovables-en-M%C3%A9xico.final_.pdf.

⁴⁵ Source: https://publications.iadb.org/publications/spanish/document/An%C3%A1lisis_de_tecnolog%C3%ADa_industria_y_mercado_para_veh%C3%ADculos_el%C3%A9ctricos_en_Am%C3%A9rica_Latina_y_el_Caribe_es_es.pdf.

⁴⁶ Source: <https://www.milenio.com/especiales/el-mercado-de-autos-electricos-crece-en-mexico>.

⁴⁷ Source: <https://www.portafolio.co/economia/asi-esta-avanzando-la-movilidad-electrica-en-america-latina-524234>.

⁴⁸ Source: <http://www.oica.net/category/production-statistics/2018-statistics/>.

⁴⁹ Source: <https://www.estrategiaynegocios.net/lasclavesdeldia/1206455-330/onu-pide-a-latinoam%C3%A9rica-apostar-por-movilidad-el%C3%A9ctrica>.

⁵⁰ <https://www.bancomundial.org/es/news/feature/2019/04/24/america-latina-carga-las-baterias-para-el-transporte-limpio>.

⁵¹ Source: <https://www.caf.com/pt/presente/noticias/2015/12/america-latina-teremos-energia-suficiente-para-todos/>.

⁵² Source: https://www.opp.gub.uy/sites/default/files/inline-files/12_%20Presente%20y%20futuro%20de%20las%20Energ%C3%ADas%20Renovables%20en%20Uruguay.pdf.

⁵³ Source: <https://nacoesunidas.org/costa-rica-recebe-premio-ambiental-da-onu-por-combate-as-mudancas-climaticas/>.

⁵⁴ Source: https://www.cemda.org.mx/wp-content/uploads/2016/06/Marco-jur%C3%ADdico-de-las-energ%C3%ADas-renovables-en-M%C3%A9xico.final_.pdf.

⁵⁵ Source: <https://www.iadb.org/en/improvinglives/lithium-white-gold-regions-development>.

For all these reasons, various international bodies ^{56 57 58} and private institutions seek to point directions and develop greater cooperation in the region, including with European and Asian countries.

The UN Environment suggested in its studies four priority axes that, if treated in an integrated way, can decisively

support the acceleration of the transition for electric mobility in Latin America.⁵⁹ The first two axes have to do with the establishment of a balanced regulatory floor, allowing electric vehicles to compete on an equal footing with combustion-like vehicles. The other two are related to the creation of conditions and infrastructures that facilitate the deployment of electric mobility.

Figure - UN Environment Priorities Axes for Latin America



Source: ONU, Move: Movilidad eléctrica em Latinoamérica.

Local countries are already moving, granting tax and non-tax incentives, according to the following framework, and set regional goals, such as an electric route between the Mercosur countries.⁶⁰

⁵⁶ Source: https://www.cepal.org/sites/default/files/presentations/movilidad_electrica_en_latam_-_esteban_bermudez.pdf.

⁵⁷ Source: https://publications.iadb.org/publications/spanish/document/An%C3%A1lisis_de_tecnolog%C3%ADa_industria_y_mercado_para_veh%C3%ADculos_el%C3%A9ctricos_en_Am%C3%A9rica_Latina_y_el_Caribe_es_es.pdf.

⁵⁸ Source: <https://www.caf.com/pt/temas/c/cidades/infraestrutura-e-mobilidade/>.

⁵⁹ Source: http://www.pnuma.org/cambio_climatico/publicaciones/JORNADA_1_MOVE.pdf.

⁶⁰ Source: <https://www.cier.org/es-uy/Lists/RevistasLD/Revista%20CIER%20N%C2%B082.pdf/>.

Figure - Summary of Incentive Policy Instruments in Latin America

Category	Political instrument	Argentina	Brazil	Chile	Colombia	Costa Rica	Ecuador	Mexico	Panama
Purchase incentives	VAT discount/exemption	■	■	■	✓	✓	✓	■	■
	Import tax discount/exemption	✓	✓	■	✓	✓	■	✓	■
	Other	✓	✓	■	■	✓	✓	✓	✓
Operating incentives	Discount/exemption from movable property tax	■	■	■	■	✓	■	✓	■
	Tolls or parking exemption	■	■	■	✓	✓	■	✓	■
	Other	■	■	■	■	✓	■	✓	■
Other Incentives	Exemption from movement restrictions	■	■	■	✓	✓	■	■	■
	Other Incentives	■	■	■	■	■	✓	✓	■
	National electric mobility strategy	✓	■	✓	✓	✓	■	✓	✓
	Regulation of charging stations	■	■	✓	■	✓	■	■	■
✓ Full incentive/policy instrument approved and implemented									
✓ Partial incentive/political instrument at the design stage									

Source: Euroclima e Aecid.⁶¹

For incentive policies in other regions of the world, see Appendix VI.

C. REGULATORY FRAMEWORK

1 CIRCULATION

The Brazilian legislation is relatively ambiguous regarding two-wheeled vehicles, and the segment would benefit from a modernization. The Brazilian Traffic Code (CTB - Law 9.503, of September 23, 1997) does not make a clear distinction between motorcycles, scooters, mopeds and electric bicycles, mainly due to the fact that electric vehicles did not yet represent a reality when the CTB was promulgated.⁶²

For the CTB, a motorcycle is a two-wheeled self-propelled vehicle, with or without a side car, driven by a driver in a mounted position. The motor scooter is a two-wheeled self-propelled vehicle, driven by a driver in a sitting position.

Electric bicycles were regulated by Resolution 465/2013 of the National Traffic Council (CNT), which equated them to conventional bicycles with human propulsion.⁶³ This measure put an end to confusion among traffic agents and insecurity among users of electric bicycles due precisely to the lack of differentiation with mopeds.

The ambiguity regarding mopeds, however, remains. According to the CTB, the moped is a two to three-wheeled vehicle that has an internal combustion engine and whose speed does not exceed 50 km/h.⁶⁴ The scooter has an electric motor, and this is the main difference between the two. However, the resolution of the National Traffic Council (CONTRAN) 315/2009, amended by Resolution 465/2013, equated the moped to:

⁶¹ Source: <http://movelatam.org/wp-content/uploads/2019/06/MOVE-Regional-Report-2018-EN.pdf>.

⁶² Source: http://www.planalto.gov.br/ccivil_03/leis/l9503.htm.

⁶³ Source: <https://www.denatran.gov.br/download/Resolucoes/Resolucao4652013.pdf>.

⁶⁴ Appendix I to the CTB.

[all electric cycle] fitted with an electric propulsion engine with a maximum power of 4 kW (four kilowatts), whether or not fitted with driver-driven pedals, the maximum weight of which, including the driver, passenger and cargo, does not exceed 140 kg (one hundred and forty kilograms) and the maximum speed declared by the manufacturer does not exceed 50 km/h (fifty kilometers per hour).⁶⁵

In this way, electric scooters falling within the above description for power, weight or maximum speed are subject to the use of appropriate helmet and clothing and are allowed to run only on the bearing tracks, never on cycle lanes and cycle lanes. In addition, it is mandatory to hold an Authorization for the Driving of Mopeds or National Driver's License - Category A, in addition to the need for registration, licensing and plate, according to Resolution CONTRAN 555/2015 and Resolution CONTRAN 231/2007.

In summary, following the standards already found for traditional motorcycles, electric scooters will require registration, licensing and plate, as well as the use of helmet and possession of own authorization to drive it, either as a moped (Authorization for Driving Mopeds, ACC), or as a motorcycle.

2 IMPORT OF ELECTRIC SCOOTERS

As for the import of scooters, in parts or assembled, at first there is no need for a license for specific or different import than is already required for the import of motorbikes and motorcycles.⁶⁶

Once the moped to be imported has been defined, an application for approval must be made, stating the make, model, version and accessories, if applicable. Only new vehicles may be imported.

For the scooter to be allowed to enter Brazil, it is necessary to obtain the License for Use of Mopeds, Motorcycles and

Similar Vehicles Configuration (LCM), issued by the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA), which certifies that the scooter is within the current environmental regulations and takes on average 15 days to be issued. With the license in hand, it is necessary to issue the Certificate of Suitability to the Traffic Legislation (CAT), which will prove that the vehicle is compatible with Brazilian traffic regulations and meets the safety criteria required by the National Traffic Department (DENATRAN). The CAT takes, on average, 30 days for its release.

Once approved, it is necessary to hire an accredited and experienced professional to carry out the service of vehicle import and customs clearance. This will initiate the import procedures, requiring the Tracking of Agents Activity (RADAR), which is a simplified import authorization for amounts less than US\$ 150,000, given by the Federal Revenue. The dispatcher will also register an Import Permit (LI) in the Integrated System of Foreign Trade (SISCOMEX), which will be sent to IBAMA and the Secretariat of Foreign Trade (SECEX). Such bodies will prove that the interested party has complied with the confirmation and proof of destination requirements for the tires.

You will also be asked to provide the Material Safety Data Sheet (MSDS), a product safety data sheet containing specifications for the material and safe handling of the battery, as well as information on material composition, chemistry, toxicity, storage, handling and disposal. The MSDS must be supplied by the battery manufacturer.

After completing all these steps, the scooters will be legally able to enter Brazilian territory. But it is of utmost importance to wait for the issuance of the CAT before authorizing the exporter to ship the goods, thus avoiding unnecessary costs for customs clearance by not presenting this document.

Finally, scooters must undergo a tax inspection before being released.

According to the experience of the importers interviewed in this study, since there is familiarity with the import procedure, it does not represent any burden to the operation, being quite predictable and without bureaucratic obstacles that deserve to be highlighted.

⁶⁵ Source: artigo 1º da Resolução Contran 315 de 2003. Source: https://www.denatran.gov.br/download/Resolucoes/RESOLUCAO_CONTRAN_315_09.pdf.

⁶⁶ Source: <http://www.autolex.com.br/importadores-independentes.html>.

D. MANUFACTURERS OF E-SCOOTERS, CHARGING INFRASTRUCTURE AND MAINTENANCE

Appendix I contains a list of the world's leading manufacturers of electric scooters. Of those questioned, most showed, in an interview, an interest in operating in the Brazilian market through partnerships or independently. Its condition, however, is that there is a regulatory movement more favorable to the segment, particularly with reductions in import taxes (II) and on industrialized products (IPI).

1 CHARGING TYPES

As explained in Appendix II, electric vehicles sold today come from the factory, usually with a 110-volt Level 1 portable charger, connected to a simple household outlet, and do not require special installation. Some manufacturers, in turn, offer a charger of Levels 1 and 2, bivolt (i.e., from 110 to 240 volts), so that at first it is not necessary to install specific charging infrastructure. Level 3 charging is possible in fast or express charging stations, whose more intense current allows for faster charging. However, this technology is not used in electric scooters on a commercial scale, due to the increased wear of the cells, which reduces the life of the batteries.⁶⁷

In a conventional outlet, full charging of the battery can take from 3 to 8 hours, depending on the model of the scooter. In this way, battery switching stations become particularly interesting when faster and/or frequent charges are required.

Older models are charged at stations for the whole scooter (Bloova). Although visually they look like bicycle sharing stations, in this case they fulfill the functions of parking and charging the vehicle. Models that have removable batteries (Emco or Gogoro) have been taking up space in the segment; because they are portable, the batteries can be taken for charging in places such as offices or apartments, as well as allowing drivers to change them and continue driving without having to take long breaks for

charging. This model is especially interesting for operators of delivery and sharing services.

2 CORRECTIVE AND PREVENTIVE MAINTENANCE

The preventive and corrective maintenance of electric scooters, further dealt with in Appendix III, is one of its major competitive advantages. The moving parts of vehicles, as with all equipment, suffer wear in use, by the friction of the movement itself, even with the periodic application of lubricating oils. Rui Almeida, director of automaker Riba Brasil,⁶⁸ explains that, while combustion motorcycles have approximately 100 moving parts, 50 to 60 only in the engine, electric scooters have only 8 moving parts:⁶⁹ have no belts, pistons or gears to wear and no filters, candles or oils to change, nor valves or clutches to adjust. Corrective maintenance, therefore, is reduced and, depending on use, topography and driving, represents a cost up to eight times lower compared to the combustion bike, as will be detailed in the Chapter III. In the perception of fleet operators, the operational economy is one of the main positive factors, although the purchase price of scooters is, in general, slightly higher than that of combustion motorcycles.

Maintenance of the mechanical part of scooters, which includes chassis, brake and bearing, can be done in traditional mechanical workshops, that is, in the same ones that do the maintenance of combustion mopeds. In general, the most worn and sometimes replaced part is the tire.

For possible electrical problems, the usual thing in the market is the replacement of the defective part with a new one, because the cost of labor-force to repair it does not pay financially. Who is responsible for this replacement, depending on the mode of acquisition, contracting and/or business model of the service.

⁶⁷ Some electric motorcycles, that is, models with higher power and weight, therefore not classifiable as electric scooters, have models with the possibility of fast charging (CCS type), such as those existing for automobiles, for example, models manufactured by Zero Motorcycles. These are usually the high standard sports motorcycles and the same system cannot be used for charging those electric vehicles that are not manufactured and adapted to receive level 3 charge.

⁶⁸ <https://www.ribabrasil.com.br/>

⁶⁹ Moving parts are front and rear wheel bearing, steering box, bushings and balance bearing, shock absorbers and throttle, brake disc and brake pad.

Within the context of the development of the current market in Brazil, it is most likely that the first agents in the provision of maintenance services are the operators and automakers already found in the market, such as the companies Riba and Wind do Brasil.

In addition, the manufacturers themselves usually provide maintenance service for the fleets. This is the case, for

example, with Govecs (Germany) and Torrot (Spain). In the Brazilian context, a scenario with the potential to be replicated is that of the German manufacturer UNU, in partnership with Bosch Service for the maintenance service of its electric scooters. Considering the breadth of Bosch Service's network in Brazil, a possible partnership in similar ways can be promising for the purposes of credibility and satisfactory coverage of the Brazilian market.

A. CONTEXTUALIZATION

Urban mobility and the opportunities of this market have been an important topic of debate around the world. The solutions are as diverse as the challenges faced by urban centers: for each problem, multiple and integrated solutions.

There are, however, points of convergence in the evolution of most alternatives, such as the search for increased efficiency, reduction in costs and sustainability. In the case of electric mobility, the solution includes electrification from ultralight vehicles, such as bicycles and kick-scooters, to heavy ones, such as trucks and buses.

Both public and private entities use electric mobility worldwide as an important ally in reducing GHG emissions and noise pollutants and, consequently, its environmental impact. The differential of electric vehicles is that their management occurs by powerful tools for large fleets, allowing behavioral control, increased safety, fulfillment of goals and performance of functions, all these elements especially important for any corporation.

While some parties, especially European and Asian, are moving steadily towards the change in the energy matrix of their means of transport, the segment's progress in some countries is more slowed down, not due to lack of demand, but mainly due to lack of financial resources and information or the lack of public policies of incentive. It is in this context that we present case analyses of corporate fleets of electric scooters in the world, always keeping in mind the potential reproduction, adapted to the Brazilian context.

By evaluating certain applications of companies and public agents that already adopt electric scooters in the provision of their services, in logistics and transport, the objective of this chapter is to allow reflection, clarify and demystify doubts inherent to the use of this type of vehicle in public and private fleets through concrete experiences.

The following case studies have, therefore, the great advantage of enabling the Brazilian market of electric scooters to develop from the good experiences of other countries and avoid bad ones, in a segment whose history is insufficient, but the evolution is intense.

Economies were selected in which the segment can be considered more mature, although not fully consolidated. The lessons learned allow the acceleration of the learning curve, the reduction of financial and human expenditures and the increase in efficiency at the time of eventual decision

making by replacing combustion motorcycle/scooter fleets with electric equivalents. However, it is important to point out the limitations found during the collection of information about the electric scooter sector in Brazil and worldwide.

Difficulties were found in the collection and organization of primary data due to slight interest by private companies, which either do not have them or create barriers to access them by strategic secrecy. Even data collection systems such as the Annual Industrial Production of the Brazilian Institute of Geography and Statistics (IBGE), the Annual Social Information Report (RAIS) or the Foreign Trade Database (Ministry of Economy) do not have data or historical series on this segment, nor do segregated import statistics that allow the projection of demand for classification and size problems of companies and the segment itself. Finally, there are still no sales volumes in Brazil that allow the establishment of a technically acceptable numerical standard.

As it is a segment not yet consolidated, in short, of incipient numbers in view of its potential, the cases selected and incorporated in this study boil down to small companies - often start-ups - or innovation divisions of large corporations or pilot projects of these. Most of the companies interviewed did not have any metrics of economy, efficiency, usability, well-being, or even the impact of any government measures.

On the other hand, the absence of secondary data, produced by companies, by sectoral entities or even by the public authority, intensifies this fragility that is the lack of numbers for those who want to invest or just know this market. In summary, the segment of electric scooters:

- it is incipient, fragile, unconsolidated, composed of small companies and start-ups and innovation divisions and pilot projects.
- does not present enough years to carry out the analysis of historical series.
- does not enable segregated import statistics that allow demand projections.
- nor does it have sales volumes in Brazil that can establish a technically acceptable numerical standard.

This chapter is composed of five case studies, selected because they deserve greater prominence and represent a more concrete opportunity in the Brazilian context if they were used as a positive reference and capable of duly adapted reproduction.

B. METHODOLOGY

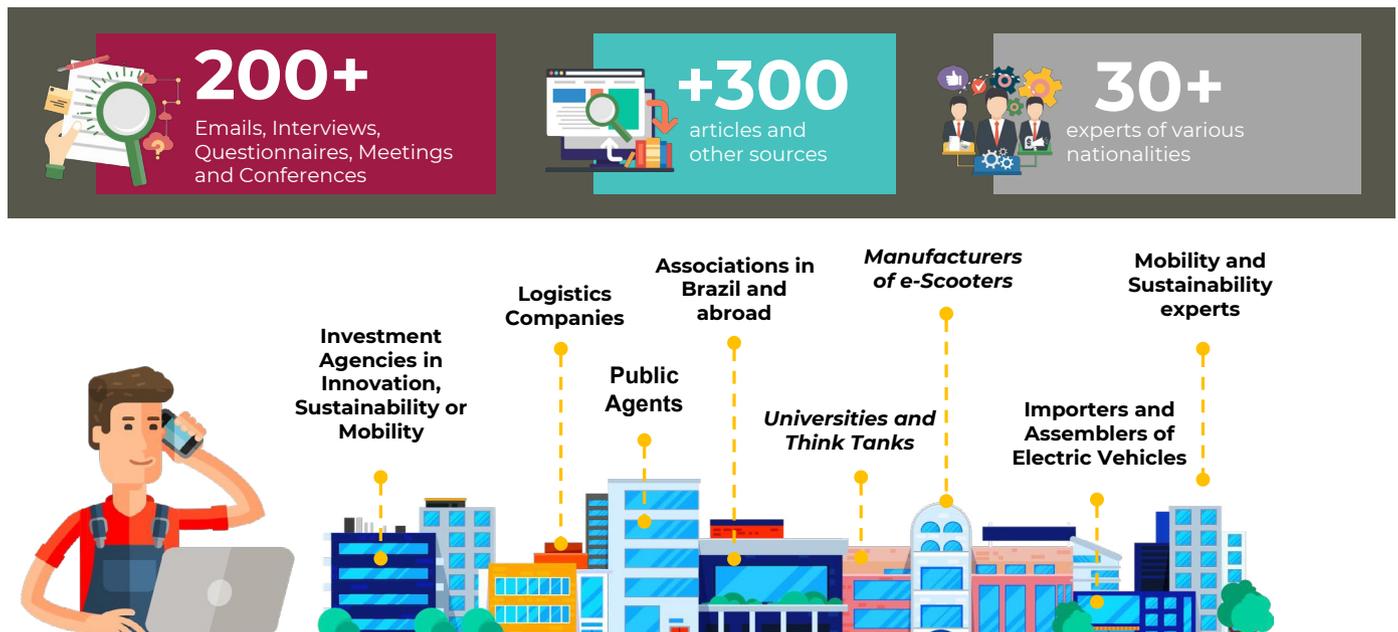
The analyses were grouped considering the various applications of electric scooters and the cases identified with the help of the manufacturers, importers and operators of the vehicles themselves.⁷⁰ These recommended their large current institutional customers and the most representative examples of each application.

The information was collected through field surveys, desk research and, mainly, semi-structured face-to-face interviews, via telephone or video call with assemblers, managers and users of companies and municipalities that use electric scooters to provide services in Brazil and abroad. In addition, structured questionnaires were sent

about costs and price formation, only partially answered, with limited numerical content and unrepresentative since most companies still lack due control of performance and economy metrics.

The information collected was organized in this section in a way addressed to all Brazilian companies that have an interest in replacing their combustion fleet with more sustainable alternatives, as well as to foreign manufacturers that potentially want to invest in electric mobility in Brazil. For European scooter producers, an understanding of the country's specific context, which of course is still unknown, was noted as a priority point.

Figure - Research Sources

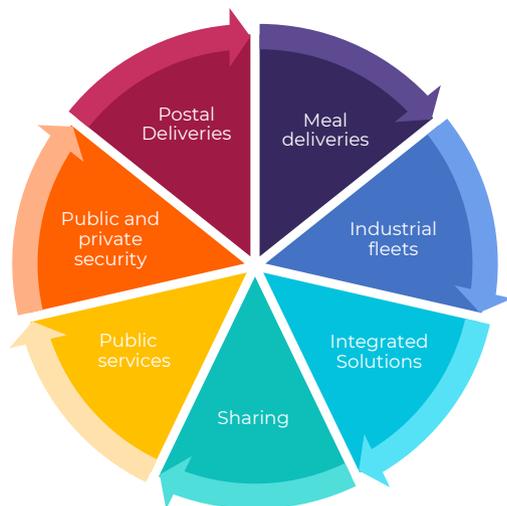


⁷⁰ The major manufacturers are described in Appendix I.

C. USES OF ELECTRIC SCOOTERS

Among the most common uses in the surveyed urban centers, some were identified that would possibly be beneficial in the Brazilian context, presenting, therefore, greater potential for adherence to the national economy and local drivers.

Figure - Demand Potential for Electric Scooters in Brazil



Source: Prepared by Sidera Consult.

Of these applications, five are analyzed in greater depth as follows: sharing services; meal delivery services; integrated solutions; postal delivery services; and municipal public services, with emphasis on security.

1 CASE STUDY NO. 1 / SHARING SERVICES

Between 2016 and 2017, scooter sharing around the world almost quadrupled in number of trips,⁷¹ in line with the spread of the culture of sharing all kinds of product and service via mobile apps.

The main reasons for such abrupt growth are:

- the independence and convenience of coming/going
- the low cost in the face of the possibility of the final consumer to enjoy products of high value and constant

technological update, without its acquisition and without worrying about maintenance.

- and the practicality of charging the batteries, as opposed to the expensive supply of combustion motorcycles.

The main reason for the expansion of the market of electric motorcycles and scooters for sharing, however, was the fact that urban centers are highly congested and light vehicles provide greater agility in circulation.

In terms of consumers' perception of sharing services, we add to the elements indicated above the concern with sustainability issues, especially on the part of the millennials' generation.

1.1 THE ELECTRIC SCOOTER SHARING MARKET

The largest fleets of shared electric scooters in Europe are found in Madrid and Paris. Global data from the sector show that almost all vehicles shared in urban centers (92%) – including scooters – are electric, and 95% are made available via free-float sharing⁷² (i.e., without specific stations for pick-up and return). This offers a particularly convenient mobility option for routes with a usual radius of up to 8 km in urban areas, without the need for investment in the ownership of a vehicle, or the risks and costs associated with its acquisition.

Figure - What Does the Sharing User Seek?

-  **INDEPENDENCE AND CONVENIENCE**
Use of the vehicle without incurring the high cost of its acquisition.
-  **CONVENIENCE OF CHARGING**
Innovations provide more and more practical alternatives to electricity, in fast charging stations or removable and immediately replaced batteries.
-  **SECURITY**
Risks linked to ownership are the sharing company, not the user.
-  **MAINTENANCE**
Both corrective and preventive, also in charge of the service provider, facilitating usability.

Source: Prepared by Sidera Consult.

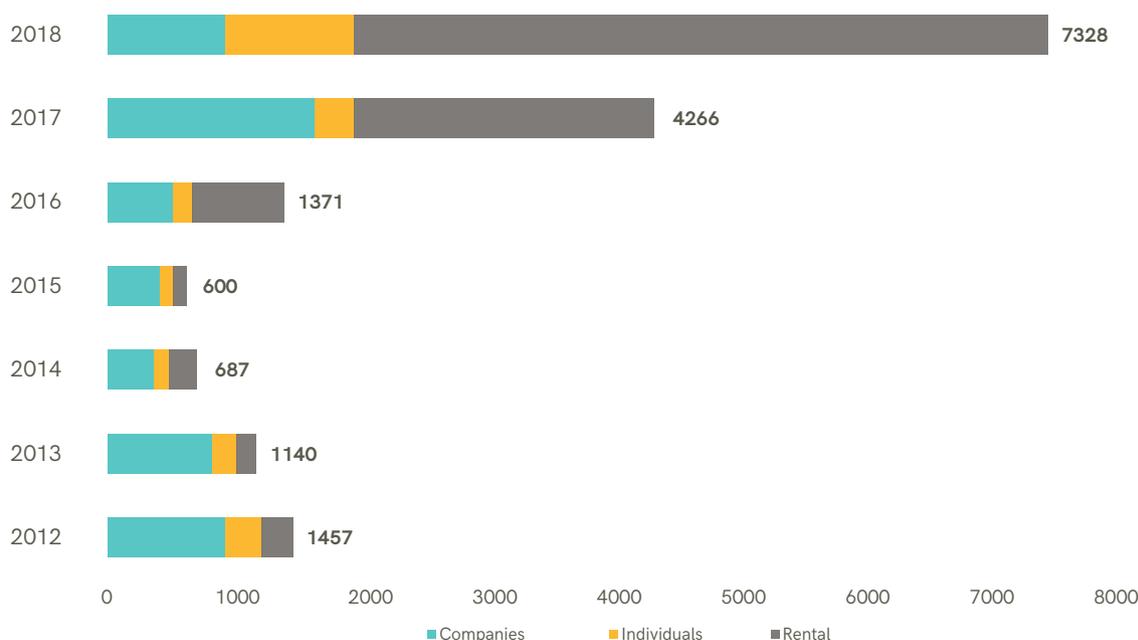
⁷¹ Source: <https://www.emco-e-scooter.com/en/scooter-Sharing/>.

⁷² Source: <https://www.emco-e-scooter.com/en/scooter-sharing/>. Accessed 9 Oct. 2019.

Driven by the sharing service, the growth of the electric scooter market is especially noticeable in Spain. According to data from the National Association of Companies of the Two-wheeled Sector (ANESDOR), between 2017 and 2018, while the moped market grew by 8.9%, there was an increase of 71.8% specifically of electric mopeds.⁷³

The following graph demonstrates the relevance of vehicle purchase to the provision of sharing services (referred to as "rental") in total electric mopeds:

Graph - Acquisitions of Electric Motorcycles and Scooters in Spain



Source: ANESDOR, 2019. Prepared by Sidera Consult.

It is interesting to note that the forecasts of the Spanish association are that this growth will continue in 2019 and 2020 in even greater progression.

The association also stated that greater legal certainty, through the publication of usability standards (such as traffic rules and necessary safety equipment) and even some limitations (of maximum speed for motorcycles and scooters, for example), was a great stimulus for the development of this segment in Spain. The lack of predictability and regulatory problems of the past, as shown today in the Brazilian scenario, was observed as one of the biggest obstacles to the growth of the sector.

As with all other technological advances, the Spanish regulatory environment took time to adapt, which generated

some fear of investment in equipment and innovation by companies. According to the Spanish association, companies feared the issue of rules that could make the business financially unfeasible and, as the rules and limitations became clearer, operators were willing to intensify their efforts to develop the market. This is also expected to occur in Brazil.

We already have the presence of some companies offering the service of sharing motorcycles and electric scooters in some large urban centers in the Brazilian territory, such as the city of São Paulo. Globally, dozens of companies are now part of a growing network of sharing systems: in Appendix V, there are some examples of electric scooter sharing companies in operation, the multiplicity of which is an indication that the market requires this business model.

⁷³ Source: <https://www.anesdor.com/>. Accessed 25 July 2019.

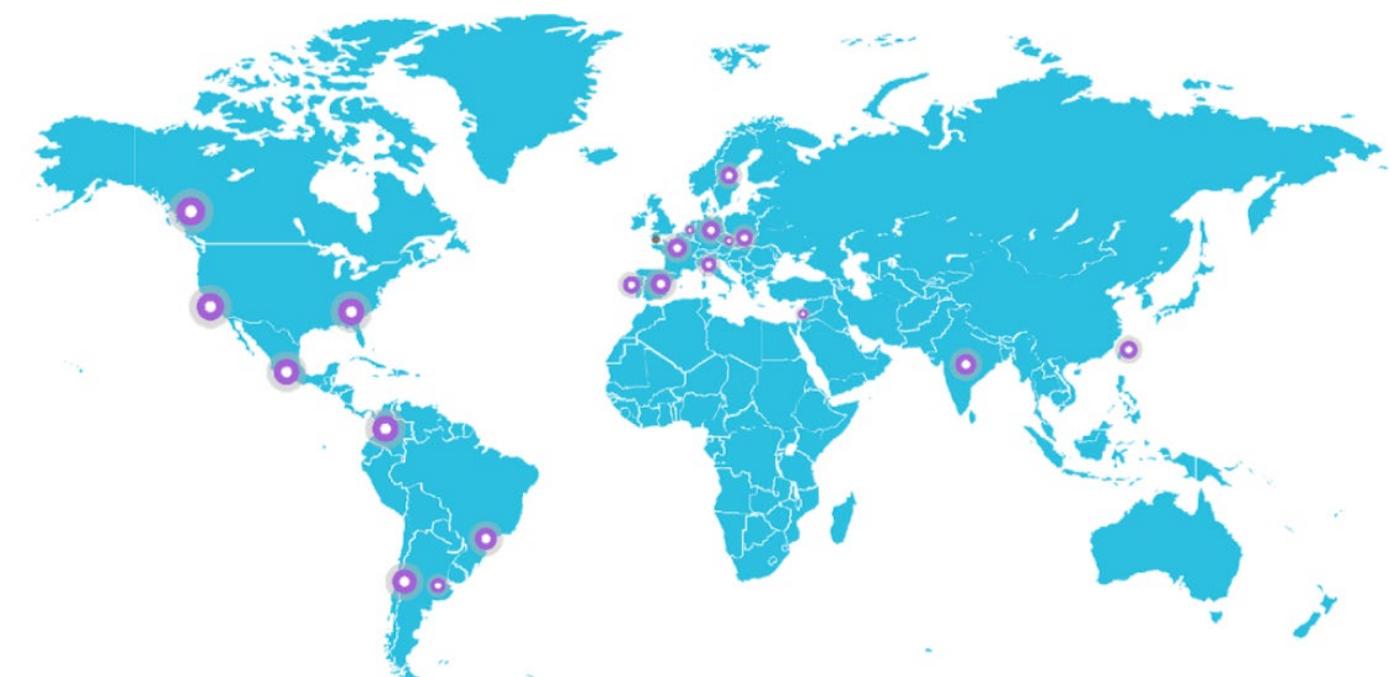
In general, the fleets available for sharing are their own, since the applications require electronic adaptations to the equipment and the manufacturers of the scooters do not allow the specifications of the vehicles to be modified, under penalty of loss of warranty of the vehicle. Most of the manufacturers identified in the study, however, have a version of the scooters specifically designed for shared urban use, whose usual top speed is 45 km/h (Europe) or 50 km/h (Brazil). Typically, they allow use by two passengers, as well as accommodate the helmet for the driver.

In more modern models, some concerns regarding the safety of the use of the vehicle and their capacity for autonomy are

already met. The compartment containing the helmet has sensors to prevent theft. Thus, the trip is only completed - and the charge suspended - when the helmet is properly repositioned on the console. In addition, in this business model, the use of removable batteries is the most common option, allowing its rapid replacement so that the scooter continues in circulation.

The preventive and corrective maintenance of vehicles is entirely in charge of the sharing company through its own workshops, which replace defective components whenever necessary directly with their manufacturers.

Figure - Map of Electric Scooters Sharing Services



Source: Prepared by Sidera Consult.⁷⁴

1.2 ELECTRIC SCOOTER SHARING COMPANIES

1.2.1 Cooltra

The e-Cooltra sharing service is a segment of the Cooltra company, which, in turn, also offers combustion motorbikes rental services in several European cities, as well as a food and document delivery service.

The e-Cooltra company is currently one of the largest players in the electric scooter sharing service in Europe,

operating in eight cities. It has a fleet of more than five thousand units and, in Brazil, operates in partnership with the Brazilian Riba in its sharing arm.

The company, founded in 2006 in Barcelona as a rental service of combustion scooters, has as its competitive advantage the time of operation and consolidation in this mobility market.

⁷⁴ The interactive version of this map, with an indication of the companies operating in each locality, can be accessed at: <https://view.genial.ly/5d1f9f39db4e5810083cf8ca/horizontal-infographic-maps-empresas-de-compartilhamento>.



Foundation
2006

**Fleet**

More than 5,000 electric vehicles

**Manufacturers of their Electric Scooters**

Askoll e Govecs

**Coverage**

8 cities (Lisbon, Rome, Milan, Barcelona, Valencia, Malaga, Palma de Mallorca and Madrid)

Transition process

The path taken to reach the current success was quite rough. The first 25 electric scooters of the parent company Cooltra were acquired in November 2009, but this first experience of the company was negative because of the then low performance of its batteries, despite the high cost and quality vehicle. Outcome: the operation barely survived.

Three years later, in October 2012, e-Cooltra, the group's free-float sharing division, was also created in Barcelona, when electric scooters finally began to play a positive role in the company's operations.

Interestingly, the decision of the Spanish operator to give another chance to the electric segment was influenced by the movement in Brazil: the company Riba, its affiliate, had acquired 50 electric scooters also in 2009, betting that this type of vehicle would be the future of mobility in Brazilian urban centers. Time later, Riba's decision to place its electric scooters for sharing services derived from its positive experience, in these years, of exclusively electric fleet, especially regarding the significant reduction of operational costs, key to any fleet operation, and the search for sustainability.

When it confirmed with its Brazilian partner that the electric alternative could also be viable for its fleet, Cooltra replicated the Brazilian experience in Spain.

Additional motivation for e-Cooltra's plans came from the Spanish government: at the time of advent of sharing, specific benefits were offered to companies operating with electric vehicles. The incentive was part of the MOVALT (Alternative Mobility Support Plan) and MOVEA (Impulse Mobility Plan with Alternative Energy Vehicles) Plans and provided discounts between 600 and 800 euros for the acquisition of L1 type mopeds,⁷⁵ classification applicable to electric scooters. The plan still exists, under the nickname MOVES Plan, covering all types of electric vehicles,⁷⁶ but with some modifications of the original scheme. In addition, the company enjoyed other benefits offered by the local government, such as the exemption of licensing fees.

Suppliers

The choice of the electric scooter model for the e-Cooltra sharing service required meeting the specifications requested by the authorities and the local market, such as:

- Maximum speed of 45 km/h;
- removable lithium battery;
- space to store helmet.
- and application for user and for remote fleet management.

Battery life and performance were fundamental factors in the planning and choice of vehicles that would be made available by the company in this new phase, especially after a negative initial experience in operation.

⁷⁵ This is the European Union's classification for ultralight two-wheel vehicles, with variation of subcategories L1eA and L1eB, in accordance with EU Regulation 168/2013 of the European Parliament and of the Council of 15 January 2013 on approval and market surveillance of two- or three-wheel vehicles and quadricycles.

⁷⁶ The purpose of these support schemes is to promote the development of electric mobility at all levels, both in private and in commercial use, with incentives even for electric buses and trucks. The installation of the electric charging point and the support for companies that bet on greener transport systems are also subsidized. Salinas, Raúl. "This is the government aid to buy an electric bike." *Autobild.es*, *Autobild*. Source: www.autobild.es/noticias/plan-moves-ayudas-gobierno-comprar-moto-electrica-377759. Accessed 21 Feb 2019.

Figure - Govecs model for e-Cooltra



Source: e-Cooltra

The first supplier of electric scooters for e-Cooltra sharing was the German company Govecs. The fact that it is a company based in Europe was decisive for issues of supply of maintenance services, quality of the product offered and, above all, alignment with the European regulations in force.

Figure - Askoll model for e-Cooltra



Source: Cooltra

In 2018, e-Cooltra switched suppliers, acquiring eSpro model electric scooters from the Italian manufacturer Askoll. The reasons indicated for the exchange were technological advances, the more modern design and the fact that it is lighter, an advantage for the performance of scooters due to the increased battery life. The Italian company made color adaptations and included the e-Cooltra logo, a wider seat, for two passengers, and support service for the use of the sharing application. The latter innovated by allowing the

scooter to be unlocked without needing a key, using only the user's smartphone.

Charging and Batteries Replacement

As mentioned, removable batteries are an essential requirement for business viability. The company's scooters have only one battery, which is replaced throughout the day as needed by an e-Cooltra team.

On the disposal of batteries at the end of their useful life, in the case of Govecs models, the manufacturer itself took responsibility for the replacement and correct disposal. With Askoll, there has been no disposal or replacement of batteries yet, since their service life has not yet ended for any of the units sold.

Customer profile

The target audience of the sharing service is made up of residents themselves because, pe la perception of the company, tourists tend to rent cars instead of using the sharing service. It has also been observed that young users, whose distances to be covered range from 2 km to 4 km, tend to choose, for comfort and speed, kick-scooters instead of walking, or use scooters and bicycles. In large urban centers, 60% of the routes up to 8 km are made with kick-scooters, bicycles and scooters, the latter being the favorite for the routes between 4 km and 8 km.⁷⁷ The electric scooter, in this sense, serves users similar to the systems of shared bikes and electric kick-scooters, but has the advantage of allowing to travel relatively greater distances than these in a more agile way.

In addition, the sharing of electric scooter was thought as a complementary option to other modes of transport, especially the commuting, mostly carried out by public transport.⁷⁸

Declared Preference

A short questionnaire was structured with questions about the importance of some regulatory measures, the relationship with the company and the decision to operate electric scooters. The responses revealed that the decision to operate or manufacture electric vehicles was based, especially, on the economic gain achieved by electric scooters, despite the higher initial capital, and on the role that the environmental agenda has taken on globally in recent years.

⁷⁷ Source: NHTS/CBNINSIGHTS.

⁷⁸ Source: <https://blogs.worldbank.org/transport/how-can-shared-and-demand-mobility-complement-public-transit>. Accessed 9 Oct. 2019.

Comments on the e-Cooltra model

Because they are related parties, the experiences of e-Cooltra in Europe and Riba in Brazil are intertwined and strengthened, allowing to optimize the development of the operation in one and the other region at each negotiation step, in a continuous symbiosis and beneficial for both. From this case study, it was identified, in the partnership in which the operators of more mature markets join the South American to explore the local segment, one of the most promising models for development, at solid steps, in the new territories of operation. It was also noted that it is important for local mobility experts to be in a strategic position for the operation, in order to incorporate their knowledge of local cultural and regulatory specificities into their day-to-day activities, being able to unravel any obstacles more easily.

1.2.2 Coup-e

Another important player is the German Coup-e Scooter Sharing,⁷⁹ which has a competitive advantage by being a subsidiary of the German multinational engineering and electronics Robert Bosch GmbH. Bosch, in turn, is one of the world leaders in the supply of batteries and electrical components to various manufacturers and automakers of electric scooters.

It is no coincidence, therefore, that Coup-e so quickly became the largest electric scooter sharing company in Germany, being also present in a relevant way in France and Spain. In February 2019, the company acquired 1,500 electric scooters that were equally distributed between Berlin, Paris and Madrid, totaling a fleet of 5,080 units.

COUP Foundation
August 2016

 **Fleet**
5,080 electric vehicles

 **Manufacturers of their Electric Scooters**
Askoll and Govecs

 **Coverage**
Gogoro

1.2.3 Movo

The sharing company Movo,⁸⁰ created in 2017 in Spain, has the private transport platform Cabify as one of its biggest investors. This has allowed its venture in Latin America, where Cabify has a strong presence, since the beginning of 2019.

In addition to the advantage of having the support of a company already active in the market of shared vehicles, Movo recently received a contribution of R\$ 22.5 million from Mutua Madrileña and the venture capital fund Seaya Ventures, evidencing the importance and potential of this market.⁸¹ The company expects to operate in 10 countries, including Brazil, Argentina and Uruguay, by the end of 2019.⁸²

 **Foundation**
August 2016

 **Fleet**
1,500 units

 **Manufacturers of their Electric Scooters**
Niu

 **Coverage**
6 cities (Madrid, Buenos Aires, Bogota, Santiago, Mexico City and Montevideo)

Comments on Coup-e and Movo models

Easy access to the considerable financial, commercial and technological resources of Bosch and Cabify offer Coup-e and Movo, respectively, clear competitive advantages. The business model of the companies proved particularly appropriate to the development of this new segment since essential factors to the operation are offered by a strong and consolidated partner.

In addition to Coup-e, there are other examples reported in Appendix I of how the partnership model aiming to exploit different competitive advantages can work. The histories are varied: senior managers of technology companies stay ahead of the business, traditional combustion motorcycle companies migrate to electric, innovation centers, research and development are involved in product engineering, partnerships are established with universities or traditional

⁷⁹ Source: <https://www.bosch.com/stories/coup-escooter-Sharing>. Accessed 9 Oct. 2019.

⁸⁰ <https://movo.me/mx/>. Accessed 9 Oct. 2019.

⁸¹ Source: <https://epocanegocios.globo.com/Empreendedorismo/noticia/2019/04/movo-startup-espanhola-vai-entrar-no-concorrido-mercado-de-patinetes-eletricos-no-brasil.html>. Accessed 9 Oct. 2019.

⁸² Source: https://cincodias.elpais.com/cincodias/2019/04/10/companias/1554883214_242190.html. Accessed 9 Oct. 2019.

sharing companies other types of vehicles. In all these cases, the robustness of one of the partners undoubtedly gave scope to the most successful operations.

In the development of the segment in Brazil, the already active automakers, Riba and Wind, for example, can offer their deep knowledge of the local market as a competitive advantage. Its understanding of local consumers and their demands, in addition to the applicable regulations, constitutes a valuable prerogative in the structuring of a joint venture with foreign manufacturer to explore the Brazilian or even South American market.

1.2.4 Muving

Of Spanish origin, Muving has been a strong competitor in the share market in Europe. The company expanded its reach to the United States in June 2018, starting operation through the city of Atlanta, with 75 scooters. The location was chosen based on the support offered by the Atlanta Chamber of Commerce and the dialogue established with the local government, including for the elaboration of a regulation on the operation of the service.⁸³



Foundation
September 2017



Fleet
3,000 electric vehicles



Manufacturers of their Electric Scooters
Torrot



Coverage
12 cities (Granada, Barcelona, Malaga, Zaragoza, El Puerto de Santa Maria, Valencia, Cordoba, Cadiz, Madrid, Seville, Murcia, Atlanta).

Comments On the e-Cooltra Model

Muving is characterized by a widespread business model. In the short time since its foundation, the company decided to spread the share to eleven cities in Spain and already set out for its internationalization: it was the first European company to breakthrough into the American market. In its first year of activity and in arms with the traditional Torrot, Muving served 185,000 users.

1.2.5 Riba Share

The company began its work in sharing services in December 2018, with 50 scooters, covering the neighborhoods of Vila Olimpia, Itaim, Moema, Jardins and Brooklin. As informed by its regional director, Rui Almeida, it intends to expand the operation to several other neighborhoods, with 300 scooters, by the end of 2019. The goal is to contribute progressively to the relief of heavy car traffic in São Paulo.⁸⁴

Areas with high vehicle density and potential for adherence to micromobility alternatives were prioritized by individuals moving around the region. From São Paulo, the company seeks to reach the coverage of seven more cities in Brazil - Belo Horizonte, Curitiba, Porto Alegre, Rio de Janeiro, Recife, Florianópolis and Brasilia - in 2020, in addition to its internationalization, in 2022, to Santiago, Bogota, Mexico City and Buenos Aires. Riba Share charges around R\$ 9.65 for a 15-minute ride.

The CEO of the Riba Group, Island Costa, describes the motivation of his venture:

In 2006, we thought Riba to undertake as a propellant of electric scooters in Brazil, despite the timid numbers of scooters around here. We imagined the streets of the big centers transforming with style, lightness, friendly to the environment (less pollution, less noise and less accidents) and with a huge dose of safety, by controlling the speed of an electric vehicle being very simple and intelligent.

We understand that this undertaking is becoming a reality after all these years; we also know that soon the mobility in the big centers, the coming and going, will become much lighter, safe and fun.

We believe that Riba is contributing to these changes and, as an organization, continues its trajectory focused on massifying the market with this modal, looking seriously and fairly to its stakeholders/ shareholders.

In reinforcement of its expansion plans, in 2014 Riba began a strategic partnership with the Center of Excellence for the Innovation of the Automotive Industry in Portugal (CEIIA). The entity is an international reference in sustainable mobility and studies, promotes and integrates operations

⁸³ Source: <https://www.bizjournals.com/atlanta/news/2018/06/18/electric-scooter-Sharing-company-launches-in.html>. Accessed 9 Oct. 2019.

⁸⁴ Source: Riba.

between governments, companies and innovation and research centers, seeking to popularize and enable the use of electric vehicles.⁸⁵ This society is proving to be so fruitful that it has been expanding to other areas of collaboration and applications, still confidential, but of great magnitude and possible impact for Brazil.

Figure - Riba Share Model



Source: Riba Share

Currently, both the maintenance of scooters and the replacement of batteries are done directly by Riba itself in its maintenance workshop, where the training of its workforce takes place.



To facilitate the replacement of batteries and increase the autonomy for users, the company intends in 2020 to install exchange stations (or swapping) in strategic points of the city of São Paulo, a model to be eventually extended to other cities.

1.3 ADDITIONAL NOTES ON THE SHARING MARKET POTENTIAL IN BRAZIL

It was identified a change in the mentality of the new generations –especially regarding consumption and locomotion habits –, who seek more and more engagement with sustainable agendas.⁸⁶ This demand adds to the sharing market potential for electric alternatives in Brazil, including scooters.

Congestion rates are increasing, which makes cities open to new mobility systems and alternatives vehicle sharing – technologies, mainly to individual combustion mobility. In addition, some studies point out that sharing systems end up attracting users of public transport.

In view of the studies described above, it can be understood that there is a growing interest in the market for sharing electric motorcycles and scooters in the world, and that this phenomenon has already reached, even if in an embryonic way, the South American cities.

It is also observed the participation of large investors in sharing start-ups, identified as a promising alternative capitalization. In this regard, Appendix I shows the extent to which the funds are committed to increasing shareholdings in these companies.

⁸⁵ Official Website: <https://www.ceiia.com/>. Accessed 9 Oct. 2019.

⁸⁶ A series of research carried out by the Brazilian Institute of Public Opinion and Statistics (IBOPE) in partnership with Rede Nossa São Paulo in the city of São Paulo indicates the growing support of young people between 16 and 24 years to measures that limit and discourage the use of polluting vehicles. Source: <https://www.nossasaopaulo.org.br/#Pesquisas>. Accessed 10 Oct. 2019.

Figure - Sharing Market Potential



Source: Detran-SP.

In Brazil, there are 26.4 million mopeds, representing 7.9 inhabitants per vehicle. According to a 2018 survey on the vehicle fleet in Brazil, the number of motorcycles is higher than that of cars in 45% of cities.⁸⁷

In the state of São Paulo alone, there are 9.1 million national driver's licenses (CNH) for motorcyclists, required to drive electric scooters. A quarter of the licensed users throughout the country are women, and this proportion increases every year, and among mopeds, women use scooters more, with 52% participation.⁸⁸ Marcos Fermanian, president of the Brazilian Association of Manufacturers of Motorcycles, Mopeds, Scooters, Bicycles and the Similar Vehicles (Abraciclo), points to the practicality of locomotion and the sense of freedom as some of the reasons for the growth of

women's interest in this market, of 50.1% in the last six years.

The entire national population contingent licensed for driving motorcycles, therefore, is already able to drive the electric scooters without any additional training or licensing.⁸⁹

Compared to large European cities, where the sharing model has already prospered, the potential of Brazilian metropolises is significant, as shown in the following figure. We highlight the data related to population and fleet densities that exist today, noting the examples of Madrid, Paris, Barcelona and São Paulo. The information indicated below reinforces the perception of the great latent potential, even more considering that European urban centers have less intense traffic than those found in the capitals of Brazil.

Figure - Comparison of Sharing Numbers/Europe and Brazil

MADRID	PARIS	BARCELONA	SÃO PAULO
Coverage: 50 km ²	Coverage: 80km ²	Coverage: 60km ²	Coverage: 16km ²
Population: 3.2 mi	Population: 22.2 mi	Population: 1.7 mi	Population: 12.1 mi
No. of scooters: 4,665	No. of scooters: 4,300	No. of scooters: 2,530	No. of scooters: 100
Number of companies: 6	Number of companies: 3	Number of companies: 5	No. of companies: 1
Fleet density: 93/km ²	Fleet density: 54/km ²	Fleet density: 42/km ²	Fleet density: 6/km ²

Source: Riba, updated by Sidera Consult.

⁸⁷ Source: National Confederation of Municipalities (CNM).

⁸⁸ Source: <http://www.cetsp.com.br/media/936406/bt-61.pdf>. Accessed 31 Oct. 2019.

⁸⁹ Source: <https://www.motociclismoonline.com.br/noticias/numero-de-mulheres-motociclistas-cresce-no-brasil/>.

Finally, it is imperative to remember that, while in European cities the sharing activities are impossible for three to four months of winter, the milder Brazilian climate allows the service to be provided without any seasonal interruption and, therefore, without suspension of revenue, making the operation even more profitable.

2 CASE STUDY NO. 2 | FOOD DELIVERY SERVICE

Electric scooters are used by meal delivery companies around the world, and respondents reported as prominent factors for their employment:

- the reduction of the environmental impact used as an appeal to the consumer and brand appreciation among the young audience.
- operational savings (energy and maintenance) for own fleets.
- and the advanced scooter management apps in operation.

In the perception of the surveyed companies, the image gain for incorporating an electric fleet, even if partial, was 8 on a scale of 1 to 10.

The possibility of remote control of vehicle performance and use is indicated by food delivery companies as one of the most appreciated advantages of electric scooters, because it provides metrics that increase efficiency in deliveries, including management of average and maximum speeds, vehicle location, time and quality of delivery.

The current models usually used by delivery companies allow the displacement for 70 km to 110 km with the battery - lithium or lead - in full charge. This autonomy can also be managed through intelligent load management systems, available for some models and equally provided by some rental service companies.

All this data is collected and build reports to managers at the desired frequency.

As for the vehicle itself, manufacturers have been offering for years different types of electric scooters whose specifications have been optimized for food delivery services.

Electric scooters have proved to be still very relevant in deliveries in the cities in which they are used, because they allow daily routes around 100 to 120 km, according to the Regional Director of Riba, Rui Almeida, versus the 40 km on bicycles. The deliverer sees advantage in this performance since the operating area goes from 3 km with conventional bikes or kick-scooters to up to 10 km per delivery with scooters. As a result, the delivery person with an electric scooter or electric bicycle is not physically exhausted at the end of the day, precisely the peak hours of requests for applications.

Finally, an externality observed, and not necessarily anticipated by the interviewed companies, was the improvement of the general safety of delivery people with electric scooters that used combustion motorcycles before. Lower regulatory speeds contributed to the reduction in the number of serious accidents. Additionally, when incidents and falls occur, the wider fairing of the scooters absorbs impact and protects drivers' legs, knees and heels.

Especially after the astonishing growth of the application delivery segment around the world, including in Brazil, deliverers generally work much more than the regulatory workload at an intense pace.⁹⁰ By not emitting noise and air pollution as combustion mopeds, electric scooters also provide a better quality of life when performing functions.

Safer and quieter travel results in less stress for operators and drivers, better quality delivery and better service, in which the food remains intact in its container. According to interviews with delivery companies in Brazil, health and safety care motivates the dedication and greater productivity of deliverers, who are absent less due to fewer accidents and reduced impact of air and noise pollution.

2.1 DELIVERY OPERATORS WORLDWIDE AND IN BRAZIL

One of the possible models of operation is that in which the food delivery company makes the vehicles available to its deliverers at competitive prices, negotiated with a sharing operator, which, in turn, customizes the vehicles with the brand of the contractor.

⁹⁰ Source: <https://hackernoon.com/the-relevance-and-growth-of-food-delivery-business-0zx32nj>.



Deliveroo, a British company with extensive operations in Europe and Asia, for example, began in 2019 to rent electric scooters with its logo, in London, for its deliverers.

The service is made available through a partnership with an electric scooter sharing company, Elmovo.⁹¹ Dan Warne, managing director of Deliveroo for the UK and Ireland, commented, on the election of the platform by electric alternatives:

Deliveroo wants every meal it delivers to be truly amazing, but that will only be possible if delivery is sustainable along with the excellent food we offer. Scooters and electric bikes represent an environmentally friendly solution to reduce emissions, which save money from deliverers in the long run.

On the other hand, the English company **Just Eat**, a competitor of Deliveroo, operates in 13 countries of Europe, Asia, Oceania and America under another business model, which also encourages the use of electric scooters by its deliverers and restaurants: it has established an alliance with the British manufacturer Eskuta and offers discounts of up to 45% on its service fees so that partner restaurants acquire this type of vehicle.⁹²

The Dutch delivery company **Takeway.com**, with operations in ten European countries, offers a third model: it has its own platform and fleet, which allow its service providers to rent electric scooters to carry out deliveries.⁹³

The most common operating model in Brazil among the largest food delivery service platforms does not require its own delivery personnel, working with independent drivers. Thus, delivery companies usually do not have their own fleets and work with specialized logistics operators. This independence, however, did not stop delivery apps or services from beginning to spur their first riders to use electric scooters.



There are, however, restaurants of varying sizes, with own delivery service, who have invested in the use of electric scooters. The **Domino's Pizza** network is one of the precursors in this market, using electric scooters for delivery services since 2011,⁹⁴ as part of a global initiative to reduce the environmental impact of the brand. Group franchises in Australia, New Zealand, the Netherlands and France use electric scooters. In the French network, in January 2018, 18% of units already used scooters and/or electric bicycles. Domino's has been using different scooter manufacturers in several cities, notably the Italian Askoll, and it is estimated that the network will use more than 500 electric scooters in the main markets of Europe (Italy, France, Germany, Spain and Switzerland) by the end of 2019.

In Brazil, Domino's does not yet have its own fleet of electric Scooters, but hires, as its own employees, registered according to the Consolidation of Labor Laws (CLT), professionals who have vehicles (own or rented) and can operate them in the performance of their delivery activities.

The group demonstrates a lot of concern with the cost globally, but also with the environment, the management of its deliverers and their well-being; therefore, it seeks innovative solutions, especially in the most dense markets in which it operates around the world, such as New York, Seattle, São Paulo and Rio de Janeiro. Regarding the environmental concern, Carlos Eduardo Martins, CEO of Domino's do Brasil, explains that the company understands that its sustainability efforts could be reflected positively in the construction of a brand equity, i.e., adding value to the brand for consumers and enhancing their sales. The investment with sustainability actions would therefore be one of the best marketing actions of the network, eventually reverting to higher revenue for the company. In this sense, they have a lot of receptivity to the use of bicycles and electric scooters in their local operation, in line with what already leads elsewhere in the world.

⁹¹ Source: <https://electrek.co/2019/04/03/deliveroo-rentingelectric-mopeds>. Accessed 9 Oct. 2019.

⁹² Source: <https://postandparcel.info/95574/news/e-commerce/just-eat-offering-discounts-on-electric-scooters-to-partner-restaurants/>. Accessed 9 Oct. 2019.

⁹³ See, for example, the French platform: <https://befr-shop.takeaway.com/Scooters>. Accessed 9 Oct. 2019.

⁹⁴ Source: <https://qsrmedia.com.au/in-community/news/domino%E2%80%99s-use-electric-scooters-reduce-carbon-footprint>. Accessed 9 Oct. 2019.

Another large restaurant network that has adhered to electric scooters for years is **Burger King**. In Spain, the manufacturer Silence is one of its main suppliers (the same as the Madrid Post Office) of vehicles, whose fleets are rented. In Brazil, the use of electric scooters by Burger King is still under analysis.

Still in Spain, more specifically in the city of Mallorca, **Pizza Hut** began in 2018 to test the use of electric scooters, also under the modality of fleet rental, but with the differential of having the company Cooltra as supplier of scooters and deliverers, its employees,⁹⁵ in an integrated solution “pilot vehicle”. On its website, the French manufacturer of e-scooters RedE also presents Pizza Hut as one of its customers.

In Brazil, **iFood**, foodtech leader in Latin America, processes 21.5 million deliveries per month. The deliverers are independent partners, being more than 83,5 thousand active registrations. For a significant number of partners, acting through applications is a way of supplementing income.



Seeking to bring more efficiency to the operation and improve the experience of the deliverers, iFood began to test electric modes, such as bicycles and kick-scooters, as well as scooters. In a recent survey conducted with deliverers, it was found that 91% of respondents like to use electric modes and that 80% believe that they offer more agility and efficiency. Between March and August 2019, more than 60 thousand deliveries with the electric alternatives were completed.

Also, in October, the company started the pilot project of electric scooters in São Paulo in partnership with Riba, in the region of Avenida Paulista and in the Itaim Bibi neighborhood. Recently announced a new generation of electric kick-scooters. The company prioritizes stronger structures, stability and greater battery autonomy, as well as reinforcement in the security and signaling system.

This and other innovation, technology and logistics projects were prioritized in the company’s strategic plan after the contribution of US\$ 500 million.

The company has the understanding that the diversity of modes of transport provides greater engagement of

deliverers for different urban needs and challenges. In a statement to the press about the initiative, Fernando Martins, iFood’s logistics innovation manager, explained that the company

[bet] on innovation and the creation of a multimodal environment that complements itself to bring more efficiency for operation, improving the experience of consumers, restaurants and delivery partners.

Due to the fact that they do not operate with their own vehicles, the platforms interviewed have not conducted, so far, studies for the measurement of costs, performance and efficiency in the delivery times of meals that could be based on a decision to partially or totally replace the fleet.

In addition to a widespread corporate concern with sustainability, there are increasing regulatory challenges that restrict combustion vehicles in some areas of large cities, enabling only deliveries on foot, by bicycles or electric vehicles. In March of this year, for example, the central region of Madrid became a “green zone”, through the implementation of sanctions for all unauthorized access (i.e., combustion vehicles). At certain times of the day, the established perimeter can only be accessed by “eco” (hybrid) or electric vehicles. Thus, to drive 24 hours without any fine or restriction, food delivery companies will need to employ vehicles without GHG emissions at least in part of their fleets.

This trend of establishing free spaces for cars and other combustion vehicles, in which better air quality is sought, is expected in Brazilian metropolises. As explained in Chapter III, Brazilian urban centers, when planning and implementing their “green zones”, demand ecological alternatives with respect to vehicles that can transit there.

2.2 FOOD DELIVERY AT EVENTS

A niche market in food delivery is the use of electric scooters at sporting events, common in Brazil, to support this activity and other services.

The absence of pollution and smoke coming from the exhaust is a major advantage in the use of electric scooters. In some cases, the use of combustion vehicles can even impair the performance of athletes, such as in cycling or running events. The electrical option eliminates this concern.

⁹⁵ Source: <https://corporate.cooltra.com/en/pizza-hut-moves-electric-thanks-cooltra/>. Accessed 9 Oct. 2019.

The use in events also includes logistical support in the case of events with long distances to be covered, such as racetrack or music festivals.



The live entertainment company Tickets4Fun periodically rents from 16 to 20 electric scooters for periodic organizational support at events at the Interlagos racetrack in the city of São Paulo. The company that organizes the stock car races also rents scooters for the same purpose, usually from 6 to 10 vehicles per event. In the same vein, racing teams and other companies working at major events at the São Paulo race track, at musical events, such as Lollapalooza, for entertainment or even at theme parks use scooters for the delivery of food supplies in the preparation of meals made on site, in addition to other forms of logistical support.

2.3.2.3 CONCLUSIONS

The following is a summary of the main benefits reported by the companies questioned. It is worth noting that the last point, regarding the financing of the operation by private and government funds due to the positive impact on sustainability, will be detailed in Chapter III, as well as in Appendix I, in which the financing programs accessed in the development of the segment are described for each company studied, as well as in Appendix VI, in which incentive schemes are reported around the world.



Reducing Environmental Impact

Companies observe sustainability policies, usually due to pressure from their consumers, voluntarily or due to the requirement of their foreign controllers.



Brand Loyalty and Appreciation

Young people, who are the most frequent users of meal deliveries through apps, are especially attentive to sustainability issues.



Economy

For intense users, the electric scooter becomes more competitive from 12,000 to 15,000 km (fuel, maintenance and management)



Management and Control

The platforms for the management and integration of electric vehicles provide control with accuracy and the possibility of tracking metrics that can be adjusted.

Mopeds provide greater stability to packaging than transport by foot or bike, generating higher quality in delivery.



Dynamics of Large Cities

The denser the city, the more it adheres to a solution that reduces congestion. In addition, established and expanded green zones require mobility alternatives that do not have access restrictions.



Access to Sustainability Funds

Some "green" actions may mean access to financial benefit programming and an incentive to reduce GHG emissions.

3 CASE STUDY NO. 3 / INTEGRATED SOLUTIONS: FROM PRODUCTION TO AGGREGATE SERVICES

During the research on companies operating in the market of electric scooters, it was found that especially start-ups seek a path of integrated and complete solutions.

Some of them venture to offer a set of solutions ranging from the manufacture and customization of the vehicle to operation systems and maintenance and charging facilities for lithium batteries. Although it is a relatively new trend amid electric mobility, the concern of manufacturers with all stages of use of their products can be observed in some companies.

For this study, we sought a young company - SPECS e-mobility - with integrated solutions for the use of electric scooters in the Dutch market. Through this example, we observed innovative strategies and a common concern among the players of this segment: the economic sustainability of their services and products in market economies still very dependent on combustion engines.

The current scooter rental model of Wind do Brasil is aimed at the corporate public and is similar to the Dutch model presented here: the company rents the vehicle with a maintenance package on site during the term of the contract. Wind also offers the possibility to customize the vehicle with the visual identity of the company.

3.1 THE USE OF ELECTRIC SCOOTERS IN THE NETHERLANDS

Before we present the case study of a Dutch company, it is necessary to carefully analyze the scenario of scooters in that country in the light of important regulatory changes.

Dutch legislation classifies scooters into two types:

- a. **Light Mopeds** - Two-wheel vehicle equipped with a combustion or electric engine system, whose power does not exceed 50cc or 4 kW. Light mopeds are limited to a speed of **25 km/h** and their driver must have a blue license (plate), in addition to being over 16 years old. The use of the helmet, at the national level, is not mandatory for this category, and the circulation of these vehicles is allowed on cycle paths.
- b. **Mopeds** - Two-wheeled vehicle equipped with combustion or electric engine system, the power of which does not exceed 50 cc or 4 kW. Mopeds are limited to a speed of **45 km/h** and their driver must have a yellow license (plate), in addition to being over 16 years old. Helmet use is mandatory, and these vehicles can only run on the road (i.e., streets, highways etc.), its circulation on cycle paths is not allowed.

Figure - Scooters with Plates Directly from the Production Line
The yellow plate indicates a moped, and the blue one, a light moped



Recently, in April 2019, the city of Amsterdam decreed a ban on the circulation of light mopeds on its main cycle paths, restricting circulation to roads and making helmet use equally compulsory for this category.

According to the interviews, the measure has the potential to affect thousands of users of these vehicles who saw as the main advantage exactly the possibility of circulation in the extensive and well-connected network of bicycle routes in Amsterdam. The main reasons for the adoption of such a restrictive measure were, according to reports: ⁹⁶

- a. the incompatibility of sharing cycle path structures, in view of the increase in the number of users of the light mopeds themselves, as well as a growth in the use of cargo bikes, electric and tricycles.
- b. the demand of the cyclists themselves, who pressed for the city hall to adopt such a measure, especially for safety reasons.
- c. the bragging of the measure as part of a strategy to reduce carbon emissions since most of the fleet of mopeds and light mopeds is still driven by combustion

⁹⁶ Source: <https://www.dutchnews.nl/news/2019/04/amsterdams-ban-on-Scooters-on-cycle-paths-comes-into-force/>. Accessed 9 Oct. 2019.

Table - Number of Light Mopeds and Mopeds with Plates in the Netherlands per year

Year	Light moped	Moped	Total
2008	339.941	423.189	763.130
2009	386.025	464.87	850.895
2010	435.247	496.145	931.392
2011	487.380	515.517	1002.897
2012	526.771	509.333	1036.104
2013	560.427	499.050	1059.477
2014	588.801	487.700	1076.501
2015	617.800	481.749	1099.549
2016	647.968	477.878	1125.846
2017	680.563	473.085	1153.648

Source: SWOV - Institute for Road Safety Research

The measure edited by the Amsterdam City Hall is quite recent and its impacts are still speculative. However, there is consensus, both among manufacturers and users of mopeds, that such a measure will have a negative effect on some level for the mopeds market - if not for those up to 45 km/h, certainly for light mopeds, which exist today in greater volume and may lose even more competitiveness in the face of a market of electric bicycles (pedelecs) in solid growth.⁹⁷

While the restrictions mentioned may have some impact, it is undeniable that scooters play an important role for the Dutch mobility ecosystem. The practicality, ease, agility and low cost of these vehicles have induced their popularization, and today it is common to observe different uses of scooters in Dutch cities - either for individual transport, or for deliveries of products and food.

3.2 ELECTRIC DUTCHMAN / SPECS E-MOBILITY



ELECTRIC DUTCHMAN

This case study is an example of an integrated solution of electric mobility, although the main activity of the company is the manufacture of electric scooters, both mopeds and light mopeds.

The company SPECS e-mobility, located in the city of Laarbeck (130 km from Amsterdam), has in its portfolio the manufacture of electric scooters by Electric Dutchman, a project whose goal is to offer customizable electric scooters,

adding integrated services to the needs of its customers, such as food deliveries, postal and maintenance services.⁹⁸

The operation began in June 2016, with the creation of a prototype that was subjected to strict rules and clearance by the official control bodies of the European Union.⁹⁹ Between 5% and 10% of all investments made by the company are directed to the regulatory processes: the company maintains an employee dedicated exclusively to follow the regulation and its constant changes.

The final product of the company is a vehicle of approximately 240 kg (including passenger), with its own design, interchangeable battery (swappable), steel frame, engine and Bosch system and exclusive controller software created by the company for its fleet.

Figure - Exclusive Model from Electric Dutchman



Source: Electric Dutchman.

3.2.1 Main Users

According to Dave Brommert, director of marketing and communication of the company,

[the] main purpose of the electric scooters of the Electric Dutchman project has always been to serve business users, such as the food and product delivery market, urban logistics, utilities and electric scooter sharing systems. But there are also liberal professionals, especially those who do supervision of works or who need to move with practicality and high frequency within the city.

⁹⁷ Source: <https://www.bike-eu.com/sales-trends/nieuws/2019/03/e-bike-now-biggest-category-in-the-netherlands-10135442>. Accessed 9 Oct. 2019.

⁹⁸ Source: <https://www.electricdutchman.com>. Accessed 9 Oct. 2019.

⁹⁹ That is, an electric scooter from SPECS/Electric Dutchman can be marketed in any country of the European Union.

The company's main customers are now concentrated in the Netherlands and at the time of the visit the company was making its first sales to other countries. Some important retail networks, such as Domino's and Shell distributor, stand out. However, scooters of the Electric Dutchman project have also been sought after for various uses, such as shared recreational use, through a fleet of 20 scooters purchased by the traditional Het Klooster Van Dalfsen hotel for the use of their guests; or to support street events, such as organizing the BinckBank Tour 2019, road cycling race that featured electric scooters in production and support during the event days.

3.2.2 New and Customized Fleet

Between 100 and 110 electric scooters have already been produced and marketed by the company between 2017 and the beginning of 2019. The company's projection is to reach, already by 2020, the mark of one thousand electric scooters produced and circulating.

The model and design of the vehicle allow the customization of some parts and the placement of the customer's visual identity, as can be seen in the following images:

Figure - Visual Identity of Customers on Scooters



3.2.3 Maintenance

Maintenance of the circulating fleet of electric scooters is done by the company, in direct contact with customers. According to Brommert,

we work with a list of specific and reliable customers to monitor and search for possible problems and maintenance solutions based on experience and continuous improvement, until we reach a product of maximum excellence. It is a constantly rising learning curve.

One of the solutions and alternatives that the company is seeking is the possibility of partnering with Bosch to use its network of workshops for maintenance and services. According to Brommert, this is already a reality in the Netherlands, for example, for electric bicycle cyclists.

3.2.4 Batteries - Charging and Reverse Logistics

About the lithium batteries of electric scooters, Brommert clarifies that

one of the systems we are developing is a network of retail partners that can receive a battery used by one of our customers and deliver a new one, charged, at the same time. Because our system is of removable batteries (swappable), people do not need to own the battery system or the charging. The idea is for the company to do this and users just replace one battery with another, at various points in the cities. It is a developing idea.

In addition, according to Brommert, the protocol is that all batteries are collected by the company after the end of their service life, that is, after 4 or 5 years, 1,000 full charges or 40 to 50 thousand kilometers driven. All batteries are received by the manufacturer after the end of the service life and sent to partner companies for reuse in other products and functions, such as notebooks or no-breaks. Batteries, therefore, are not directly disposed of, but reused by other manufacturing industries.

3.2.5 Declared Preference Questionnaire

The responses of this stage revealed that the decision to operate or manufacture electric vehicles depends on the importance and the role that the environmental agenda has assumed globally. Very clearly, this paradigm shift translates into comfortable and ethical decisions, combined with the understanding of an image gain - for the company/brand -, in view of the marketing appeal with customers and consumers.

3.2.6 Conclusion and Analysis

As can be deduced from the Dutch case study, recent changes in the traffic regulation of the light mopeds category in Amsterdam have the potential to impact the production chain as a whole of these vehicles, forcing producers to adapt to the new realities.

The positioning of SPECS and the Electric Dutchman project to present integrated and customizable business-to-business (B2B) solutions for a myriad of customers - with diverse intentions and expectations - proved to be an important market differential.

Although the company is young (the operation began only in 2018), its growth in such a short time, it's already successful implemented projects and the prospect of partnerships with large networks that seek environmental and financial sustainability solutions point to a very positive projection of short and medium terms.

In addition, the declared preference survey applied to the Dutch company's management revealed that the sustainability and climate change agenda was the most relevant attribute for the decision to start the production of electric scooters in the country.¹⁰⁰

Finally, on the concentration of integrated services under the umbrella of the same company and/or the same project (Electric Dutchman), the scale of the project allows the company to be able to adapt to the needs of customers in a level of almost handmade solution - either through changes in the production process, in the incorporation of accessories and technologies, or by offering proprietary systems for the management of logistics operations.

¹⁰⁰ This agenda has growing popular support: <https://www.euronews.com/2019/03/10/tens-of-thousands-march-for-stronger-climate-change-policies-in-the-netherlands>. Accessed 25 Oct. 2019.

¹⁰¹ Source: <https://www.ipc.be/services/sustainability/sustainability-emms/sustainability-report>. Accessed 9 Oct. 2019.

4.4 CASE STUDY NO. 4 | POSTAL DELIVERY SERVICES

Electric scooters for postal services are gaining more supporters around the world every day. One can mention the Taiwan Postal Service and that of Austria, as well as the Spain Post Office or even the Spanish private company Unipost, which also provides postal delivery services. For these and other members of the International Postal Corporation, a cooperative made up of dozens of post offices worldwide, electric vehicles are an important tool of work, since these agencies have committed to a goal of reducing carbon emissions by 20% by 2025, in addition to the 20% already amortized between 2008, reference year, and 2014.¹⁰¹

The Brazilian Post Office, although not part of this organization, uses some of its sustainability references as voluntary guidelines. In this sense, they made a pilot project with the electric scooters of Brazilian Riba, started on January 9, 2013 and ended on September 20 of the same year.

From preparation to the start of the test, Riba's scooters underwent, as usual, their own reengineering regarding their storage capacity, total weight of the vehicle with orders, battery autonomy, efficiency when getting on the scooter and on delivery routes and optimization of charge planning. Already during the pilot project, the scooters ran 10,205 km in total, driven by 16 postmen from six distribution centers. Of the 10,205 km driven, 7,367 km were monitored (72.19%), consuming 601.22 kWh at a cost of R\$ 201.93. In other words, it was found a significant operating economy, which would probably be even greater if the operation of the electric power plants gained scale. For the same route, regular post office motorcycles would consume R\$ 851.63 in **supply**, that is, a **421.75% higher cost**.

As for the **maintenance** - preventive and reparative - and exchange of components, if applied the current factor of the Post Office for maintenance per kilometer driven (R\$ 0.18/km), the cost would be R\$ 1,836.90 with the combustion motorcycles to run the same 10,205 km traveled by electric scooters - i.e., **765.38%** higher than that of electric scooters.

Regarding the **environmental impact**, based on the kilometers driven by the Post Office with electric scooters, the company ceased to launch near a ton of CO₂ and more than 90 kg of CO during the implementation of your pilot project. Whereas the São Paulo fleet is around 1,500 mopeds, it is estimated that the company would have stopped releasing 330 tonnes of CO₂ and about 2 tonnes of CO by replacing the combustion fleet with electric scooters in the same period, if it were possible.

The emission of GHG, however, was not the only point in favor of electric scooters in terms of sustainability: the non-use of lubricating oils, air filters and oil, and the consequences of the use of such components, i.e. the cost of cleaning the environment and collecting such waste was also a benefit. Still, in the final report of the pilot project Correios-Riba, it was observed that

one of the most noticed aspects in the use of the electric scooter by the postal workers and the population in general was the absence of noise. The electric scooter allowed postmen to perform their function more carefully and safely, without adding to the noise pollution of urban centers.

Whenever feasible and appropriate in terms of weight and volume of the cargo or document to be delivered, electric scooters could represent one of the lowest cost solutions to the demand for sustainability compared to electric cars and vans. In the contrast between cars and scooters, it is worth

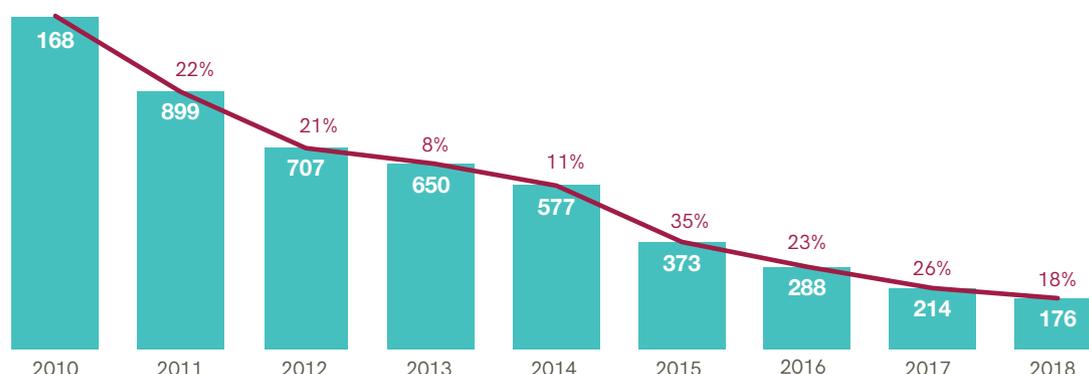
noting that, in addition to the value of the vehicle itself, the necessary infrastructure is more expensive: a charging point for electric cars represents a unit cost of R\$ 200,000.00, according to the Brazilian Post Office, while scooters could be recharged in traditional outlets.

Regarding combustion motorcycles, the capital cost of electric similar vehicles in Brazil is still higher, which causes a natural resistance in their use for any application. However, it was observed that the inflection point regarding the total cost can occur in less than a year depending on the intensity of use of the equipment, since the savings of electrics in operation is significant, especially in relation to maintenance and energy consumption (fuel versus electricity).

There is also a trend of cheaper vehicles with their manufacture on a larger scale, not to mention the progressive technological development of all their accessories, components and parts, which in many cases leads to gains in competitiveness. The vehicle battery alone corresponds, on average, to 40% to 60% of the final price of the scooter. Thus, the reduction in the cost of manufacturing and selling price of batteries directly impacts the value of electric scooters.

The following graph, which presents the historical evolution of battery prices in recent years, allows the correct deduction that this component is the main focus in innovation research in the segment, both to reduce its weight (increasing the autonomy of the vehicle) and to increase its energy storage capacity and performance, faster charging, among others.

Figure - Lithium Batteries Price History | Weighted Means (\$/kWh)



Source: Bloomberg.¹⁰²

¹⁰² Source: <https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/>.

On the subject, Rui Almeida, director of Riba, clarifies:

the driving part of electric vehicles has undergone limited technological evolution in the last 120 years, but the Achilles' heel of electric scooters is effectively the batteries, i.e., their storage capacity, size and, most importantly, their weight. The latter - weight - is the factor of greatest susceptibility to the performance of electric vehicles. By reducing the weight of the battery and the vehicle in general, the autonomy is increased, fewer horses are needed to get it out of inertia. Lighter scooters achieve better performance.

Although several aspects of comparability have been quite favorable to the use of electric scooters as a replacement vehicle to combustion mopeds, in the final report of the pilot project of the Brazilian Post Office with Riba, there is resistance and even rejection to electric scooters by usual drivers of combustion motorcycles:

when presenting scooters for the first time, regardless of the distribution center, the first reaction was to discredit the possibility of the scooter meeting the needs of the Post Office. These impressions were gradually losing support with the daily use of the vehicle and should, like everything, always be seen from a much broader context that is that of cost-benefit.

For fleet managers, therefore, there is an important challenge to be overcome regarding this cultural resistance of their motorcyclists, in order to encourage the use of the vehicle, breaking quite rooted paradigms, although unfounded. Without this change and the effective engagement of users, the acquisition or rental of electric scooters can turn out to be an expensive and meaningless move.

4.1 FLEET DESCRIPTION

As in Brazil, it is common in most countries that the postal delivery service is mainly done by companies or state bodies. Among the private parties, this is a concentrated, conservative sector, with few companies dominating the international market,¹⁰³ of which all employ electric vehicles in their operation, even if partially. In the public sector, it was also possible to identify multiple companies around the world that invest in the transition from the combustion fleet to an electric fleet.

In general, postal delivery companies have mixed fleets,

with trucks, vans, motorcycles and bicycles. In the transition to an electric fleet, it was possible to observe the entry of electric scooters, replacing both combustion motorcycles, vans and bicycles.

On the other hand, electric scooters also compete with electric bikes in the transition to a sustainable fleet and in productivity gains. This was the case of the Croatian National Post Office, which, after testing with the two modes, chose to invest in electric bicycles for the replacement of combustion vans.

Electric bikes and electric scooters provide reduced delivery time, with the postman's faster return to your unit compared to the walk or conventional bike ride. In addition, both electrical alternatives minimize fatigue, which makes the work of the operator more efficient and increases the well-being and quality of life in the performance of their functions, in a similar way to what was observed with food deliverers. From this perspective, it can also be assumed that, in view of the increase in delivery efficiency, a smaller contingent of postmen riding electric vehicles can perform the same work that today is done by several deliverers on foot.

In Brazil, postal document delivery services are now performed by pedestrians, cyclists (generally for deliveries on flat terrain) and motorcyclists, while drivers of cars and vans are responsible for packages. This segmentation, in the current perception of the Brazilian Post Office itself, represents a logistical inefficiency that requires a revision and probable updating.

Electric scooters, in turn, could be used for the delivery of documents and packages in an efficient and economical way, as pointed out by the experiences of Austria, Taiwan and Spain and the pilot project itself carried out in Brazil. The following examples of success can be used as inspiration for the Brazilian context.

4.2 4.2 TAIWAN POST OFFICE



POST
Chunghwa Post Co., Ltd.

Chunghwa Post, Taiwan's official postal service, already uses electric scooters in about 20% of

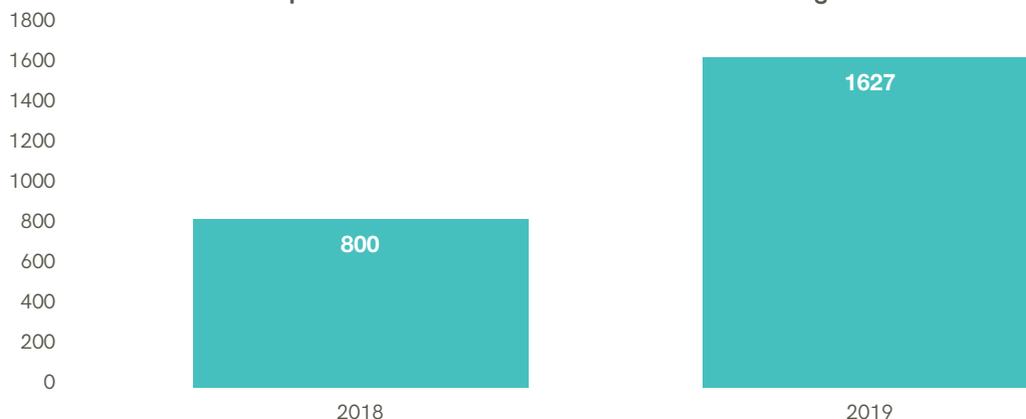
its fleet of vehicles in operation, a move that has occurred in the last two years. The goal is to make it completely electric by 2023, which is the term set out in the Air Pollution Reduction Action Plan, in 2017, by the Taiwanese government. The main objectives of the plan are: halving the number of days with a Code Red Air Quality Alert by the end of 2019, replacing all public vehicles with electric by

¹⁰³ Source: <https://www.statista.com/statistics/809574/market-share-of-couriers-local-delivery-providers-by-region/>. Accessed 12 July 2019.

2030, banning the sale of combustion scooters by 2035 and requiring that all mopeds and cars in the country be electric by 2035 and 2040, respectively.

Of the 9,000 Chunghwa Post scooters, since January 2018, 1,627 are electric, as the following chart shows.¹⁰⁴

Graph - Number of Electric Scooters from Chunghwa Post



Source: Prepared by Sidera Consult

Electric scooters are mainly used for deliveries in urban areas, with the old combustion-powered motorcycles being used only in rural or mountainous areas.¹⁰⁵ of the 1,627 electric scooters in operation, 1,000 were rented and the other 627, purchased. The model in use has autonomy of 50 km by full charge and removable manganese battery.

The supplier of the scooters is the Taiwanese company GreenTrans, which offers both the rental service and the possibility of purchase. According to Taiwanese Post operators interviewed, there is a preference for the rental model, whose cost proved more competitive, in addition to including the convenience of vehicle maintenance and immediate replacement of units that eventually fail.

4.3 AUSTRIAN POST OFFICE



In 2018, the Austrian Post Office (Österreichische Post AG) purchased just over 100 electric scooters from the Italian manufacturer Askoll, whose request was:



*[that of a] strong vehicle, that would fit your daily work and be able to move faster and safer in urban traffic. Easy to drive and park.*¹⁰⁶

Similarly, to the Taiwanese Courier, the initiative is part of the program to neutralize carbon emissions, which, in the case of the Austrian company, has been in force since 2011.

The vehicles have an autonomy of 96 km, with one or two lithium batteries, an average weight of 7.5 kg, which can be charged directly on the scooter or on the regular outlet, when removed.

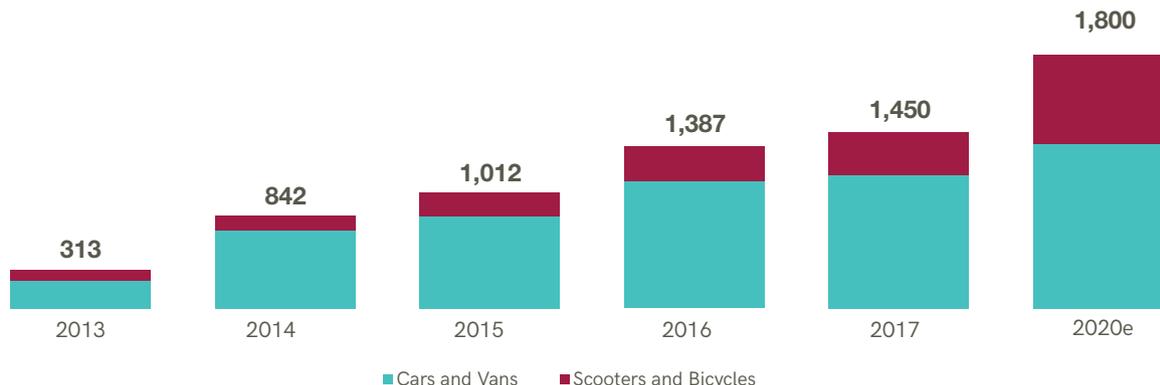
The growth and projections for 2020 of the electric vehicle fleet of the Austrian Postal Service Company are shown in the following chart. Notable are not only the constant evolution of the share of electric vehicles in the fleet, but also the gain in relevance of scooters and electric bicycles.

¹⁰⁴ Source: <https://www.taiwannews.com.tw/en/news/3341607>. Accessed 12 July 2019.

¹⁰⁵ Source: <http://www.taipeitimes.com/News/taiwan/archives/2019/03/21/2003711885>. Accessed 12 July 2019.

¹⁰⁶ model eSpro K2. Source: <https://www.askollelectric.com/public/030818-172310-20180803askollcsaustrianpostbf.pdf>. Accessed 16 July 2019.

Graph - Evolution of the Electric Vehicle Fleet of the Austrian Post Office



Source: Österreichische Post AG, translated by Sidera Consult.

By 2020, the 1,800 electric vehicles will account for about 25% of a total fleet of seven thousand vehicles. The goal, however, is to gradually increase this proportion. In March 2019, as part of the global EV100 initiative, led by the Climate Group, the Austrian Post, together with the Swiss Post Company, committed to have a 100% electric fleet by 2030.¹⁰⁷

For the implementation of this fast-track fleet replacement initiative, the Austrian Post relied on financial support from the European Union, the European Agricultural Fund for Rural Development (EAFRD), the Austrian Ministry for Sustainability and Tourism, the Austrian Ministry of Transport, Innovation and Technology, the Klimaaktiv Mobil Funding Program and the Climate and Energy Fund. In addition, funding is complemented by monetization through innovative postal services, including food delivery, the promotion of self-service solutions, carbon offsetting activities, digital payment solutions and the internationalization of operations, including to other continents.

This move by the Austrian Post Office is not an isolated action for the agency’s sustainability, but only an arm of 42 local and several international projects, including a plan to reduce food waste in South Africa and another plan to use biomass in Thailand. The environmental awareness that the company transmits in its actions is reflected in reputation gains and brand appreciation to consumers and the European population in general. Although revenue may not be the driving force behind its innovation and sustainability projects, the company sees increasing profitability in its operations.¹⁰⁸

¹⁰⁷ Source: <https://www.theclimategroup.org/news/top-companies-signal-major-demand-evs-automakers-gather-geneva>. Accessed 26 July 2019.

¹⁰⁸ Source: <https://www.post.at/en/downloads/Austrian%20Post%20Finacial%20Report%20FY%202018.pdf?1572325733>.

¹⁰⁹ Source: <http://www.radiocable.com/scooter-electrico-esp-correos429.html>. Accessed 15 July 2019.

¹¹⁰ Source: <https://movilidadelectrica.com/motos-electricas-correos-madrid/>. Accessed 15 July 2019.

4.4 CORREIOS DA ESPANHA



In Spain, since 2016, electric scooters are gradually incorporated into the fleets of various cities¹⁰⁹ in order to reduce carbon emissions associated with deliveries. That year, 100 units were acquired, and in 2017, another 200 were added to the fleet of the Spanish Post Office, plus 300 in 2018. There were almost 600 vehicles in just over two years, constituting today one of Europe’s largest fleets of electric vehicles from postal delivery companies.

The 2017 acquisition was based on the estimate that the electric scooters would save 500 euros per 1,000 kilometers driven, and a total of 90,000 liters of diesel compared to the existing combustion motorcycles in the fleet.¹¹⁰ In fact, as a result of the non-use of diesel, CO2 emissions were reduced by 200 tons that year. The initiatives also resulted in further reductions in emissions of nitrous oxide and other atmospheric contaminants, in addition to noise pollution itself, contributing to the improvement of air quality in Spanish urban centers.

The Spanish Post Office’s sustainable delivery strategy prompted the purchase of 200 scooters in June 2019, and another 1,150 in August of the same year. It is worth noting that the The Spain Post Office declares that the electricity used by the new fleet comes entirely from renewable sources.

Finally, given the tendency to increase packages of orders, the need for innovation and efficiency measures in the long term, and the continuous investment in electric scooters, are understood by the government as priorities, in order to complement the modes whose movement of weights or volumes is more limited (especially for deliveries on foot and with conventional bikes).

The Spanish authorities interviewed also reported vehemently that they must constitute examples for the population in every way so that they deserve the respect of their citizens. Their commitment to sustainability is just one of several obligations they must maintain, honor and communicate openly to the public.

Image - Philip VI, King of Spain, inspecting the Scooters Purchased by the Spain Post Office, in Support of the Fleet Replacement Initiative



Source: *Diário de Tarragona*.¹¹¹

SILENCE 
URBAN ECOMOBILITY

In every year, the purchased models were manufactured by the local company Silence, and adapted and customized to the requirements of the Post Office. The required specifications were modified with each purchase, indicating that, in addition to the advances of technology and innovation, users and managers requested adjustments to the model originally acquired from continuous use and in search of a better experience of postmen and managers. This movement of successive adjustments and evolution was observed in all applications analyzed, not only in postal delivery services.

The latest models purchased by Correios from the company Silence, therefore, show significant evolutions in their specifications: maximum speed much higher than the first models, rising from 50 km/h to 80 km/h, increased autonomy from 75 km to 125 km and load capacity of 175 kg. Finally, it is worth remembering that not only the Post Office, but other Spanish municipal services, seek to make the night charging of batteries, more slowly and at more competitive energy costs.

Figure - Scooters Acquired by Spain Post Office in 2019

Manufacturer: Silence
Model Scutum S02
Speed: 80km/h (before 50km/h)
Autonomy: up to 125 km (before 75 km)
175 kg load (before 50 kg)
Model created specifically for delivery services
Removable battery, not interchangeable
Modalities: Sport, City and Eco

The Spanish Post Office also has a special division for urgent deliveries, Correos Express, which has a delivery project in the historic centers of Spanish cities and aims at the complete replacement of combustion vehicles by electric bicycles and scooters in the near future.

4.5 OTHER

In France, the company Chronopost, the express delivery arm of the state-owned La Poste, also already uses electric scooters. There is no data on the current fleet, but it is known that the model chosen was that of the French manufacturer RedE.¹¹² Within its social responsibility policy, in June 2018, the company managed to implement the plan to have in Paris a 100% free fleet of combustion engines by July 2019.¹¹³ The acquisition of electric scooters, therefore, is in line with this policy.

The Croatian National Post, Croatia's national postal service company, has many combustion scooters and has already started the process of replacing its fleet with electric scooters and bicycles. In 2015, as part of the Pro-e-bike

¹¹¹ Source: <https://www.diaridetarragona.com/naltros/-Correos-incorpora-a-su-flota-100-motos-electricas-Scutum-20160415-0063.html>.

¹¹² Source: <https://redescooter.com/>. Accessed 15 July 2019.

¹¹³ Source: <https://postandparcel.info/115227/news/chronopost-brings-zero-emission-deliveries-to-paris/>.

project, supported by the European Union, the first test was carried out with a electric scooter in its delivery service, with great acceptance by users and deliverers.¹¹⁴ The test involved bicycles as well, and, despite the satisfaction with both vehicles, most of the investments after the test were directed to electric bicycles, due to their lower cost.

Among the private companies offering the postal delivery service, the German DHL International GmbH also stands out for its initiatives in electric mobility. In 2014, DHL acquired StreetScooter GmbH as part of its effort to transition from combustion to electric fleet. Despite the name, StreetScooter does not produce electric scooters: its main products are electric vans, initially aimed at DHL's

own delivery service, but which continue to be marketed to third parties, including with expansion plans for China and the United States.¹¹⁵ The German company has not yet publicly disclosed the development of its own model of electric scooters .

4.6 CONCLUDING NOTES ON POSTAL DELIVERY SERVICES

In interviews with the postal services, the post offices emphasized the following points, which favor the use of electric scooters in their operation, replacing combustion vehicles:

Figure - Benefits Reported by Interviewed Agencies



Source: Prepared by Sidera Consult.

5 CASE STUDY NO. 5 | MUNICIPAL SERVICES

Municipal services range from public services of conservation, support, charging and maintenance in the supply of electricity and gas to traffic control, as well as public defense.

¹¹⁴ Source: <http://www.pro-e-bike.org/publications2/>. Accessed 19 July 2019.

¹¹⁵ Source: <https://www.dpdhl.com/en/media-relations/press-releases/2019/streetscooter-showcases-all-new-versions-of-successful-work-and-work-l-models.html>

Figure - Examples of Municipal Services with Electric Scooter Fleets in Other Regions of the World



Source: Elaboração Sidera Consult.

The city of Madrid, for example, uses electric scooters for numerous municipal services, with emphasis on public safety. Silence, a Spanish manufacturer, even added to its product portfolio a model designed especially for police forces, more robust and with top speed higher than standard.

In this sense, it is interesting to remember that there are Brazilian municipal guards who use bicycles and kick-scooters to perform their duties. Scooters could complement this use for regions where geography, mobility, distance or high temperatures discourage the use of other modes of transport.

Although still on a small scale, Wind do Brasil has a positive experience with the Municipal Civil Guard of São José dos Campos (GCM-SJC), home city of the automaker. The GCM-SJC is the object of international study, because it is the largest western fleet of electric vehicles intended for public services. Due to its inclination towards electric mobility, the GCM-SJC tested scooters and electric bicycles from Wind do Brasil to carry out rounds in city parks.

The model chosen was the bicycle, since the rounds in the parks demand movement on rough tracks. Because of their low height relative to the ground and their smaller rims than those of bicycle wheels, scooters did not meet this need as well, regardless of whether they were powered by electricity or combustion. However, GCM-SJC was interested in its use for other security services and round provided on asphalt terrain and with large pedestrian circulation,

including support to the Military Police; municipal guards from other locations have shown similar interest, on the recommendation of GCM-SJC.

5.1 FIRST AID

The first-aid service usually involves moving ambulances, but often accidents or occurrences can be solved or minimized by only one person with equipment transported in smaller vehicles.

In the case of first aid, the possibility of the customized model reaching speeds greater than that of conventional electric scooters is a determining factor since fewer minutes in care service can save lives. The goal, it is noted, is not to transport the patient, but only to stabilize him and provide the first care.

The main reason for using electric scooters, in these cases, eliminates the need to move a larger vehicle, whose mobility is reduced by traffic, and anticipates the care of paramedics, usually transported by ambulances. Thus, having identified the possibility of quick resolution with the healthcare professional on the electric scooter, there is no need to move more people and larger vehicles. It was reported even lower exposure of the victim to carbon emissions by vehicles closest to the care area. Finally, if there is a need for support, the person who made the first call can inform the complementary team exactly the type of support and the equipment they will require.

Such a program has existed in Israel since 2006, run by the non-governmental organization (NGO) United Hatzalah. The work done by the organization was able to significantly reduce the response time to emergencies, from an average reaction of traditional ambulances from 12 to 15 minutes to about 3 minutes,¹¹⁶ Due to the use of mopeds, called ambucycles. The vehicles have all the equipment available in an ambulance, but the stretcher. In 2017, the organization responded to more than 295,000 calls in Jerusalem, with a volunteer corps of 4,000 doctors and a fleet of 650 ambucycles.

Figure - Scooter Model Used by Emergency Service



Source: United Hatzalah/Shira Hershkopf

In Brazil, the “motolance” was incorporated into the Emergency Mobile Care Service (SAMU) intervention fleet throughout the SAMU 192 Network through Ordinance No. 2971 of December 8, 2008. The regulation contains in its annex technical guidelines for the use of motorcycles, stating that they must have a motor with at least 250cc and be of the trail type.

The Minimum Program for the implementation of Motolances in the SAMU 192 Network, published by the Ministry of Health, explains that¹¹⁷:

the chosen motorcycle is trail type, 250 cc, because it has adequate torque for most situations that require the intervention of the SAMU 192, without the obligation to develop high speed. The power of the chosen model allows to achieve safe speeds, compatible with agile driving, to the point of allowing the arrival of Motolance, on average, about 3 to 5 minutes before the ambulance.

Thus, the eventual transition to an electric model will require meeting these demands of performance and design, in addition to the inclusion of the possibility of electric propulsion in the ordinance. It points out the case of the electric scooter used by the Madrilenian municipal guard, developed by the manufacturer Silence, which has similar specifications and allows the customization of vehicles for the required municipal services.

Motolances are already in use in several Brazilian states, such as Rio Grande do Sul, Pernambuco, Espírito Santo and Distrito Federal. This allows a transition of the fleet, with a simpler adaptation, since the idea of emergency care using a two-wheeled vehicle is already widespread.

5.2 5.2 SECURITY AND SUPPORT

Among the main advantages of electric scooters for this application, the interviewees again cited distance management of each professional’s driving behavior, average speeds, compliance with pre-established routes and other protocols, as well as the possibility of remotely controlling the real autonomy of scooters, facilitating fleet management and optimization of resources and expenses.

In addition, when you think about its use inside condominiums, shopping centers, factory parks or parking lots, as part of the security and/or maintenance system, there is the advantage of not having to remove the scooter from the place to refuel at regular stations. This solves the problem of reimbursement of gasoline expenses and supply frauds faced by some condominiums and companies. By not having to leave to refuel, or to bring fuel to refuel in the facility, it promotes a safer operation from the point of view of the subject to accidents - either an incident on the public road, or by the irregular handling of fuels.

¹¹⁶ Source: <https://edition.cnn.com/2013/04/19/health/tedmed-beer/index.html>. Accessed 9 Oct. 2019.

¹¹⁷ Source: http://bvsmms.saude.gov.br/bvs/publicacoes/programa_minimo_motolancias.pdf. Accessed 9 Oct. 2019.

In fact, the question of speed counts in favor of scooters, since in Brazil it is limited by legislation to 50 km / h. This means that the security agent does not exceed the speed in closed environments, such as condominiums or shopping center parking lots, in flagrant situations of bad conduct, promoting the physical safety of drivers and pedestrians.

In relation to autonomy, the experience of the automaker Wind do Brasil, one of the companies interviewed, shows that models with interchangeable batteries (swappable) or spare scooters are prioritized for replacement while charging the one that was in use. This happens because the model that requires charging impairs some operations that require constant round.

A controversial point of use in security services is the fact that electric scooters are quiet.

On the one hand, there is the elimination of noise pollution, which is highly positive in the sustainability and comfort factor not only of the drivers themselves, but also of the residents of the condominium and of people who live in the space being monitored. The benefit of silence is even greater when considering the preservation of the sleep of residents on the night routes. Studies show that noise from cities strongly interferes in the quality of sleep of humans and animals, decreasing their quality of life.

On the other hand, some interviewed security agents working in Madrid reported the perception that the sound made by the vehicle is one of the factors that inhibit possible criminal activities, given the association between vehicle noise and the presence of security forces.

In the experience of the customers of the automaker Wind do Brasil, however, the doubt about where the electric vehicle is means a greater inhibiting factor than the noise emission by the vehicle, alerting about its presence and, thus, revealing its position. The stealthy action of electric vehicles has been shown to be more efficient, since the action of invaders is preceded by a study of routines, and the fact of not knowing where they are during the action makes the attacker uncomfortable.

Although no specialized literature addressing the issue has been identified, this understanding seems to have resonance in other jurisdictions. In the United States, for example, the National Highway Traffic Safety Administration (NHTSA) will require all hybrid and electric vehicles to emit artificial noise by September 2020. The entity conducted a study in which it noted that hybrid vehicles were involved in 1.18 times more pedestrian accidents than vehicles with internal combustion engines. The agency estimates that artificial

noise at low speeds could prevent 2,400 injuries each year, a data especially relevant for the visually impaired.

Similarly, since July 1, 2019, new four-wheel models of electric vehicles in the European Union require an acoustic vehicle alert system (AVAS), a noise-emitting device that goes into action whenever the vehicle is below 19 km/h (12MPH). Theoretically, the system will prevent pedestrians and cyclists from being taken by surprise by cars that would otherwise be almost silent.

Manufacturers such as Ford, however, have created specific safety features for their electric vehicles used by security agents, aiming to tailor them to the needs of police and security services across the country. They therefore required the possibility of equipping the new law enforcement vehicles with devices to turn off mandatory noise, which would allow them to be silenced in situations where police officers do not want to give their location, such as when they try to approach a suspect or arrest him.

5.3 MISCELLANEOUS SERVICES IN MADRID

The city of Madrid can be considered a benchmark in terms of electric fleet. The first tests with electric vehicles of the Madrilenian City Hall were done in the 1990s, in parks and gardens. However, it was in 2017 and 2018 that the inclusion of electric cars took place significantly, so that, currently, most of the services provided are made by electric vehicles incorporated into the municipal fleet.

The Air Quality and Climate Change Plan A, the main local guide on the topic, establishes milestones in 2020 and 2030 to reach a proportion of 75% and 90%, respectively, of clean vehicles (categories "zero", i.e., electric, and "eco", i.e., hybrids) in the municipal fleet.

In 2018, an investment of 270,000 euros was made for the installation of electric charging points for cars and scooters in buildings and municipal centers. The electric vehicle rental and acquisition contracts assume an approximate annual cost of 1,100,000 euros, but the measurements are not yet made in a systematic way, in order to enable the quantification of real savings in the medium or long term.

According to Rafael Moran Llanes, the deputy director-general of the Body of Agents of Mobility in the City of Madrid, in spite of the acquisition of two generations of electric scooters, there is a tendency for some managers to develop a migration model for the acquisition of the lease, because the cost of the operation would be more competitive than the maintenance of the vehicle and the instant replacement of the drives that will eventually fail.

On January 1, 2019, in addition to the security services and the post office, Madrid's zero-emission municipal fleet consisted of 243 electric cars, 5 plug-in hybrid cars, 6 electric trucks and 23 electric scooters. To this fleet are added those of the outsourced companies that provide services to the city, with 25 electric cars, 29 electric trucks and 1 electric truck. These vehicles were integrated into multiple urban activities, such as environmental inspection and cleaning, administrative services, support for green areas and health services.

5.4 CONCLUDING NOTES ON MUNICIPAL SERVICES

The options for the use of electric scooters in municipal services are diverse and include from the first care, in cases of medical emergency, to maintenance services for public equipment, security, inspection of areas, cleaning and others.

Positive reports were collected, justifying its use for reasons ranging from agility in roads of heavy traffic to the lower exposure of people to the emission of monoxide and carbon dioxide in case of accidents, the prevention of fraud, theft and diversion of inputs or vehicles themselves and the reduction of noise pollution.

Although Madrid was the most prominent among the cases analyzed, especially for the variety and scope of the services in question, the study was able to detect other projects in progress, as well as opportunities with systems already deployed with combustion mopeds that could be replaced by electric scooters with some ease, providing recognized benefits. In Brazil, regulatory adaptations remain as barriers, in addition to the design and power adjustments of the vehicles for some cases, such as use as motolances.

Based on the data collected and the interviews conducted in the market research and case studies, **strengths, weaknesses, opportunities and threats** of the electric scooter segment were identified and verified, in an objective way, the feasibility of developing a market of its own in Brazil, as occurs in other economies in the world.

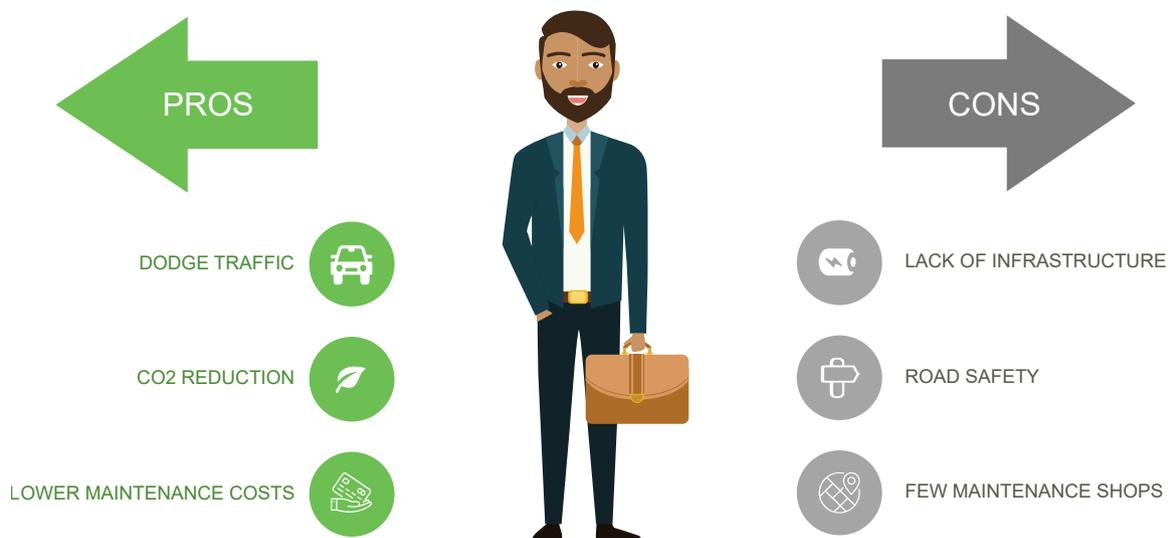
For the analysis of strengths and weaknesses, the internal environment of the segment included the set of human, financial and physical resources. Above all, it is possible to exercise control over these resources, because they are intrinsic to the segment, can be managed and managed strategically and together they become a competitive advantage for the development of the segment in relation

to other mobility options. In the opposite direction, we also analyzed the weaknesses, shortcomings that the segment has in relation to its combustion similar vehicles.

On the external environment - opportunities and threats -, present the factors that exist outside the limits of the segment, but that somehow influence it. Although they must be monitored continuously, as they are the basis for strategic planning, it is not possible to control them.

Finally, if we consider that external factors homogeneously influence all companies operating in the segment, we can affirm that only those who can better identify changes and can adapt will take better advantage of the opportunities.

Figure - Positive and Negative Points Most Cited by Respondents in Brazil



In countries such as China and India, the pros and cons in the use of electric scooters very much coincide with the responses of respondents to this study in Brazil, despite the profound disparities in the level of maturation of each of these markets. It is relevant to consider the perception of both these economies since the entire Latin American region is still structuring the segment and can benefit from the mistakes and successes of other regions.

As positive points of the Chinese and Indian segments, the significant reduction of pollutant emissions and transit, the better traffic flow when scooters become more abundant and the reduction of operating costs were indicated, mainly

in battery charging and maintenance, but also in relation to the exemption of applicable taxes and fees. As negatives, the shortage of charging stations, the high insurance costs and the few maintenance workshops were pointed out.¹¹⁸

Another relevant perspective was that of a leading group in the electric vehicle market: Renault does not yet operate with electric scooters but is the leader in the electric vehicle market in the world. In his interview, he identified three main challenges for the development of the market in Brazil that deserve attention and, in a way, motivate their absence in this segment:

¹¹⁸ Source: https://theicct.org/sites/default/files/publications/India-hybrid-and-EV-incentives_working-paper_ICCT_27122016.pdf#page=14.

- High prices: the acquisition of electric scooters (whose batteries are the most expensive component) requires a high investment for the population of developing economies, despite being justified after less than a year of use, unlike larger electric vehicles.
- Lack of incentives to low prices: according to their studies, 6% of the Brazilian population could pay, for example, an electric car of the simplest models for R\$ 150,000. However, for the same price, you can purchase a luxury combustion vehicle. It is worth noting that, in the case of electric scooters, a company recognizes that the prices are less divergent and there are some exceptions where the value of the electric scooter is even more competitive than its similar fuel version. Despite this situation is rare, the best model of the automaker Wind do Brasil, for example, costs between R\$ 9,000 and R\$ 10,000, while the basic combustion motorcycle of large multinationals,

Honda, Yamaha or Suzuki, is valued at close range, approximately R\$ 10,000.

- Tax burden: the import tax is also an obstacle, and its reduction would contribute to lower the price for the consumer. The improvement of tax conditions would allow, in the short and medium term, cheap electric vehicle in Brazil and, in the long term, develop the domestic market. In this way, the business would be structured via imports and assembly initially, with the expectation that, in a second moment, the local production would oversee supplying the demand.

Electric vehicles generally constitute a growing market in Brazil and, according to studies, a significant part of the population is interested in electric mobility.¹¹⁹ In addition, Brazil and other Latin American countries are already well advanced in terms of renewable energy, which is favorable to the development of the electric vehicle market.

A. FORÇAS

1 SUSTAINABILITY ASPECTS

1.1 REDUCTION OF GHG EMISSION

In the interviews conducted, sustainability was cited as one of the two main factors that led or would lead companies to the transition to or acquisition of electric scooters, receiving an average score of 9 on a scale of 0 to 10 of importance.

The global search for economic, social and ecological advancement is motivated by the collection of end consumers and the general population, but also by access to government schemes to support "green" projects, national programs to reduce emissions and improve air quality or even global investors policies that follow the UN Sustainable

Development Goals. The offer of electric scooters seems to meet the growing demand of society, in its various spheres, for mobility solutions compatible with the reduction of environmental impacts.

The burning of fossil fuels¹²⁰ – especially diesel and gasoline – by means of transport accounts for 13.8% of Brazilian GHG emissions, being its main source of emission in cities. Nationally dominated and widespread technologies, such as ethanol and biodiesel, can mitigate these lashing effects, but electric or hydrogen cell-driven vehicles are the most efficient at eliminating this source of GHG and reducing pollutant emissions. Migration to vehicles and fleets with a predominantly renewable energy matrix, therefore, becomes a central agenda to achieve the objectives associated with sustainability.

¹¹⁹ Source: MARX, Roberto; MELLO, Adriana Marotti de; ZILBOVICIUS, Mauro; LARA, Felipe Ferreira de. Spatial contexts and firm strategies: applying the multilevel perspective to sustainable urban mobility transitions in Brazil. *Journal of Cleaner Production*, 1 Dec. 2015.

DA SILVA, Luiz C. P. et al. Sustainable campus model at the University of Campinas—Brazil: an integrated living lab for renewable generation, electric mobility, energy efficiency, monitoring and energy demand management. In: Leal Filho W., Frankenberger F., Iglecias P., Mülfarth R. (eds). *Towards Green Campus Operations*. World Sustainability Series. Springer, Cham. 2018. Access at: https://link.springer.com/chapter/10.1007/978-3-319-76885-4_30.

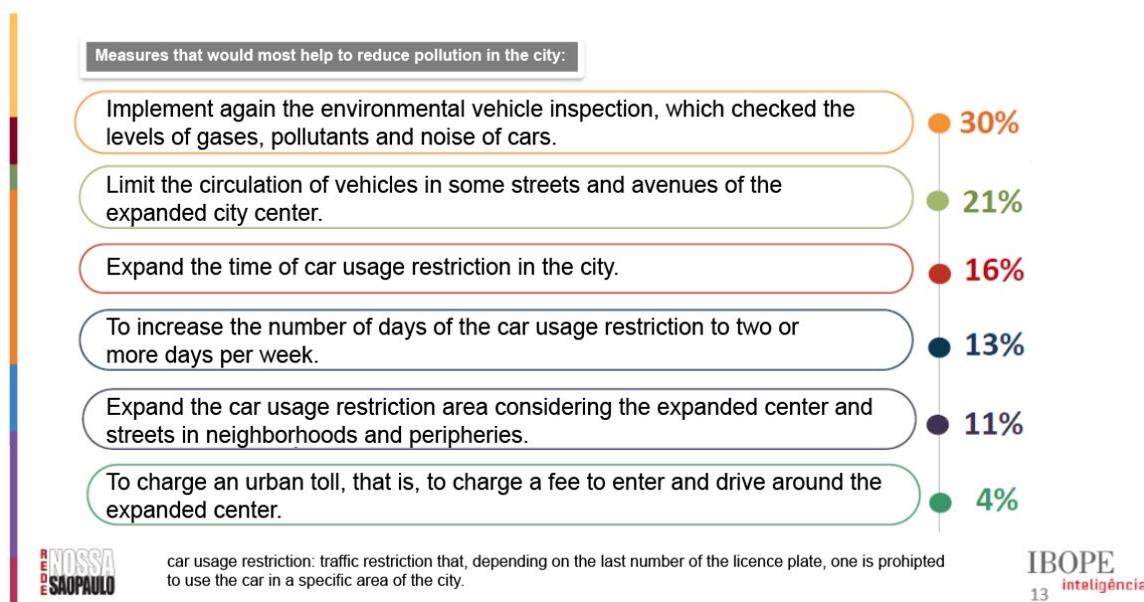
COSTA, Evaldo; PAIVA, Arthur; SEIXAS, Julia; COSTA, Gustavo; BAPTISTA, Patricia; Ó. GALLACHÓIR, Brian: Spatial planning of electric vehicle infrastructure for Belo Horizonte, Brazil. *Journal of Advanced Transportation*, 2018.

¹²⁰ Source: <http://emissoes.energiaambiente.org.br/graficos>. Accessed 12 Oct. 2019.

Brazil has a goal, set in its Nationally Determined Contribution (NDC) following the 2015 Conference of the Parties (COP 21) in Paris and the signing of the Paris Agreement, to reduce GHG emissions in 43% by 2030 compared to 2005 levels. The implementation phase of this target begins in 2020.¹²¹

There is also an increasing awareness and movement of the population of large Brazilian urban centers for better air quality, with the intensification of demand for reduction of pollutants for their well-being. Recent studies have been published that corroborate the extent to which traffic contamination significantly affects the health of urban citizens.¹²²

Figure - Research on Air Quality Programs and Emission Restrictions in São Paulo



For example, in response to a poll conducted by IBOPE, 7 out of every 10 people in the city of São Paulo require air quality program and GHG emissions restriction. It is assumed that this will be increasingly demanded from the municipal legislator and that traffic restriction measures will be implemented even more intensified and extensive than Paulista Aberta and municipal traffic restrictions.

In turn, the drivers of electric scooters, in pilot tests or permanent fleets, cited an improvement in their health, with fewer breathing problems and absences from work, as well as a general well-being, due to the lower daily exposure to pollutants.

In conclusion, it is clear that the concern for sustainability motivates the use of electric scooters as alternatives to traditional mopeds, since companies recognize that electric vehicles help reduce GHG emissions, which lead to climate change, and do not emit exhaust pollutants, which are harmful to human health.

The environmental benefits of electric vehicles intensify if they are driven by electricity from renewable sources, including wind, solar, geothermal, water and biomass. However, even though electricity is generated from fossil fuels, there are significant reductions in global GHG emissions, and electric vehicles are always less polluting than conventional combustion vehicles.¹²³

¹²¹ Source: <https://unfccc.int/process-and-meetings/the-paris-agreement/nationally-determined-contributions-ndcs>.

¹²² Source: <http://www.abc.org.br/2019/06/19/em-uma-hora-de-transito-em-sp-populacao-fuma-5-cigarros-diz-estudo/>.

¹²³ Source: <https://www.energy.gov/eere/electricvehicles/electric-vehicle-benefits>; <https://www.local.gov.uk/case-electric-vehicles>.

1.2 REDUCTION OF NOISE POLLUTION

The reduction of noise pollution was mentioned as a relevant element of sustainability in the replacement of combustion fleets by electric scooters, having been mentioned by users in all the applications detailed in the case studies of the previous chapter.

Vehicle traffic is one of the main factors contributing to noise pollution (approximately 55% of urban noise in Europe and up to 90% in Brazilian centers, such as São Paulo).¹²⁴ According to the World Health Organization, more than half of the world's population occupies urban spaces, with alarming estimates of demographic growth.¹²⁵ It was found that, in 86% of Brazilian cities, traffic noise levels exceed the legal maximum.¹²⁶

Numerous studies in the most diverse countries, including Germany, Finland, Switzerland and Norway (i.e., economies with levels of noise pollution far below those experienced in Brazil), have related pollution with increased anxiety, depression, high blood pressure, cardiovascular disorders, strokes and impaired mental health, as well as diabetes and obesity,¹²⁷ in addition to the obvious hearing damage for users with greater exposure to noise pollution.

The "noise maps" are used as tools for urban planning strategies, aiming at the quality of life of the local population, as they allow the quantification of noise, the evaluation of its exposure, the development of future scenarios, the identification of conflict areas and proposals for solutions. Although "noise maps" are not yet configured as a Brazilian reality, there are several legal and normative devices that already deal with the reduction of noise pollution.¹²⁸

Electric vehicles are quieter than conventional vehicles. Compared to most combustion motorcycles, the only noises that scooters generate are those caused by wind resistance or friction of tires at moderate to higher speeds.

The adherence to electric scooter fleets contributes to a healthier environment in the cities and areas where they circulate, and the welfare externalities of drivers are not negligible, even if they are inserted in traffic with other combustion vehicles.

2 REDUCTION OF OPERATING COSTS

There are several aspects intrinsic to electric vehicles that result in a significant reduction in operating costs compared to those incurred in combustion fleets. The data are objective and convincing, and these savings must certainly be considered in the decision of Brazilian companies about the acquisition or rental of combustion motorcycles or electric scooters.

The Italian manufacturer Askoll, for example, uses as a marketing strategy the information that in three quarters, in Italy, fully recovers the difference in the cost of the scooter compared to the equivalent of combustion, becoming, from there, more economical. This is because the liability insurance is reduced, tolls are free for five years and, finally, foreseeing daily trips of 40 to 55 km, the annual cost of energy supply will be around 90 euros. This is the graphic presented by the manufacturer itself on its page aimed at Askoll's corporate customer service model, eSpro:

¹²⁴ Source: Brazilian Association for Acoustic Quality. Available at: http://www.proacustica.org.br/noticias/videos-sobre-acustica-e-temas-relacionados/ruido-do-transito-e-o-maior-vilao-do-barulho-em-sp.html?searched=tr%E2%80%99nsito&advsearch=oneword&highlight=ajaxSearch_highlight+ajaxSearch_highlight1. Accessed 14 Oct 2019.

¹²⁵ Source: World Health Organization (WHO). Guidelines for community noise. Berghund, Birgitta; Lindvall, Thomas; Schela, Dietrich H. (eds.). 1999. Available at: <http://whqlibdoc.who.int/hq/1999/a68672.pdf>. Accessed 14 June 2014.

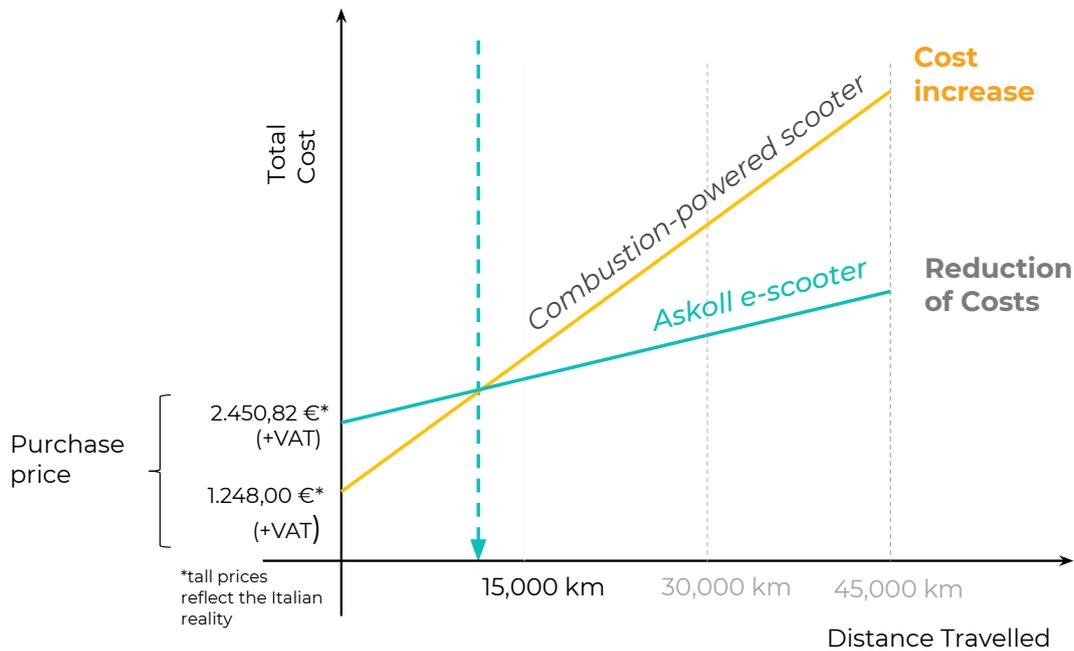
¹²⁶ Source: Cruz, Mauro Vieira. Acoustic mapping law of the city of São Paulo: urban planning and noise management. São Paulo, 2017. Available at: https://www.usjt.br/biblioteca/mono_disser/mono_diss/2019/455.pdf.

¹²⁷ Source: Sørensen, Mette et al. Long-term exposure to road traffic noise and incident diabetes: a cohort study. *Environmental Health Perspectives*, v. 121, n. 2, p. 217-222, 2013. Accessed at: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3569689/>. Accessed 3 Oct. 2019.

Liu, Lijie et al. Chronic noise-exposure exacerbates insulin resistance and promotes the manifestations of the type 2 diabetes in a high-fat diet mouse model. *PLoS ONE* 13(3): e0195411, 2018. Available at: <https://doi.org/10.1371/journal.pone.0195411>. Accessed 3 Oct. 2019.

¹²⁸ Source: Federal Law 10.257/2001, known as the City Statute; CONAMA Resolution 001/1990, which deals with noise emission; CONAMA Resolution 002/1990, which establishes the Silence Program; CONAMA Resolution 020/1994, which establishes the Noise Seal; and technical standards NBR 10.151:2000, NBR 10.152:1987 and NBR 7.731:1983.

Graph - Askoll Cost-distance Ratio



Source: Askoll

In the scenario proposed by Askoll, with 14,600 km or approximately one year, the turning point would already be reached, in which the operation with fleets of electric scooters is more economical than with similar combustion. Assuming an average of 40 km per day and equivalent levels of electric tariffs in Brazil and Italy, the electric scooter in Brazil would be more advantageous from the 375th day, i.e., with just over a year of use.

The conclusion of all the simulations, based on the experiences of Brazilian operators Riba and Wind do Brasil and the operational expenses raised for themselves and their customers, was: there is a time when it is more advantageous to have electric fleets instead of combustion; this inflection point varies according to several factors, but usually occurs between six months and one year of use.

2.1. ENERGY EFFICIENCY

Electric vehicles are more efficient in energy conversion compared to conventional vehicles. According to the Office of Energy Efficiency and Renewable Energy of the United States Department of Energy:

electric vehicles convert from 59% to 62% of the electricity from the grid into power on the wheels. Conventional gas-powered vehicles convert only 17% to 21% of the energy stored in the fuel into power on the wheels.¹²⁹

When converting fuel energy into propulsion, most of it is wasted on heat and while the engine is stationary. On the other hand, an electric motor has conversion efficiency of 85% to 90%, i.e., converts from 85% to 90% of the electricity supplied to it in motion. The difference between the efficiency of the engine and that of an electric car is accounted for by the losses attributed to the charging and discharging of the battery and the conversion of alternating current (AC) into direct current (DC) and vice versa. Less wasted energy leads to less energy consumed, which contributes to greater environmental benefit.

Safety services in Brazil, for example, are mostly - 98% - provided by combustion motorcycles such as the Honda Bros model, whose energy efficiency is 18%, because of losses due to friction with parts, especially the transmission. On the other hand, comparable electric mopeds have efficiency greater than 90%,¹³⁰ which translates into savings, since the electricity consumed in charging is wasted to a lesser extent.

¹²⁹ Source: <https://www.fueleconomy.gov/feg/evtech.shtml>.

¹³⁰ Source: <https://www.univates.br/bdu/bitstream/10737/1885/1/2017EversonFin.pdf>; <https://www.worten.pt/motas-eletricas-askoll>; http://www.ppe.ufrj.br/images/publica/C3%A7C3%B5es/doutorado/Renato_Barao.pdf.

It is noteworthy that numerous variables impact the result of energy efficiency measurement, including vehicle weight, load and driver weight, vehicle model etc.

2.2 ENERGY EXPENDITURE

For an approximate calculation, we took the average price

of gasoline of R\$ 4,50/l,¹³¹ the price of electricity of R\$ 0,80/kWh,¹³² and it was assumed that a combustion bike travels 20 km/l of gasoline, while the scooter spends from 1 kWh¹³³ to 4kwh every 80 km.¹³⁴ It was achieved five to ten times less consumption of the scooter compared to the combustion motorcycle.

Table - Comparison of Operating Costs | Energy

Year	<i>Electric scooter</i> ¹³⁵	Suzuki Burgman 125i 2012 ¹³⁶	Suzuki EN 125 Yes 2009 ¹³⁷	NXR 160 BROS ESDD FLEXONE 2019 ¹³⁸
Maximum autonomy (km)	40.0	300,6	490.0	432.0
Power (W)	2000.0	6619.0	9561.0	10738.3
Power (HP)	2.72	9.00	13.00	14.60
Consumption km/L	-	50.1	35.0	36.0
Charger consumption (kWh)*	0.918	-	-	-
Consumption km/kWh	43.6	-	-	-
Gasoline (R\$/l)**	-	4.50	4.50	4.50
Electricity (R\$/kWh)	0.50***	-	-	-
Consumption R\$/km	0.01	0.08	0.12	0.11
Consumption km/kWh	87.1	12.2	8.5	8.8
Current price (April 2019)	R\$8,990.00	R\$9,017.00	-	R\$13,492.00

Source: Wind do Brasil, prepared by Sidera Consult.

* for a 360 minutes charge

** city average of São José dos Campos (SP) - April 2019

*** extrapolated value

Finally, European respondents confirmed that electric vehicles have several performance benefits. According to them, electric motors offer quiet and smooth operation and stronger acceleration, as well as requiring less maintenance than combustion engines.

2.3 MAINTENANCE COSTS

Electronic systems are more resistant than mechanical ones, because they break less often due to less friction and, logically, less wear. As a result, electric vehicles last longer and therefore reduce the environmental impact in their use compared to vehicles powered by fuel.

About maintenance, the cost is also reduced because there are no belts, pistons or wearable gears, or filters, spark plugs

and oils that require to be changed. Also, no adjustment of valves or clutches is required. This is all due to the absence of a combustion engine, which implies a significant reduction in the number of parts and their friction between them. Maintenance is therefore limited to mechanics, which includes only chassis, brake, bearing and tire. As for the electrical part, the battery should be changed every three years of use, approximately, according to interviews with manufacturers.

Finally, according to Rui Almeida, director of Brazilian Riba, it is estimated that the life of the electric scooter requires to change it every 10 to 15 years and therefore requires three to four battery changes. The service life of the combustion mopeds cannot exceed six years, to preserve the safety of the driver.

¹³¹ Source: National Petroleum Agency (ANP), average price until October 2019.

¹³² Source: ENEL. Available at: <https://www.enel distribuicao sp.com.br/para-sua-casa/tarifa-de-energia-eletrica>.

¹³³ As measured by the Paulista State University (UNESP), with whom the company Wind do Brasil has an academic agreement.

¹³⁴ Equivalent to a full battery, depending on the model.

¹³⁵ Model chosen for comparison: WIND e-Tec/e-Comfort. Source: Wind do Brasil.

¹³⁶ Source: <https://quatorrodas.abril.com.br/noticias/ficha-tecnica-burgman-125i/>.

¹³⁷ Source: <https://www.carrodegaragem.com/suzuki-yes-125-precos-consumo-avaliacao/>.

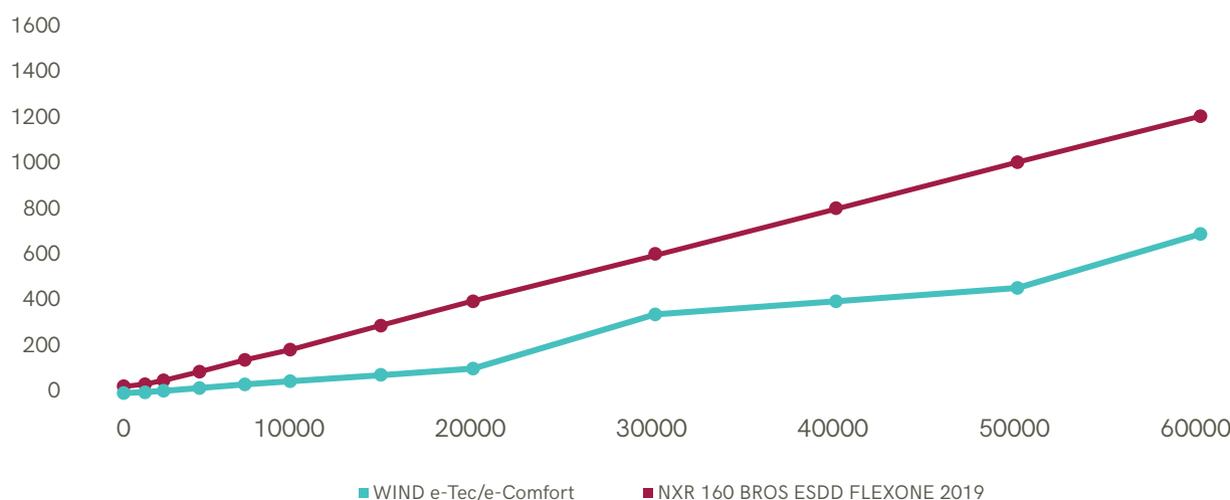
¹³⁸ Source: <https://consumocombustivel.com.br/consumo-honda-nxr-bros-160/>.

Table - Comparison of Maintenance Costs

Item	Electric scooter ¹³⁹	Combustion motorcycle ¹⁴⁰
Refueling with fuel	Unnecessary	Close to maximum autonomy or before
Clutch maintenance	Unnecessary	With wear
Synchronize throttle and idling	Unnecessary	Every 100,000
Change engine oil filter	Unnecessary	Every oil change
Change engine oil	Unnecessary	Every 100,000
Check engine oil level	Unnecessary	Whenever starting
Adjust valve clearance	Unnecessary	From the first routine check-ups
Change air filter	Unnecessary	Every oil change
Replace secondary transmission items	Unnecessary	Every 12,000 km
Check fuel hoses	Unnecessary	With each routine check-up
Replace spark plugs	Unnecessary	Check every 6,000 km
Replace fuel filter	Unnecessary	Every 10,000 km
Adjust clutch cable	Unnecessary	With each routine check-up

Source: Wind do Brasil, prepared by Sidera Consult.

Graph - Comparison of Maintenance Costs



Source: Comparativo dos modelos Wind e Bros, elaboração Sidera Consult.

In the comparison between the combustion and electric models, it is clear the economy of the electric scooter, although there are spending peaks, indicated in the graph, which correspond to battery changes.

Sustainability appears as a primary factor for the manufacture and use of electric scooters, but the reduction of costs with supply and maintenance is certainly a positive point of absolute relevance for the growth of the segment.

3 MOBILITY VERSUS TRAFFIC

The data referring to the negative externalities of traffic on the well-being of the population and the economy are alarming: according to the World Bank, in 2015, more than 55% of the population of the planet lived in urban centers, and this share will grow to 75% by 2030.¹⁴¹ Moreover, the expectation is that more than fifty global cities have a population of at least 10 million. It is also estimated that global demand mobility in urbanized areas - in terms of

¹³⁹ The Wind e-Tec/e-Comfort model was used for the analysis.

¹⁴⁰ For the analysis, low displacement mopeds (125cc) were taken.

¹⁴¹ Source: <https://data.worldbank.org/indicator/sp.urb.totl.in.zs>. Accessed 12 Aug. 2019.

passengers per kilometer per year – is expected to double by 2050.¹⁴² All these figures impact urban mobility and, consequently, are already reflected in intensification of the challenges typical of cities.

The average daily time spent in 2019 for the Brazilian to travel around the city to perform his main activity, such as work or study, is 2 hours and 58 minutes, equivalent to 31 days a year.¹⁴³ This period exceeds what would be the statutory leave of a worker.¹⁴⁴ Micromobility thus offers an escape from this stressful phenomenon: average speeds higher than the current average of 15 km/h in the world's major urban centers, less time spent waiting in car queues, lower cost of ownership and health benefits from being outdoors.¹⁴⁵

Financial losses in the country are greater than R\$ 111 billion for the time wasted in traffic, according to a survey of the Federation of Industries of Rio de Janeiro (FIRJAN). This value falls short of reality because it does not account for several factors. The fact is that transit prevents the due economic growth of some regions, making it impossible, for example, the swift delivery of basic supplies and fresh and perishable food, and entails logistical losses or, at best, higher energy consumption for refrigeration in the transport of food. In addition, stopped traffic causes a delay in the first care, as already discussed in Chapter II.

Faced with a complex challenge, the solutions will also be multiple. The offer of electric scooters, especially in sharing services for the commute home-work-home, arises as a business opportunity, working in a complementary way to other options.

It is no coincidence, therefore, that from 2014 to 2015, the number of driving licenses issued in São Paulo, for example, collapsed from 826,267 to 663,081. Adriano Pires, director of the Brazilian Center for Infrastructure (CBIE) and PhD in Industrial Economics from the University of Paris XIII, has his interpretation of this abrupt fall:

the young man and the middle-aged adult are abandoning the car. Abroad, even stronger than here, the car, which was once a status symbol, has been tied to the environmental issue. We live in the era of the shared economy.¹⁴⁶

The segment of micromobility vehicles experiences unprecedented warming,¹⁴⁷ precisely because it can provide companies that their employees pass through traffic and regain, at least partially, control of their time in the face of increasing urban congestion.

Companies have invested more than US\$ 5.7 billion in micromobility start-ups since 2015, with more than 85% targeting China. The market has already attracted a strong customer base and has done it about two to three times faster than car sharing. In just a few years, for example, several start-up micromobility companies have accumulated valuations in excess of US\$ 1 billion.

Electric scooters are definitely not the solution, but only an alternative that, together with others, can unlock cities in Latin America depending on the number of cars. The choice by this means of transport is linked to the other advantages it offers, discussed in the present study.

4 INTEGRATED FLEET MANAGEMENT SYSTEMS

The technology included in most models of electric scooters today has been developed in such a way as to allow easy integration of systems for complete and thorough monitoring of mopeds. It can be said that they are vehicles designed and built since their conception in a deeply integrated way.

By integrated systems, we mean the existence of control panels for all metrics, i.e., for the user and the manager. For the **user**, the data of speed control, autonomy control and geolocation are mainly available in real time and with accuracy.

¹⁴² Source: https://www.adlittle.com/futuremobilitylab/assets/file/180330_Arthur_D.Little_&_UITP_Future_of_Mobility_3_study.pdf. Accessed 12 Aug. 2019.

¹⁴³ Assuming 254 working days in a year. In 2019, there was an increase of 20 minutes on average, considering the 2015 benchmark.

¹⁴⁴ Source: https://www.nossasaopaulo.org.br/wp-content/uploads/2019/09/Pesquisa_ViverEmSP_MobilidadeUrbana_completa_2019.pdf.

¹⁴⁵ Source: <https://www.mckinsey.com/~/media/McKinsey/Industries/Automotive%20and%20Assembly/Our%20Insights/Micromobilitys%2015000%20mile%20checkup/Micromobilitys-15000-mile-checkup-VF.ashx>.

¹⁴⁶ Source: <https://cbie.com.br/category/espaco-do-adriano/>.

¹⁴⁷ Source: <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/micromobilitys-15000-mile-checkup>.

For corporate fleet drivers, the registration made by employees is usually fast, using the name and the institutional email. From registration, one can book, lock, unlock and drive each scooter. The information is displayed on the panel, in which it is controlled up to the geographical limits that the scooter is enabled to go - outside the authorized perimeters, the vehicle can be switched off automatically or the fleet manager can be alerted. All options are customized by the company that makes the vehicles available. Some models have, even, a safety button for the event of accidents, in which the responsible for that

fleet or employee is alerted immediately, with the exact indication of the location of the driver and can make the necessary arrangements for his rescue.

For **managers** who have an interest in fleet control, the metrics made available by the software offered by the manufacturers of electric scooters are accurate and useful, with pre-ready modules for the main applications that allow the optimization of the operation in all its cost components and quality in function performance, to the smallest detail.

Figure - Information Controlled via Fleet Manager Control Panel



- Initial and Final Odometer Reading/Distance (odometer, GPS, speed).
- Duration of the trip.
- Average/Maximum Speed.
- Minimum/Maximum Acceleration.
- Number of stops (and per km).
- Average time between stops.
- Altitude variation (positive/negative/total).
- Initial and Final Battery Charge/Variation.
- Distance per delivery; energy consumed, and maximum/average power (estimated).
- Energy consumed and generated, and maximum/average power (measured on battery).
- Time moving, stopped, accelerating, braked, decelerating, at constant speed.
- Estimated average consumption, measured.
- Gain or loss of autonomy.
- Cost of electricity and equivalent fuel.
- Emissions saved CO₂, CO, HC + NO_x, NO_x, PM.
- Base origin/destination.

Source: Compilation by Sidera Consult.

The integration facilitates the management of vehicles individually and the fleet, as well as the feasibility of high logistics complexity services, whether sharing, delivery or service. Speed control and profile monitoring and driving behavior allow managers to optimize service performance and establish optimal routes for each task. In this way, they make it possible to direct the attention of those professionals with a direction not in accordance with the company's standards, aiming at adequacy. Autonomy control is critical to optimizing battery recharging, while geolocation increases owners' security along with keyless unlocking, which is an advantage for sharing services.

The costs associated with maintenance and fuel are displayed in graphs, usually comparing year-to-year data on a monthly basis. The manager can also select each month to track detailed cost information related to each

vehicle, including the maintenance history of all its electric scooters. This fleet management panel also tracks route deviations, how much of the fleet is available, the average mileage and age of the scooter, as well as insurance costs. The panel uses modifiable parameters, making it easier to view by vehicle.

For the manager, reports are generated to track all metrics at the desired frequency.

The inclusion of software with similar functions is also possible in other vehicles, such as combustion motorcycles. This post-purchase alteration has inferior performance and much higher costs, since it is not a common practice, which is also why there are few companies that offer this type of control, an extra effort that has not been carried out since the vehicle was designed.

5 MORE EFFICIENT BATTERIES

Technological advances in terms of batteries, especially as regards their charge density, making them extractable and more competitive, are the focus of the main research and development efforts of the electric scooter segment around the world. This is a positive cycle, in which the greater consumption of scooters stimulates research for more modern models in order to meet the demand for innovations.

As demonstrated in the case studies of the previous chapter, these technological advances have also allowed new applications to use electric scooters. Models with removable batteries or that allow simultaneous use of two batteries result in greater autonomy without pause for charging, allowing travel longer distances.

6 DIVERSITY OF APPLICATIONS

The case studies presented some of the numerous possible applications for electric scooters: food delivery service, sharing service, postal delivery service, municipal services, among others.

The experience of Riba Brazil has shown that direct sales to

consumers still pose challenges, especially with regard to the initial capital required for the acquisition of equipment, which is more expensive because it is electric, and the taxes imposed on it. The B2B concept, however, is promising.

Taking the service sector in Brazil, including the public ones, it is noticed how widespread is the use of motorcycles in all regions of the country, largely for the reasons explained in Chapter II: credit facility in the acquisition, low price of services, exemptions from the federal government, besides limitations in the coverage of public transport. In most of these applications, the replacement by electric scooters is not only feasible, but would provide better performance and advantages for users and managers in various situations. From the analysis of the cases presented, therefore, there is visibly a large market to be exploited in the replacement of a large part of the existing fleets in Brazil.

As reported in the previous chapter, some of these companies have already shown interest in this partial or total fleet exchange, seeking market studies and conducting negotiations with local automakers that can meet their demand. Several of these corporations, moreover, have already been in search of the implementation of pilot tests or even a personalized experience, definitively incorporated into their business.

Figure - Potential Applications for e-Scooters in Brazil and Major Companies



Source: Prepared by Sidera Consult.

7 REDUCTION OF ACCIDENTS

Traffic collisions and run-ins claim 1.35 million lives globally every year. With more than 37,000 deaths per year on the streets, avenues, roads and highways, Brazil figures as the fourth country that kills most in traffic, losing only to China, India and Nigeria.¹⁴⁸

In response to this problem, Brazil is a signatory to the “Decade of Action for Road Safety” (2011 - 2020), proposed by the Pan American Health Organization (PAHO)/UN -an agreement - commitment signed by several countries to reduce by at least 50% the number of deaths in the period of a decade. Measures that help to reduce traffic occurrences, therefore, are urgent, as they are intended not only to comply with the country’s international commitment but, above all, to save lives.

Therefore, one of the main issues associated with policies to extend road safety is the control of the speed limits of vehicles circulating on public roads. The higher the speed, the greater the damage in the event of a hit and collision, and the worse the responsiveness of the vehicle and the driver in the defensive direction.

Millionaire investments were generated by cities, states and the Union to enable the supervision and control of speed limits, especially on roads, highways and arterial roads.

And, regarding speed control and monitoring of the driving profile, electric scooters can act directly in reducing accidents and deaths in traffic, because reduced speeds are inherent characteristic of the vehicle. Several models have a factory limit of 50 km/h, with the possibility of an even greater and personalized reduction. In the countries of the European Union, for example, electric scooters have a speed limit of 45 km/h. This reduction alone decreases the severity of possible accidents.

According to the CEO of Riba Share, Island Costa, it is estimated a 50% reduction in the chances of fatal accidents with the use of electric scooters when compared to combustion motorcycles.¹⁴⁹ Riba’s estimates are consistent with the latest figures of fatalities in Europe with mopeds:

Figure - Mortality Rates of Electric Scooters and Motorcycles in Europe

Country	Scooter		Motorcycle	
	For every 1 million inhabitants	Every 100,000 vehicles	For every 1 million inhabitants	Every 100,000 vehicles
Austria	5.0	1,4	11.9	3.1
Czech Rep.	2.1	0,2	11.3	3.6
Finland	0.8	0.3	5.7	2.1
France	5.9	2.7	14.5	7.8
Germany	1.3	0.6	10.3	2.2
United Kingdom	0.4	2.3	9.3	4.9
Greece	5.2	0.3	36.6	3.6
Netherlands	3.7	1.9	4.7	1.4
Portugal	10.0	2.5	17.7	12.2
Slovenia	3.0	1.8	17.0	22.7

Source: European Commission.¹⁵⁰

The countries were selected for having data collected in the last ten years, which allow a more accurate historical analysis. It is worth remembering that the number of claims varies according to the intensity of the use of mopeds, and that a more correct denominator would be kilometers driven. The fact is that the speed limitation of scooters, electric or not, is a positive impact factor in reducing accidents compared to motorcycles.

Along the same lines, according to a study by the Government of São Paulo, the increase of 1 km/h in the maximum standard speed of vehicles results in an increase of 3% in the incidence of accidents that result in injuries and 4% to 5% in the registration of fatal accidents. In the case of run-ins, the risk of death of an adult pedestrian is less than 20% if he is hit by a vehicle at 50 km / h, but reaches almost 60% at 80 km/h.¹⁵¹

It is clear, therefore, that the transition to a fleet of electric scooters means greater safety for drivers and pedestrians, and a consequent reduction in costs and other negative externalities related to accidents for the whole society.

¹⁴⁸ Source: <https://nacoesunidas.org/campanha/seguranca-transito>. Accessed 12 Oct. 2019.

¹⁴⁹ Statement given by Island Costa during the 2nd SINDLOC-SP Business Meeting on August 13, 2019.

¹⁵⁰ Source: https://ec.europa.eu/transport/road_safety/specialist/knowledge/poweredtwwheelers/safety_of_ptw_s/moped_and_motorcycle_fatality_rates_en.

¹⁵¹ Source: <http://www.saopaulo.sp.gov.br/ultimas-noticias/viagem-de-verao-exige-atitude-responsavel-para-evitar-acidente-na-estrada/>. Accessed 19 Aug. 2019.

B. WEAKNESSES

1 INITIAL INVESTMENT

The price of an electric scooter in Brazil today is, on average, one and a half to two times that of a combustion motorcycle of equivalent category, with rare exceptions. Although the return in the short or medium term is noticeable in all simulations, the value of the initial investment, as well as the absence of attractive financing schemes, tends to intimidate and discourage fleet owners from considering electrical alternatives.

The difference is mainly due to the production on a smaller scale, the tax incentives received by combustion bikes manufactured in the Manaus Free Zone and the high costs of electric batteries, largely also imported, which today represent 45% to 50% of the value of the vehicle.

On the other hand, the prospect is of reducing the prices of electric scooters, because the demand for electric vehicles has been growing worldwide, driving manufacturers to increase their production. In addition, the cost of batteries has fallen by about 75% since 2008, as demonstrated in the previous chapter.

In the first moment, the obstacle of the initial costs for a fleet transition to electric scooters can be partially overcome with financing and credit lines of its own for electric mobility, in order to reduce the difference between the value of the combustion bike and that of the electric scooter. Similar initiatives already exist in some developing countries to promote the use of renewable energy and the acquisition of electric and hybrid cars.

Alternatively, the rental of fleets shows an opportunity and possibility for the transposition of this obstacle, as will be better explored below.

The countries with the greatest presence of electric scooters have practiced a monetary incentive to the buyer in different

ways, from a discount on the price to a credit that can be used in the tax rebate. The measure aims to increase demand to allow scale production and, consequently, generate a reduction in prices.¹⁵²

An expansion of these sustainability-focused funding to include also electric scooters, by government or private initiatives, would be coherent and promising. Banco Santander, for example, has launched a program to finance electric bicycles for individuals like the one proposed, to verify the growing demand in the Brazilian market and the unavailability of resources of potential buyers. Cassio Schmitt, Director of Credit and Recovery products for individuals at Santander Brasil, explains his motivation, which would be equally compatible for electric scooters:

we started with an action for our employees, with special conditions for the purchase of the electric bike through the partnership with Vela Bikes and Sense. And we realized the opportunity to support people in the search for real alternatives of urban mobility to escape the chaotic traffic of cities, in a sustainable way.

An additional alternative is the operating model of Taiwanese Gogoro: battery costs are not accounted for in the price of the scooter. Instead, the battery is offered by subscription to end users. This allows the company to extend the technology and efficiency of the batteries of its vehicles without passing on the costs to the user. The price of the scooter in Taiwan is around US\$ 3,000.00 to US\$ 4,000.00, while the battery subscription costs between US\$ 10.00 and US\$ 30.00 per month, depending on the range of users. This value proposition was the main reason why the company managed to sell more than the market leader in Taiwan already in the second month of launch. In addition, by evaluating data from the GoStations network, the scooters themselves, the batteries and the user's movement, Gogoro analyzes the ideal location for new GoStations, enabling an optimized match between supply and demand for batteries.

¹⁵² Source: <https://www.bndes.gov.br/wps/portal/site/home/conhecimento/noticias/noticia/veiculos-eletricos>. Accessed 20 Aug. 2019.

Figure - Competitive Advantage Toolbox



Source: Prepared by Sidera Consult.

With regard to the import tax, Mercosur’s list of offers in the Free Trade Agreement between Mercosur and the European Union has recently been published.¹⁵³ The list is not yet definitive, but gives strong indications of the goods to be deducted and to what extent. It seems that electric scooters will have a tariff reduction of 20% to 10% whenever they come from the European community, from the implementation of the agreement, expected for 2021.¹⁵⁴ The reduction would impact the other taxes and, consequently, the potential price that would reach scooters for internalization in Mercosur. For scooters of other origins, however, the import tax would remain at the non-preferential level, i.e., 20%, unless equivalent liberalizations were agreed in other preferential agreements that are under negotiation.¹⁵⁵

There is also the expectation of revision of the Common External Tariff and liberalization of several tariff positions in Mercosur¹⁵⁶ in the coming months, whose content, however, was not disclosed, and the inclusion of the position of electric scooters in this revocation is uncertain.

As for the manufacture or assembly of batteries in Mercosur, strong companies in the segment, both in Brazil and in the

rest of the Customs Union, have ambitious plans for its regional development, prioritizing partnerships with Korean and Chinese companies, which practically control the technology of battery cell production in the world. Its goal is to enjoy the abundant deposits of the so-called lithium triangle, between Argentina, Bolivia and Chile.¹⁵⁷

Finally, regarding the possibility of local assembly, there are already some companies operating in the market, such as Riba, Wind do Brasil and others of smaller size in the Federal District and in the Northeast, targeted by foreign manufacturers for partnerships that enable their expansion and penetration in the regional market of South America.

2 LACK OF BATTERY CHARGING STRUCTURE

Another challenge for the market of electric scooters in Brazil is the time and the offer of charging options. Currently, most electric mopeds can be charged in conventional outlets, but a full charge requires between six and eight hours. Unfortunately, fast charging technology is not yet available for electric scooters.

¹⁵³ Source: <http://www.itamaraty.gov.br/pt-BR/notas-a-imprensa/20626-texto-do-acordo-mercosul-uniao-europeia>.

¹⁵⁴ Official document available at: https://www.cancilleria.gob.ar/userfiles/ut/oferta_mercosur_25102019a.pdf.

¹⁵⁵ Source: <https://valor.globo.com/brasil/noticia/2019/10/28/mercosul-deve-concluir-acordos-com-canada-coreia-e-cingapura-em-2020.ghtml>.

¹⁵⁶ Source: <https://valor.globo.com/brasil/noticia/2019/10/29/brasil-deve-caminhar-junto-com-argentina-diz-secretario.ghtml>.

¹⁵⁷ Source: https://publications.iadb.org/publications/spanish/document/Litio_en_la_Argentina_Oportunidades_y_desaf%C3%ADos_para_el_desarrollo_de_la_cadena_de_valor_es_es.pdf.

Some countries are already expanding their charging infrastructure for scooters and other electric vehicles. In Israel, instead of charging the battery, drivers go to the stations where they can exchange the discharged battery for a fully charged one, model that is also being developed in other countries, such as Taiwan, as already cited in this study.

In Brazil, there was an initiative of the National Electric Energy Agency (ANEEL) in 2018, with the approval of Normative Resolution 819/2018. By the Resolution, any interested party was allowed to carry out charging activities of electric vehicles, including for the purpose of commercial exploitation at freely negotiated prices, the so-called public charging.¹⁵⁸ Although the Resolution is aimed at charging cars, it can be considered an indication for future public charging stations also for scooters. In addition, the country has only projects under discussion on the topic, which, effectively, needs to be prioritized and addressed.

3 LACK OF SKILLED LABOR-FORCE

In Latin America, only a small volume of electric vehicles is marketed. However, as a global leader in 100% electric vehicles, Renault can represent an example to be followed by the segment of electric scooters. The company has a network of dealerships in Latin America and has the Zero Emission Specialist Center, with qualified technicians, trained to perform all the necessary repairs on ecological vehicles. In addition, in Brazil, Renault has a training center, whose technician, graduated in France, oversees training his colleagues in maintenance. In addition, it has an agreement with the electricity company Itaipu for the installation of one of the two training centers for automobile technicians.

Although the maintenance of electric scooters is simpler and cheaper, cost up to six to eight times lower than that of similar combustion, it is a point of insecurity for users. This is because, if there is no representative of the manufacturer in the locality where the vehicles are in use, the service can

become difficult to access, with a delay in replacing parts.

Renault, a leader in the segment in Europe, a pioneer in the field of electric vehicles and with more than a decade of experience, expressed interest in developing its presence in Latin America, more particularly in Brazil.¹⁵⁹ However, did not report plans for the development of electric scooters. Despite this, his testimony is relevant.

He pointed out that, in the world, 30,000 of its employees are trained in electric mobility and that this training would be fundamental for the development of the market. In Europe and other third countries, Renault has also developed a network of dealerships prepared and trained based on its international experience, including in the maintenance of electric vehicles.

There are still few workshops and professionals specializing in the maintenance of electric vehicles. The body shop and mechanics can be done by professionals specialized in motorcycles. However, the electrical part, depending on the problem, requires specialized labor-force, mainly because misconceptions and failures in this type of maintenance can generate serious or even fatal occurrences.

In Brazil, partnerships between manufacturers of electric scooters and batteries would allow not only the research and development of models to meet the demands of different applications, but also the training and agility in the maintenance services of scooters in general. This type of partnership has already been established, for example, between the German manufacturer UNU and Bosch Service for the maintenance service of its electric scooters. The agreement allowed UNU users access to broader workshop networks, with capillarity, efficiently addressing the problem of lack of training.

Thus, in an ideal scenario, the growth of the electric scooter sector depends on a qualification of professionals to provide the necessary manpower for its maintenance.

¹⁵⁸ Source: <http://www2.aneel.gov.br/cedoc/ren2018819.pdf>

¹⁵⁹ Interview with Eric Guillon, General Manager of Latin America Electric Vehicle Business Development in France, and Leandro Trevisan, responsible for Latin America Business Development in Brazil.

C. OPPORTUNITIES

1 LOW COMPETITION

While in major European cities there are five or six companies acting in parallel in the most common applications, such as sharing scooters, for example, in Brazil have been identified a few small-sized assemblers of electric scooters, among them Riba Brasil, Wind do Brasil and Sousa Motos. None, however, with large-scale production or effectively domestic reach. Thus, new players entering the segment will enjoy low competition, both in Brazil and in Mercosur, despite the large market.

From a contrasting perspective, the competition of the other micromobility modes was mentioned in the interview, which could, in theory, pose a threat, as detailed in the following section. The great market growth for ultralight vehicles in a very short time, such as kick-scooters and electric bicycles, is noticeable and highlights the potential for market exploration for electric scooter companies, as already discussed throughout this study. On the alleged competition, Ricardo Rossi, head of Institutional Relations of Wind do Brasil, offered his perception:

I do not consider [that there is competition]. There is room for all modes, and the electric mobility public already comes up with an idea of what they want even before the acquisition. They idealize many things and it is up to us to elucidate doubts and myths, so that it is a positive experience. But in this context, it is common for people to already imagine themselves using the vehicle before owning it, which helps a lot. Commonly, faced with one or another obstacle to the acquisition of electric scooter, we at Wind offer alternatives from our portfolio, but rarely the person gets out of the initial idea. So, everything depends on the correct application and the desire of each one, because the choice for an electric scooter goes far beyond the acquisition of a means of transport: it is the complementation of a style allied to ideals of conscious sustainability that the individual wants to convey.

2 GLOBAL GROWTH

The electric scooter market was valued by Polaris Market Research at US\$ 17.63 billion in 2017.¹⁶⁰ According to the Innovation Centre for Mobility and Societal Change (InnoZ), in the sharing sector alone, between 2017 and 2018, the number of electric scooters almost tripled. In the previous year (from 2016 to 2017), this number almost quadrupled.¹⁶¹

Another study, prepared by MarketsandMarkets,¹⁶² estimates that the global market for electric scooters and motorcycles grows at a CAGR of 35.8% (2019-2027) and that a greater emphasis on reducing GHG emissions would boost the market. In France, for example, the segment of electric scooters equivalent to 125 cc grew 52% in 2015 compared to 2014, by independent analysis of Frost & Sullivan.

The study identified that the growth in demand for two-wheeled electric vehicles, sustainable alternatives and at more affordable prices compared to cars, is significant in the world market of electric mopeds. However, it also pointed out that the lack of infrastructure or charging stations and performance constraints can create an obstacle to its development.

This trend continues with the approximation of the deadlines for banning the sale of new combustion vehicles in the European Union and in other countries. In Taiwan, for example, the legislative change prohibiting the sale of new combustion motorcycles from 2035 was one of the main reasons for the fleet transition from the local postal delivery service. Brazil also has bills in this direction (see Appendix VII).

Moreover, from the interviews conducted, the growth of the sector of automobiles, bicycles and electric kick-scooters pulls the sector of electric scooters, since it brings the electric mobility of consumers closer.

¹⁶⁰ Source: <https://www.polarismarketresearch.com/industry-analysis/electric-scooter-market>. Accessed 20 Aug. 2019.

¹⁶¹ Source: Innovation Centre for Mobility and Societal Change (InnoZ) GmbH. Global ScooterSharing Market Report 2018, Nov. 2018.

¹⁶² Source: https://www.reportlinker.com/p05796719/Electric-Scooter-and-Motorcycle-Market-by-Vehicle-Type-Battery-Type-Distance-Covered-Voltage-Technology-Region-Global-Forecast-to.html?utm_campaign=slpstats&utm_content=report+title&utm_medium=app&utm_source=member_reportlinker

3 POSSIBILITY OF FLEET RENTAL

As explained earlier, the higher cost of purchasing electric scooters is one of the main obstacles to their greater diffusion in developing economies, such as Brazil. In addition to the mentioned aspects aimed at increasing the competitiveness of these vehicles, the option of fleet rental can be a solution to deal with this problem.

Some of the scooter manufacturers offer this possibility. The case of the Brazilian Riba is emblematic. The company had a difficult start while betting on the direct-to-end consumer model of electric scooters. The growth came with the transition to the corporate fleet rental model, both for continuous use and for major events.

It has already been observed the growth of the trend in the migration from the purchase of the own vehicle to the use of sharing services, both for final consumers and for companies. Market bets point to a completely new transportation paradigm, where sharing, subscriptions and leasing will be preferred over ownership.

In Brazil, car sharing services companies currently operate about 8,000 vehicles and have 230,000 registered users. The consultancy PricewaterhouseCoopers predicts that by 2030, one in every three kilometers of traffic in the world will be driven on shared vehicles. In the United States, China and Europe, the industry is also expanding. International consulting firm Frost & Sullivan estimates that there are more than 7 million users of this service globally, a number with estimates to triple within five years.¹⁶³ In addition to this, the already mentioned growth of the market for sharing electric scooters and the reduction in the number of car owners, per thousand inhabitants, in some metropolises, as shown in the table below.

Table - Trend of cars per 1,000 inhabitants

City	Population (millions)	GDP per capita 2025 (US\$)	No. of cars (2009) Motorcycle	No. of cars (2025)
Tokyo	38,5	46.494	353	340
New York	25,9	67.591	230	220
London	14,4	57.746	400	340

Source: Frost & Sullivan, 2011

Owning and operating a vehicle becomes less and less attractive in metropolitan areas. Own vehicle imposes expenses such as insurance, taxes, maintenance and supply. There are even traffic jams and scarce or expensive parking spaces. Consequently, according to the Boston Consulting Group, it is approximately 50% cheaper to use sharing services than having a car in large urban centers.¹⁶⁴

The transition from property to sharing and rent is not completely new. In recent decades, people have already changed from a property model to renting and sharing with movies, music and even houses. Now the same phenomenon is happening with the vehicle industry. In the United States alone, estimates by the Boston Consulting Group say that by 2030, a substantial portion of the 175 million Americans living in the nation's largest cities will use shared autonomous electric vehicles, which will make up 25% of the miles traveled.¹⁶⁵

All these movements signal an intense paradigm reconstruction, which will imply a demand for mobility alternatives, not focused on vehicle ownership. In this scenario, opportunities also arise in the electric scooter sector.

4 POSSIBILITY OF REDUCING THE TAX BURDEN

Within the range of measures to positively impact the consumption of electric scooters, it is worth highlighting the possible reduction of the tax burden, prioritizing II and IPI.

The list of exceptions to the Common External Tariff (LETEC) is a governmental mechanism that allows the modification of tariffs applied to products imported to Mercosur, with reduction or increase in relation to the tariffs negotiated and consolidated by its States Parties before the World Trade Organization (WTO).

Brazil has the right to create exceptions to the tariffs applied by Mercosur for up to 100 MCN tariff positions. Under the legislation currently applicable, for inclusion in LETEC, a petition is required, submitted, analyzed and approved by the Technical Group on Temporary Changes to the Mercosur Common External Tariff (GTAT-TEC).

¹⁶³ Source: noticias.r7.com/economia/ja-nas-ruas-carro-compartilhado-ganha-forca-e-vira-tendencia-no-pais-18112018.

¹⁶⁴ Source: <https://www.bcg.com, www.bcg.com/publications/2017/reimagined-car-shared-autonomous-electric.aspx>.

¹⁶⁵ Idem.

As mentioned, electric cars today enjoy reduction of the II¹⁶⁶ as an instrument to promote new technologies of propulsion and attraction of investments for national production. Similarly, there is the possibility of petition for the inclusion of electric scooters in LETEC.

A second alternative would be to analyze the possibility of pleading the reduction for the tariff positions of parts and parts of the electric scooter to the ex-tariff regime of non-produced auto parts.¹⁶⁷ For this, it would be necessary to check which parts and components of the scooter do not have domestic production.

As the current legislation does not provide for any MCN of parts for motorcycles or mopeds, the petition for inclusion or to be featured in the tax classification would also have to be prepared with solid data and arguments that would justify it. There is also the possibility of pleading for the extension of the scope of the national strategy for the development of the automotive sector, according to Law 13.755 of 2018, in order to also consider electric scooters.

Finally, the mechanism of shortage of Mercosur, regulated by Resolution GMC 08/08,¹⁶⁸ allows to reduce the rates of II to up to 2% in cases of:

1. *"impossibility of normal and fluid supply in the region, due to imbalances of supply and demand.*
2. *the existence of regional production of the good, but the characteristics of the production process and/or the quantities requested do not economically justify the expansion of production.*
3. *the existence of regional production of the good, but the producer State Party does not have exportable surpluses sufficient to meet the required needs.*

4. *the existence of regional production of a similar good, but the same one does not have the characteristics required by the production process of the industry of the requesting country; and*
5. *shortage of regional production of a raw material for a given input, even if there is regional production of another similar raw material for input via an alternative production line."*

From the initial analysis made possible by this study, it is concluded that the options of the Regime of Non-produced Auto Parts and of Reduction of Tax Rate by Shortage are the most promising. In this case, in-depth studies on the national industry of components and parts of electric scooters would be needed, as well as statistical data to corroborate any petitions.

For permanent tariff reductions, in case of non-existence of manufacturing in Mercosur, the petitions for alteration have lower tariff level limit, corresponding to 2%, with some exceptions.¹⁶⁹

In Brazil, until the moment of preparation of this study, the Ministry of Economy is responsible for receiving and analyzing all the procedures for reducing import taxes (LETEC, Shortage and Permanent Alteration) of the national productive sector and the public sector. After initial evaluation, proposals with a favorable opinion are sent for discussion in Mercosur.

In addition, there are mechanisms to reduce other taxes in the chain, especially the IPI, equivalent to what was developed for electric bicycles, still pending final resolution. This topic will be covered in Section D, "Threats".

¹⁶⁶ Source: CAMEX - Ministry of Economy. CAMEX approves reduction of the import tax rate for electric and fuel cell powered cars. Available at: <http://www.camex.gov.br/noticias-da-camex/262-camex-aprova-reducao-da-aliquota-do-imposto-de-importacao-para-carros-eletricos-e-movidos-a-celulas-de-combustivel>. Accessed 31 July 2019.

¹⁶⁷ Source: MDIC. Legislation of the Regime of Non-produced Auto Parts. Available at: <http://www.mdic.gov.br/index.php/component/content/article/105-assuntos/competitividade-industrial/1813-legislacao-do-regime-de-autopecas-nao-produzidas>. Accessed 31 July 2019.

¹⁶⁸ Source: MDIC. Tariff reduction for shortage. Available at: <http://www.fazenda.gov.br/assuntos/atuacao-internacional/comercio-exterior/reducao-tarifaria>. Accessed 31 July 2019.

¹⁶⁹ Source: MDIC. Permanent change. Available at: <http://www.mdic.gov.br/comercio-exterior/estatisticas-de-comercio-exterior-9/arquivos-atuais-4>. Accessed 31 July 2019.

Regarding the manufacture or assembly of electric scooters in the country, law 11.196, nicknamed the Law of Good, is a tax incentive granted to companies that invest in research and development, allowing the recovery of up to 27.2% of the expenditure linked to the activity of technological innovation.¹⁷⁰ The deducted amounts may be reinvested in research and development, providing innovations to the market, through:

- deduction in the calculation of profit for the payment of Income Tax.
- up to 50% reduction in IPI.
- accelerated depreciation and deduction in the result for the payment of Income Tax and Social Contribution.
- accelerated amortization and deduction on the result for the payment of Income Tax.
- exemption from taxes on shipments made abroad for registration and maintenance of trademarks and patents.

To benefit from the Law of Good, the company needs to register in the FORMS system. Once this is done, its evaluation and eventual approval by the Ministry of Science, Technology, Innovations and Communications will take place.

As for the rates of circulation, in six states of northeastern Brazil and Rio Grande do Sul, owners of electric vehicles are already exempt from the property tax on Motor Vehicles (IPVA), while in three states - Mato Grosso do Sul, São Paulo and Rio de Janeiro - the rate of this tax is reduced for electric vehicles, in general by 50%. There are moves to extend the IPVA exemption for such vehicles in the Federal District and in the states of Acre, Alagoas, Amazonas, Amapá, Bahia, Espírito Santo, Goiás, Minas Gerais, Mato Grosso do Sul, Mato Grosso, Pará, Paraíba, Paraná, Rio de Janeiro, Rondônia, Roraima, Santa Catarina, São Paulo and Tocantins.

Regarding the possibility of expanding benefits for electric scooters, the Rota 2030 - automotive regime implemented by the Brazilian federal government currently in force - does not yet provide specific benefits for the commercialization of electric or hybrid motorcycles.¹⁷¹ However, it already provides for lower tax burden for hybrid and electric

cars, depending on the energy efficiency of the car, which demonstrates the evolution of the segment towards the promotion of sustainable vehicles.

Of the mechanisms available to reduce government costs in Brazil, finally, were identified those potentially applicable to the production and import of scooters. It is important to highlight that, for any effective application of the benefits and instruments, it will be necessary to do detailed feasibility study, follow the procedures and draft a petition for inclusion, as well as perform the management of approval processes.

Finally, it is worth recalling what has already been mentioned above about the recent signing of the Preferential Trade Agreement between the European Union and Mercosur, which makes it possible to liberalize a substantial part of the trade between the two blocks and which, probably, will include scooters and other European components, whose import taxes will be reduced when the agreement enters into force.

5 ENERGY SUSTAINABILITY IN BRAZIL

Finally, it is important to return to the theme of sustainability and note that the magnitude of the environmental benefits of electric vehicles is somehow conditioned to the sources used for the generation of electricity to recharge the batteries.

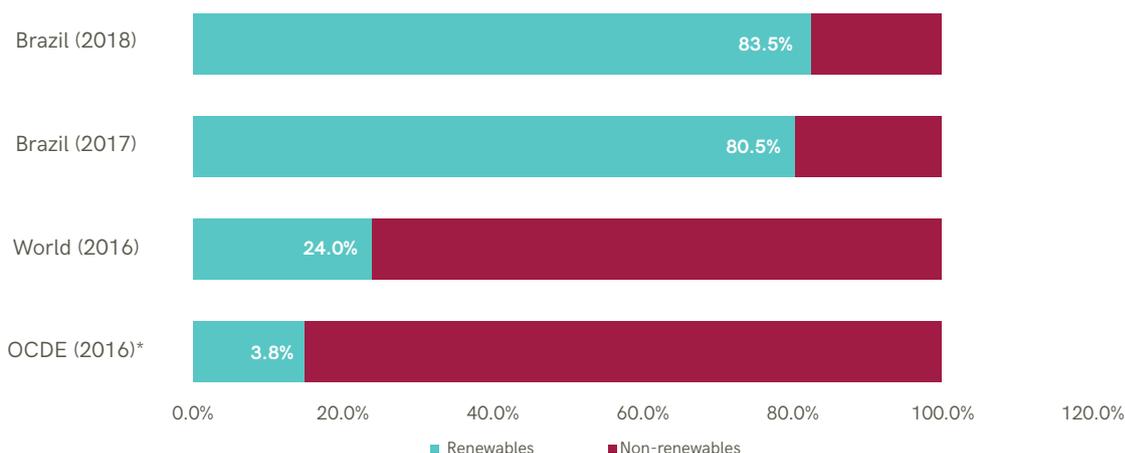
Brazil and Latin America can particularly benefit from the accelerated transition of electric mobility, as they have one of the energy matrices with lower GHG emission, due to the high participation of hydroelectric generation and the progressive evolution in generation based on renewable sources.

Brazil's energy matrix has more than 50% of renewable sources (well above the world average of 14%). According to the Brazilian Energy Master Plan 2016-2026, renewable energies represent 80% of electricity generation (65% hydroelectric and 6% wind). In some areas of Northern and Northeastern Brazil, wind farms generate energy at a productivity level of 60% (the world average of 24.7%) and, in relation to solar irradiation, a key parameter for the generation of electricity by solar source, the states of Minas Gerais, Bahia and Piauí present a global record.

¹⁷⁰ By Article 2 of Decree 5.798/2016, technological innovation is "the conception of new product or manufacturing process, as well as the aggregation of new features or characteristics to the product or process that implies incremental improvements and effective gain in quality or productivity, resulting in greater competitiveness in the market".

¹⁷¹ Source: <http://www.mdic.gov.br/index.php/competitividade-industrial/setor-automotivo/rota2030>.

Graph - Share of Renewables in the Electrical Matrix / Brazil vs. World



Source: BEN 2019.¹⁷²

* OECD: Organization for Economic Cooperation and Development

The availability of a predominantly renewable electric matrix in Brazil represents a positive aspect for the development of the segment of electric scooters for companies in search of mobility solutions based

on sustainability. It is a positive aspect, too, for the replacement of fleets, since it is possible here a complete cycle of electricity, from generation to the use of vehicles, with very low GHG emissions.¹⁷³

D. THREATS

1 TAX BURDEN

In addition to the previous section and despite their obvious contribution to the fulfillment of the Brazilian GHG reduction agenda, electric scooters currently have no incentive or benefit for import or assembly in Brazil, at levels identical to those of combustion motorcycles. The high cost of internal taxes (IPI, PIS, COFINS), as well as the high II, today represent impediments to the expansion of the segment.

Table - Compared Tax Burden

Tax	Electric scooter (MCN 8711.60.00)	Combustion engine (NCM 8711.20)	Electric car (NCM 8703.60.00)	Combustion vehicle (MCN 8703.2)
II	20%	20%	0 a 7%*	35%
IPI	35%	35%	7 a 18%*	7 a 25%
PIS	2,1%	2,1%	2,62%	2,62%
Cofins	9,65%	9,65%	12,57%	12,57%
ICMS (SP-DF)	18%	18%	12%	12%

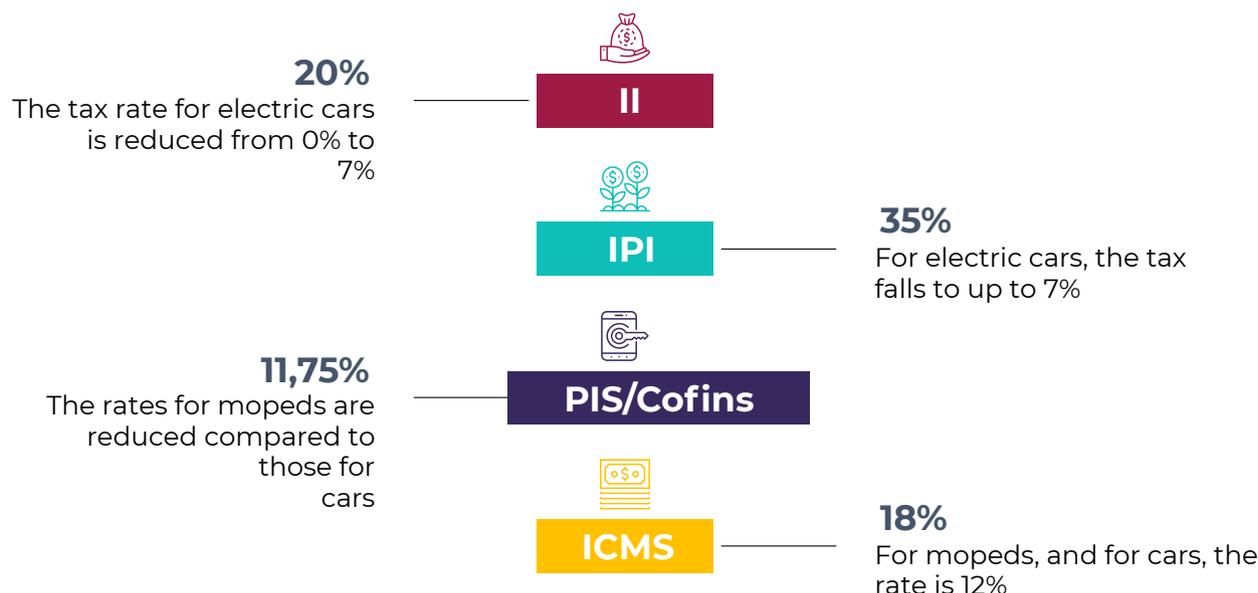
Source: Prepared by Sidera Consult

*Variations due to LETEC, considering energy efficiency and vehicle weight. Hybrid vehicles are not being considered

¹⁷² Source: Energy Research Company, National Energy Balance - BEN 2019.

¹⁷³ It is worth mentioning that producing batteries for electric vehicles requires important energy and resources, which can reduce their ecological benefits.

Figure - Taxes Subject to Reduction



Source: RFB, prepared by Sidera Consult.

As for federal taxes, the II of an assembled scooter is 20%, and the IPI is 35%. For scooter parts, import taxes range from 4% to 35%, and up to 18% for the IPI.¹⁷⁴ The incidence of high taxes hindered the growth of the electric scooter sector in Brazil and removes the competitiveness that would enable its more pulverized use by cities.

Specifically the IPI, at the level of 35%, makes the electric scooter comparable to luxury or superfluous items, such as perfumes (42%), fur coats (35%) and electronic games (20%), or products whose consumption represents a risk to the health of the population, such as alcoholic beverages (30%), cigarettes (30%) and firearms (45%). Even makeups (22%), statuettes and other ornamentation objects (20%) and fireworks (30%) generate more reasonable IPI taxation compared to that of electric scooters.

The policy of excessive encumbrance on a good with so many positive externalities to the economy and the national population, in terms of sustainability, health and mobility, among others, is in alignment with what is observed in the rest of the world, that is, seeking a pattern of exemption from this good.

In addition to the movement of the private sector described throughout the study, there are now at least 40 bills that seek to encourage more sustainable vehicles, reduce their taxes, provide public infrastructure for charging and even ban the manufacture and import of combustion vehicles (Appendix VII). Thus, there are indications, both from the national context and from external influence, that electric vehicles will end up at least enjoying the same benefits already identified for electric cars in Brazil in the medium term.

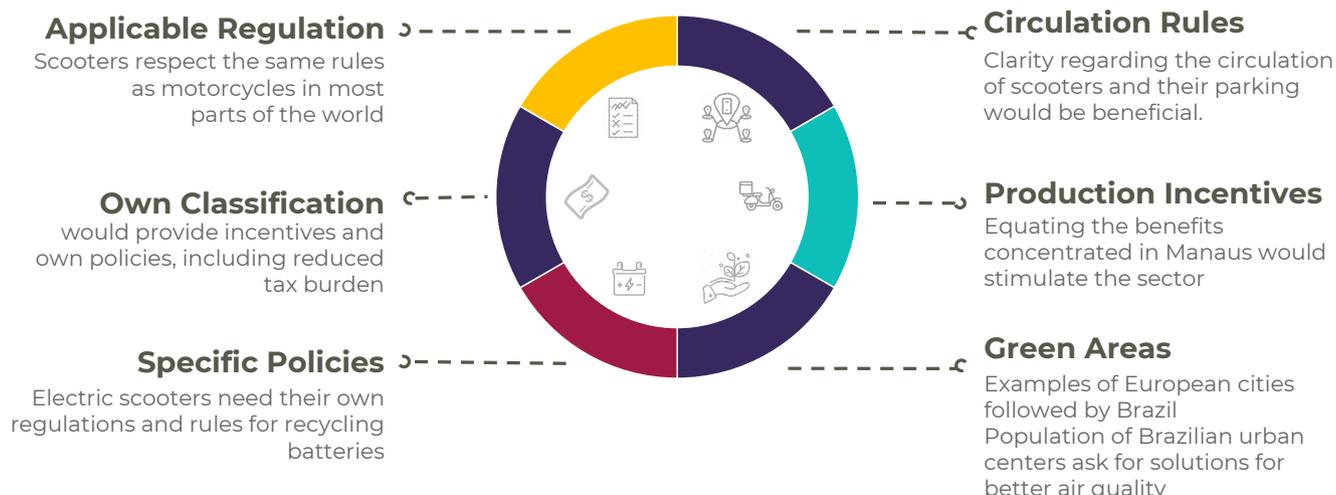
2 GENERIC CLASSIFICATIONS AND REGULATORY UNCERTAINTY

An economic and legal environment to encourage the transition to an electric fleet requires, minimally, legal certainty, i.e., certainty with respect to applicable laws and regulations, as well as protection against retroactive changes. This is a basic precondition for private and corporate users, as well as manufacturers, to be able to invest in the segment of electric scooters as an effective mobility alternative.

On the other hand, an appropriate tax classification facilitates the regulatory monitoring by the companies in the sector and the monitoring of the government on the growth of the number of products in circulation in the country, to identify policy needs and demands.

¹⁷⁴ Source: TEC WIN. Available at: <https://tecwinweb.aduaneiras.com.br/Modulos/Home/Home.aspx>. Accessed 31 July 2019.

Figure - Regulatory Optimization



Source: Elaboração Sidera Consult.

As a relatively new product, electric scooters are marketed under a generic classification, also applicable to electric bicycles and kick-scooters. As already noted in this document, this overlap inhibits clear and accurate analysis of the import data of electric scooters in Brazil and the generation of historical series that allow technically substantiated demand projections. Consequently, it is difficult to find any government guidelines for promoting and obtaining tax incentives, or even structuring industrial policies and attracting investments, both financial and intellectual, relevant to the segment.

Electric scooters are classified in a generic way and with data combined with those of electric bicycles and kick-scooters also in the nomenclature of the IBGE's Annual Industrial Survey (PIA). According to this research, in 2016, 16,362 electric mopeds were manufactured in the country, but it is uncertain how much of this quota refers to the product analyzed here.

In this scenario of regulatory obscurity, in which there are no specific rules for electric scooters, doubts arise regarding the need for specific qualification, licensing, license plate and registration, which implies transaction costs and insecurity for companies that wish to acquire them.

Similarly, the classification of electric scooters for the effects of traffic on roads throughout the country - today grouped both in Appendix I of the Brazilian Traffic Code (CTB) and in resolutions 315/2009 and 465/2013 of the CNT - needs revision and updating.

Appendix I to the CTB defines the **moped** as the

two- or three-wheel vehicle, fitted with an internal combustion engine, of a cylinder capacity not exceeding fifty cubic centimeters (3.05 cubic inches) and of a maximum manufacturing speed not exceeding fifty kilometers per hour.

Article 1 of Resolution 315/2009, which "establishes the equalization of electric-cycle vehicles with mopeds and mandatory equipment for driving on public roads open to circulation", in turn, defines the limits of engine power (up to 4 kW) and speed (up to 50 km/h). Let's see what the text of the resolution says:

for the purposes of equating to a moped, a cyclo-electric vehicle is understood to mean any two- or three-wheel vehicle equipped with an electric propulsion engine with a maximum power of 4 kW (four kilowatts) with or without pedals driven by the driver, whose maximum weight including driver, passenger and cargo, does not exceed 140 kg (one hundred and forty kilograms) and whose maximum speed declared by the manufacturer does not exceed 50 km / h (fifty kilometers per hour).

The Council thus defined weight limits, including the load, the driver and the vehicle itself, creating a situation of legal uncertainty. The limitation of weight to 140 kg for mopeds and cycloelectrics, where electric scooters are inserted, practically makes the development of this segment impossible, since it becomes unlikely to meet such a requirement.

In Brazil, the average weight of men is estimated at 73 kg and, of women, 63 kg. Considering a light load of 10 kg, we will have 83 kg and 73 kg, respectively, adding up with the weight of the individuals. The weight of a scooter, without

the drivers or the load, is between 70 and 150 kg, depending on the model, as shown in the table below, with some of the most internationally known models.

Figure - Models of Scooters and Their Weights

Cooltra	Dafra (50cc)	Golvecs Schwalbe	Nuuk	Askoll eS3
150 kg	90 kg	120 kg	115-130 kg	70 kg

Source: Prepared by Sidera.

Unable to comply with this requirement, producers, importers and users, contrary to the law, are subject to the inspection and application of penalties by legal regulations that, in theory, would be unenforceable to the characteristics of this vehicle.

That is, there are rare scooter models available internationally that could fit Brazilian standards if we add the weight of the vehicle to the driver and to the minimum load. Therefore, an important component of regulatory gap and discouragement for new investors in this market is triggered.

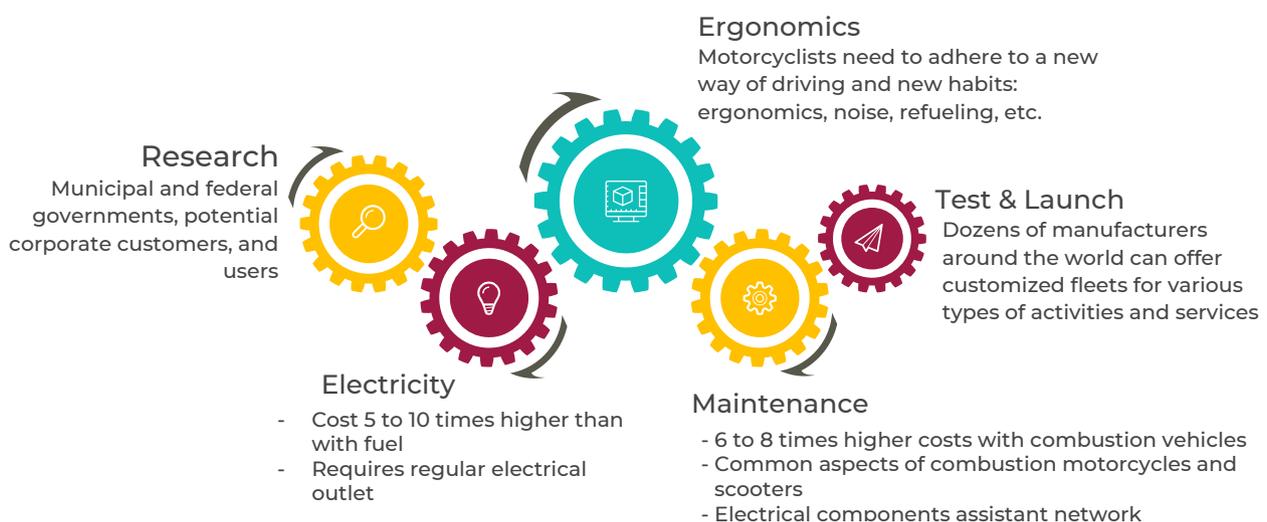
The Brazilian Association of Electric Vehicles (ABVE) prioritizes the action with the authorities and business entities related to the automotive sector, aiming to make decisions that encourage the development and the use of electric

vehicles.¹⁷⁵ Regarding the need to adapt these traffic rules, one of the priorities of ABVE is the strategy that consists of involving the Brazilian National Standards Organization (ABNT) in the classification of safety rules and, subsequently, bringing them to the attention of legislators, in order to build together the best regulatory framework.

4 LACK OF KNOWLEDGE AND CULTURAL BARRIERS

One of the challenges identified by the interviewed manufacturers is the general lack of knowledge regarding the product, its usability, its charge and aspects related to maintenance and applicable regulation, among others addressed throughout this study.

Figure - Points to Be Clarified to Potential Users



Source: Prepared by Sidera Consult.

¹⁷⁵ Source: <http://www.abve.org.br/>.

We can also mention the so-called range anxiety, which refers to the anxiety of potential users regarding the autonomy of the vehicle, that is, whether it will be possible to complete the trip or the working day without running out of battery power. The fear, however, is unfounded. Firstly, because it is possible to have clear control over the distance that one can still travel. Secondly, because the level of customization of electric scooters, in general, considers the needs of each application, for example, the recommendation to use models with interchangeable battery for sharing services.

Besides that, the scooters have built-in charger and rely only on a common outlet for charging. In the exceptional case of need of an emergency charge, it is possible to achieve it, especially considering that most recent models have a removable battery and the use will be in an urban environment. As more modern batteries are more widespread and accessible, ignorance and fears of possible new users are warded off.

In the markets where combustion motorcycles are more widespread, including Brazil, the need for a change in the user's paradigm was sometimes difficult to overcome, since motorcyclists declared that they are accustomed to the position in which they place themselves on motorcycles and did not want to change. On scooters, the driver conditions the legs in front of the trunk, on a platform, and not at the side, as occurs with traditional motorcycles. For use by providers and public agents, their managers were sometimes forced to create incentives for changing habits, including the award for those who ventured to test the new vehicles. In other cases, the cultural barrier was transposed by the indication of two options: perform activities on foot or with electric scooters. Practically compelled, users eventually adapted to different conditions, even going so far as to enjoy the novelty.

5 COMPETITION WITH OTHER ULTRALIGHTS

In Brazil, 97% of combustion motorcycles are manufactured in the Manaus Free Zone.¹⁷⁶ This means that they enjoy significant tax benefits, which contribute strongly to the low prices of motorcycles in the country and their adherence by the population of all social classes. The production is strongly dominated by two actors, Honda and Yamaha, who accounted for 78% and 13.5%, respectively, of the volume of new bikes placed in Brazil in 2018.¹⁷⁷

¹⁷⁶ Source: Scarpetta e Gonçalves, 2015.

¹⁷⁷ Source: FENABRAVE. Yearbook 2018. Available at: <http://www3.fenabrave.org.br:8082/plus/modulos/listas/index.php?tac=indices-e-numeros&idtipo=6&layout=indices-e-numeros>. Accessed 19 Aug. 2019.

¹⁷⁸ Source: <https://www1.folha.uol.com.br/cotidiano/2019/09/patinetes-ja-circulam-11-mil-km-por-dia-em-sao-paulo.shtml>

In the scenario of a budding industry relevant to the national market, it would be interesting that the described benefits were equated and extended in favor of the electric scooter industry.

Although there is practically no competition between suppliers of electric scooters in Brazil, the product, by its characteristics, competes with other ultralight vehicles, such as kick-scooters and electric bikes.

One of the target markets for potential investors in the electric scooter sector in Brazil is the postal or food delivery service. In this branch, the use of both electric bicycles and electric kick-scooters has become widespread. Eventual competition in the branch loses, in this case, the argument of sustainability gain in a comparative analysis in the transition from combustion motorcycles to electric scooters.

An example of this competition is the case of the Croatian Postal Service, which, after testing with electric bicycles and electric scooters, opted for bicycles. The reasons were that, in addition to electric bicycles having the same benefits as scooters, they increase the level of physical activity of employees and have a lower initial cost. In addition, bicycles do not require permission to drive, as is the case with electric scooters in Brazil.

In the sharing service of electric scooters, the perception reported by some users was of competition with the sharing services of electric kick-scooters. The kick-scooters presented some intrinsic advantages, such as the smaller size, the dispensability of the driver's license and the familiarity of the end customers with certain brands already well established in the sector.

However, there is market space for both services. Firstly, because the challenges of urban mobility are complex, therefore, they require combined solutions and several alternatives. Secondly, because the electric kick-scooter meets the demand for displacements from one to two kilometers,¹⁷⁸ while the electric scooter has advantage for displacements from 2 kilometers.

In addition, electric kick-scooters have faced regulatory clashes in several cities around the world, and one of the main reasons is the place where they circulate (whether on sidewalks, bike paths or on the streets, with cars). Electric scooters do not face this dilemma, their space is defined, which facilitates the relationship with regulators.

From the point of view of mobility and sustainability, however, competition is positive for providing complementary alternatives to the diversity of users, most of which are less aggressive to the environment.

6 RECYCLING AND DESTINATION OF BATTERIES

In the Report on the Implementation of the Strategic Action Plan on Batteries: Building a Strategic Value Chain for Batteries in Europe, released in April 2019, batteries were identified as a strategic value chain, as they constitute a key element for the already ongoing transition to clean energy.¹⁷⁹ It also concluded that a sustainable chain is essential, that is, from the acquisition of raw materials to the end of life, including reuse, repair, remanufacturing, recycling and disposal, ideally in the light of a circular economy approach. .

Cells and batteries are, however, generally considered toxic waste, because their content often includes substances such as mercury, lead, cadmium and lithium. Lithium is, for example, formally considered hazardous according to guidelines and publications such as the Occupational Safety and Health Administration, from the US,¹⁸⁰ and Directive 2006/66/EC, from the European Union.¹⁸¹

In the midst of scandals in the use of African countries and other regions as a toxic waste dump, in 1989 the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal was adopted, establishing international mechanisms to control the movement of hazardous waste, among others, in order to curb illegal trafficking and provide for the intensification of international cooperation for the environmentally sound management of this waste. The convention obliges its parties to ensure that hazardous waste is disposed of in an environmentally correct manner and, in the same sense, encourages them to minimize the quantities moved across borders, so that they treat and dispose of waste as close as possible to the place of generation, as well as how to prevent or minimize the generation of waste at the source. Brazil acceded the Convention in 1992, making important

commitments in the area of solid waste disposal, which would permeate other legislative efforts in the country.

Thus, the country has been moving in this direction for some time, even before the publication of the National Solid Waste Policy (PNRS, Law 12.305/2010),¹⁸² with laws, ordinances and normative instructions related to the destination of waste in force since 2000, such as Law 9.974/00 and other regulations for environmental protection.

The PNRS treats batteries in a specific way, establishing in its article 33 the obligation of manufacturers, importers, distributors and traders to structure and implement reverse logistics systems, upon return of products after use by the consumer, including and expressly for cells and batteries. It also encourages non-generation, reduction, reuse, recycling and treatment of waste. Finally, there are regulations on the import of new batteries with prior authorizations and licenses issued by IBAMA,¹⁸³ and specific limits of lead, cadmium and mercury for products marketable in the national territory established by CONAMA Resolution 401/2008.¹⁸⁴

It is also required the presentation of the competent plan of management of cells and batteries, contemplating the environmentally appropriate destination and the registration of those involved in the Federal Technical Register (CTF), among other requirements that require more detailed legal analysis.

Offenses related to the environment are punishable under Law 9.605/1998,¹⁸⁵ for both legal entities and individuals. Restrictive fines and penalties of law apply (provision of services to the community; temporary prohibition of rights; partial or total suspension of activities; pecuniary provision; home collection). To the legal entity, fines and penalties restrictive of rights are also applicable: partial or total suspension of activities; temporary prohibition of establishment, work or activity; and prohibition of contracting with the public authorities.

Faced with an extensive regulatory scenario such as the one in Brazil, it is essential to provide adequate regulatory advice to any company that wants to enter the market.

¹⁸⁰ Source: <https://www.osha.gov/dts/shib/shib011819.html>.

¹⁸¹ Source: Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators. Available at: <https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2006:266:FULL&from=PT>.

¹⁸² http://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12305.htm.

¹⁸³ Source: Normative Instruction of the Brazilian Institute for the Environment and Renewable Natural Resources - IBAMA No. 8, of 14 July 2017. http://www.in.gov.br/materia/-/asset_publisher/Kujrw0TZC2Mb/content/id/19219957/do1-2017-08-07-instrucao-normativa-n-8-de-14-de-julho-de-2017-19219825.

¹⁸⁴ Source: <http://www2.mma.gov.br/port/conama/legiabre.cfm?codlegi=589>.

¹⁸⁵ Source: http://www.planalto.gov.br/ccivil_03/LEIS/L9605.htm.

E. FINAL CONSIDERATIONS

The objectives of this study were centered on the introduction of macro dimensions and some specific, inherent to electric scooters, with content aimed at potential corporate users, operators and investors. The objectives of this study were also to clarify and demystify doubts for the use of electric scooter fleets, as well as assist decision makers of public and private companies in their assessments about the acquisition of electric fleets or replacement of combustion fleets.

Because this is an exploratory-descriptive study, some difficulties were present and represent limitations of the analysis: the absence of reliable secondary data, especially from the government; the distrust of most private companies interviewed in opening their numbers for a study on this market; and the incipience of this market still little consolidated, which made it impossible to reliable projections about this sector in Brazil.

The limitations, however, do not overshadow the positive and optimistic prognosis for the market of electric scooters that this study glimpsed evidenced. The global trends of this market and the urgency of the environmental agenda are two attributes that allow us to affirm, with an even conservative tranquility, that the electric vehicle market in Brazil only tends to grow by leaps and bounds in the years to come.

The global electric scooter market was valued at \$ 17.6 billion in 2017 and the annual growth forecast is 12.8% by 2026. Some Latin American countries, as we saw in the study, have advanced in programs and policies to encourage electric fleets in their countries, as is the case of Uruguay, where electric vehicles have taxation 75% to 95% lower than that of combustion vehicles, resulting in a 133% increase in sales of electric vehicles in 2018.

CONCLUSION 1: FINANCING POSSIBILITIES FOR BRAZILIANS

In developed countries, investments in mobility projects are encouraged through the provision, by public and private banks, of financial capital with a term equivalent to investment projects.

In Brazil, the segment **lacks de-bureaucratized long-term capital.**

As a result, the Brazilian entrepreneur often ends up **financing long-term projects with short-term capital and high cost**, or simply gives up the segment.

The solution involves changing public policies, but also the necessary increase in legal certainty, so that investors have the guarantee that long-term capital will be safeguarded, without regulatory surprises.



Source: Prepared by Sidera Consult.

Although it is a rising market and already inserted in a context of a global value chain, motorcycle market giants such as Honda, Yamaha, Suzuki and Kawasaki, for example, do not yet have products of global relevance in the electric segment. According to interviews conducted for this study with major players in the motorcycle sector, factors such as

feasibility of the cost of assembly, compatibility of the final price with the income of Brazilians, uncertainty of regulatory framework, running autonomy (battery), user habits, fast charging infrastructure, skilled labor-force and sustainable solution in the post-use still represent important barriers to the entry of large players in the market of electric scooters .

As the study showed in Chapter I, the regulatory framework for electric scooters is still extremely confusing, as CTB itself did not incorporate the specificities between two-wheeled motor vehicles, notably motorcycles, scooters, mopeds and cycloelectrics. CONTRAN sought to correct and update the regulatory framework, as we saw in Chapter III; however, the results for electric scooters are still unsatisfactory and cause some legal uncertainty.

However, there are cases of success and reference around the world with the use of electric scooters. The present study sought to highlight such examples to serve as inspiration, provocation and, even, reference for Brazil.

What stood out from the case studies was the diversity of uses for different purposes. The study deepened such cases into five categories that best synthesize the uses and potential use of electric scooters in corporate fleets: food delivery services; sharing services; integrated services; postal delivery services; and City public services, with emphasis on safety.

In the service of shared electric scooters, a broad survey with the main operators of shared systems, located especially in Europe and Brazil, revealed that 95% of the systems are free-float (without fixed stations) and that users seek these services for independence and convenience, safety, practicality in loading and guaranteed maintenance. That is, not owning a vehicle turns out to be something desired, especially in large urban centers.

In the food delivery service, the advantages associated with the economy with energy expenditure and maintenance gained prominence among the cases analyzed. Scooter fleet

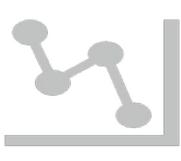
management applications in operation have also proved to be important for these operators.

In integrated solutions, research on companies operating in the electric scooter market identified a set of small businesses (start - ups) seeking a path of integrated and complete solutions - often from the production/manufacture and customization of the vehicle to the supply of fleet management and control systems.

For postal delivery services, due to the goals of electrification of the fleet - which we find in the main companies (public and private) - electric scooters are increasingly used. The increasing volumes of deliveries, associated with the need for greater mobility and restrictions on the movement of large vehicles-especially in the central areas of cities - point to a path in which electric scooters and electric bicycles will gain space in the fleets of postal delivery systems. One of the examples presented in the study, the Taiwanese delivery service (Chunghwa Post), already uses electric scooters in 20% of its fleet in operation.

Finally, the study presented cases of use of electric scooters for municipal services, with emphasis on general maintenance services, traffic control, public safety and emergency medical care. About the latter, an interesting case was presented in Israel, where 650 scooters-ambulances responded to more than 295 thousand emergency calls in the city of Jerusalem, in less time compared to traditional care and often avoiding, even, the displacement of ambulances.

The study concluded with an analysis of Strengths, Weaknesses, Opportunities and Threats about the electric scooter market, which can be summarized in the following table:

			
<p>Strengths</p> <ul style="list-style-type: none"> • Sustainability • Reduced operating costs • Mobility versus traffic • Integrated fleet management systems • Efficient batteries • Diversity of uses • Reduction of accidents 	<p>Weaknesses</p> <ul style="list-style-type: none"> • Top initial investment • Lack of structure for charging batteries on public roads • Lack of skilled labor-force 	<p>Opportunities</p> <ul style="list-style-type: none"> • Low competition • Global growth • Possible fleet rental • Possible reduction of the tax burden • Energy Sustainability in Brazil 	<p>Threats</p> <ul style="list-style-type: none"> • High tax burden • Regulatory uncertainty • Cultural barriers • Competition with other ultralights • Recycling and disposal of batteries

The analysis on the forces showed the reduction of air and noise pollution and the change of the energy matrix to a renewable option as fundamental dimensions of the sustainable attributes associated with electric scooters. This gains even greater prominence in a country with a wide offer of renewable sources of electricity (hydraulic, solar and wind), but still very dependent on fossil fuels. As a result, almost 14% of GHG emissions come from fossil fuels and 90% of urban noise comes from vehicular traffic.

Still in relation to forces, the study revealed that electric

scooters are at least five times more efficient than combustion motorcycles. While electric vehicles convert between 51% and 62% of grid energy into wheel power, in gasoline vehicles this conversion is only 17% to 21%.

Maintenance costs are also advantageous: 40% lower than for combustion models. European company data indicated that, with 15 thousand kilometers rotated, it is already reached the point where the operation with electric scooters becomes more economical than with combustion scooters.

CONCLUSION 2: ALTERNATIVE WITH HIGHER QUALITY AND LOWER COST

The reality observed in Brazil and globally was that the highest initial cost implies dammed demand, surpassed only with significant initial capital injection.

↳ A well-organized, consolidated and efficient **segment** can have significantly increased earnings and numerous positive externalities for the country: greater well-being of users of corporate fleets and the general population, contribution to meeting sustainability goals and greater profitability for operators.

By optimizing the segment, the revenues generated feedback the operations, and reduce the dependence on financing, currently so expensive in Brazil



The first stimulus could be a vitamin complex of external capital, application of the best productive techniques identified around the world, and intense government support.

Source: Prepared by Sidera Consult.

To conclude the analysis of the forces, the study highlights fleet management and control as essential factors and important differential of electric vehicles. Through software it is possible to control the autonomy, view the geolocation, monitor the profile and the direction, unlock the vehicle with smartphones and electronically control the speed limits. This last dimension is one of the most assertive measures regarding road safety, because the electronic control of the speed limits allows to adjust the speed of the vehicle in circulation to the characteristics of the traffic infrastructure and the correct sharing of the road aiming at the safety of all users and reducing, in this way, the risk factors associated with human failures.

The analysis on weaknesses was focused on the high initial

investment, showing how electric scooters are one and a half to two times more expensive than combustion motorcycles of equivalent category. Similarly, the lack of infrastructure for charging and skilled labor-force were exploited as weaknesses, especially to deal with the specificities of each producer or operator.

The analysis of opportunities reinforces the dimensions identified as strengths, especially in identifying the potential of this market. In Brazil and Mercosur, as we have seen, there are only small automakers and operators, which emerges as an opportunity for new players. The real possibility of reducing the tax burden and access to incentive funds – both public and private – ends the list of important opportunities for this sector.

CONCLUSION 3. FACTORS THAT CAN BE REDUCED, MAKING THE FINAL PRICE MORE COMPETITIVE



TAXES

Government tax-free policies would give competitiveness to the sector.



COST OF BATTERIES

Batteries could be developed in Mercosur, given the lithium mines in the region.



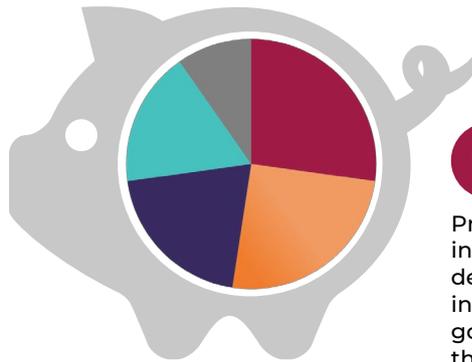
TAXES AND TOLLS

General measure of elimination of all charge components.



INCENTIVES

Equating government support granted to combustion motorcycles.



INNOVATION

Programs to encourage innovation such as those described in the study and incentives of the Brazilian government would stimulate the accelerated service of dammed demand.

Source: Prepared by Sidera Consult.

Finally, the analysis on threats was focused on four dimensions: tax classification (MCN), regulatory uncertainties, high tax burden, competition with other ultralights and disposal of batteries.

The first dimension, the generic tax classification (MCN), prevents the obtaining of data on this market and hinders the adoption of tax incentive policies. As we have seen, Code 8711.60.00 mixes electric kick-scooters with electric bicycles, electric scooters and other cycles with auxiliary motor.

Regulatory uncertainties related to traffic and circulation rules today represent an important threat to the development of this sector. An example of this is the impossibility for producers and operators to comply with a CONTRAN standard - Resolution 315/2009, which limited the weight of scooters to 140 kg, including the driver - because there are rare models of scooters on the international market weighing less than 70 kg. Considering the average weight of Brazilians (73 kg), it is difficult to find a model in the national

and international market that meets the requirements of the regulatory standard.

The high tax burden on this sector is an inhibitory factor, and therefore a real threat to its development. Only the applicable IPI of 35% is higher than that of superfluous and health-damaging products such as alcoholic beverages, cigarettes and revolver bullets.

In turn, competition with other lightweight vehicles, especially combustion motorcycles, proved to be an important threat, since 97% of the national production of combustion motorcycles is found in the Manaus Industrial Hub, with voluminous tax incentives and benefits.

Finally, the last major threat is the need for correct disposal of batteries and electronic components, in view of scandalous situations throughout the 20th century of irregular (and illegal) disposal of electronic waste - highly harmful to the environment, especially to groundwater.

A. LIST OF MANUFACTURERS AND AUTOMAKERS OF E-SCOOTERS

1 AUSTRALIA

1.1 VMOTO

Vmoto Limited is a global manufacturing and distribution group of electric powered scooters and other two-wheeled vehicles, whose capital is Australian-owned. It sells electric scooters designed in Europe and manufactured at its 30.0002 plant in Nanjing, China, to be later distributed from Amsterdam, in the Netherlands. In other words, Vmoto seeks to combine low-cost Chinese manufacturing capabilities with European design and is committed to offering products at competitive prices and high performance to international markets. It operates through three main brands: Vmoto (brand focused on the value market in Asia), E-Max (brand aimed at international B2B markets with a premium product) and Super Punch (outsourced brand that Vmoto provides in international markets in business-to-consumer (B2C) format. In addition to operating under these brands, the company manufactures original equipment for various custom customers (such as original equipment manufacturer, OEM). In 2018, it sold 10,875 two-wheel electric vehicles and had a total revenue of US\$ 19.6 million (an increase of 30% over the previous year), driven largely by the growth of international sales, with 10,081 units sold during the period - sales in the European market in the same period continued in an abrupt upward trend, with 4,280 units, representing an increase of 310% over 2017. The company continued to develop strong delivery, sharing and rental relationships with its customers and end consumers, with orders that would be delivered throughout 2019. In Brazil, the company already operates through the automaker Riba.

<http://www.vmoto.com/>
Suite 5, 62 Ord Street, West Perth
Western Australia 6005
info@vmoto.com
+86 187 5207 9789

2 GERMANY

2.1 GOVECS

GOVECS was founded in 2009. Unlike many other manufacturers, the company designed its vehicles as pure e-scooters from the very beginning, the frame of which was developed specifically for this modality. Manufactures a variety of electric vehicles at its Polish plant, which has 230 employees, and distributes products of its own brand, as well as those developed and produced for other brands. The main line is that of electric scooters, marketed to private users and to operators of B2B fleets, including for delivery services, in a transport version under the brand name go GOVECS! The company markets its electric scooters in the United States and 17 countries and puts on the market 3,500 additional vehicles each year. Since 2010, GOVECS has been in a cooperation agreement with Bosch, which offers maintenance services to its customers. In July 2015, GOVECS acquired the complete factories of the pioneering e-scooter manufacturer Vectrix, which was also located in Wroclaw, expanding its production capacity to 20,000 units per year. GOVECS e-scooters are serving the police in Leiden (Netherlands) and the Domino's Pizza food service chain in several European cities, as well as independent e-scooter sharing services based in the city of San Francisco, California. In addition, GOVECS' rental scooter fleets are being used in San Francisco, Barcelona and Ibiza and in the UNESCO Natural Heritage Site of Geirangerfjord, Norway.

<https://www.govecsgroup.com/en/sectors/delivery/>
Grillparzerstrasse 18
Munich
81675 Alemanha
sales@govecs.com

2.2 EMCO

EMCO has been producing electric scooters since 2011, specializing in sharing fleets and delivery services through the retro and Classic product lines, with models from 1,000 to 3,000 watts, maximum speeds from 25 to 45 km/h and autonomy up to 130 km. The dual lithium-ion, removable battery, controller and motor are all developed by EMCO itself. In numerous cities, EMCO has successfully implemented and manages various concepts of electrical mobility - technically and logistically. In addition to sales in Germany, EMCO achieved greater success in the markets of Spain, the Netherlands, Italy and Turkey. The company does not disclose the number of electric vehicles and electric scooters produced, nor their annual income.

<https://www.emco-e-scooter.com/en/>
Breslauer Straße 34-38
Lingen (Ems)
49808 Alemanha
+49 591 / 9140 - 0

2.3 UNU

Unu is a German manufacturer of electric scooters based in Berlin, founded in 2013 with the support of the Technical University of Munich. The vehicles are assembled in China and distributed in Germany, Austria, Switzerland, France and the Netherlands. All three models of scooters offer power less than 4 kW and a maximum speed of 45 km/h, placing the scooter in the EC L1e vehicle class, according to the European classification. The scooter has a technology that allows partial charging with braking. In addition, the Unu-scooter is customized on demand for each customer, assembled in China and delivered a few weeks later. Scooters are sold via the internet, but it is possible that customers schedule a display or a test drive with a representative of the company. Unu has a partnership with Bosch service for the provision of maintenance. In order to ensure the availability of this service, scooters are only marketed to regions that have Bosch service workshops. After the introduction of Unu-scooter in Germany, sales were extended to Austria, Switzerland and in 2016 to the Netherlands, where the scooter is also offered in a 25 km/h version, which in the Netherlands allows the rider to drive without a helmet and on bike paths.

<https://unumotors.com/en>
+49 (0) 30 220121299

3 BRAZIL

3.1 RIBA BRASIL

Riba, a pioneer in Brazil in the development and representation of electric scooters has a business relationship with the leading manufacturers of this segment in the world. It has been on the market for more than nine years and has its assembly cell in Minas Gerais, where it has government incentives. Riba currently has three business models in Brazil: Riba Share, a sharing system available in the city of São Paulo; B2B, which consists of renting fleets to other companies; and selling to individual users. The original parts of the models assembled by Riba are currently from the E-Max line, acquired from the company Vmoto.

<https://www.ribabrasil.com.br/>
Rua Francisca Emília
Bairro Vila Firmiano Pinto
São Paulo (SP) - Brasil

3.2 SOUSA MOTOS

Sousa Motos started its operations at the industrial hub of Manaus in 2010. The company specialized in the development of specific assembly lines for two-wheel products, owning the first factory in Manaus in the two-wheel segment with electric powered vehicles. The two-wheel segment has a technology agreement signed with suppliers in China, granting technology for approval with the competent bodies since the beginning of its operations, in 2010, with the electric bicycle line. Sousa Motos employs approximately 150 employees and its total production capacity of the two-wheeled line is 9,000 units per year, with a shift of work and clear possibility of expansion without significant cost increase.

<http://www.sousamotos.com.br/>
Av. Tiradentes, 3091 - Saúde
03980-150
Guarulhos (SP) - Brasil
sousamotos@sousamotos.com.br
+55 92 2125-8370 / 92 3618-6801

3.3 WIND DO BRASIL

Wind do Brasil is a Brazilian company, automaker of lightweight electric vehicles (mopeds, bicycles and self-balancing duocycles). Founded in 2013 in the Paraíba Valley, known technological hub of the state of São Paulo, began its activities importing electric vehicles from Asia to study the Brazilian market and validate the acceptability of the Brazilian to the new mobility technology. For his pioneering work, he encountered, in the first years of activity, a still incipient Brazilian legislation on electric mobility. Always adjusting to the changing regulations, it used this to also initiate its own developments, adapt its portfolio to the demands of customers and offer products more consistent with the segments in which it operates and with the Brazilian reality. Internationally recognized as one of the companies that dictates the Brazilian model of electric mobility, currently Wind do Brasil focuses efforts on the development of new electric mopeds and electric motorcycles, as it did with its newly renovated line of electric mopeds (4th generation). In full expansion, Wind do Brasil has also been implementing its network of dealerships and is structured to bring its assembly line to its own factory in Brazil.

<http://winddobrasil.com.br>
 Av. Dr. João Guilhermino 426 - Centro
 12.210-131
 São José dos Campos (SP) - Brasil
contato@winddobrasil.com.br
 +55 (12) 3209 7518
 +55 (12) 9 6666 1031

4 CHINA

4.1 NIU

Niu is a company based in Wujin, China, founded in 2014 by Li Yanan, former vice president of Huawei and CTO of Baidu, and Token Hu, former employee of Microsoft. The company has about 500 employees and is a large Chinese participant of electric scooters, with more than 26% market share. Niu operates throughout Europe, Mexico, Chile, Argentina, Nepal, Israel, India, Malaysia and New Zealand. In its first year, the company had more than 100,000 customers worldwide with the N1 and M1 scooter models. At the end of 2018, its global sales of e-scooters reached 640,000 units since its foundation. Currently, Niu designs, manufactures and markets smart e-scooters and has a simplified portfolio

of products, composed by three series, N, M and U, but with various models and specifications for consumers, delivery and sharing services. Some scooters are equipped with two high-performance lithium-ion batteries, which can be removed and charged at any time, while others are recharged directly into the outlet. 60v35ah batteries have enough power for an autonomy of more than 100km at an average speed of 70km/h. Its app monitors the battery, offers GPS and an anti-theft system that alerts the driver when the scooter is moved. Niu won seven major international design awards, including Red Dot, iF, Good Design, Idea, Red Star, DFA and Golden Pin in 2017 for the M Series scooters. Niu's net revenue in 2017 was US\$ 116.2 million, an increase of 116.8% over 2016. Niu reported about US\$ 155 million in net revenue in the first nine months of 2018, with just under 10% of sales in foreign markets.

<https://www.niu.com/en/>
 No. 5 Lingxiang Road, WEZ, Wujin, Changzhou - China
international@niu.com

4.2 LUYUAN

A Luyuan Electric Vehicle Co., Ltd. it is a Chinese company based in Jinhua, south of Shanghai, and has seven factories in China and Vietnam. Since 1997, it focuses on the two-wheel electric vehicle market and is one of the pioneers in the electric vehicle industry in China. The company designs, develops and produces various electric vehicles, including bicycles, scooters and touring cars. The series cover retro, sports and utility style, applied in personal use aimed at students and urban travelers, family utilities or delivery services. It has total production capacity of 6 million units of electric vehicles, counting on a network of more than 11,000 dealers and more than 1,300,00 Chinese customers. Luyuan also exported to more than 70 countries. Recently, the company has established thousands of chain stores and employs more than 10,000 trade representatives in China, its market-focus. It stands out for having complete production systems and research and development capacity in battery, motor, controller, charger and metal frame.

<https://www.luyuanvehicle.com/>
 Zhejiang Luyuan Electric Vehicle Co., Ltd.
 Add: No.168, Shicheng Street
 Jinhua City, Zhejiang Province - China
 Tel: +86-579-8227.25.28
luyuanvehicle@luyuan.cn

4.3 SUNRA

Founded in 1999, Jiangsu Xinri, better known as SUNRA, is a Chinese company located in Wuxi, China, specializing in research and development, production and distribution of electric vehicles, their components and parts. It has six local factories, with more than 5,000 employees, including 500 engineers. The company has annual production capacity of 4 million electric vehicles, including bicycles, scooters, motorcycles, tricycles and cars. It has exported to more than 70 countries, but apparently focuses on the local market.

<http://www.sunraev.com/>
No. 501 Xishan Road, Anzhen, Xishan District, Wuxi, Jiangsu Province - 214106 - China
info@sunraev.com
+86-510-88109820

4.4 YADEA

Yadea is mainly engaged in research and development, manufacture and sale of two-wheel electric vehicles and related accessories and has four plants in China, with more than 3,000 employees, plus a strong research and development team in Shanghai and Wuxi, with 340 professionals. Its main products include scooters, batteries and Chargers, bicycles and parts of two-wheeled electric vehicles. The group has an annual production capacity of approximately 6 million electric two-wheel vehicles. Its commercial network, consisting of 1,824 distributors and more than 9,000 outlets in China, was responsible for the increase in sales of scooters and electric bicycles from 3,319,582 units in 2016 to 4,060,030 units in 2017. Yadea has also exported to more than 70 countries through its international distribution network. Total revenue from sales of two-wheeled electric vehicles and accessories increased by approximately 17.8% in 2016 to more than \$ 1 billion in 2017, with 51.3% generated by electric scooters.

<https://globalyadea.com>

5 COLOMBIA

5.1 ELECTRIKA

Being the largest brand of electric bicycles in Colombia, it produces mopeds and electric scooters and has had more

than 12 thousand vehicles sold in the last six years. Their business philosophy is to create quality of life through clean alternative mobility solutions. In 2017, it established new charging stations, located in 13 strategic points of Bogota, in order to provide more usefulness and practicality to users.

<https://electrika.co/productos/scooters-electricas/>
Av. Boyacá No. 74 - 05 Esquina
Costado Norte - Sur - Santa María del lago
+57 315 2591143
comercial@electrika.co

5.2 ATECO

Autotécnica Colombiana S.A.S. (Auteco) is a motor vehicle and motorcycle manufacturer in Colombia.¹⁸⁶ It was the first motorcycle manufacturer in the country, founded in 1941; at the beginning of its operations, it was limited to selling spare parts, auto parts and combustion motorcycles. In 2003, Auteco established an alliance with Taiwanese producer Kymco, entering the electric vehicle market in Colombia and, with a market share of 32.6%, maintains the national leadership for the 10th consecutive year. Auteco has two automakers, with about 1,600 employees in three cities, in addition to the backup team for commercial activity. In total, there are about 670 points selling Auteco products, 620 authorized service centers and more than 2,500 spare parts stores across the country. All these points of trade allies generate more than 6,000 jobs. As for the 1,006 units of his Starker scooter sold until May 2019¹⁸⁷ in Colombia, the following are the main models:

Starker E3

The E3 is a Starker electric bike with a maximum speed of 55 km/h and autonomy of 65 km at an average speed of 45 km/h.

Starker Avanti 2.0

The Avanti 2.0 is a starker electric bike with a maximum speed of 55 km/h, range of 80 km at an average speed of 45 km/h and maximum power of 2,500 W. It is the main model of the company.

Starker e Cargo

Electric bike developed for the B2B market, mainly delivery, with 75 km/h maximum speed and autonomy of 100 km at an average speed of 45 km/h, in addition to power from 2,500 W to 4,000 W.

¹⁸⁶ Source: https://media.auteco.com.co/recursos/pdf/informes/Informe-Sostenibilidad-Auteco-2018.pdf?_ga=2.171934761.802456650.1561119383-302190636.1561119383.

¹⁸⁷ Source: <https://www.vehiculoselectricos.co/4-de-cada-1-000-motos-vendidas-en-colombia-son-electricas/>.

Starker Shipper

Electric starker motorcycle with rear seat that opens and becomes a loading platform and side hardware for fastening. With a maximum power of 2,500 W and autonomy of 50 km in the city, the bike Shipper is ideal for companies or self-employed who are dedicated to transporting items or light goods and who make short but frequent trips.

<https://www.auteco.com.co/>
Colombia

6 SPAIN

6.1 BULTACO

Bultaco was a Spanish manufacturer of combustion motorcycles inaugurated in 1958. Due to industrial unrest and market pressures, Bultaco's production was closed in 1979; the plant reopened in 1980 but closed again in 1983. In May 2014, a new Bultaco was announced and the company has been selling street electric motorcycles since 2015. The research and development department is located in Madrid, while the factory in Barcelona.

<https://www.bultaco.com/>
Calle Gobelás, 13, Urb. La Florida
Madri
28023 Spain
+34.910.13.37.03/ 935.79.99.24

6.2 NEXT ELECTRIC MOTORS

Next Electric Motors was founded in 2017 by entrepreneurs from the world of motor and technology. Its goal is to develop electric scooters that represent the real alternative to combustion motorcycles in all aspects: design, user experience and price, to eliminate all entry barriers to the adoption of the electric vehicle.

<https://nextelectricmotors.com/>
La Marina de València, Muelle de la Aduana s/n, Edificio Lanzadera
València - 46024 Spain
hi@nextelectricmotors.com

6.3 NUUK

Nuuk's first units went on sale in January 2016. From that moment on, the offer expanded in Spain. In 2018, the company began planning market expansion to Europe and America. The Volta BCN model has a maximum power of 25 kw (35 hp), which is equivalent to a combustion motorcycle from 250 to 400 cm³. According to the company, maintenance is eminently preventive, to check the condition of parts that suffer deterioration by use, such as tires, brake levers and brake oil.

<https://nuuk-europe.com/en/pf/cargo/>
Santa Ana Kalea, 14 - Pol. Ind.
Barrondo 48450 Etxebarri, Bizkaia -
Spain info@nuuk-europe.com
+34 944 263 833

6.4 SILENCE

Silence has created designs, developed technologies and manufactured electric scooters and batteries with its own technology since 2011. It has clients such as Correos España (the Spanish postal service), the Madrid traffic agents service and the Barcelona City Council. Since 2015, it is expanding internationally.

<https://www.silence.eco/en/>
C. Santiago Rusiñol, 18-20
Esplugues de Llobregat, Barcelona
08950 Spain
info@silence.eco

6.5 TORROT

Torrot Electric Europa S. L. is a Spanish company dedicated to the production of bicycles, velocipedes¹⁸⁸ and electric mopeds. It was founded in 1948 and took on the position of renowned European manufacturer of combustion motorcycles; after a troubled corporate history, it closed its doors in the 1990s. It was reborn in 2011 as Torrot Electric Europa SL, with a manufacturing line focused on exclusively electric vehicles, from the collaboration with the Andalusian Institute of Technology, the Catalan Technological Center ASCAMM Foundation, Proyectos Automotivos Técnicos, Grupo Constant and Edalma Inversiones, and the owners of

¹⁸⁸ Velocipede is a three-wheeled electric vehicle.

the brand Torrot. The initial forecasts were greatly exceeded, and in 2016 the turnover of the company was 16 million euros. Its electric scooter models, Muvi¹⁸⁹ (for individual user and sharing) and Muvi Business¹⁹⁰ – with different capacities and load models (refrigerated, thermal, standard, from 25 to 85 liters), for delivery, police, mobility agents, first aid, forest rangers, environmental tax, postal services, among others –, are sold in more than 30 countries. It has more than 300,000 registered users in the mobile application developed by the company for operational management, logistics and fleet maintenance, customer service, control of motorcyclists' driving and communication.

<https://torrot.com/>
C/ Los Moros, 32
El Puerto de Sta María – Cádiz – 11500, Spain
info@torrot.com
+34 972 406 115

6.6 VOLTA MOTOR COMPANY, S.L

<https://www.voltamotorbikes.com/>
C. Vilatenim 33, Nau 3.1
Figueres
17600 Spain
sales@voltamotorbikes.com
+34 872 020 412

OTHER SPANISH MANUFACTURERS ASSOCIATED WITH INDUSTRIES OF OTHER COUNTRIES (Small factories)

6.7 E-BROH

eBroh is a company that seeks to explore the market niche of economical electric motorcycles.¹⁹¹ This brand wants to take to the big cities the models eBroh Strada Max and Spuma Li, and reach the public of the scooters with prices between 2,309 and 4,995 euros, respectively.

<https://ebroh.es>
C/ Tarento, 9, Plataforma Logística Zaragoza PLAZA
Zaragoza
50197 Spain
info@ebroh.es
+34 876 269 494 / 976 933 003

6.8 GOING GREEN

<http://www.thecorebike.com/>
info@goinggreen.es

6.9 LEM EV

Lem Ev started its activities in September 2007 in a consortium of companies with different specialties,¹⁹² in order to propose an urban scooter that complied with two basic principles: offer a safe and pleasant driving and reduce energy consumption, favoring sustainable mobility.

<https://www.lemev.com/>
info@lemev.com

7 ESTADOS UNIDOS

7.1 GENZE

Mahindra GenZe, which operates under the brand name GenZe or GenZe by Mahindra, is a brand of electric bicycles and scooters. It is a subsidiary of the Mahindra Group of India. In 2013, GenZe presented its first electric bike and electric scooter. The name GenZe is the abbreviation of Generation Zero Emissions, in reference to the zero-emission characteristic of its vehicles. Its headquarters are in Fremont, California. Their products are manufactured, hand-assembled and tested on roads in Ann Arbor, Michigan. The GenZe electric scooters were launched on the market in 2015 and are used by Postmates delivery service. They are also available through the public scooter sharing system of Scoot Networks, which received investments from the private equity of the Mahindra Group.

¹⁸⁹ Muvi catalog available at https://torrot.com/index.php?mact=CGExtensions,cntnt01,getfile,0&cntnt01_d=SjlkQUVrakFxZENQaE51bGNSQ0ty-SmY2ZzBJbRWOW1vVG9vWkJOOU5WbG1kcjJqc25CalpaU2dUMjRYR2REaWxxK0NubHVWL2Y5ejFXVDU1S1J5eFhsWitBb0YwRG94OWhRaX-ZuR3VyVzNweGV2eFdiemxWaDVieTR4MVIEQUk0dU9nTUV1eDdJbjdMdnZaYmdlZHA2c2pFZDFubXAvR3FvU3JqNnd2WwVnPT06Qt7EK-Gqngeo9z%2BG8yBL7eQ%3D%3D&cntnt01returnid=1&showtemplate=false.

¹⁹⁰ Muvi catalog available at https://torrot.com/index.php?mact=CGExtensions,cntnt01,getfile,0&cntnt01_d=Mk5kZEVvQdzdMTU4NDZFT3BMN-llkWGZkUGdOWStiVWY2aitYzJBOXViZ2szQkltTTIMSIJTcENUVnU4Nk03TmxobHpkTkFwY053ZTkxbVZOMmlRaEO5NGxnMSt1cVgzeUswTnBv-V1ErTmNEMUtTTVlxbnNQnjhPRmx2Q3U1cWRsYOYrRWg3ZEZablINDSmV6Z0wvRjV1cDFkY1MzUHc3dlU5RkRqL3FCcTJzPT06QLp2hc2VmtuX-1kDgl19KmA%3D%3D&cntnt01returnid=1&showtemplate=false.

¹⁹¹ Source: <http://www.moto1pro.com/reportajes-motos/la-movilidad-del-futuro-es-electrica-y-asequible>.

¹⁹² Consortium formed by Luma, a leading European company in the manufacture of anti-theft Motorcycles, owner of the Italian helmet brand Lem, with eight subsidiaries worldwide; Inmotec, dedicated to engineering for the development of racing bikes; and Dhemem, an industrial design company awarded several times in world competitions, such as the iF or the Red Dot Award.

<https://www.genze.com/>
2901 Bayview Drive
Fremont, CA
94538 - United States
customerservice@genze.com
+1 855-464-3693

8 FRANCE

8.1 PEUGEOT

Peugeot Motorcycles S. A. manufactures two-wheel motor vehicles. The company offers combustion and electric scooters and mopeds, and sells its products via its subsidiaries, its importers and dealers in France and internationally. The company was founded in 1898 and is headquartered in Mandeure, with factories in Mandeure and Dannemarie, France, and Jinan, China. Since January 20, 2015, Peugeot Motorcycles S. A. has been operating as a subsidiary of Mahindra Two Wheelers Limited.

<https://www.peugeot-motocycles.fr/gamme/peugeot-2-0-electrique>
257060 Valentigney Cedex
France

8.2 REDE

REDE is a start-up founded in 2015, which designs its electric scooters in France and partially assembles them in China. Once imported to France, the finish by the technical team takes place in the workshops in Montrouge, near Paris, before entering the French market. It works with well-known suppliers, such as Bosch, for engines, and Lenovo, for removable lithium-ion batteries, with a range of 60 km. In addition, to meet the needs of delivery professionals, there is the option of buying two batteries, which ensures greater autonomy. The RedE scooters are available for lease and rental with purchase option, and of the current transactions, 80% are rented. The company is developing complete options for users, including rentals with other services, such as maintenance and warranty, and training for delivery professionals, so that they remain in compliance with French legislation. The network focuses on four market segments: foodtech (Uber Eats, Deliveroo), delivery (Sushi Shop, Pizza Hut), Express Delivery (Amazon, Fnac) and official institutions (Paris City Hall).

<https://redescooter.com/en/our-scooters/>
valentin@redescooter.fr
+33 682743674

9 NETHERLANDS

9.1 IVA MOBILITY

Iva Mobility focuses on the mobility market with maximum speed up to 45 km/h, mainly supplying combustion and electric scooters and tricycles for the specialized trade. In addition, it distinguishes itself as a supplier to companies seeking mobility and micromobility, selling its products to its own dealer network in the Netherlands, Belgium and Germany. The electric scooters have a removable lithium-ion battery from Bosch that gives them autonomy of up to 80 km, being recharged in approximately six hours. The company does not disclose the number of electric vehicles produced or sold annually, nor their annual revenue.

<https://www.ivamobility.com/>
+31 085-4016831
info@ivamobility.com
Sportlaan 391, 3364 DK Sliedrecht
Netherlands

10 INDIA

10.1 ATHER ENERGY

Ather Energy was founded in 2013 by Tarun Mehta and Swapnil Jain. In early 2014, it received US\$ 65,000 in investments from the Madras Indian Institute of Technology (IIT Madras) and Indian entrepreneur Srinivasa V. Srinivasan. In December 2014, Flipkart founders Sachin Bansal and Binny Bansal invested US\$ 1 million in the company. In May 2015, Ather Energy received an additional US\$ 12 million from Tiger Global for investments in vehicle development, testing, production and launch. In February 2016, the company launched the S340 smart scooter at a Surge Technology Conference 2016 in Bangalore. Hero MotoCorp then invested US\$30 million in the series B financing round in October 2016 and obtained a 32.31% stake in the company, again investing US\$ 19 million in 2018. In May 2019, Ather Energy raised an investment of US\$ 51 million in its last round of financing, highlighting the US\$ 32 million investment, again from Sachin Bansal. Currently, it has a factory, with installed capacity from 20,000 to 25,000 units. Its main models are the Ather 340 and the Ather 450.¹⁹³

<https://www.atherenergy.com/>
3rd Floor Tower D
IBC Knowledge Park, Bannerghatta Main Road
Bengaluru, Karnataka - 560029 India
+91 7676 600 900

¹⁹³ Source: <https://economictimes.indiatimes.com/small-biz/startups/newsbuzz/with-51m-raised-ather-plans-new-scooter-plant-and-charging-infra/articleshow/69608022.cms>.

10.2 HERO ELECTRIC

In 1956, the Hero brand was launched by the late Dayanand Munjal with the aim of providing mobility to millions in India. In the following years, the brand expanded to various fields, such as bicycles, motorcycles and health, and became one of the most renowned and trusted names in the world in its industry. For ten years, Hero Electric has been a pioneer and market leader in the two-wheel electric vehicle industry and other electric mobility modes in India. Currently, it has about 610 points of sale and service throughout the country and plans to increase the production capacity of its Ludhiana unit to about 80,000 units by April 2020, also investing in a new facility in South India.

<https://heroelectric.in/>
50 Okhla Industrial Estate (Phase III)
New Delhi
110020 - India
+18 602 662 2662
info.electric@heroeco.com

10.3 TWENTY-TWO MOTORS

<http://www.22motors.in/>
Vatika Business Park
4th Floor, Tower-1 - Sec-49 Sohna Road
Gurgaon
122018 - India
care@22motors.in
+91 124 4315900

10.4 OKINAWA AUTOTECH

<http://okinawascooters.com/>
Unit No. 119, 1st Floor, JMD Megapolis, Sector 48, Sohna Road
Gurgaon, Haryana
122018 - India

11 ITALY

11.1 PIAGGIO

The Italian Piaggio Group, founded in 1884, is the largest manufacturer of scooters and motorcycles in Europe and one of the world leaders in this sector. Piaggio & Co. it operates in the field of scooters, bicycles and motorcycles using the brands Piaggio, Vespa, Gilera, Aprilia, Moto Guzzi, Derbi and Scarabeo. His electric scooter is the green evolution of an Italian icon. In 1975, the company created a

first electric vehicle that opened the doors for the transport of goods and people using renewable energy sources, but only in 2018 was born the electric version of the scooter, powered by a 2 kW battery. It has an autonomy of 100 km, and the lithium-ion battery has full charging in four hours. The Vespa is equipped with two driving modes thanks to two buttons on the handlebar, the Eco and the Power. The Eco energy saving allows longer battery life, limiting the speed to 30 km/h, while the Power mode exploits the engine power in full (45 km/h). The electric scooter can be easily connected to the phone via Bluetooth to get all the necessary information through a central panel positioned on the handlebars. The monitor tracks the operational status of the vehicle: mileage, battery level, geolocation and updating of the phone-calls, messages and even music. Except for private users, the electric Vespas were assigned to the School of Student Marshals by the General Command of the Carabinieri. Italy is the main market for the electric Vespa, although this is also relevant in the United States and in three major eastern metropolises: Beijing, Shanghai and Singapore. The Piaggio Group has six production centers in Italy, India and Vietnam, as well as operating a joint venture in China. In 2018, consolidated revenues were 1,389. 5 million euros, an increase of 4.3% compared to 2017.

<https://elettrica.vespa.com/en/>
Viale Rinaldo Piaggio, 25
56025 Pontedera, Italy

11.2 ASKOLL

The Italian group Askoll was founded in 1978 by Elio Marioni. Today the group has factories in Italy, China, Mexico, Romania and Slovakia, being the Brazilian devoted to another line of products, components of household appliances. The group launched the line of business involving the production and sale of electric vehicles for urban mobility in 2015, and currently produces three models of electric scooters: eS1, eS2 and eS3. The eS1 model won the 2016 Grand Prix, a competition promoted by No Smog Mobility that received nearly 1,600 entries. In addition, the eS2 was a success for the company, as it was the best-selling model of e-scooter in Italy at the end of 2016, with a market share of about 50%. In addition, the eS3 model won the award for best electric vehicle in Motor Days. The main features of these models are high energy efficiency, low consumption, low use of raw material and the fact that all their most sophisticated technical components (battery, electronic control unit, motor) are developed internally, which gives them more competitive advantage. Production is organized into four departments. The first manufactures the batteries from the battery cells purchased from the suppliers, and transforms them into

the final battery, designed and assembled by the group. The second produces the engine with a manual assembly, followed by an automatic test phase. The third and fourth departments assemble the various components of the e-scooters to the final product. In 2018, Askoll achieved annual production capacity of about 6,600 e-scooters and revenue of 14.175 million euros. The company is currently focusing on expanding its business partnerships, some already established with major operators in the sharing sector (such as Cooltra and Mimoto) and postal services also abroad (with Austrian Post Office and Nexive), with long-term rental companies (ALD Automotive) and other professional operators (in particular, operating in the area of food delivery, Domino's and Burger King).

<https://www.askollelectric.com/site/en/index/>
Via Industria, 30
36031 Dueville - VI, Italy

11.3 MEGROUP

MeGroup is an Italian start-up that designs and manufactures the ME model, the world's first scooter with a patented frame of sheet molding compound (SMC).¹⁹⁴ The company was born in 2013 from a joint venture between three companies: Scalvenzi Società Cooperativa, a leader in the production of waste compaction systems; Rossa, a communication agency specializing in strategies and design for companies in the industrial sector; and Vehicle Engineering & Design, which operates in the automotive sector (with customers such as Alfa Romeo, Opel and Fiat). According to MeGroup, the scooter has high mechanical, thermal and resistance against atmospheric agents. To bring his prototype to the market, MeGroup has created a successful crowdfunding campaign, raising 300,000 euros and considerably increasing the visibility of the company, to the point that even the BBC has named it as "the new Italian icon after the Vespa", for its original design. The production line of ME is extremely simplified: it consists of a mold of the first stage and a subsequent stage of assembly and testing, and the traditional production cycle (welding, galvanizing and painting) is not necessary, neither lubricants or thinners need to be used. All this happens between Brescia, Bergamo and Milan, in the factories of MeGroup and the company's production partners. His scooter can accumulate 21.6 kWh of electricity and guarantees 80 km of autonomy, with eight hours for full charging. It has dual charging mode: removable battery or direct connection to 220V household socket. The company does not disclose information about units sold or annual income.

ME Group S.r.l.
Via Oscar Romero 1 - 25040 Passirano (Brescia) Italy
+39 030 63 92 148
info@scooterelettrico.me
<https://www.scooterelettrico.me/it/>

12 LUXEMBOURG

12.1 UJET

Ujet was founded in 2015 as a spin-off of OCSiAl, the world leader in the manufacture of graphene nanotubes. It is headquartered and factory in Luxembourg, offices in Germany, where the vehicles are designed, and has an international team of more than 60 professionals. In 2018, the company started the global launch of its electric scooter at the Consumer Electronics Show (CES) in Las Vegas and then in Paris, Milan, Barcelona, Monaco and Luxembourg. In 2019, it made the release in the rest of the European Union and Russia. The Ujet scooter has a lightweight and robust folding structure (weighing 49 kg), composed of advanced alloy and carbon fiber composite, materials commonly used in the aerospace segment, as well as nano-increased tires, the lightest in its class, according to the company. The motor can reach its maximum speed (45 km/h) in a matter of seconds with the 3-kW electric motor on the wheel, offering instant torque of up to 80 Nm. The lithium-ion batteries are removable and can be chosen from two sizes, with an estimated range of up to 75 km for the smallest or 150 km to the largest, refillable in three or six hours, respectively. The battery case is removable and can be taken out, like a small luggage. The scooter is equipped with two wheels at the bottom and a telescopic handlebar. The app for iOS and Android operating systems dedicated allows you to lock and unlock the scooter, track its location, monitor performance and notify any potential alerts. The Ujet scooter design has won recognition from leading design professionals and won two of the most prestigious awards in the world, the Red Dot Award 2019 and the Gold Award 2019. The company did not disclose information about units of electric scooters sold, nor the annual income.

<https://corporate.ujet.com/>
1, Rue de la Poudrerie
3364 Leudelange
Luxembourg
+352 2786 34 46

¹⁹⁴ Sheet moulding compound é um material de poliéster reforçado com fibra de vidro, pronto para moldar, enchimentos minerais, pigmentos e resinas que tornam o quadro resistente, elástico e leve, usado principalmente na moldagem por compressão.

13 ISRAEL

13.1 BLITZ MOTORS

<http://www.blitzmotors.com/>
 Israel Bak 7
 Tel-Aviv
 6701912 - Israel
 info@blitzmotors.com
 +972-722-555-722

14 POLAND

14.1 VECTRIX

Vectrix Corporation, formerly known as Breeze Acquisition Corporation, was founded in 1995. Based in Poland, it is dedicated to the design, development and production of two- and three-wheel vehicles with zero emission engine for the United States and internationally. It provides e-scooters for individual passengers, fleet operators, delivery services and municipalities, and has strategic partnerships with companies such as Parker Hannifin Corporation, Brembo, Marzocchi, Pirelli, Gold Peak, ZLKL, ESD, Plastal, Grimecca and GP Batteries International, Ltd. Vectrix has introduced new innovative versions of lithium-ion power systems (traction batteries), which increase the autonomy and performance of scooters: in cooperation with Amita Technology (TW), batteries have been developed that offer a capacity of up to 16 kWh, with autonomy of 280 km. In 2016, they upgraded the 50cc VX-2 scooters with removable batteries to attract private users and fleet operators. In January 2017, they released a new high-speed charger, with 6.6 kW.

<http://vectrix-scooters.com/it/model/vx-1/>
 Vectrix Sp. z o.o. (Ltd)
 ul. Brochowska 21
 52-019 Wrocław, Poland
 L Phone: +48 510 167 338
 EN Phone: +48 501 212 022
 contact@vectrixparts.com

15 UNITED KINGDOM

15.1 E-RIDER

E-Rider is the UK's leading retailer of bicycles, electric mopeds and electric motorcycles. Sells directly to customers online to help keep prices as low as possible. E-scooters are equipped with removable lithium batteries for charging. The company does not disclose data in terms of electric scooters sold or annual revenue.

<https://eriderbikes.com/>
 160 Kemp House, City Road, Londres
 EC1V 2NX - United Kingdom
 info@eriderbikes.com
 +44 19 28 583.030

16 TAIWAN

16.1 GOGORO

In 2011, Horace Luke and Matt Taylor founded the Taiwanese start-up Gogoro, a company focused on integrating the latest in technology and innovation with power management, intelligent mobility and connectivity. Gogoro is a venture capital company, currently with 1,200 employees. In 2015, it launched the first line of the Smartscooter™ model, as well as its network with more than 1,248 lithium-ion battery exchange stations, called Gogoro® Energy Network. By the end of the same year, more than 4,000 Smartscooters™ were sold and their share in the electric scooter market in Taiwan reached 33.94%. After having sold 10,000 units in 2016, it was announced in 2017 the second model, the Gogoro 2, which can reach 95 km and has a sensor that collects information such as speed, battery level, consumption rate, system failures and falls of the scooter. This information is presented to pilots through Gogoro® mobile applications, which can also be used to define energy efficiency - the riding style can be optimized by adjusting the amount of energy to be saved with regenerative braking. In addition, users can pair their smartphones with Smartscooter™ to lock and unlock the vehicle with ease. In Taiwan's electric scooter market, Gogoro's sales reached a new record of 123,000 units, and in 2018, the company exported more than 50,000 units and established the leadership in the domestic market. It plans to build two battery exchange stands every day, with the goal of having 1,000 of them across

the island by the end of 2018. In addition, the company began selling B2B: the market leader in the logistics sector, the company DHL, is already using Gogoro e-scooters for their deliveries. In addition, in the summer of 2018, the company hit the streets of Madrid and Ishigaki Island in Japan after a successful launch in Paris and several cities in Germany. The number of Gogoro scooters being employed by sharing companies in foreign markets now totals more than 4,000 vehicles. Yamaha, Aeon and PGO have turned the Gogoro power grid into their flagship technology platform for their new e-scooters, which would be launched in 2019. As they separately develop their e-scooters, the three manufacturers will also continue to incorporate the electronic control system, the smart battery and the battery

exchange mechanism first created by Gogoro. In addition, Yamaha Motor and Gogoro announced in September 2018 a new partnership for the development of electric vehicles in the Taiwan market. Regarding to the production of these vehicles, it is important to note that all parts are designed and manufactured entirely by Gogoro, except the batteries, designed in partnership with Panasonic.

<https://www.gogoro.com>
No 18, Songshou Road Xinyi District
Taipei City,
110 Taiwan
horace.luke@gogoro.com, matt.taylor@gogoro.com
+886-2-2729-8777

B. CHARGING POINTS

The practicality of electric scooters finds in the charging structure a great advantage, since any point of electrical network serves to recharge them, i.e., no specific structure is required for such, as with electric cars.

Solutions have been presented around the world for immediate recharging; the Spanish Torrot, for example, has scooters that send a location signal when they are low load. Immediately after the signal, a technician from the company replaces the battery with a full-charged one, which he takes with him. Such a model is more practical for the user, who does not have to worry or spend time on charging until fullness.

More recently, the model of charging stations has been developed, already well spread on the Asian continent, whose incorporation into the Brazilian segment is something feasible in strategic points of the city, according to information from the automakers. The idea is that the user can change the battery when the charge ends, at stations, leaving the battery discharged and picking up a full one. The Ipiranga Network (pump stations), which already offers fast charging stations for electric cars, has shown interest in placing stations in some of its stations, instructing its franchisees to generate the charge for energy, as it already does for cars. Smart alternatives to the traditional charging system are indicated below.

1 BECHARGED

The system offered by BeCharged is especially designed for electric scooters: it is equipped with two separate sockets, and the aluminum housing makes this charging station very robust. The screen and LED lights allow a simple and interactive communication with the user, being suitable for indoor and outdoor use and for private and public areas. There is the possibility to provide personal identity by placing a logo and prevent unauthorized access.

<http://www.becharged.eu/en/>
 Sassevaartstraat 46 bus 305 - Gent
 9000 Belgium
 32 (0)9 395.05.93
info@becharged.eu

2 IONEX

IONEX Commercial offers a range of charging solutions, including standard charging, fast charging, battery switching

or any combination of them. Power stations can be customized to meet a diversity of business requirements. The Charging Infrastructure Solution is designed for companies or governments that want to build an energy infrastructure to provide charging services to a market. Includes removable batteries, power stations, an operating system, management software, applications and system customization. The fleet operation solution is designed for companies that require an electric fleet to fulfill their business functions. It is especially suitable for logistics companies and retail companies that provide delivery services.

<https://ionex.global/>
 Kwang Yang Motor CO., LTD.
 No.35, Wansing St., Sanmin District, Kaohsiung City - 80794 Taiwan
 +886-7-382-2526
kymcoglobal@gmail.com

3 BLOOVA

Bloova Style is a system suitable for private, public and commercial use. For this flexibility, the charger is available with different authorization methods, from access keys and RFID technology to smartphone apps. Several solutions that allow monetization of charge are possible.

<http://www.bloova.com/index.html>
 North Circular Road
 London
 1000 England
sales@bloova.com

4 CHARGEPOINT

ChargePoint designs, builds, and supports all the technology that powers the charging network, from charging station hardware to power management software for a mobile application. ChargePoint also has charging stations, with industrial design, for each type of electric vehicle, customizable according to demand.

<https://www.chargepoint.com/solutions/public-sector-fleet/>
 USA 240 East Hacienda Avenue - Campbell, CA
 95008-6617 - United States
 1-408-7051992
sales@chargepoint.com

C. ELECTRIC SCOOTER MAINTENANCE COMPANIES

The maintenance segment – preventive and corrective – of electric scooters is not concentrated in one or a few players. Quite the contrary, this is a large market, totally fragmented and formed by small and medium-sized companies.

As detailed throughout this study, workshops offering traditional mechanical support can also serve to electric scooters. Because they are smaller and generalist workshops, however, they depend on adequate training to offer after-sale support, both for institutional clients and individuals.

For electrical issues, the usual thing on the market is to replace the defective part with a new one, usually supplied or purchased from the manufacturers, because the cost of labor to repair them does not pay financially.

1 ATECO

Auteco, already described in this study, is a motor vehicle and motorcycle manufacturer from Colombia. It was the first Colombian motorcycle manufacturer, established in 1941, in the city of Medellin, and today is a leader in the manufacture and maintenance of electric scooters in the country.

<https://www.auteco.com.co/>
Colombia

2 MYMOBILITY VEÍCULOS ELÉTRICOS

MyMobility is a multifunctional company dedicated to electric vehicles in a pioneering way in Brazil, unifying several types of urban locomotion 100% electric. Created in 2016 by Artur Bauab, with the aim of bringing electric mobility to the daily life of people and companies, it specializes in the marketing (sale and lease) of electric powered vehicles, in addition to providing maintenance service and spare parts.

Rua Caravelas, 324
Vila Mariana – São Paulo
+55 11 2306-9421
comercial@mymobility.com.br
<http://mymobility.com.br/wp/>

3 NORAUTO

Norauto, the main autocenter in Europe and with 45 years of market, has, in Spain, a team of approximately 2,000 professionals distributed in more than 85 workshops and in its headquarters, located in Burjassot (Valencia). It has services aimed at various combustion and electric vehicles. A company in the process of expansion, Norauto Spain aims to reach 100 workshops by 2020. Norauto's workshops offer multi-brand solutions to drivers in terms of equipment, maintenance, comfort, safety and alternative mobility. Norauto is part of the Mobivia network, which includes more than 21,000 employees in 20 federated companies in 11 countries, with the same goal: to facilitate mobility.

<https://www.norauto.es/>
Spain

D. COMPARATIVE ANALYSIS OF MODELS OF ELECTRIC SCOOTERS

The following table presents some of the main information of the recommended fleet models from the manufacturers identified in this study.

Table - Specifications of Selected Models of Scooters

Manufacturer	Model	Autonomy	Maximum speed	Charging time	Charging method	Note
Askoll	eSpro45	71 km	45 km/h	0% a 80% = 5,5 h	Wired or removable battery	
Askoll	eSpro70	96 km	70 km/h	0% a 80% = 7,5 h	Wired or removable battery	
Emco	Novi	130 km	45 km/h	100% = 3,5 h	Wired or removable battery	
E-Rider	50 Cargo	110 Km	70 km/h	100% = 6 h	Wired	
Govecs	GO!T2.6	100 km	45 km/h	0% a 80% = 5,5 h	Wired, removable battery or charging station	
Govecs	GO!T3.6	90 km	83 km/h	0% a 80% = 5,5 h	Wired, removable battery or charging station	
Niu	N-Series	70 km	45 km/h	100% = 6 h	Wired	
Riba/ Vmoto	eMaxCity	70 km	45 km/h	0% a 70% = 3 h	Wired or removable battery	
Riba/ Vmoto	eMax 120D	110 km	75 km/h	0% a 70% = 1,5 h	Wired or removable battery	
Silence	S02	215 km	80 km/h	-	Charging station	Version for police (trail)
Starker	Avanti 2.0	80 km	55 km/h	100% = 8-12h	Wired	
Torrot	Muvi L3e	100 km	60 km/h	100% = 2,5 ou 5 h	Wired or removable battery	
Torrot	Muvi L1e	100 km	45 km/h	100% = 2,5 ou 5 h	Wired or removable battery	Features fast charger

E. ELECTRIC SCOOTER SHARING COMPANIES

Figure - Specifications of Scooter Models

Company	Coverage
Acciona Mobility	Spain (Madrid, Valencia, Barcelona and Seville)
	Portugal (Lisbon)
Alma Mobility	Spain (Madrid)
Blinkee	Poland (Warsaw, Krakow, Posnania, Koszalin, Trójmiasto, Breslávia, Łódź, Rzeszów , Kielce , Ostrowski , Powiat, Serock, Lublin, Katowice Bydgoszcz Białystok, Bydgoszcz)
	Hungary (Budapest, Pecs)
	Bucharest (Romania)
	Malta
	Sweden (Stockholm)
Bloom	Croatia (Split and Omiš)
Bounce	United States (university campus)
Cityscoot	India (Bengaluru)
	France (Paris and Nice)
Coup-e Scooter €	Italy (Milan and Rome)
	Germany (Berlin and Tübingen)
	France (Paris)
Deins und Meins by Wunder fleet	Spain (Madrid)
Econduce	Germany (Gütersloh)
eCooltra	Mexico (Mexico City)
	Spain (Barcelona, Madrid, Valencia, Malaga)
	Italy (Rome, Milan and Palma de Mallorca)
Eddy	Portugal (Lisbon)
Emmy	Germany (Dusseldorf)
Evo Sharing	Germany (Hamburg, Munich, Dusseldorf and Berlin)
Felyx	Germany (Essen and Oberhausener)
FlowBie	Netherlands (Amsterdam, The Hague, Rotterdam)
Frank-e Sharing by Wunder fleet	Germany (Bielefeld)
GGo Global	Germany (Frankfurt)
Go-green-city	Australia (Perth)
	Switzerland (Geneva and Zurich)
GoShare by Gogoro	More cities not yet released
Sharing + plataforma de troca de baterias	Taiwan (Taoyuan City)
Gotcha (trikes)	United States (university campus)
GoUrban	Austria (Vienna)
GoVolt	Italy (Milan)
Immotor (Ehuandian) – apenas estação de troca de baterias	China (Shenzhen)
Indigo wheel	France (Toulouse, Lyon, Bordeaux) and more cities not yet released
Ioscoot	Spain (Madrid)
Loop	Canada (Vancouver)
	Lebanon (Beirut)
Meli-Sharing by Share2move	Germany (Lingen)
Mimoto	Italy (Milan and Turin)
Mo2drive	Austria (Vienna)

Company	Coverage
Mobility	Switzerland (Geneva)
Mobiscoot	Germany (Bruchsal)
Moritz by Share2move	Spain (Barcelona)
Motit	Italy (Milan)
	France (Paris)
	Spain (Madrid)
Movo	Spain (Madrid, Seville, Granada, Cadiz, Malaga, Valencia, El Pto de Sta Maria, Zaragoza, Cordoba)
Moving	United States (Atlanta and more cities not yet released)
Moving (Estados Unidos)	Germany (Norden, Norddeich)
NeroSharing by share2move	Austria (Vienna and Graz)
ÖAMTC easy way	United States (Austin, Dallas, Hoboken)
OJO	Germany (Osnabrück)
Oki-Sharing by share2move	Brazil (São Paulo)
Riba Share	United States
Scoobi	United States (San Francisco)
Scoot	Belgium (Antwerp and Brussels)
Scooty	United States (San Francisco)
Scoot Networks	Spain (Barcelona)
	Italy (Rome)
Scuter	Germany (Stuttgart)
Stella	Germany (Krefeld)
SWK KRuiser Sharing (frota Wunder)	India (Chandigarh)
Toocs	India (Bangaluru)
Tresmoto	United States (Portland)
Tryshared	Vietnam (Ho Chi Minh)
Vimotor app	India (Bengaluru, Mysuru, Hyderabad)
Vogo	Taiwan (Taipei)
WeMo	Malta
Whizascoot	Portugal (Lisbon)
Wyze	Spain (Barcelona and Valencia)
Yego	France (Bordeaux)
	India (Bangaluru)
Yulu	China (80 cities)
Zeebike	Italy (Rome and Milan)
Zig Zag	

F. INTERNATIONAL GOVERNMENT INCENTIVES TO ELECTRIC SCOOTERS

The existence of incentive funds and international government programs of financing and promotion is a public tool to give breath to a still incipient and fragile sector, disseminate and popularize the use of electric scooters, in addition to promoting the technological advancement of this electric alternative whose experience is positive in the urban centers in which they are used.

Sales of conventional scooters have grown greatly because of the increase in the purchasing power of the final consumer. In addition, the governments of various countries have adopted various measures to reduce air pollution levels, establishing rules on the use of conventional scooters, taxes associated with them and a number of other regulations. At the same time, they have also stimulated the rise of hybrid and electric scooters by offering attractive incentives and subsidies to their owners. In China, the government offers subsidies from US\$ 600.00 to US\$ 1,000.00 each purchase of an electric or hybrid scooter, depending on the size of the battery. Cities such as Beijing and Shanghai also offer free location for customers of electric scooters.

Already in the United States, the government has allocated donations of about US\$ 2.4 billion for the development of hybrid and electric vehicles, as well as high-density batteries. The United States administration has also granted incentives to customers of electric vehicles, including scooters, in the form of tax credits worth up to US\$ 7,500, depending on the battery type of the hybrid or electric vehicle.¹⁹⁵

In this sense, some of the following are presented:

main incentives worldwide in favor of electric scooters, aiming to provide examples that can be replicated or adjusted for Brazil, both by the government and the private sector.

1 INNOVATION AND TECHNOLOGY COOPERATION PROJECTS

1.1 PLANNING

Innowide is a program that aims to finance start-ups, small and medium-sized European companies to conduct Viability Assessment Projects (so-called VAPs) in markets outside Europe.¹⁹⁶ The aim is to help the beneficiaries to progressively access markets of developing economies (e.g. Brazil, Russia, India, China and Mexico), in transition and, finally, developed countries.

Innowide's VAPs are preliminary regulatory, political-socio-economic, technical (including update, transfer and integration) and market assessments that seek, in a comprehensive, balanced and coherent manner, to validate the feasibility of innovative business solutions along emerging global value chains.

These projects should identify and evaluate the framework of preconditions that may favor or block the implementation of solutions and collaboration models in the target countries. They should also include a detailed definition of the feasibility of such solutions and business models, with their implementation strategies, in addition to:

- present a creative partnership with a local partner (subcontractor from a target country such as Brazil, Russia, India, China and Mexico) - be it supplier, customer, consultant, legal consultant, research and development provider, collaborator or absorber, among others.
- structure a wide variety of activities to explore the practical, technological and commercial feasibility of an innovative solution and how it fits to meet local conditions and demands.
- last up to six months.

¹⁹⁵ Source: https://www.reportlinker.com/p05043358/Electric-Scooters-Market-Standard-Segment-by-Product-Type-Estimated-to-Register-a-Significant-CAGR-over-the-Forecast-Period-Global-Industry-Analysis-and-Opportunity-Assessment.html?utm_campaign=slpstats&utm_content=report+title&utm_medium=app&utm_source=member_reportlinker

¹⁹⁶ Source: <https://innowide.eu/about/>

- structure the project so that it is the first phase of the business model of a potential innovative technological cooperation project with an agent in that country in the short or medium term.
- have total eligible project costs of at least 86,000 euros, to be financed by a maximum of 70%, with a fixed donation of 60,000 euros.
- be carried out by a small or medium-sized company established in a member state of the European Union, which subcontracts a partner in the country of destination (in this case, Brazil).

After the implementation of the project, the European company should be empowered to propose future activities in the target market with the strategic partner, which may involve future investment decisions on the part of potential buyers, investors and end users.

1.2 IMPLEMENTATION

The Center for Industrial Technological Development (CDTI), based in Spain, has signed two agreements with Brazilian public entities to promote and facilitate bilateral research and innovation projects between companies from both countries. The first was signed with the Studies and Projects Finance Company (FINEP) and contemplates the establishment of a bilateral technological cooperation program between Spanish and Brazilian companies.¹⁹⁷

The second, signed with the São Paulo State Research Foundation (FAPESP), established a bilateral Technological Cooperation Program between Spanish companies and small and medium-sized enterprises (less than 250 employees) in the state of São Paulo.¹⁹⁸

Both agreements have as their goal that the companies of the two countries develop in collaboration research and development projects that address the needs or challenges of the specific market and represent a technological contribution of high industrial relevance and commercial potential. The objective is to position itself in new markets and establish means for long-term relationships with companies and/or entities that complement European resources and capabilities to jointly share risks and be more competitive.¹⁹⁹

Since the project is defined among all participants, the form

of the bilateral program should be presented to the CDTI, FINEP or FAPESP.

Each participant, through its administrative bodies – CDTI in Spain and, in Brazil, FINEP and FAPESP –, is responsible for the evaluation and subsequent certification of approved projects with a “quality seal”, which offers participating companies:

- added value associated with international cooperation and official recognition of the technological level of participants.
- sufficient information that makes it easier for companies to obtain financial aid in each country, according to their own rules and without international remittance of financial resources.

Collaboration projects with Brazilian entities can, in some cases, be presented at any time of the year and, in others, only through specific calls to be published.

Both international certification and bilateral projects are jointly issued by CDTI and the corresponding counterpart in Brazil. In parallel, the CDTI also informs interested companies about granting or obtaining this certification.

1.3 FINANCING

The minimum budget for the project of a company to be selected is 175,000 euros. In the case of projects developed by a consortium or with the International Energy Agency (IEA), the minimum budget of the project will be 500,000 euros. The research and development projects presented may be financed by a partially repayable investment, with a financial coverage of up to 75% of the total approved budget and may exceptionally reach 85%. The refundable and non-refundable fractions (NRT) go up to 33%.

To qualify for NRT, projects must have the corresponding seal certifying the existence of cooperation between the entities and the international nature of the proposal. To consolidate the NRT associated with CDTI funding as an international cooperation project, it will be necessary to verify the maintenance of the international character of the project until its completion. At the end of the project, an International Completion Report must be issued.

¹⁹⁷ Source: <http://www.cdti.es/index.asp?MP=101&MS=842&MN=2&TR=C&IDR=2579>.

¹⁹⁸ Source: <https://www.icex.es/icex/es/Navegacion-zona-contacto/revista-el-exportador/mercados/REP2018795002.html>.

¹⁹⁹ Source: <https://www.icex.es/icex/es/Navegacion-zona-contacto/revista-el-exportador/mercados/REP2018795002.html>.

1.4 PROCEDURE

The company must register its idea on the CDTI website by submitting a research and development project request with international technological cooperation (PCTI) / unilateral projects. The applicant shall provide the following documentation and conduct these activities:

- a chart (Gantt), where the tasks to be performed by each participant of the international consortium are described.
- application form written in English (except for projects in which only Spanish and Ibero-American companies are involved) and emphasizing the project, the activities of the participants and the importance of it for all partners. It must be agreed, concluded and signed by all parties of the international consortium.
- Consortium Collaboration Agreement: document in English, which ensures the execution of the project and describes the agreed conditions for exploitation of the results. It must be submitted and signed by the legal representatives of all participating entities before its final approval by the CDTI. The document should include a section reflecting the specific commitment of the parties to hold the following meetings with the presence of the CDTI in the premises of the non-Spanish partner:
 - project presentation meeting, to verify the active cooperation between the participating companies and ensure the achievement of the objectives.
 - meeting to present the results of the project.

2 ITALY

In Italy, the bonus for buyers of electric scooters is called Ecobonus. It consists of a fund of 10 million euros, valid only for new vehicles, registered for the first time in Italy between 1 March 2019 and 31 December 2021. The contribution is in the form of a discount on the listed price of up to 30% (up to 3,000 euros). The discount is available only in case

of exchange of an old motorcycle for a brand new one. The discount occurs at the time of purchase, anticipated by the dealer, which is then reimbursed by the state in the form of a tax credit. Those interested should go to the dealership with their used scooter and proceed with the purchase.²⁰⁰

3 DENMARK

The incentives consist of offering free parking for electric vehicle drivers in central Copenhagen and exemption from the registration fee and scooter property tax.²⁰¹

4 NORWAY

Drivers of electric scooters can travel on motorways without paying a toll and to use the preferred lanes of public transport. Other forms of incentives include exemption from purchase tax, VAT, as well as registration fee and annual circulation tax.²⁰²

5 NETHERLANDS

In the Netherlands, buyers of electric scooters can get a local incentive in the city of Rotterdam, consisting of a bonus of 300 euros, provided that the electric scooter is intended to replace a conventional, combustion, registered before 2010.²⁰³

6 SPAIN

The objective of the MOVES Plan (incentives for Efficient and Sustainable Mobility) is to promote the development of the electric vehicle at all levels, both in private scope and in commercial use, including the use of electric buses or trucks. The installation of the electric charging point will also be subsidized, as well as assistance to companies that bet on sustainable transport systems.

²⁰⁰ Source: <https://www.money.it/Incentivi-moto-elettriche-scooter-elettrici-2019>. Accessed 19 Aug. 2019.

²⁰¹ Source: Amsterdam Roundtable Foundation and McKinsey & Company The Netherlands. Available at: <https://www.mckinsey.com/~media/McKinsey/Locations/Europe%20and%20Middle%20East/Netherlands/Our%20Insights/Electric%20vehicles%20in%20Europe%20Gearing%20up%20for%20a%20new%20phase/Electric%20vehicles%20in%20Europe%20Gearing%20up%20for%20a%20new%20phase.ashx>. Accessed 20 Aug. 2019.

²⁰² Idem.

²⁰³ Source: <https://ujet.com/support/1566/purchase-incentives>. Accessed 15 Aug. 2019.

The aid for electric motorcycles includes between 600 and 800 euros of public subsidy for those models with two or three wheels and a maximum speed of more than 45 km/h. In other words, this aid does not include electric scooters, even though it is the best-selling electric motorcycle model in Spain. This is due to the strong presence of sharing companies in the country: Spain is the world leader in shared scooters.

Despite this, the plans Movea²⁰⁴ and Movalt,²⁰⁵ in force, respectively, in 2017 and 2018 were largely responsible for the exponential growth in the number of electric scooters through the Spanish streets.

In addition to the public aid, the plans stipulated that manufacturers and dealers themselves should apply discounts to make the purchase of electric motorcycles a viable option for the largest number of customers.²⁰⁶

The Spanish government's plans aim to stimulate the purchase of vehicles using alternative energy sources, the installation of electric vehicle charging infrastructure and the development of incentives to implement electric bicycle lending systems.²⁰⁷

7 PORTUGAL

Currently, state support is aimed at the purchase of cars, motorcycles and electric bicycles, provided that for urban use, through the so-called Environmental Fund.

The incentive for the introduction of two-wheeled vehicles and electric mopeds (including scooters) translates into a 20% discount on the value of the vehicle, up to a maximum of 400 euros. The amount allocated by the Environmental Fund is 100 thousand euros.²⁰⁸

²⁰⁴ Source: <https://www.lineadirecta.com/seguros-coche/preguntas-frecuentes/que-es-plan-movea.html> e https://www.idae.es/sites/default/files/documentos/ayudas_y_financiacion/informe_final_web_3.pdf. Accessed 15 Aug. 2019.

²⁰⁵ Source: <https://www.idae.es/ayudas-y-financiacion/para-movilidad-y-vehiculos/plan-movalt-vehiculos>. Accessed 15 Aug. 2019.

²⁰⁶ Source: Salinas, Raúl. Estas son las ayudas del gobierno para comprar una moto eléctrica. *Autobild.es*, Autobild, 21 Feb. 2019. Available at: www.autobild.es/noticias/plan-moves-ayudas-gobierno-comprar-moto-electrica-377759. Accessed 15 Aug. 2019.

²⁰⁷ Source: www.abc.es/motor/economia/abci-plan-moves-momento-comprar-coche-o-moto-electrica-ayudas-mas-6000-euros-201902260157-noticia.html. Accessed 15 Aug. 2019.

²⁰⁸ Source: Eco. "Elétrico? Dez perguntas e respostas sobre o apoio do Estado." *ECO*, 10 Mar. 2019, Available at: <https://eco.sapo.pt/2019/03/10/quer-um-eletrico-perguntas-e-respostas-sobre-os-apoios-do-estado/>. Accessed 20 Aug. 2019.

²⁰⁹ Source: Futurezone.at. Ankaufförderung Für E-Motorräder Verdoppelt. *Futurezone.at*, Futurezone.at, January 4, 2017. Available at: <https://futurezone.at/digital-life/ankauffoerderung-fuer-e-motorraeder-verdoppelt/239.247.407>. Accessed 20 Aug. 2019.

²¹⁰ Source: http://www.forum-elektromobilitaet.ch/fileadmin/DATA_Forum/Publikationen/Schlussbericht_E-Scooter_2013.pdf. Accessed 20 Aug. 2019.

²¹¹ Source: Aide Financière. Aide Financière, November 3, 2018, Available at: aide-financiere.net/aide-achat-scooter-electrique/. Accessed 20 Aug. 2019.

8 AUSTRIA

The country was one of the first to offer incentives for electric motorcycles. Since March 2017, Austria has had a federal incentive program for electric bicycles and motorcycles (including scooters). The collective organization of importers and the Austrian bicycle industry, Arge2Rad, participates financially in the electric mobility package of the Ministry of Transport and the Ministry of the Environment. Thus, the federal government incentive of 375 euros can be doubled per electric vehicle. The benefit can be used by individuals, businesses, communities and associations who purchase a motorcycle or electric bicycle.²⁰⁹

9 SWITZERLAND

Switzerland does not have, at the federal level, incentive programs for the acquisition of electric vehicles. However, the purchase of electric scooters is encouraged by discounts on motor vehicle taxes in most cantons.²¹⁰

10 FRANCE

Support from Paris City Hall

The Paris City Hall is doing everything possible to reduce pollution in the capital, which includes offering financial aid for the purchase of two-wheeled electric vehicle. The amount available for this program is up to 400 euros. The aid from the city hall is, however, limited to electric scooters with power equivalent to 50 cc and electric bicycles.²¹¹

Financial support from the national government

The government bonus for a two-wheeled vehicle purchased in 2019 is up to 900 euros if the maximum engine power is at least equal to 2 kilowatts, within the limit of 27% of the cost of acquisition. For a scooter with lower power, this aid is up to 20% of the total price, with a discount limit of 100 euros. This state aid is valid for individuals and companies and can be combined with other local aid.

Financial support for individuals

Some other French cities offer subsidies for individuals in the purchase of electric scooters:

- Metropolis of Nice Côte d'azur: the subsidy is fixed at 25% of the purchase price, up to a limit of 150 euros.
- Roannais Agglomération: up to 200 euros of assistance, limited to 20% of the tax-free price per electric scooter.
- city of La Motte Servolex: 20% subsidy, limited to 300 euros.
- city of Villeneuve-Les-Avignon: assistance of 200 euros, with limit of two units per residence.

Financial support for companies

For companies, the best benefits are offered by the French regions for the acquisition of a fleet or electric vehicle.

- Île-de-France: for small and medium-sized enterprises and companies with less than 50 employees, the amount of assistance is from 1,500 euros to 3,000 euros per scooter according to its characteristics, limited to five vehicles per company.
- Hauts-de-France: the same aid as in Île-de-France.

11 BELGIUM

In the region of Flanders, public authorities do not charge

any registration fee when they register an electric motorcycle (including electric scooter). That is, there is no tax or any fee to put it into circulation. Since April 2018, Flanders also offers a zero-emission discount of 25% on the purchase price (with a maximum of 750 euros for Class B mopeds and 1,500 euros for electric motorcycles).²¹²

12 UNITED KINGDOM

The United Kingdom was one of the first to offer incentives for the purchase of electric vehicles, including scooters. Consumers are entitled to a discount on the price of new low-pollutant vehicles through a government grant to car dealerships and manufacturers. A fund of up to £ 7.5 million was made available from the summer of 2015 through 2020, whereby buyers get a 20% discount on the purchase, limited to £ 1,500 per vehicle.²¹³ The dealer will include the amount of the subsidy (maximum of 3,500 pounds) in the price of the vehicle.²¹⁴

13 TAIWAN

As a way of encouraging electric mobility, Taiwan has put into action a plan to install 3,300 battery charging and charging stations for electric scooters between 2018 and 2022.²¹⁵ The number of charging stations and batteries exchange installed in Taiwan, with the help of government funding, reached 1,825 in 2017. The plan aims to raise that number to more than 5,000 by the end of 2022.

Taiwan has implemented several programs in recent years to encourage public adoption of electric scooters. The Environmental Protection Administration offers NT\$ 3,500 (about \$ 110) for the purchase of the vehicles, with an additional NT\$ 2,500 (about US\$ 80) if the buyer is exchanging a combustion motorcycle. As the government began in 2016 offering incentives for people to replace fuel-powered scooters with electric models, the country's total scooter manufacturing was pushed to 1.1 million units in 2017.²¹⁶

²¹² Source: Deux-roues électriques: quels incitants en Belgique? GreenCars.Be! Greencars.be, 17 Dec. 2018, Available at: greencars.be/deux-roues-electriques-quels-incitants-en-belgique/.

²¹³ Source: <https://egenScooters.com/2015/04/21/government-grants-for-electric-Scooters/>. Accessed 20 Aug. 2019.

²¹⁴ Source: <https://www.gov.uk/plug-in-car-van-grants>. Accessed 20 Aug. 2019.

²¹⁵ Source: <https://taiwantoday.tw/news.php?unit=2,6,10,15,18&post=127518>. Accessed 20 Aug. 2019.

²¹⁶ Source: <http://focustaiwan.tw/news/aeco/201905150020.aspx>. Accessed 20 Aug. 2019.

There are also local government subsidies, ranging from NT\$ 1,200 to NT\$ 12,000 for new purchases and from NT\$ 2,100 to NT\$ 17,000 for vehicles purchased to replace combustion scooters, with additional subsidies available in some regions. There are also subsidies such as special parking spaces and free access to national parks.

14 AUSTRALIA

The Australian Government does not offer subsidies to electric vehicles, so it is up to states to provide incentives. For example, the state of Victoria offers a discount of AU\$ 100 on hybrid and electric vehicles and licensing fees are waived on electric vehicles.

15 UNITED STATES

Federal tax credit

The U.S. federal government offers a tax credit titled E-motorcycle Federal Tax Credit. This is an amount that can be deducted from the taxes due by the taxpayer. The amount is 10% of the value of the new vehicle purchased, limited to US\$ 2,500.00. The amount of the credit is determined by the final price of the invoice, including additional accessories and batteries purchased on the same invoice.²¹⁷

State incentives

Some states offer other incentives to purchase electric motorcycles:

- **California:** state rebate of US\$ 900.00 (currently suspended, waiting for funds).
- **San Joaquin Valley:** US\$ 1,000.00 off.
- **Maryland:** tax credit of US\$ 100.00/kWh (effective July 1, 2017-June 30, 2020, pending funds).
- **Massachusetts:** US\$ 450.00 discount (limited funds).
- **Oregon:** US\$ 750.00 discount (effective January 1, 2019).

- **Arizona:** reduced annual license fee of US\$ 4.00/US\$ 100.00 in value for electric motorcycles. For the first 12 months, the value is 1% of the manufacturer's suggested retail price (MSRP). For subsequent years, the value is 15% lower than the value of the previous 12-month period. Minimum license tax for registration: US\$ 5.00. (The regular vehicle license tax is US\$ 2.80/US\$ 100 in assessed value based on 60% MSRP).
- **Illinois:** the registration fee for electric motorcycles should not exceed US\$ 35.00 for two years or US\$ 18.00/year. The regular motorcycle registration fee is US\$ 38.00/year).

16 GERMANY

Munich E-Mobil

The local government of Munich offers up to 25% off the net cost of purchasing an electric motorcycle, up to a maximum of 1,000 euros, to residents of Munich or companies based in the city.

Exemption from Motor Vehicle Tax

The tax exemption for electric vehicles is 10 years for the first registration between May 18, 2011 and December 31, 2020. The tax exemption always starts from the first date of registration of the vehicle. In the event of a change of ownership within the exempt period, the new owner of the vehicle will receive tax exemption for the remaining period. After the end of the tax exemption, the motor vehicle tax to be paid is reduced by 50%.²¹⁸

Electric service vehicles

The calculation of the tax exemption does not use the total price of the vehicle, as is the case with conventional vehicles, but a reduced amount, depending on the battery power. When buying an electric vehicle, a portion of the taxable amount will be deducted per kWh of energy stored on the motorcycle. The amount of the benefit will be reduced by 50 euros every year until 2022.

²¹⁷ Source: Electric Motorcycle Incentives || ZERO MOTORCYCLES. Available at: www.zeromotorcycles.com/incentives/. Accessed 19 Aug. 2019.

²¹⁸ Paragraph 9, subitem 2, KraftStG.

G. BILLS IN PROCESS IN BRAZIL

The following are the forty bills in process in Brazil for the electric mobility sector, both in the Federal Senate and in the Chamber of Deputies. We highlight those that directly or indirectly affect electric scooters.

1 FEDERAL SENATE

1.1 BILL 3.986/2019

Author: Senator Irajá

Synopsis: Changes Law 8.989, of 24 February 1995, to grant exemption from the IPI to motorcycles or motorbikes of domestic manufacture equipped with engine of displacement not exceeding 250 cubic centimeters acquired by professional motorcyclists (mototaxi drivers), labor cooperatives or persons with disabilities.

Date: 7/9/2019

1.2 BILL 5.590/2019

Author: Senator Daniella Ribeiro

Synopsis: Establishes tariff to pay for the deployment of charging points for electric and hybrid vehicles and provides other arrangements.

Date: 10/22/2019

1.3 SENATE BILL 340/2016

Author: Senator Telmário Mota

Synopsis: Provides for the exemption of the IPI in the acquisition of electric vehicles and gives other provisions.

Date: 9/13/2016

2 CHAMBER OF DEPUTIES

2.1 BILL 5.272/2019

Author: Carlos Henrique Gaguim - DEM/TO

Date of submission: 9/30/2019

Synopsis: Grants tax incentives under the IPI, IOF and IRPJ to vehicles equipped with exclusively electric motor, classified in codes 8702.40.10 and 8702.40.90 Ex 02 of the IPI Incidence Table; changes law 10.485, of July 3, 2002, to reduce to zero the rate of contributions PIS/PASEP and COFINS, charged on the sale of electric vehicles and their components; and changes the law 10.438, of 26 April 2002, to grant a discount on electricity tariffs applicable

to consumption verified in the activity of charging electric vehicles intended for public passenger transport.

Situation: Joint Procedures

2.2 BILL 3.435/2019

Author: Valtenir Pereira - MDB/MT

Date of submission: 6/11/2019

Synopsis: Provides on the mandatory installation of charging point for electric and hybrid cars in covered parking lots with more than 200 spaces.

Situation: Joint Procedures

2.3 BILL 9.616/2018

Author: Pastor Eurico - PHS/PE

Date of submission: 2/21/2018

Synopsis: Grants tax incentives for the production and marketing of vehicles powered exclusively or partially by electric motor.

Situation: Joint Procedures

2.4 BILL 1.967/2019

Author: Hélio Lopes - PSL / RJ

Date of submission: 4/2/2019

Synopsis: Grants exemption from the IPI, the contribution to PIS/PASEP and COFINS for the import and marketing on the domestic market of vehicles equipped solely with an electric motor.

Situation: Joint Procedures

2.5 BILL 7.582/2017

Author: Beto Rosado - PP/RN

Date of submission: 5/9/2017

Synopsis: Provides for the marketing and circulation, in the national territory, of passenger cars, domestic or foreign production, equipped with combustion engines and electric motors.

Situation: Joint Procedures

2.6 BILL 3.948/2015

Author: Marcelo Belinati - PP/PR

Date of submission: 12/10/2015

Synopsis: Establishes incentives for the use of renewable fuels and high-efficiency engines and authorizes the manufacture of diesel engines for passenger vehicles.

Situation: Joint Procedures

2.7 BILL 3.412/2015**Author:** Carlos Henrique Gaguim - PMDB/TO**Date of submission:** 10/27/2015**Synopsis:** Provides tax incentives to produce electric or hybrid vehicles and for the installation of energy supply points.**Situation:** Joint Procedures**2.8 BILL 1.964/2019****Author:** Hélio Lopes - PSL / RJ**Date of submission:** 4/2/2019**Synopsis:** Provides incentives to expand the use of electric energy for propulsion of motor vehicles. **Additional data:** It changes Law 10.438, of 2002.**Situation:** Joint Procedures**2.9 BILL 1.371/2015****Author:** Deley - PTB/RJ**Date of submission:** 5/5/2015**Synopsis:** Grants tax benefits relating to IPI, II, contribution to PIS/PASEP and Contribution to the Financing of Social Security charged on operations with cars equipped with engines driven exclusively by electric energy.**Additional data:** It changes Law 10.865, of 2004.**Situation:** Joint Procedures**2.10 BILL 8.291/2017****Author:** João Gualberto - PSDB/BA**Date of submission:** 8/16/2017**Synopsis:** Establishes a ban on the production and marketing of passenger cars and Urban Cargo Vehicles (UCV), domestic or foreign production, powered by internal combustion engines, and provides other provisions.

Purchases of vehicles for public administration use are electric powered vehicles.

Situation: Joint Procedures**2.11 BILL 7.167/2014****Author:** Eliene Lima - PSD/MT**Date of submission:** 20/2/2014**Synopsis:** Extinguishes the rates of IPI that is charged on vehicles powered by electricity.**Situation:** Joint Procedures**2.12 BILL 1.618/2019****Author:** Zé Vitor - PMN/MG**Date of submission:** 3/20/2019**Synopsis:** Provides for mandatory charging points for electric vehicles in new residential buildings, the installation of charging stations for electric vehicles on public roads and changes in the allocation of resources of the Energy Development Account.**Situation:** Joint Procedures**2.13 BILL 1.410/2015****Author:** Fábio Faria - PSD/RN**Date of submission:** 5/6/2015**Synopsis:** Provides tax incentives for the production and marketing of electric or hybrid vehicles.**Situation:** Joint Procedures**2.14 BILL 156/2015****Author:** Roberto de Lucena - PV/SP**Date of submission:** 2/3/2015**Synopsis:** Provides for the exemption of IPI and II charged on the marketing of machinery, equipment, structures and other components necessary for the manufacture of electric cars.**Situation:** Joint Procedures**2.15 BILL 3.197/2019****Author:** Sebastião Oliveira - PL/PE**Date of submission:** 5/29/2019**Synopsis:** Establishes the mandatory installation of charging points for electric vehicles on public roads and in residential and commercial environments.**Situation:** Joint Procedures**2.16 BILL 6.503/2016****Author:** Evandro Roman - PSD/PR**Date of submission:** 11/17/2016**Synopsis:** Changes Law 12,715, of September 17, 2012, Law 8,383, of December 30, 1991, and Law 9,074, of July 7, 1995.**Additional data:** Deals with tax incentives to industry, through the inclusion as a beneficiary of the Inovar-Auto Program of companies that manufacture or market parts and components intended exclusively for use in the manufacture of electric or hybrid vehicles powered by ethanol and/or gasoline.**Situation:** Joint Procedures

2.17 BILL 874/2019**Author:** Edna Henrique - PSDB/PB**Date of submission:** 4/2/2019**Synopsis:** Provides for measures to promote an increase in the number of public charging points for electric vehicles.**Situation:** Joint Procedures**2.18 BILL 4.106/2015****Author:** Marcelo Belinati - PP/PR**Date of submission:** 12/16/2015**Synopsis:** Establishes incentives for the use of renewable fuels and high-efficiency engines to ensure a healthier environment.**Situation:** Joint Procedures**2.19 BILL 7.262/2017****Author:** Altineu Côrtes - PMDB/RJ**Date of submission:** 3/29/2017**Synopsis:** Grants tax benefits of IPI, II, contribution to the program of Social Integration and Training Program of Public Servant Assets and Contribution to the Financing of social security charged on operations on cars that have engine driven exclusively by electric energy.**Additional data:** It changes Law 10.865, of 2004.**Situation:** Joint Procedures**2.20 BILL 3.339/2019****Author:** Rodrigo Agostinho - PSB/SP; Rosana Valle - PSB/SP**Date of submission:** 6/5/2019**Synopsis:** Provides for the prohibition of production, commercialization, sale, licensing and circulation of new vehicles of self-propelled traction, powered by fossil fuel, on the date specified in the national territory, gives new wording to Law 10.438 of April 26, 2002, and gives other provisions.**Situation:** Joint Procedures**2.21 BILL 4.086/2012****Author:** Fernando Coelho Filho - PSB/PE**Date of submission:** 6/19/2019**Synopsis:** Provides tax incentives for the production and marketing of electric or hybrid motor vehicles.**Situation:** Awaiting the opinion of the rapporteur in the Committee on Economic Development, Industry, Trade and Services (CDEICS)**2.22 BILL 4.825/2019****Author:** Daniel Freitas - PSL/SC**Date of submission:** 9/3/2019**Synopsis:** Grants tax benefits relating to the IPI, II, contribution to the PIS/PASEP and Contribution to the Financing of Social Security charged on import operations of cars equipped with engine driven exclusively by electric energy, and establishes tax incentive to the production and marketing of motor vehicles powered by electricity or hybrids.**Situation:** Joint Procedures**2.23 BILL 8.402/2017****Author:** Danrlei de Deus Hinterholz - PSD/RS**Date of submission:** 8/29/2017**Synopsis:** Modifies Law 12.715, of September 17, 2012, to provide on the prohibition of the marketing and import of cars powered by diesel oil and automotive gasoline from January 1, 2040.**Situation:** Joint Procedures**2.24 BILL 8.630/2017****Author:** Sublieutenant Gonzaga - PDT/MG**Date of submission:** 9/20/2017**Synopsis:** Changes the wording of caput Article 72 of Law 8.383 of December 30, 1991 and caput Article 2 of Law 8.989, of February 24, 1995, expand the scope of these devices, in relation to taxi drivers.**Situation:** Joint Procedures**2.25 COMPLEMENTARY BILL 560/2018****Author:** Arnaldo Jardim - PPS/SP **Date of submission:** 12/19/2018**Synopsis:** Provides for the differential treatment of goods and services, and the processes of production and provision on the grounds of the environmental impact they cause, as a general principle of economic activity on the environment and ecological balance, and the establishment of special criteria for taxation, with the aim of preventing imbalances in competition for goods and services with less environmental impact.**Situation:** Joint Procedures**2.26 BILL 9.393/2017****Author:** Carlos Henrique Gaguim - PODE/TO**Date of submission:** 12/19/2017**Synopsis:** Exempts from IPI motor vehicles powered by electric or mixed engines and reduces to zero the contribution rates for PIS/PASEP and COFINS on such vehicles.**Additional data:** It changes Laws 4.502, of 1964, and 10.925, of 2004.**Situation:** Joint Procedures

2.27 BILL 902/2015**Author:** Luciano Ducci – PSB/PR**Date of submission:** 3/25/2015**Synopsis:** Extends the IPI exemption for the benefit of autonomous professional motorcyclists, cooperatives and people with disabilities, established by Law 8.989, of February 24, 1995, to the acquisition of electric and hybrid vehicles.**Situation:** Joint Procedures**2.28 BILL 6.954/2017****Author:** Carlos Henrique Gaguim – PTN/TO**Date of submission:** 2/20/2017**Synopsis:** Provides tax incentives to encourage the use of electric or hybrid powered vehicles.**Additional data:** It changes Law 10.485, of 2002.**Situation:** Joint Procedures**2.29 BILL 7.785/2017****Author:** Luiz Nishimori – PR/PR**Date of submission:** 6/6/2017**Synopsis:** Establishes tax incentive for the industrialization and commercialization of hybrid and electric powered vehicles.**Situation:** Joint Procedures**2.30 BILL 7.342/2014****Author:** Ricardo Izar – PSD/SP; Danrlei de Deus Hinterholz – PSD/RS**Date of submission:** 4/2/2014**Synopsis:** Provides on the regulation of electric bicycles throughout the national territory.**Situation:** Joint Procedures**2.31 BILL 2.145/2015****Author:** Jhc – SD/AL**Date of submission:** 6/30/2015**Synopsis:** Establishes incentives to produce energy from alternative renewable sources and biofuels and for electric and hybrid motor vehicles, amending Law 9.249, of December 26, 1995, and Law 9.250, of December 26, 1995; and provides other measures.**Situation:** Joint Procedures**2.32 BILL 7.344/2014****Author:** Danrlei de Deus Hinterholz – PSD/RS; Ricardo Izar – PSD/SP**Date of submission:** 4/2/2014**Synopsis:** Provides for the IPI exemption for the purchase of electric bicycles, mechanical, and their accessories.**Situation:** Joint Procedures**2.33 BILL 2.226/2019****Author:** Aureo Ribeiro – SOLIDARI/RJ**Date of submission:** 4/10/2019**Synopsis:** Provisions on the use of electric-powered bicycles, whether equipped with pedals driven by the driver and electric-powered kick-scooters or not. (Bill of Sustainable Urban Mobility)**Situation:** Joint Procedures**2.34 BILL 3.274/2019****Author:** Eli Corrêa Filho – DEM/SP**Date of submission:** 4/6/2019**Synopsis:** Provides on the Shared Micromobility System as an instrument of the National Urban Mobility Policy.**2.35 BILL 3.242/2019****Author:** Vinicius Poit – NOVO/ P; Lucas Gonzalez – NOVO/ MG**Date of submission:** 5/30/2019**Menu:** Changes Law 12.587, of January 3, 2012, to regulate the transportation with electric motorized cycle vehicles and gives other provisions.**Situation:** Joint Procedures**2.36 BILL 349/2019****Author:** Felipe Carreras – PSB/PE**Date of submission:** 2/4/2019**Synopsis:** Changes the IPI rate for mopeds in position 8711.60.00 of the MCN.**Situation:** Joint Procedures**2.37 BILL 4.507/2012****Author:** Ângelo Agnolin – PDT/TO**Date of submission:** 10/9/2012**Synopsis:** Grants tax incentives to electric and hybrid cars.**Additional data:** It changes Law 10.865, of 2004.**Situation:** Joint Procedures

PROMOB-e



Por meio da:



MINISTÉRIO DA
ECONOMIA

