BRAZILIAN BICYCLE ECONOMY

JULY 2018

UNIVERSIDADE FEDERAL DO RIO DE JANEIRO

LABMOB
Laboratório de Mobilidade Sustentável

ALIANÇA BIKE
Associação Brasileira do Setor de Bicicletas

BRAZILIAN BICICYLE ECONOMY

JULY 2018

Overall Coordination
Victor Andrade
Juciano Martins Rodrigues

Executive Coordination
Pedro Paulo Machado Bastos

Technical Team
Filipe Marino
Juliana DeCastro
Letícia Quintanilha
Luiz Saldanha
Marcela Kanitz
Regina Silva

Consultant
Marcelo Gomes Ribeiro

Organizers
Daniel Guth (Aliança Bike)
Victor Andrade (LABMOB)

Communication
Adriana Marmo

Revision
Paulo Kaiser

Translation
Richard Taylor

Cover
Estúdio Nono

Funding
Aliança Bike
Banco Itaú
Instituto Clima e Sociedade

Forum
Adolfo Mendonça, ANTP
André Geraldo Soares, UCB
Augusto Machado, Bicicleta para Todos
Cadu Ronca, Aromeiazero
Celso Cardoso, Aliança Bike
Felipe Alves, UCB
Flora Marin, Gruppo (facilitação)
Francisco Carlos Barbosa, FIPE
Giancarlo Clini, Aliança Bike
João Lacerda, Transporte Ativo
Marcelo Maciel, Aliança Bike
Marcelo Ribeiro, Aliança Bike
Murilo Casagrande, Aromeiazero
Renata Falzoni, Bike é Legal
Rene José Rodrigues Fernandes, FGV
Rodrigo Afonso, NürnbergMesse Brasil
Suzana Nogueira, CET-SP
Victor Callil, CEBRAP
Walter Figueiredo, Instituto Clima e Sociedade
Zé Lobo, Transporte Ativo

EXECUTIVE SUMMARY

The Laboratory of Sustainable Mobility of the Federal University of Rio de Janeiro (LAB- MOB / UFRJ) and the Bike Alliance present this study whose objective is to map and monetize the economic complex of the bicycle. Based on the development of a methodological framework, it was sought to define a set of indicators that would be representative of the "Bicycle Economy" in Brazil.

The present document points out the results of this study derived from the proposal of the methodology of collecting, systematizing and analyzing the data that compose the economic complex of the bicycle.

It is necessary to say that there were many challenges and incentives for the development of this work, the most important being the methodological challenge. In the first place, it was necessary to identify the economic activities, that together form the Economic Complexity of the Bicycle in Brazil. In this point, dialogue with partner institutions was essential, as they are an inexhaustible source of knowledge about bicycle use, its history and, even more, its place in Brazilian society. These identified, the same challenge was to seek economic classifications that answered to these activities - that is, to what extent economic activities related to the bicycle and recognized / perceived by individuals, social groups or by society are considered by official statistical classifications.

Many of them did not find support in the traditional economic classifications, so it was necessary to seek alternative classifications for the cases in which the traditional economic classifications failed to answer our questions. And here again, the partners and collaborators were instrumental in advancing the study.

Finally, the analysis was developed from the conception of five analytical aspects through which the Bicycle Economy was observed: (Chain of Production, Public Policies, Transportation, Related Activities and Benefits) and distributed in 22 themes associated to each of these groups.

One of the key findings revealed in the **Production Chain** sector was that in 2005, according to IBGE data, Brazil produced more than 5 million bicycles. When we analyze the Bicycle Economy from the point of view of foreign trade, we see little movement, in addition to a low interest, especially for exports. This finding indicates that most of the bicycles circulating in Brazil are assembled in the country itself. Therefore, domestic demand seems to be the main driver of the Brazilian Bicycle Economy, which is not only reflected by production data, which has grown in recent years. In the commerce sector, for example, there was an increase both in the number of enterprises and in jobs in the wholesale trade. On the other hand, even in periods of economic crisis, there was stability in these same indicators corresponding to the retail sector. In the Rental, 99 enterprises were identified that provide a rental service of bicycles, distributed in 24 Brazilian capitals, highlighting Rio de Janeiro and São Paulo. It was estimated that Brazil would have approximately 296 people employed in this activity, with a total salary mass of R$ 4,583,908.12.

The **Public Policies** sector indicated the economic participation of the bicycle in its treatment in the public sphere both directly and indirectly. It was estimated that the public authority invested R$ 1,200,695,380.00 for the implantation of 3,008.5 km of cycling routes in the 27 capitals, with emphasis on São Paulo and Rio de Janeiro, which together represent 45% of the all invested in Brazil. Public investments in public partnerships in the implementation of Parking Infrastructure total R$ 754,200 relating to 4,075 bicycle parking lots and bicycle parking racks in seven Brazilian capitals - Aracaju, Belo Horizonte, Fortaleza, Porto Alegre, Recife, Rio de Janeiro and São Paulo. The Brazilian Shared Public Bicycles System, in turn, indicates that 13 of the 27 Brazilian capitals already have their own systems, with emphasis on the Northeast and Southeast. In all, these 13 systems have 906 stations with 7,861 available bicycles. In addition, one of the case studies indicates that an operator of 11 shared public bicycle systems is responsible for 208 jobs and has an average annual revenue of R$ 5,800,000.00.

The **Transport** section evaluated the participation of the bicycle from the way it is used in the domestic sphere (Personal Use) and in the commercial sphere (Cyclologistics).

The completion of the case study involving five families of bicycle users in the metropolitan area of Rio de Janeiro showed that this mode of transportation generates an economy in the household budget of approximately R$64

thousand reals per year if the total number of bicycle trips declared by the families were performed by private car in the five analyzed realities. *Cyclologistics* showed that the use of the bicycle presents numbers in the range of R$3 million in revenues for a specialized bicycle courier company and a 16.3% share in deliveries in the commercial area of Bom Retiro in São Paulo.

In the **Related Activities** sector, it was verified that in 2016 there were 55 organizations and groups working in favor of bicycle mobility in Brazil, receiving amounts of around R$5.1 million in revenues from public and private financing programs. In the scientific sector, between 2007 and 2017, 124 research projects were surveyed with the theme "bicycle", involving 270 researchers and R$3,702,716.58 in funding. In Cyclotourism, the operation of the European Valley Circuit was presented, with 287.1 km of cycling routes distributed in nine municipalities in the state of Santa Catarina. Cycle-entrepreneurism considered the cases of two profitable projects classified as bicycle cafes in Rio de Janeiro and São Paulo, whose initial investments varied from R$ 700,000 to R$ 90,000, generating eight to four direct jobs, respectively. In Sporting Events, it was pointed out that the total estimated cost in events held in Brazil is in the order of R$17,162,635.00 and the total of 37,555 participants per year.

In the **Benefits** sector, we realized that the use of the bicycle could avoid a total emission rate of 1,879,488 tons of CO2 for private cars and 17,364,672 for buses of the diesel fleet per year. Respectively, these values correspond to 0.08 and 0.76% of the 2,278 billion gross tons emitted in total by Brazil and were contextualized in the Climate and Energy theme. In Health, we resorted to a brief bibliographical review to indicate the effects of the use of the bicycle in the improvement of national public health.

This research was aided by the support of Aliança Bike, Banco Itaú and the Climate and Society Institute.

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Vera Bamberg
Yuriê Baptista César (INESC)
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CONTENTS

1 INTRODUCTION

Considering the growing demand for information on the bicycle market and the benefits of its use for society, the Sustainable Mobility Laboratory (LABMOB / UFRJ) and the Bike Alliance present the results of the study developed to map and monetize the Bicycle Economy in Brazil, also defined by the idea of a Bicycle Economic Complex. The objective of this work was to systematize and analyse the data collected from the development of a proper methodological framework, defining a set of indicators that would be representative of the "**Bicycle Economy**" in Brazil.

Under general coordination of LABMOB / UFRJ, this document synthesizes the content presented and discussed in the first panel, elucidating the results derived from the proposal of the methodology of collecting, systematizing and analysing the data that make up the economic complex of the bicycle. These results are ordered by five economic dimensions (Chain of Production, Public Policies, Transportation, Related Activities and Benefits) and distributed in 22 themes associated to each of these groups.

The initial conception of the Bicycle Economy mapping in Brazil looked to follow a holistic approach to cycling as a central element of a systemic economic complex, although it is important to highlight the inevitable presence of possible conceptual uncertainties, unavailability of information and limitations of data collected due to unpublished work.

In the first place, the conceptual elaboration ran counter to the fact that we did not always find a correspondence between the sectors - and their unfolding - and the classifications of economic activities in Brazil. Thus, the systematization of indicators faced the challenge of working with secondary data at levels of aggregation that in many cases were not ideal, which may limit to some extent a more detailed analysis than was intended to be charted. Finally, when working with official data, with the application of specific surveys and case studies, we cannot ignore the existence of an informal dimension of the bicycle that does not find direct correspondence to the nature of the organization of economic activities in Brazil and is explicit in the information collected. In this sense, the methodology developed reflects a rather objective scenario

on the information currently available, but a little speculative regarding the economic informality of the bicycle in Brazil.

The contents of this document were presented and discussed in a panel composed of representatives of the Bike Alliance, the National Public Transportation Association (ANTP), the Bicycle for All, Casa Fluminense, the Brazilian Center for Analysis and Planning (Cebrap), the (CETPE), Ciclocidade, Fundação Instituto de Pesquisas Econômicas (FIPE), the Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering (COPPE), the Institute of Climate and Society (ICS) , Fundação Getúlio Vargas (FGV), NürnbergMesse Brasil, NGO Active Transport, and União de Ciclistas do Brasil (UCB).

We emphasize that this methodological and analytical effort to map and analyse the different dimensions that make up the Bicycle Economy was aided by the support of Aliança Bike, Banco Itaú and the Climate and Society Institute.

2 THE BRAZILIAN BICYCLE ECONOMY

The conception of Bicycle Economy is vast and involves a tangled network of economic activities. Working with the idea of Bicycle Economy goes beyond simple considerations about the economic advantages that its use can bring to a family's domestic budget, to local development or to individual well-being.

In order to refine this conception, in this study the Brazilian Bicycle Economy is treated as a systemic economic complex (GADELHA, 2006) composed, in addition to its benefits, of several economic activities within the industry and services sector. Therefore, this economic complex, its composition and its organization are represented by a set of indicators organized in sections, sub-sections and themes.

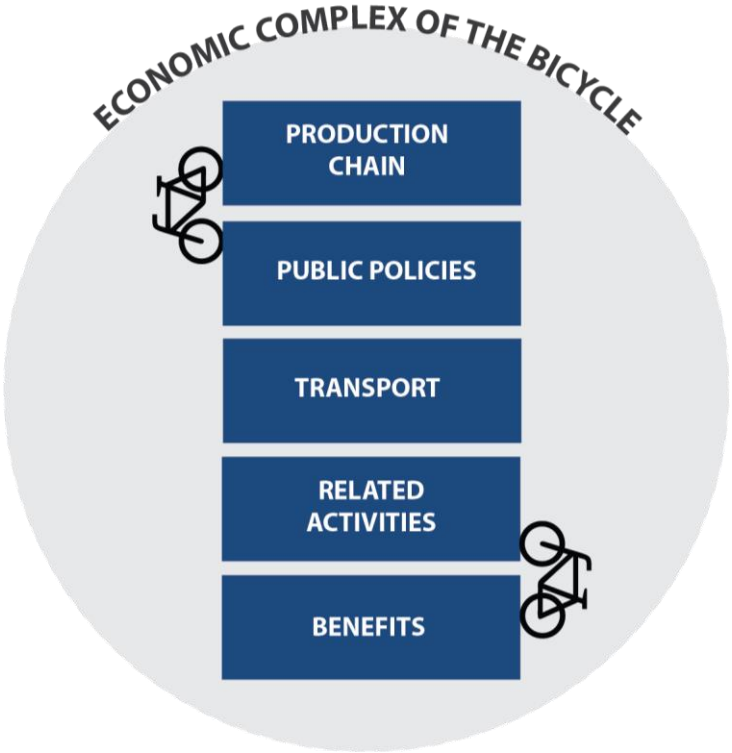


Figure 1. The bicycle economy: dimensions.

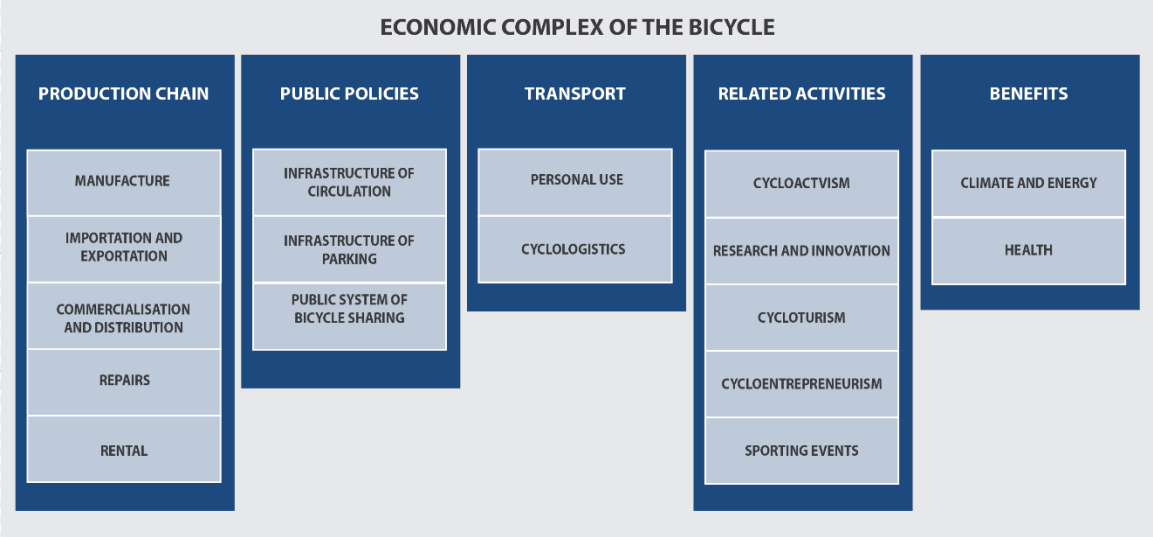


Figure 2. The bicycle economy: sectors and themes.

The Bicycle Economy in Brazil encompasses five major aspects: the **Production Chain**, composed of themes ranging from the manufacture of bicycles and parts to importation and exportation, as well as services such as marketing, repairs and rental; **Public Policies**, characterizing the economic participation of cycling infrastructure and the provision of bicycles in public services and private and public and bicycle parking lots; **Transport**, a section that represents the way in which the bicycle is used for both personal and commercial purposes, such as *Cyclologistics*; **Related Activities**, in which the bicycle would be the object of research and innovation activity, actions promoting mobility by bicycle (*Cycloactivism*), entrepreneurial actions and sports; and, finally, the **Benefits**, in which the bicycle has a direct and indirect influence on climate and energy (especially on air quality) and on public health.

3 PRODUCTIVE CHAIN

The **Production Chain** sector collects the consecutive stages through which the various inputs required by the bicycle as a product and its transfer to the final consumer pass and are being transformed and transferred. This section includes two subsections: **Manufacturing / Assembly** (with the themes *Bicycle Manufacturing*, Parts Manufacturing, and *Component and Accessory Manufacturing*); **Importation / Exportation** (with the themes *Exporting of Final Products [of bicycles]*; *Exportation of Parts and Accessories*; *Importation of Final Product [of bicycles]*; *Import of Parts and Accessories)*; and three themes: *Marketing*; *Repairs*; and *Rentals*.

3.1 MANUFACTURING

In the scope of this study, the subsection **Manufacturing** comprises the activities of (i) bicycle manufacturing (which may include the assembly resulting from the combination of its various components) and (ii) the manufacture of those components, i.e parts and other subassemblies which make up the final product "bicycle". It unfolds in three themes: *Bicycle Manufacturing*, *Parts Manufacturing* and *Component and Accessory Manufacturing*.

Information on these issues was extracted from two official statistical sources: i) the microdata of the Annual Social Information Relation (RAIS) of the Ministry of Labor; ii) the Annual Industrial Survey (PIA) of the Brazilian Institute of Geography and Statistics (IBGE). To extract the data from both sources it was necessary that we previously appropriated the way in which economic activities related to the bicycle1 are identified in the National Classification of Economic Activities (CNAE).

The RAIS data provided information on the number of jobs, establishments and the payroll of the Bicycle Industry. The PIA provided, in turn, information on the number of bicycles and parts produced in Brazil between 2007 and 2015.

According to data from 2016, the Bicycle Industry, which includes both the manufacture of bicycle parts and other components, employed more than 7,000 people in 296 manufacturing establishments throughout the country. Graph 2 shows that there was an increase in employment in this activity compared to 2006, when manufacturing

generated just over 4,000 jobs, although it also shows that there is a slight downward trajectory since 2013.

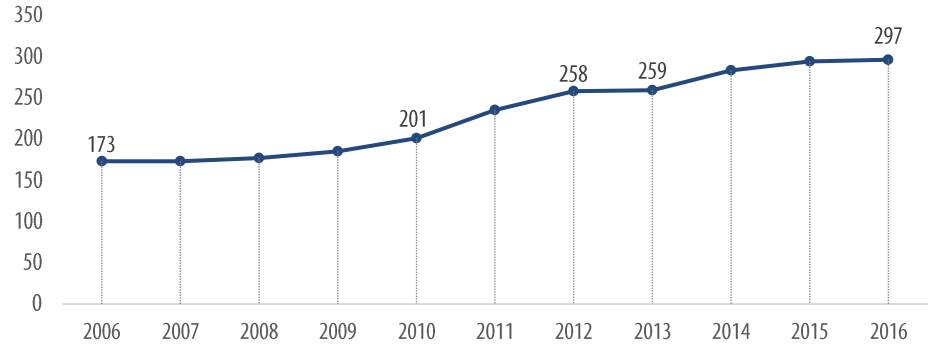


Chart 1. The number of manufacturing establishments in Brazil - 2006 to 2016

Source: RAIS/MTE.

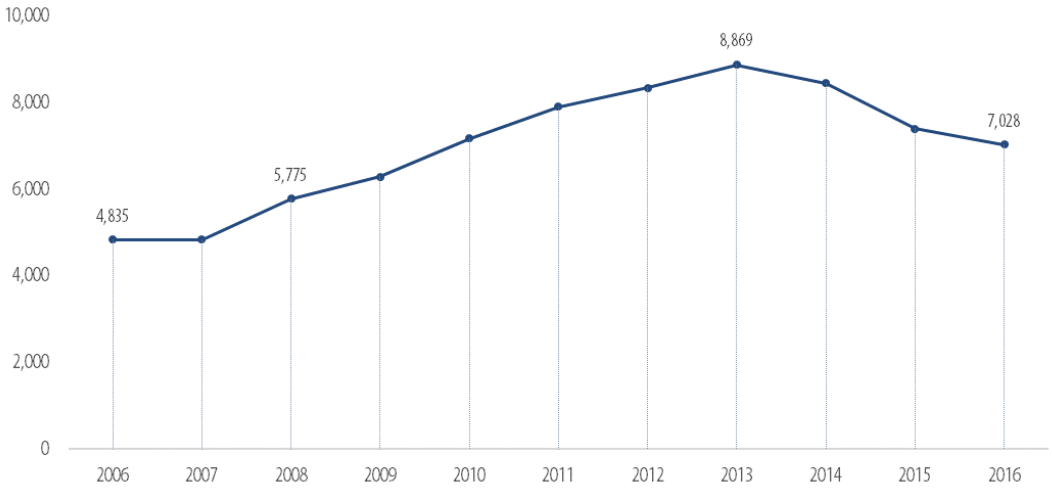


Chart 2. Jobs in the manufacturing sector - 2006 a 2016

Source: RAIS/MTE

The following maps provide an overview of how employment and industrial establishments are distributed across the country. There is a strong concentration of this activity in the center-south of the country, especially in São Paulo.

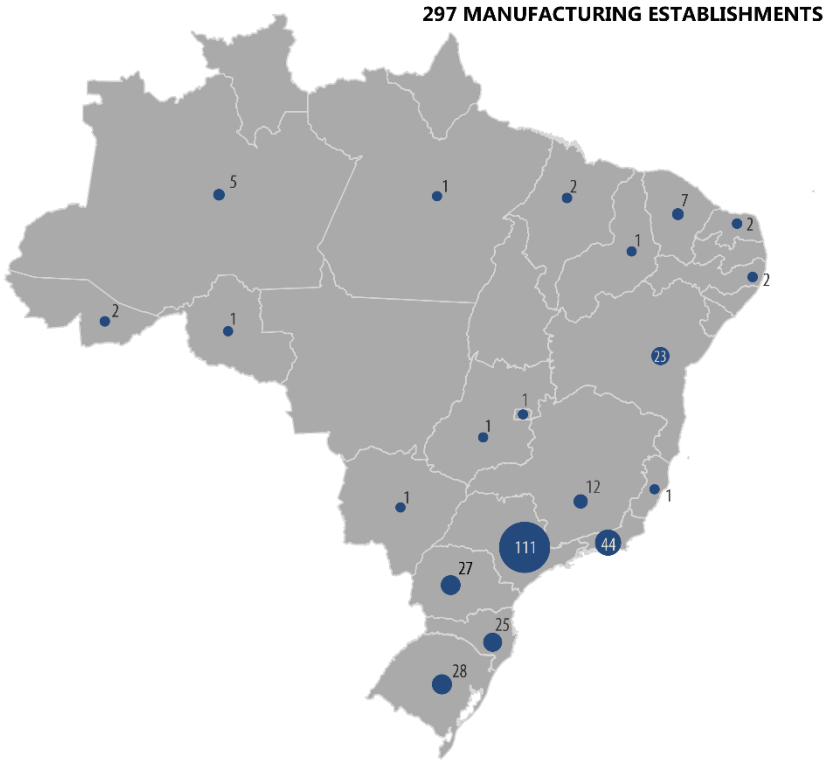


Figure 3. Number of manufacturing establishments by state - 2016

Source: RAIS/MTE

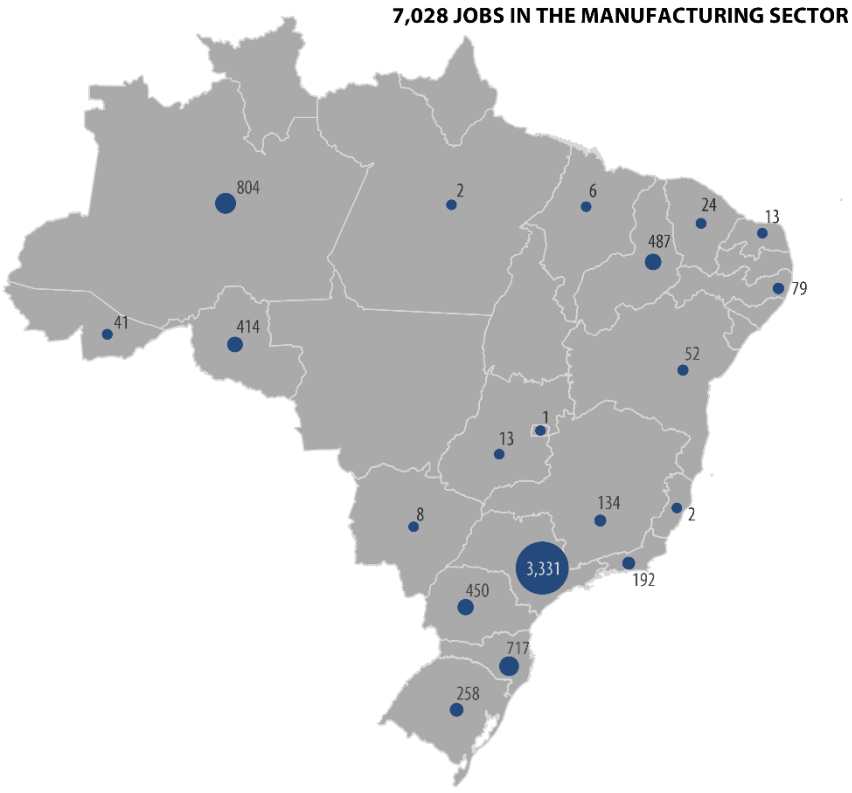


Figure 4. Number of Jobs in the manufacturing sector – 2016

Source: RAIS/MTE

The sum of all wages paid in the Bicycle Industry in 2016 is around R$ 174 million and the average income, considering the entire country, is R$ 2,063.39. It is worth remembering that some states do not have any establishment of this activity. They are Roraima, Amapá, Tocantins, Paraíba, Alagoas, Sergipe, and Mato Grosso. In those where there is production, the average monthly salary varies between R$ 948.00 paid in Maranhão and the R$ 2,421.27 in São Paulo.

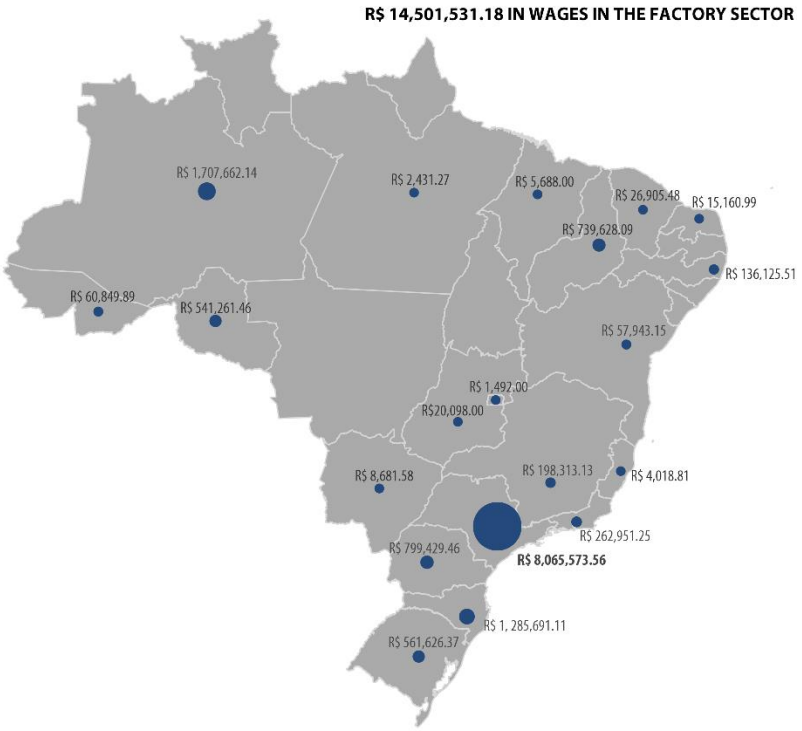


Figure 5. Value of salary masses – 2016

Source: RAIS/MTE

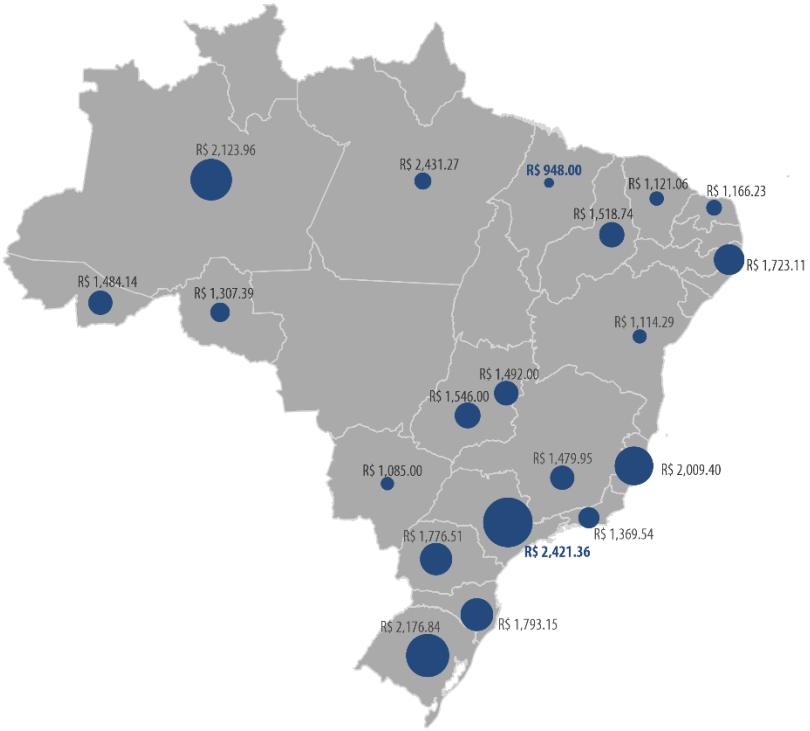


Figure 6. Average compensation values in *Bicycle Manufacturing* by state - 2016

Source: RAIS/MTE

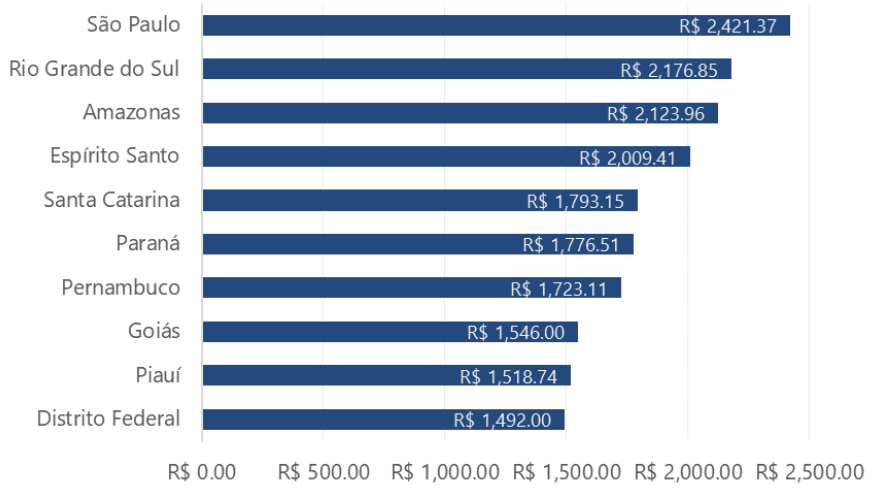


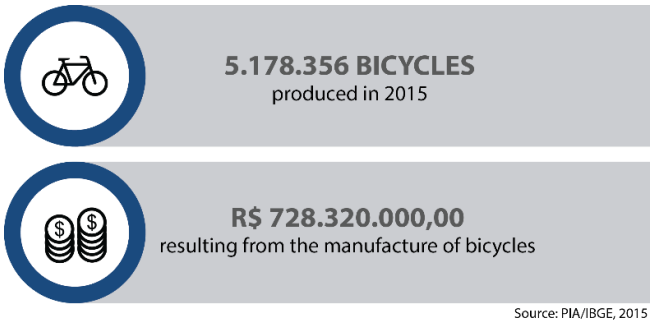
Chart 3. The 10 States with the highest average value of remuneration in the manufacturing sector

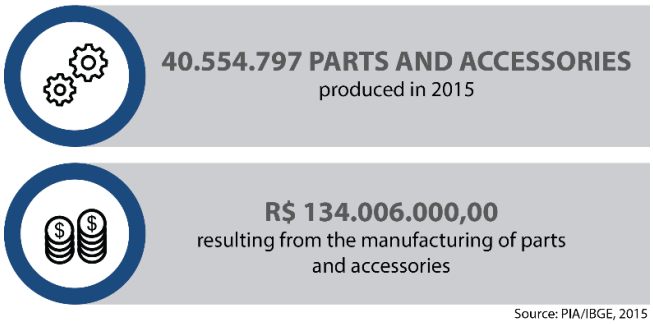
Source: RAIS/MTE.

In all, Brazil produced more than 5.1 million bicycles in 2015[1] reaching a mark of R$ 728.3 million[2]. The country, that same year, produced brakes, cubes, hoops and spokes, pedals, frames and saddles, as well as other parts and accessories for bicycles. The production of more than 40.5 million components, parts and accessories was worth over R$ 134 million.

[1] Regarding this aspect of manufacturing, the most up-to-date data correspond to the annual Industrial Survey (PIA-Product) of IBGE for the year 2015. As of 2005, the sample of this research began to be formed by all industrial production units belonging to the PIA-Empresa, i.e. industrial companies with 30 or more persons employed and / or which earned gross revenue from sales of industrial products and services above a certain value in the year prior to the reference of the survey. In 2010, the cut of R$ 9.33 million was adopted.

[2] The production value corresponds to the sum of the production values of all the informants of the product. The constructed variable, for each product occurrence, was determined by the following criterion: production value = average value of sales (value of sales / quantity sold) x quantity produced. When only the quantity produced is reported, the average value of the product declared by the same company in other occurrences of the same product shall be used. If not, the average value of the product is used in the context of the Unit of the Federation in which the unit is located. If not, the national average value of the product is adopted.





Over the years, production ranged from the 2.7 million bicycles produced in 2007 to 5.1 million produced in 2015. The amount produced each year can be monitored in the chart below. Likewise, the resulting value of this production over time can be verified in Chart 5.

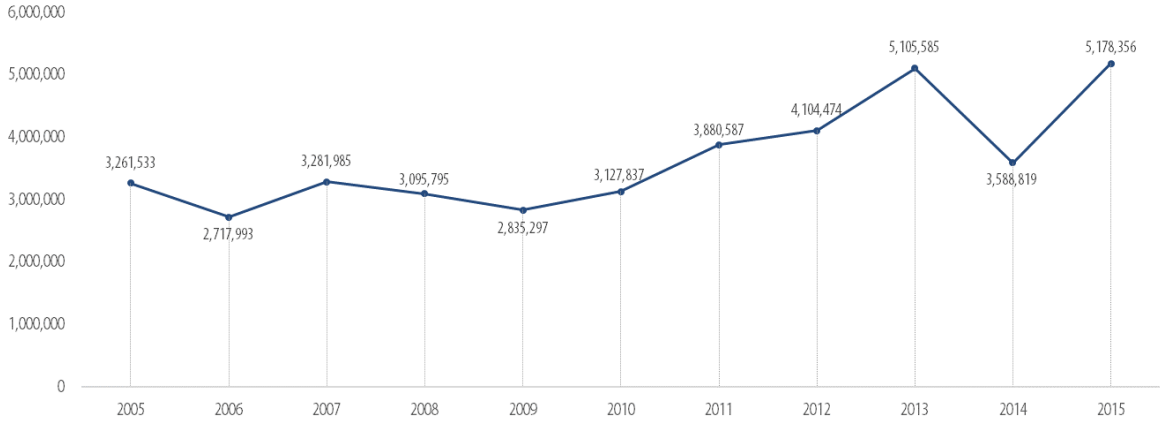


Chart 4. Quantity of bicycles produced in Brazil - 2005 to 2010

Source: PIA/IBGE (2015).

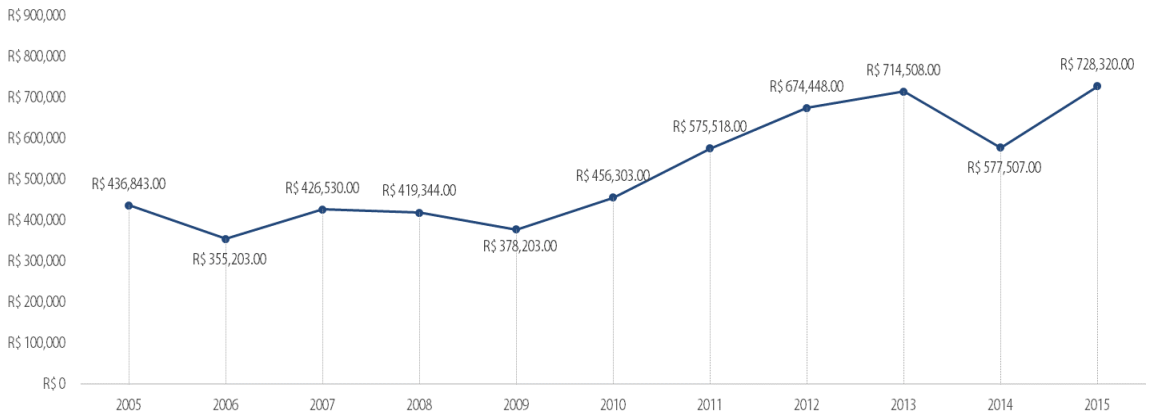


Chart 5. Value of bicycle production in Brazil – 2005 to 2015

Source: PIA/IBGE (2015).

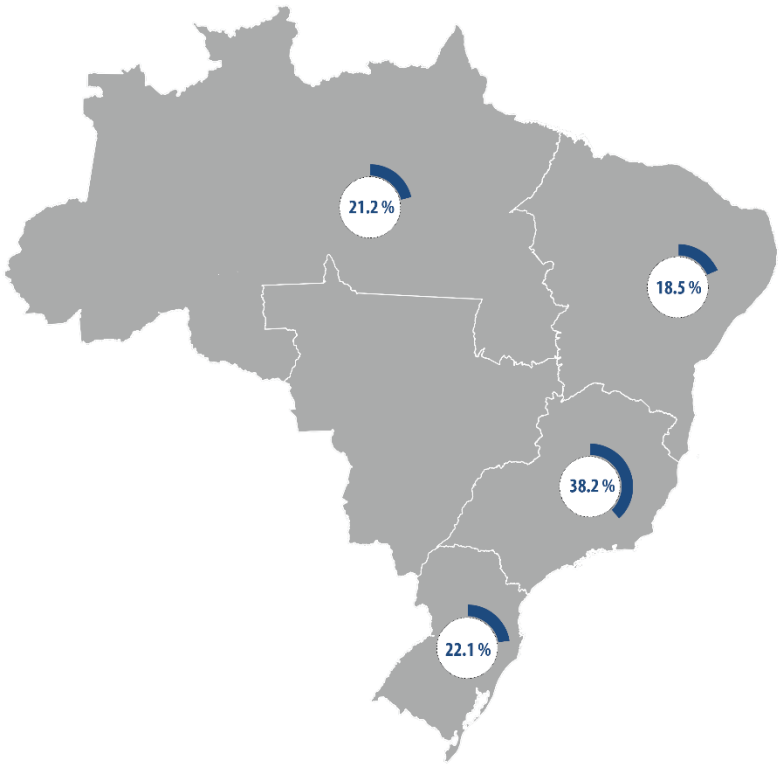


Figure 7**.** Participation of the Brazilian macro-regions in the bicycle production - 2015.

Source: PIA/IBGE (2015).

3.2 IMPORTATION/EXPORTATION

In the **Importation / Exportation** subsection, we present the data of import and export activities related to the bicycle sector. These economic activities are approached from the perspective of four themes: (i) *Exportation of Final Products (of bicycles)*; (ii) *Exportation of Parts and Accessories*; (iii) *Importation of Final Products (of bicycles)*; and (iv) *Importation of Parts and Accessories*.

The data was obtained through the databases provided by the Ministry of Industry, Foreign Trade and Services (MDIC). Initially, it was necessary to identify the goods related to the economy of the bicycle and their respective codes in the NCM (Common Nomenclature to Mercosur) system. Identified, these goods were classified as follows:

a) Bicycles

- Bicycles without motor (NCM code 87120010)
- Other cycles without motor, including tricycles (NCM code 87120090)

b) Parts and Accessories

- New tires, of rubber, of a kind used on bicycles (CN code 40115000)
- Rubber inner tubes, of a kind used for bicycles (CN code 40132000)
- Lighting or visual signaling apparatus of a kind used on bicycles, electric (CN code 85121000)
- Frames, forks, and parts thereof, for cycles or cycles (CN code 87149100)
- Rims and spokes for bicycles and other cycles (NCM code 87149200)
- Other free wheel hubs and sprockets for bicycles, etc. (CN code 87149300)
- Hubs, other than those of brakes for bicycles and other cycles (CN code 87149310)
- Free-wheel pinions for bicycles and other cycles (NCM code 87149320)
- Brake hubs for bicycles and other cycles (Code NCM 87149410)
- Other brakes and parts thereof, for bicycles and other cycles (CN code 87149490)
- Bicycle and other cycle saddles (NCM code 87149500)
- Other parts and accessories for bicycles and other cycles (CN code 87149600)
- Other parts and accessories for bicycles and other cycles (CN code 87149900)
- Gearboxes for bicycles and other cycles (NCM code 87149910)
- Other parts and accessories for bicycles and other cycles (code NCM 87149990)

In 2017, Brazil exported 28,492 bicycles, which is equivalent in monetary terms to just oveR$ 859,000, or around $ 2.9 million. This number registered in 2017 shows that exports have risen again after the number of units exported fell dramatically by 2016, when the country exported 8,436 units. Until that year, the total drop in exports had been 75%. A comparison between the last two years can be made by observing the following two maps.

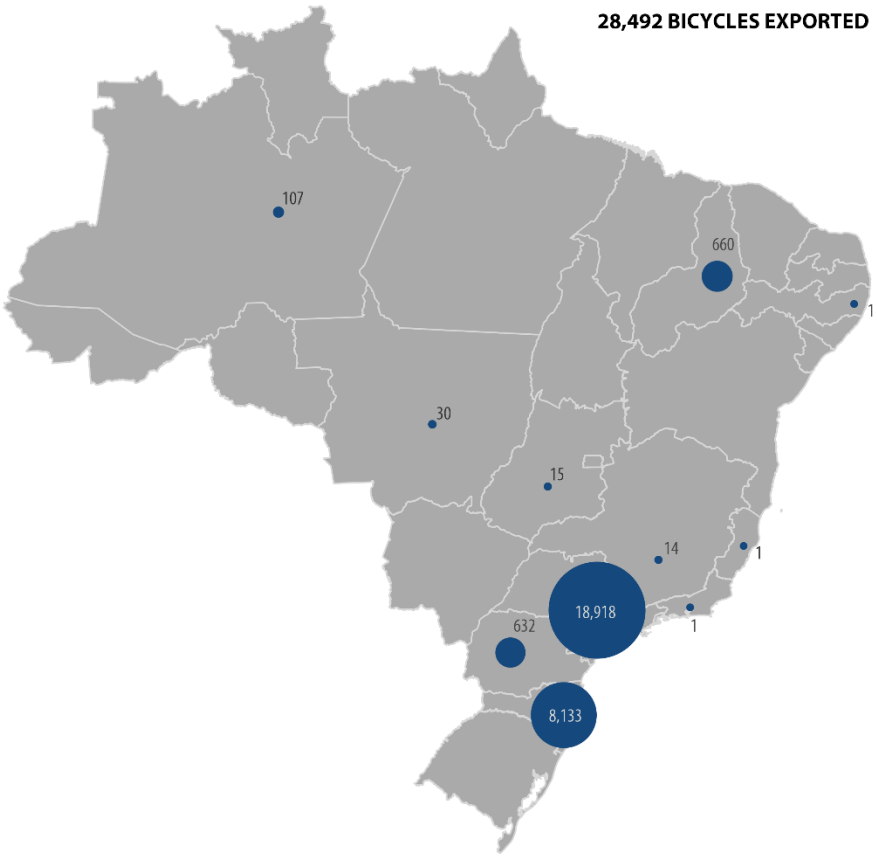


Figure 8. Number of bicycles exported by state – 2017

Source: SECEX/MDIC.

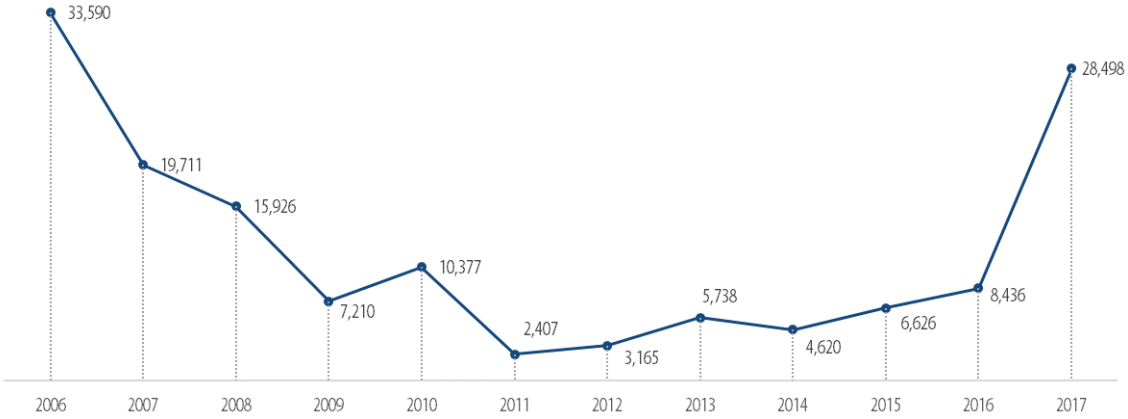


Chart 6. Quantity of bicycles exported - 2006 to 2017.

Source: SECEX/MDIC.

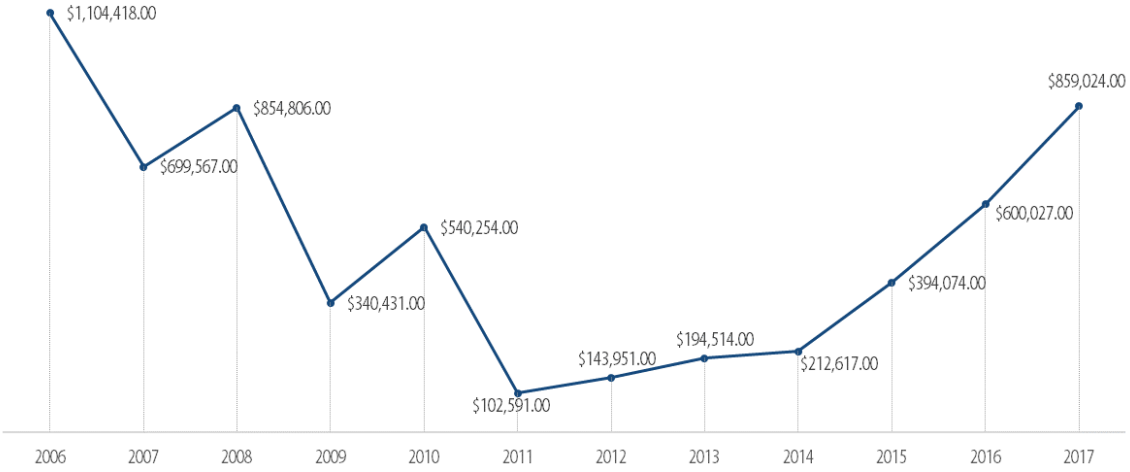


Chart 7. Total nominal value of bicycles exported – 2006 to 2017 (in US$)

Source: SECEX/MDIC.

In terms of parts and accessories, in 2017 the number of units exported was 470,349 and the value of exports of these products reached just over US $ 1.4 million, which, translated into reais, corresponds to R$ 5,1 million[3].

[3] For this conversion was used the average value of the dollar for purchase in 2016: R$ 3.49.

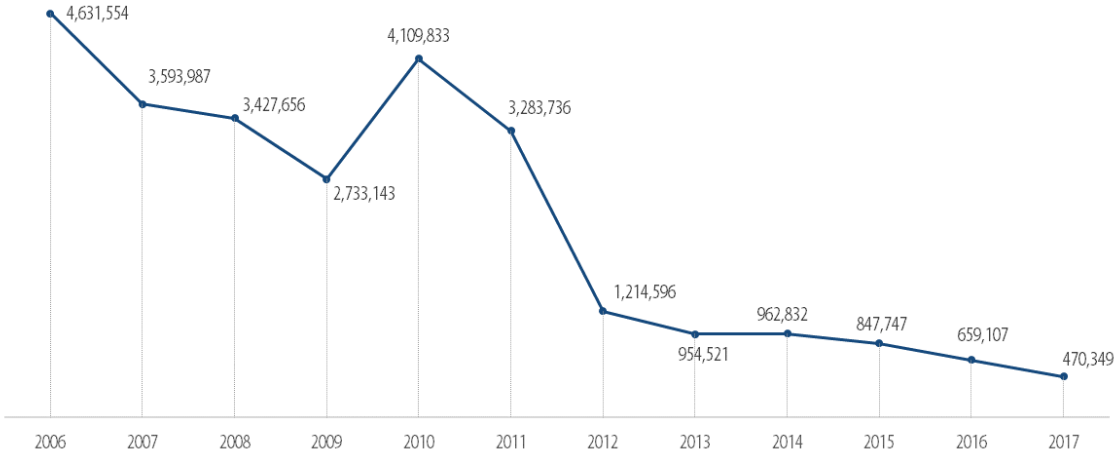


Chart 8. Quantity of pieces and accessories exported – 2006 to 2017

Source: SECEX/MDIC.

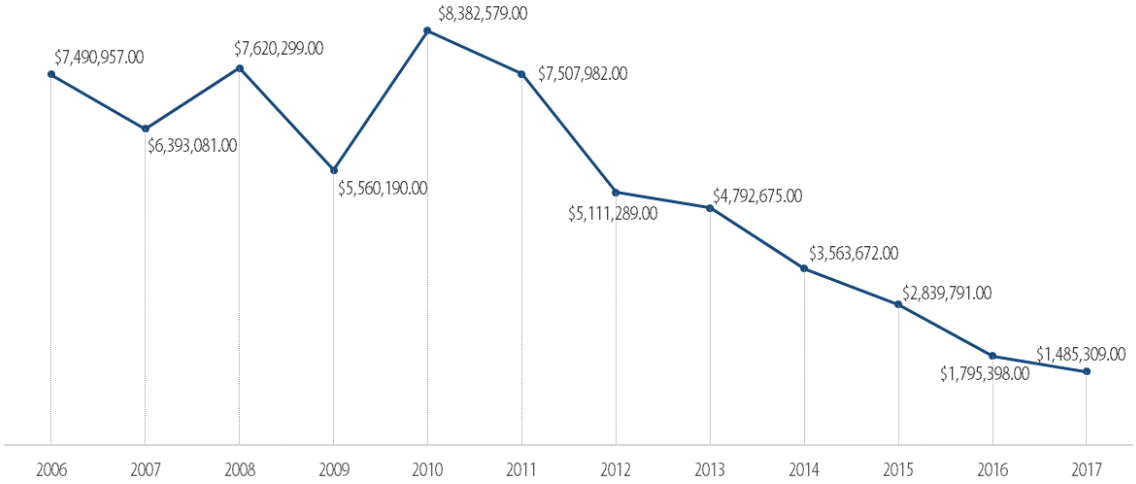


Chart 9. Total value of parts and accessories exported - 2006 to 2017 (in US$).

Source: SECEX/MDIC.

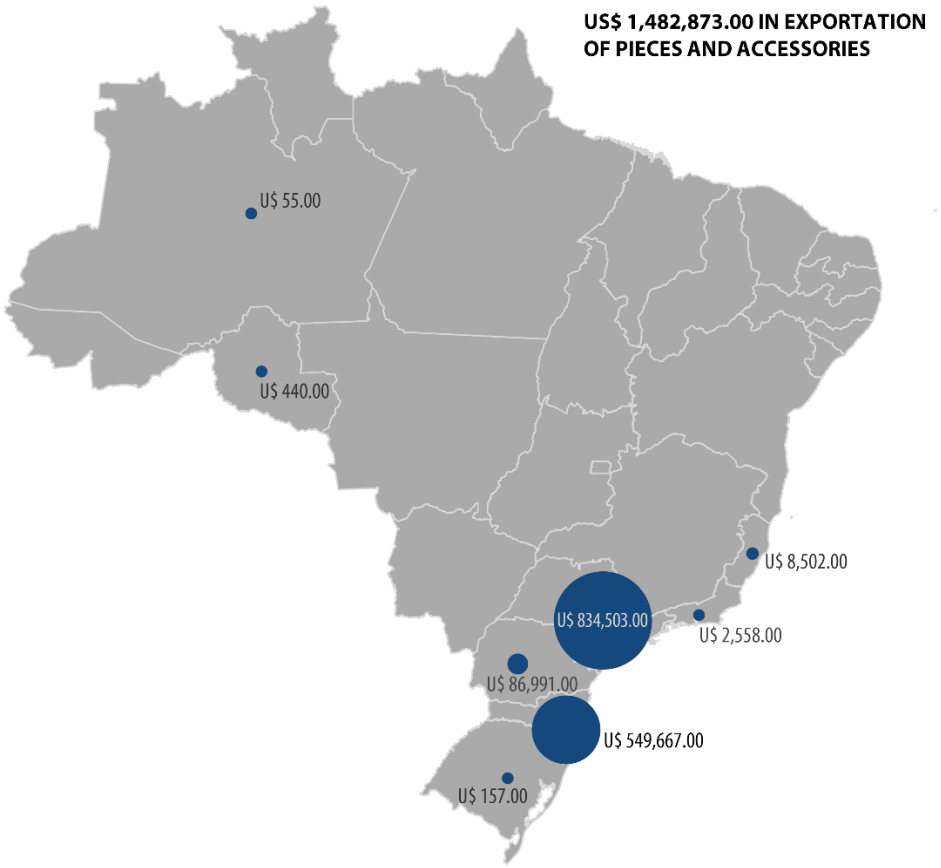


Figure 9. The value of exported parts and accessories – 2006 to 2017 (US$)[4].

Source: SECEX/MDIC.

On the other hand, import volumes, both bicycle and its components, assume much higher values. In 2017 alone, Brazil imported 157,659 bicycles, totaling US$ 25.7 million, equivalent in reals to more than 89.9 million.

[4] The total sum in US$ dollars differs from the total of Brazil shown in the **Chart 14**, since it is not considered "Consumption on board", a category adopted by the MDIC.

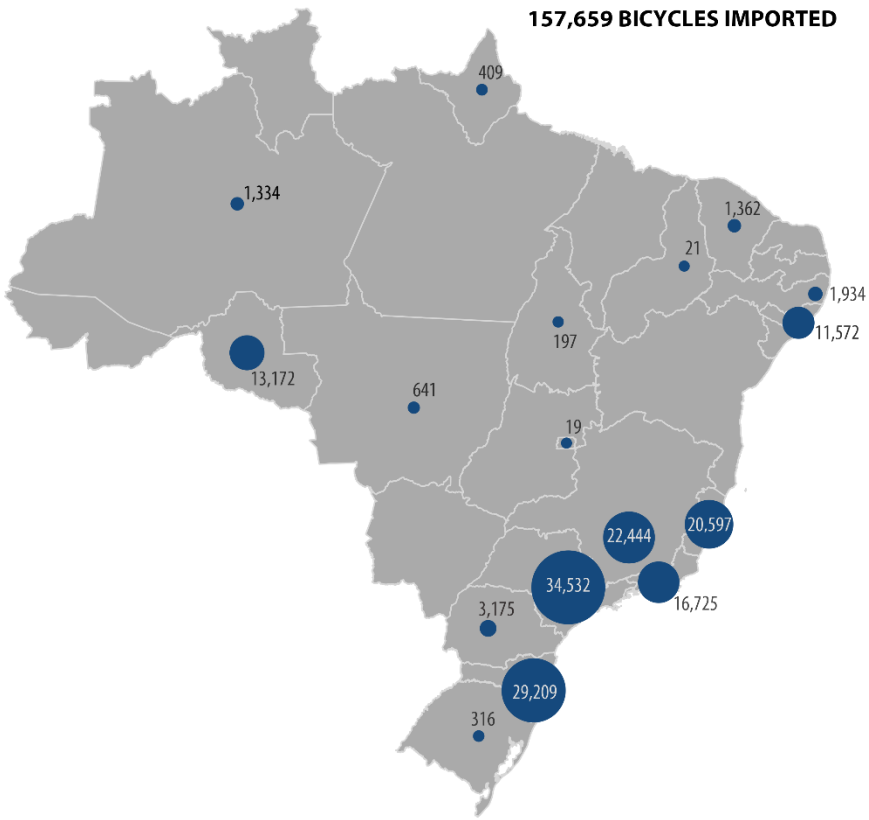


Figure 10. Number of bicycles imported by state – 2017

Source: SECEX/MDIC.

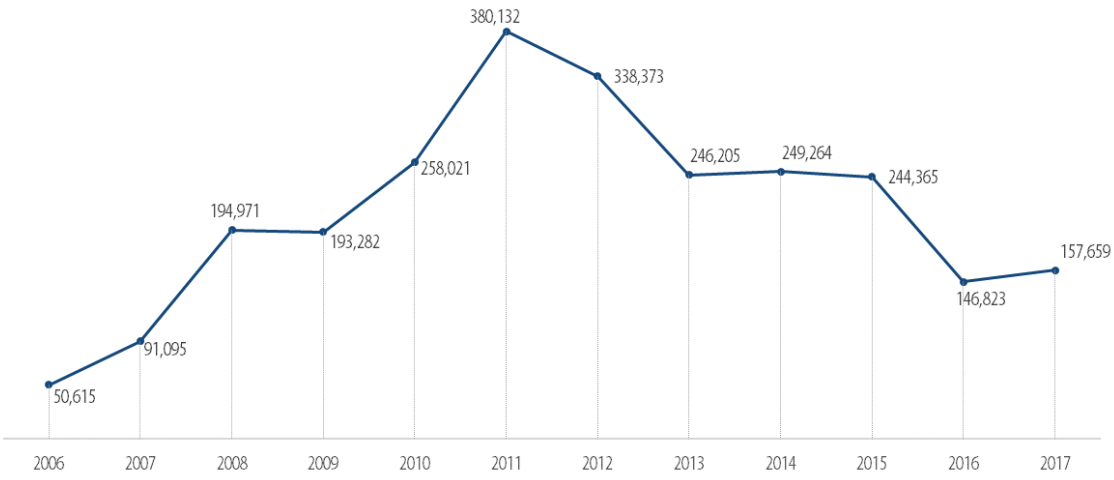


Chart 10. Quantity of bicycles imported – 2006 to 2017.

Source: SECEX/MDIC.

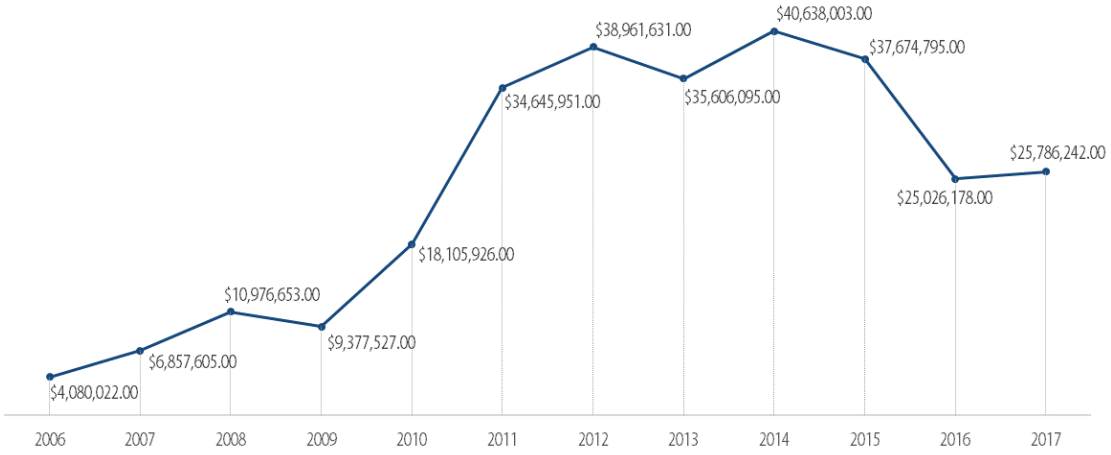


Chart 11. Total nominal value of bicycles imported – 2006 to 2017 (in US$)

Source: SECEX/MDIC.

In parts and accessories, more than US $ 185.9 million were imported in 2017, corresponding to the value of 35.1 million units imported. Between 2006 and 2016, the country imported more than 329.4 million units, which means more than US $ 1.7 billion dollars. It is worth noting that, shortly after 2011, there is a significant decrease in the number of imported bicycles. This decrease may be due to the increase in the import tax rate that occurred in that year, when it increased from 20 to 35%.

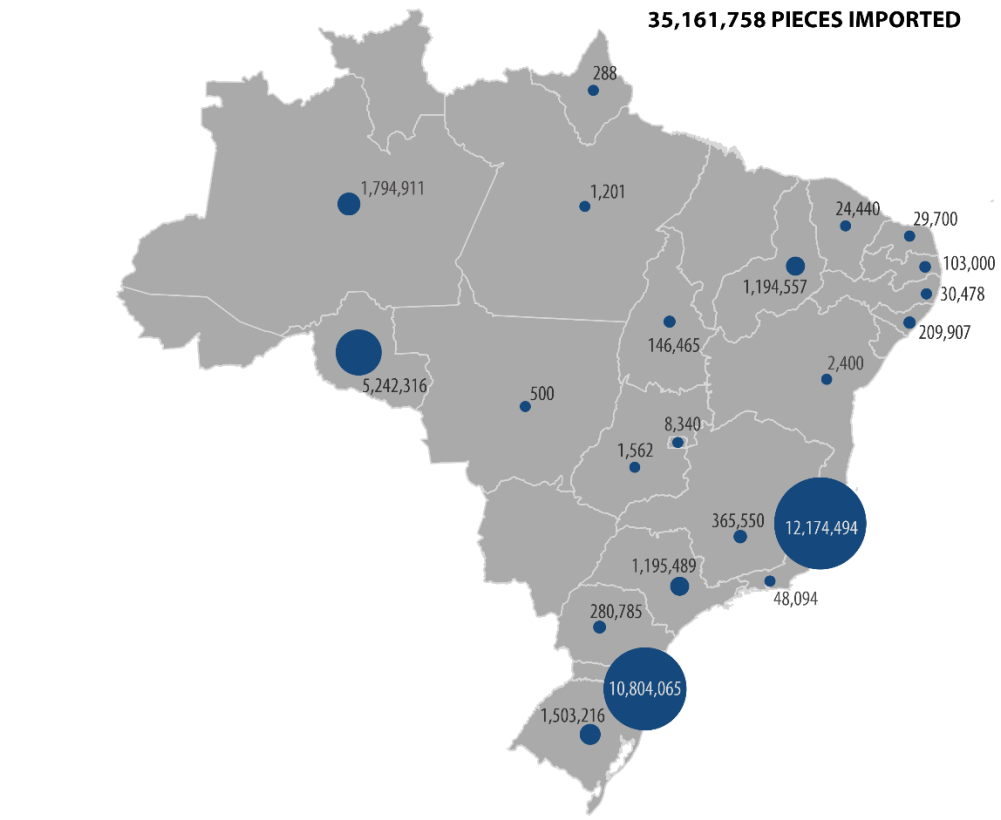


Figure 11. Number of pieces imported by state – 2017

Source: SECEX/MDIC

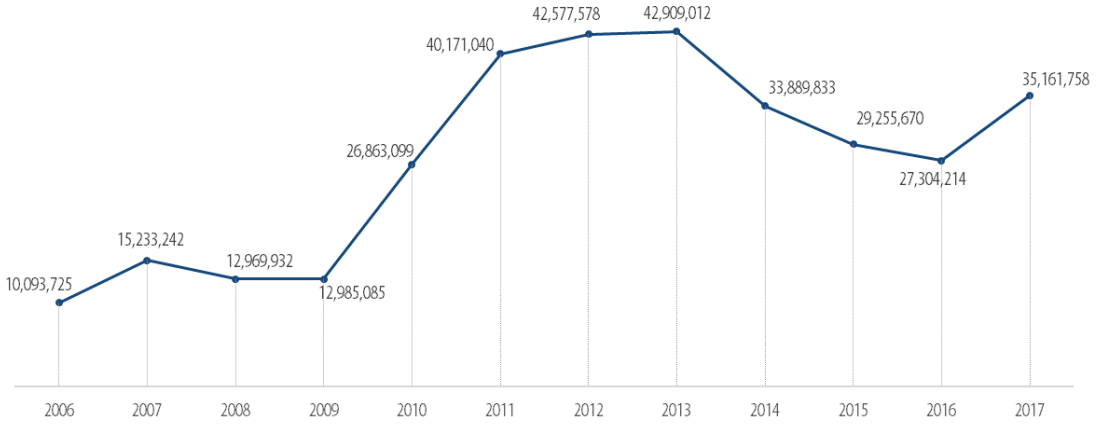


Chart 12. Quantity of pieces and accessories imported – 2006 to 2017

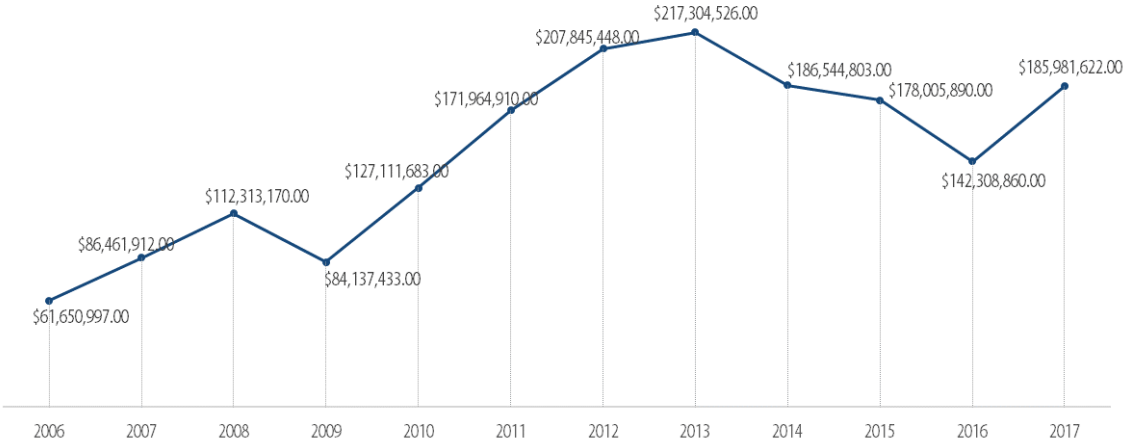


Chart 13. Total value of pieces and accessories imported – 2006 to 2017 (in US$).

Source: SECEX/MDIC.

Unit of Federation	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Acre	-	-	-	-	-	90	-	-	-	-	-	-
Amapá	1,772	9,885	1,900	1,353	2,587	1,216	-	1,634	289	678	192	409
Amazonas	5,554	1,465	4,930	6,449	14,524	20,463	14,951	8,574	5,602	2,042	70	1,334
Pará	-	-	-	5	478	2,880	706	267	13	3	-	-
Rondônia	1,790	1,061	739	646	3,786	6,376	7,257	3,408	1,746	2,165	11,894	13,172
Roraima	-	-	-	-	370	-	-	-	-	-	-	-
Tocantins	-	-	-	-	-	-	340	-	-	-	131	197
Alagoas	-	300	-	-	-	-	3,712	406	10,224	11,816	15,390	11,572
Bahia	-	-	1	6	3	1	-	1	88	29	-	-
Ceará	4	3	-	437	2,988	470	1,369	1,436	-	10	31	1,362
Maranhão	-	-	-	-	-	-	-	2	-	-	-	-
Paraíba	-	-	3	661	2	5,596	1,648	75	-	-	-	-
Pernambuco	818	319	310	-	6	834	1,743	2,111	5,875	314	772	1,934
Piauí	-	-	-	-	-	719	-	5	-	-	2	21
Rio Grande do Norte	-	-	-	-	3,352	-	-	1	-	-	2	-
Distrito Federal	1	278	-	-	-	1,461	4	3	1	-	3	19
Goiás	76	-	1	34	-	-	47	2,324	1,200	-	32	-
Mato Grosso	-	-	11	493	-	1,473	2,483	1,422	1,920	316	215	641
Mato Grosso do Sul	-	-	-	-	-	-	-	6,406	282	-	-	-
Espírito Santo	24,335	53,150	68,968	28,515	46,544	50,229	55,069	33,818	30,322	28,210	17,640	20,597
Minas Gerais	154	612	3,330	971	877	421	8,883	9,643	21,853	37,989	51,294	22,444

Unit of Federation	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Rio de Janeiro	288	1,473	2,457	3,352	6,224	15,091	18,569	6,523	7,479	4,088	1,461	16,725
São Paulo	12,985	17,078	21,505	90,496	59,535	161,094	110,664	110,131	114,499	112,381	12,048	34,532
Paraná	2,204	1,971	6,974	6,160	3,962	10,746	9,098	13,310	7,288	7,014	4,865	3,175
Rio Grande do Sul	496	1,138	5,374	9,199	22,826	17,695	3,898	1,348	1,468	13,200	11,600	316
Santa Catarina	133	2,329	78,467	44,503	89,731	83,249	97,923	43,345	39,086	24,101	19,428	29,209

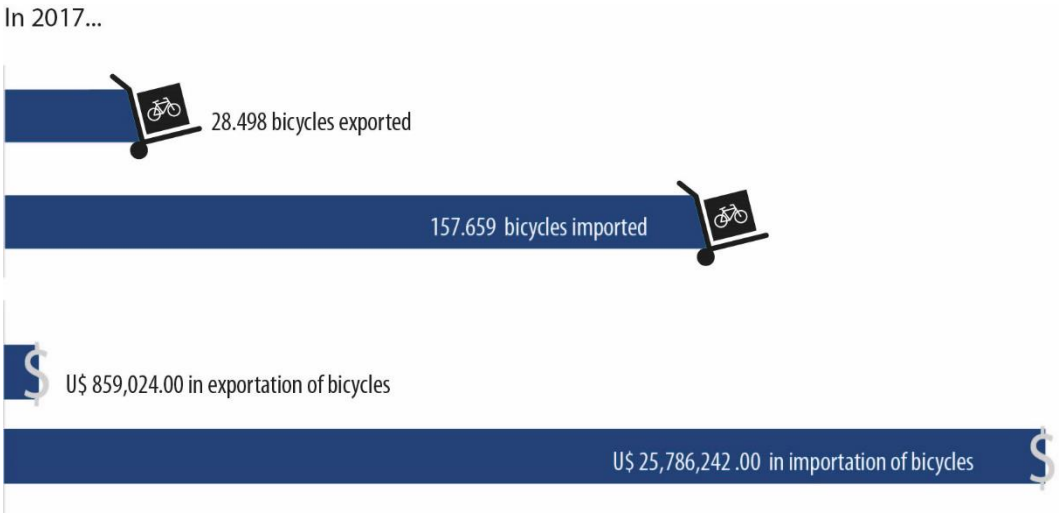
Table 1. Bicycles imported according to the Federative Units of the importer's headquarters (2006 to 2016).

Source: SECEX/MDIC

Unit of Federation	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Amazonas	40	-	-	363	2,520	31	58	71	6	16	68	107
Bahia	4	-	-	-	-	-	-	-	-	-	-	-
Ceará	4	-	16	-	-	-	-	-	-	-	-	-
Espírito Santo	-	-	-	-	-	-	-	-	-	-	2	1
Goiás	-	-	2	2	-	-	-	-	-	-	-	15
Mato Grosso	-	-	-	5	23	24	-	-	4	-	-	30
Minas Gerais	-	-	100	41	-	30	-	-	-	-	-	14
Paraná	-	-	4	-	6	43	2	121	433	1,467	778	632
Pernambuco	-	-	-	14	-	-	-	-	2	1	-	1
Piauí	-	-	-	44	54	160	250	-	230	-	-	660
Rio de Janeiro	-	-	8	10	-	-	14	4	-	20	-	1
Rio Grande do Sul	13	3	4	-	-	-	521	8	4	-	3	-
Rondônia	-	-	-	-	1	-	-	38	-	30	18	-
Roraima	-	-	-	-	-	38	-	-	-	-	-	-
Santa Catarina	5,727	10,934	13,221	4,409	6,186	1,510	2,074	5,136	3,585	4,070	3,936	8,113
São Paulo	27,762	8,716	2,409	2,219	1,547	564	462	104	350	1,007	3,134	18,918
Nationalized Merchandised	-	-	-	-	-	-	-	-	1	1	11	-
Consumption	30	27	5	7	6	5	-	1	-	1	473	-

Table 2. Bicycles exported according to the Federative Units of the importer's headquarters (2006 to 2016)

Source: SECEX/MDIC



Countries	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Argentina	-	-	-	-	-	1,585	-	-	-	-	-	-
Camboja	-	-	-	-	-	1,482	4,165	9,047	3,239	1,132	1,538	-
China	35,972	70,652	174,245	169,453	229,523	340,460	295,542	201,131	213,272	218,736	126,472	134,248
Taiwan	10,715	14,217	16,130	17,319	19,056	28,118	30,631	28,799	24,283	19,208	11,013	11,353
United States	-	-	2,181	1,482	1,466	-	-	1,123	-	1,087	-	-
Indonesia	-	2,705	1,482	2,410	-	2,331	2,154	-	-	-	-	-
Hong Kong	570	-	-	-	1,433	-	-	-	3,013	-	1,643	-
Paraguay	480	770	-	-	-	-	-	-	-	-	-	-
Portugal	-	-	-	1,086	1,634	-	-	2,029	1,153	947	3,918	3,592
India	-	721	-	-	-	-	-	-	-	-	-	-
Italy	-	-	241	-	-	-	1,053	-	-	-	-	-
Uruguay	1,584	-	-	-	-	-	-	-	-	-	-	-

Table 3. Bicycles imported according to the five main countries of origin in each year (2006 to 2016).

Source: SECEX/MDIC.

Countries	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Angola	3,982	3,402	3,354	-	3,749	106	516	34	-	-	-	660
Argentina	7,100	-	-	-	-	-	-	-	-	-	-	-
Bangladesh	-	-	-	-	-	-	-	-	-	-	473	-
Bolivia	-	-	-	-	100	319	242	173	124	1,193	2,962	2,875
Canada	-	-	-	-	-	-	-	-	-	-	13	-
Chile	6,439	4,600	2,304	2,400	-	-	-	-	210	800	-	-
Colombia	-	-	-	-	5	-	-	-	-	-	-	-
Spain	-	-	-	40	-	-	-	-	-	-	-	-

United States	-	-	-	14	-	-	-	-	-	-	-	-
Guiana	-	-	-	-	-	38	-	-	-	-	-	-
Mexico	-	-	-	-	-	-	-	-	-	-	-	300
Mozambique	-	-	-	-	-	-	10	-	25	-	-	-
Paraguay	8,606	5,819	5,531	46	488	403	855	2,297	2,551	2,960	4,192	22,683
Peru	-	-	-	-	-	-	-	-	-	121	-	-
Poland	-	1,440	-	-	-	-	-	-	-	-	-	-
Uruguay	5,424	3,142	4,348	2,009	6,000	1,508	1,506	1,629	1,704	1,500	778	1,672
Venezuela	-	-	101	-	-	-	-	1,600	-	-	-	-

Table 4. Bicycles exported according to the five main countries of destination in each year (2006 to 2016).

Source: SECEX/MDIC.

3.3 COMMERCIALIZATION

Commercialization includes the activities related to the sale of bicycles and accessories, either for resale establishments or for the final consumer, being represented by two sub-topics: *Wholesale* e *Retail Trade*[5]. The data was obtained through the systematization of the RAIS / MTE microdata.

3.3.1 WHOLESALE TRADE

Regarding the wholesale trade in bicycles, parts and accessories, that is, those responsible for large-scale commercialization, making contact between producers and the retail trade, it is important to note that it is not distributed in the same way for the national territory, assuming a configuration more concentrated. Moreover, given the very nature of the activity, the number of establishments is much smaller than in the

[5] 4649403 - Wholesale Bicycles, Tricycles and Other Recreation Vehicles; 4763603 - Retail Bikes and Trims.

retail trade, as we will see later. By 2016, Brazil had 269 establishments of this branch, employing 3,203 people.

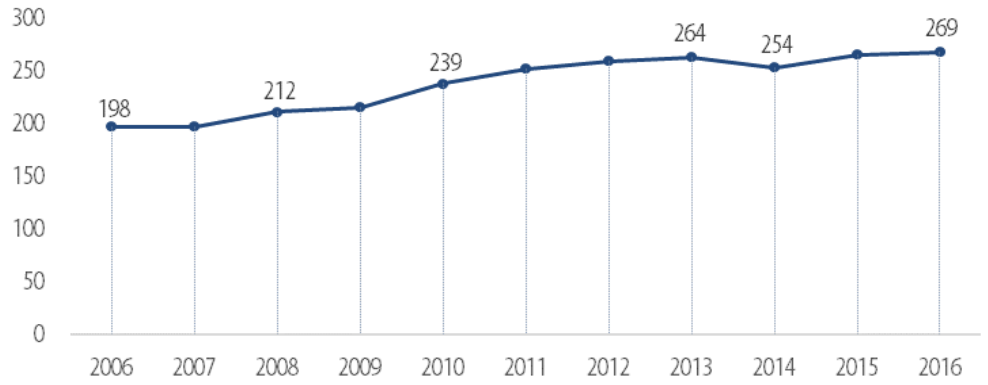


Chart 14. Wholesale trade establishments in Brazil – 2006 to 2016

Source: RAIS/MTE.

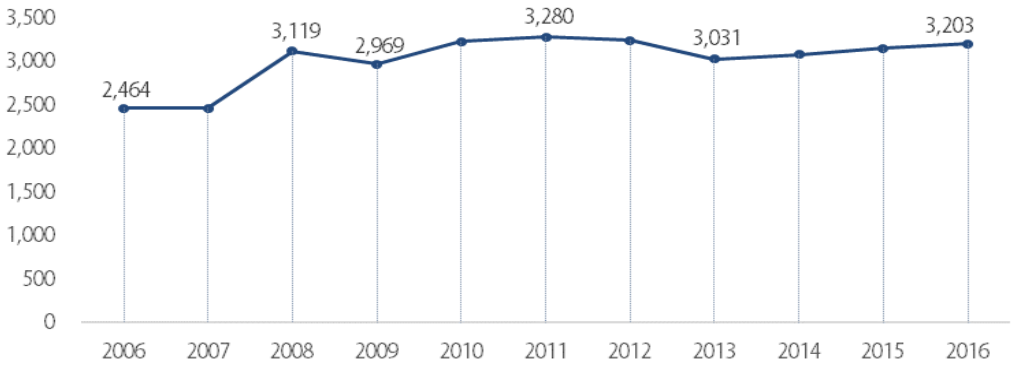


Chart 15. Number of Jobs in wholesale trade – 2006 to 2016.

Source: RAIS/MTE.

The state of São Paulo concentrates the largest number of establishments in the wholesale branch, as you can see in the map below. Of the 269 establishments in this sector in the country, 77 are in this state. It is interesting to note that the wholesale trade activity seems to follow the manufacturing branch. In the five cities with the largest number of establishments in the manufacturing sector, 17% of all wholesale establishments are located, while these same cities account for only 5% of retail establishments. It is important to remember that this same logic also applies to the location of jobs.

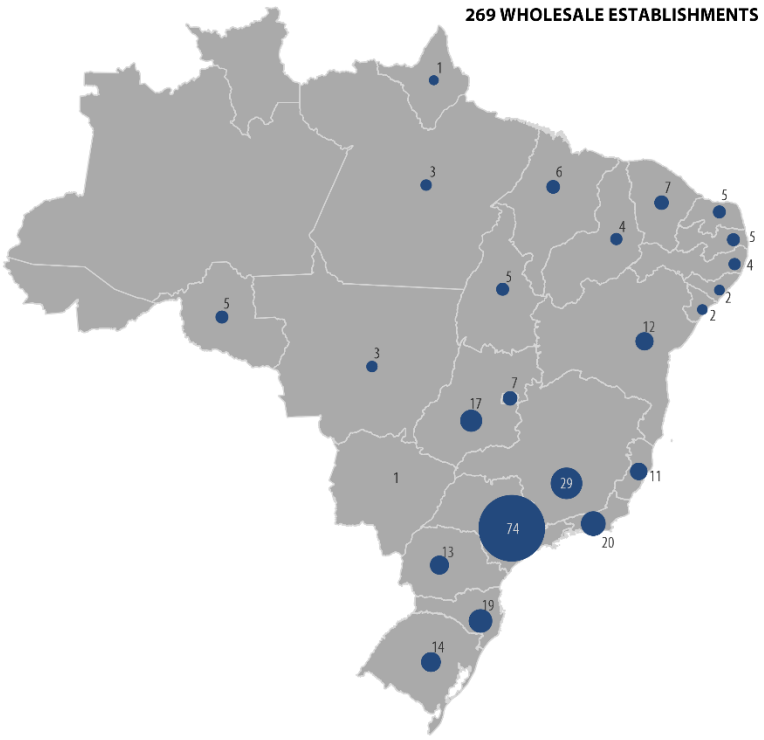


Figure 12. Wholesale establishments by state.

Source: RAIS/MTE.

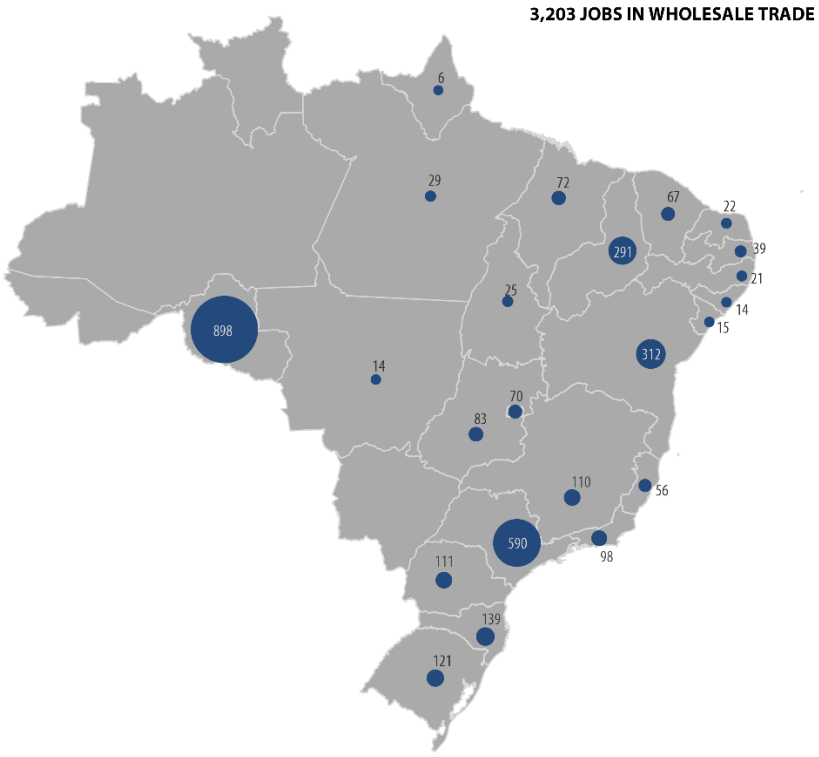
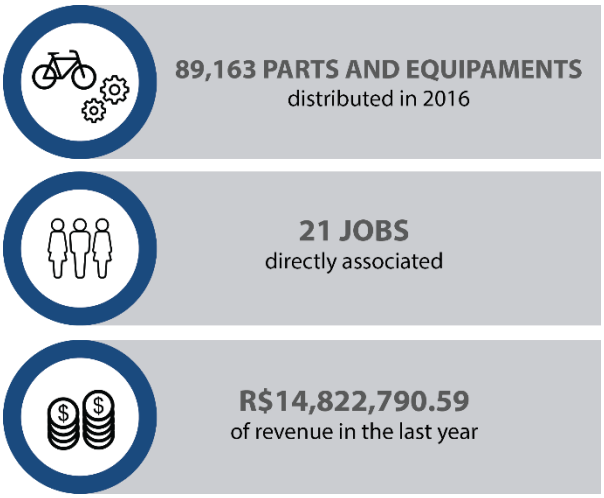


Figure 13. Jobs in wholesale trade by state.

Source: RAIS/MTE.

In the bicycle production chain, wholesale trade plays a fundamental role in the distribution, allowing the connection between the manufacturer and the final seller of the product. Through information collected at a branch company located in the State of São Paulo and acting at the national level, we find elements to better characterize this activity. This company operates distributing bicycles, parts and equipment related to retail establishments in different states. In the year 2016, 89,163 pieces or equipment associated with the bicycle were distributed, generating a revenue of R$ 14,822,790.59 in this period. In addition, to carry out such activity, the company has 21 people employed in the distribution sector.



3.3.2 RETAIL TRADE

The retail trade of bicycles, parts and accessories is an important sector of the production chain. In fact, it is the activity related to the bicycle that has the largest number of establishments and jobs. In addition, it is the activity that presents itself in a more fragmented way throughout the national territory, being present in all the Units of the Federation and in most of the municipalities. By 2016, Brazil had 5,689 establishments in the retail sector, which, in turn, employed 13,783 people. Comparing these results with those of previous years, there is little variation, indicating a certain stability in this activity in the country. Nonetheless, there has been a slight downward trend since 2011, when the number of jobs reached 15,000, the highest amount in recorded history, which covers the years between 2006 and 2016.

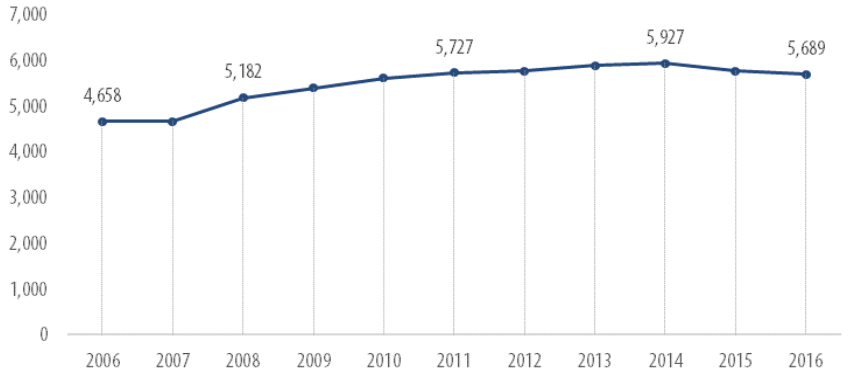


Chart 16. Number of retail bicycle shops - 2006 to 2016

Source: RAIS/MTE.

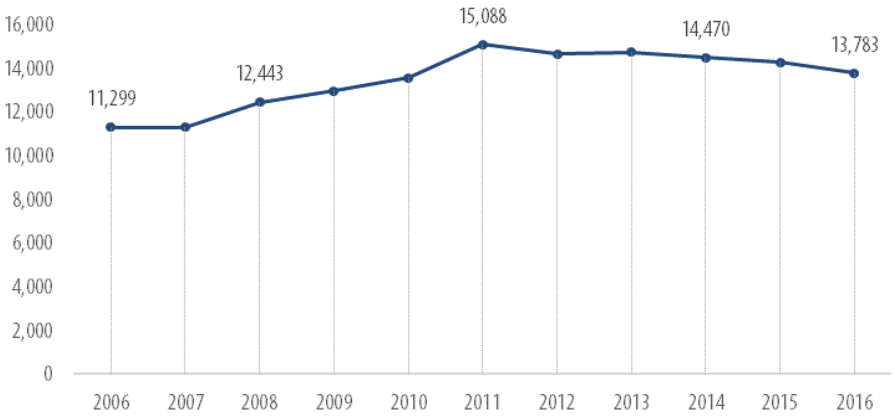


Chart 17. Number of jobs in the retail trade - 2006 to 2016

Source: RAIS/MTE.

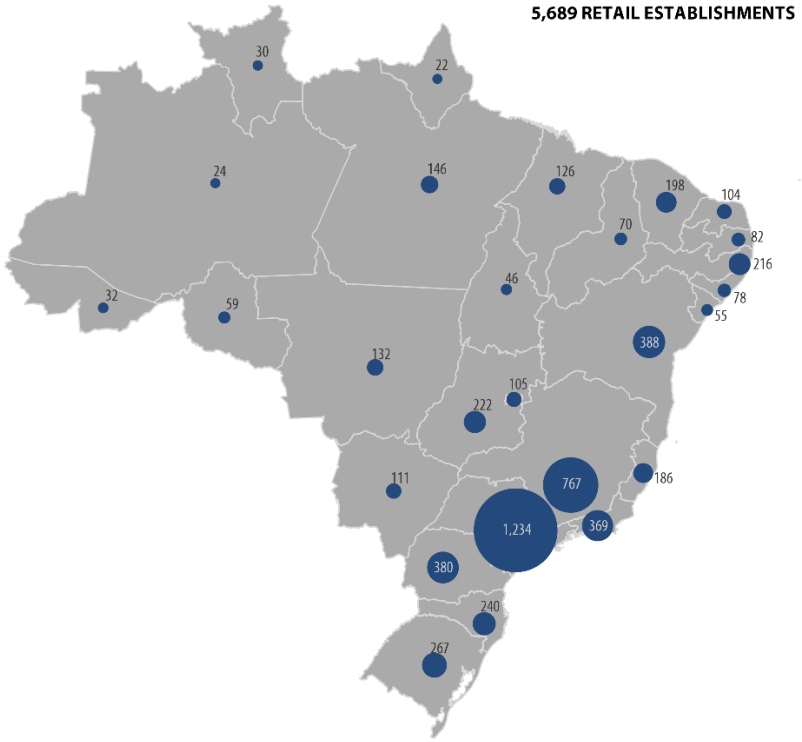


Figure 14. Number of retail establishments by state

Source: RAIS/MTE.

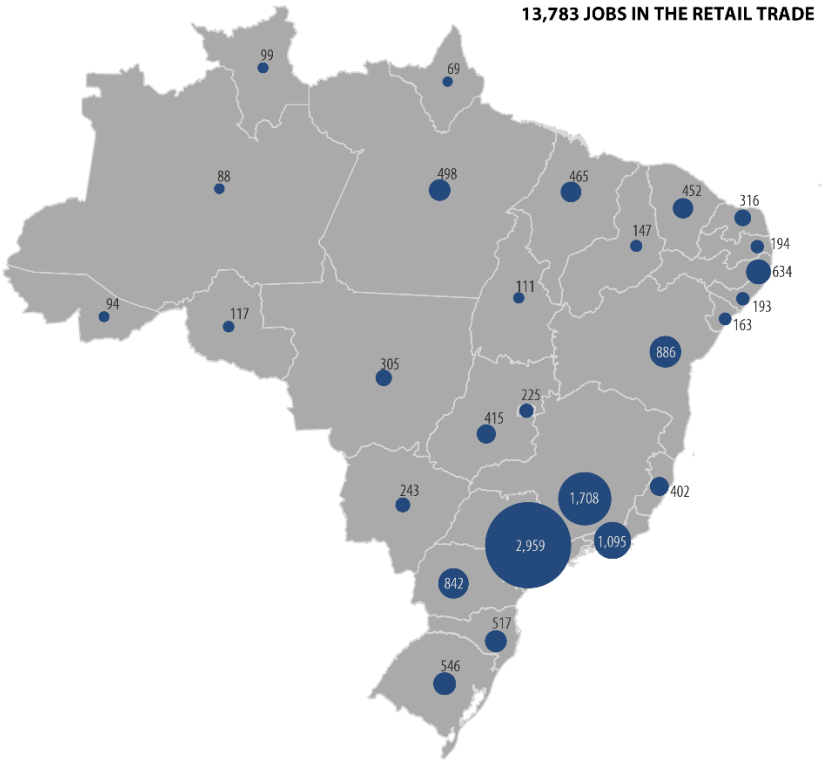


Figure 15. Number of jobs in the retail trade by state

Source: RAIS/MTE.

Most enterprises and jobs are in the state of São Paulo, as can be seen in the figure below. Of the little more than 5 thousand establishments, 1,234 are in this state. This is reflected, obviously, in the location of employment, with São Paulo concentrating 21% of the 13 thousand people employed in the retail trade

The average remuneration in the retail trade of bicycles, parts and accessories in 2016 was R$ 1,245.00, and the total wage bill in 2016 totaled R$ 205,998,144. The highest income was recorded in the state of Santa Catarina, where the average retail trade in December 2016 was R$ 1,540.47. The largest amount in terms of salary mass, due to the concentration of enterprises in this state, was registered in São Paulo, where it reached the mark of R$ 51,507,591.72, which represents 25% of the total salary mass in this branch of trade in the country.

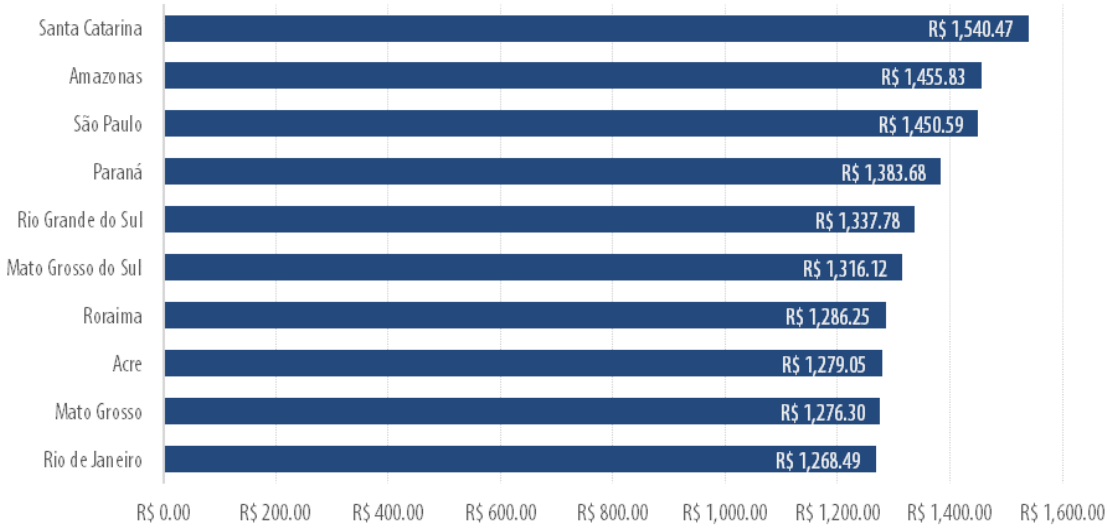


Chart 18. The ten States with the highest average wage in retail trade.

Source: RAIS/MTE.

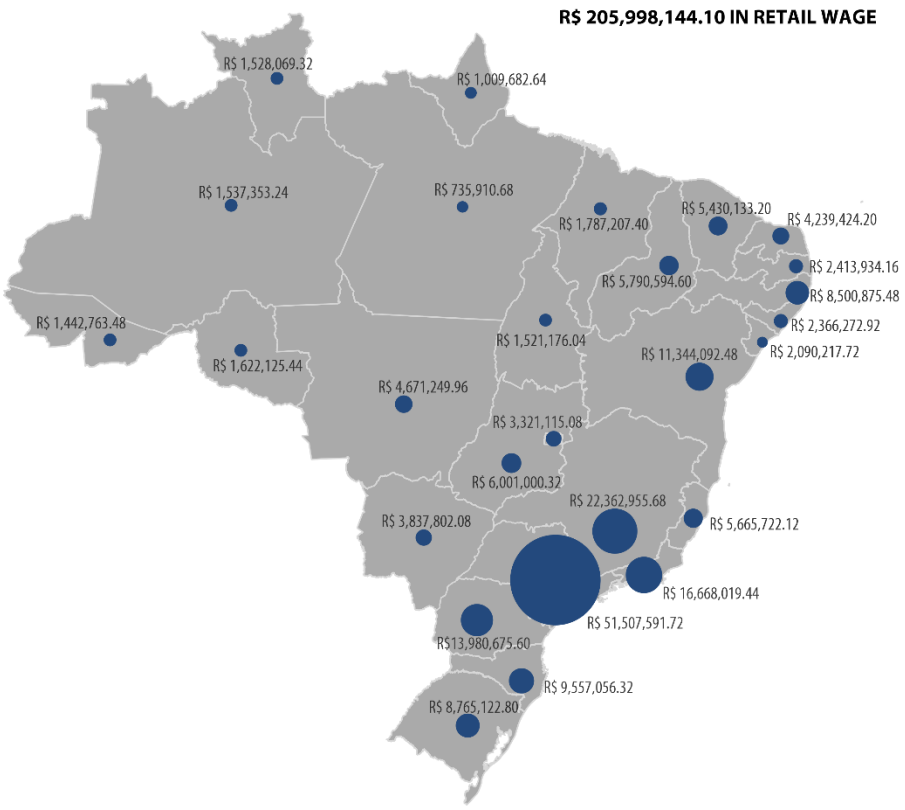


Figure 16. Retail wage volume by states in 2016.

Source: RAIS/MTE.

a) Characterization of Retail Trade

In addition to the surveys conducted at the RAIS base, a survey was carried out with retail stores of bicycles, components and bicycle accessories to characterize Bicycle Trade. The structured questionnaire was directed to bicycles and bike shops through e-mail. Data were collected between September 28 and October 23, 2017. In all, 138 stores, in 18 Federative Units, completed the online form, providing important information for the characterization of the retail industry in Brazil.

The state of São Paulo concentrates 54% of the respondents. The others, which are distributed among the other 17, are more present in Minas Gerais (5.8%), Rio Grande do Sul, Bahia and Santa Catarina (4.4% each) and Rio de Janeiro, Paraná, Pernambuco and Espírito Santo (3.6% each). The others are distributed between Ceará, Federal District, Goiás, Mato Grosso, Pernambuco and Rondônia.

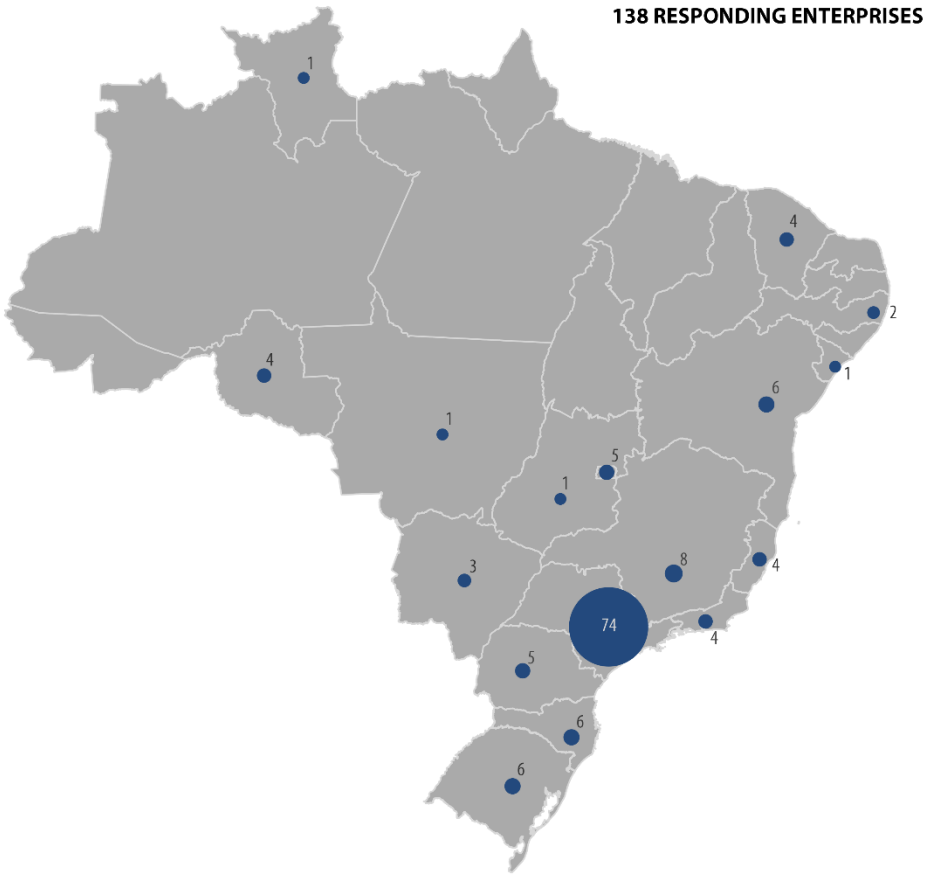


Figure 17. Enterprises responding to the questionnaire per unit of the Federation

The survey showed that the average turnover of this type of enterprise in Brazil is R$ 796,031.13. Of these, 22% have revenues between R$ 50 thousand and R$ 200 thousand. Another 20% has revenues between R$ 200 thousand and R$ 500 thousand. Only 1% of these establishments have revenues more than R$ 10 million[6].

[6] 14% of enterprises did not answer this question.

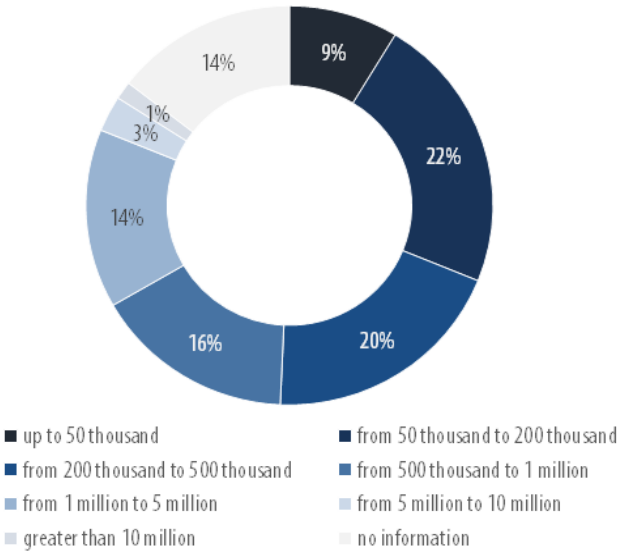


Chart 19. Enterprises responding to the questionnaires by billing range.

In 36% of retail enterprises, the period of activity is in the range of 10 to 30 years. Another 13% have been in the market for over 30 years. It is noteworthy, however, that 18% have been in operation for less than two years.

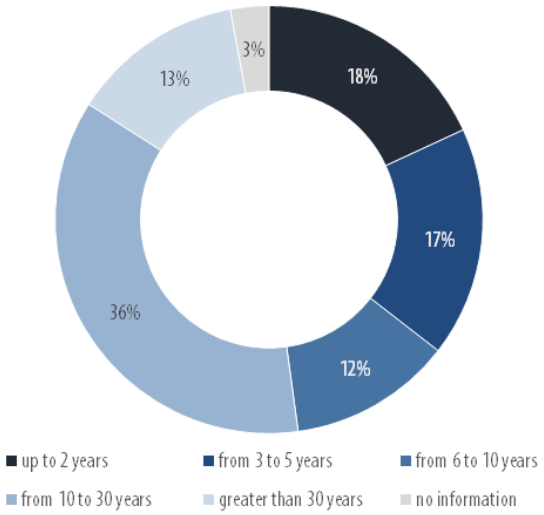


Chart 20. Enterprises with reference to period of activity.

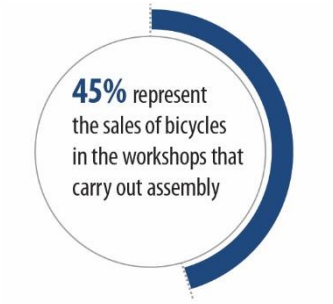
It is interesting to note that 76.8% of the interviewed bike shops have up to five (05) employees, with 22.4% of them having only one (01). One of the main characteristics of this branch is precisely the tendency to be configured in smaller commercial establishments. The average number of employees, which is 4.9 employees per

establishment, reinforces this characteristic of the retail bicycle business in Brazil. In addition, 83.3% of these enterprises reported being eligible for the SIMPLES tax regime.

Important information collected through this survey refers to the assembly of bicycles. It is known that many retail establishments, in addition to selling parts and performing repairs, also carry out the assembly of bicycles for sale. Of respondent bike shops, 67.4% stated that they performed this type of activity. This is relevant because it indicates and reinforces the suspicion that a large part of the national production of bicycles happens in small establishments whose main activity is the retail, constituting, therefore, a production not counted by the official statistics. Therefore, we can say that the number of bicycles produced in Brazil is higher than the 5,178,356 units reported by the PIA / IBGE. In addition, the fact that many of these bike shops provide the repair service indicates that this activity may be undersized by RAIS / MTE.

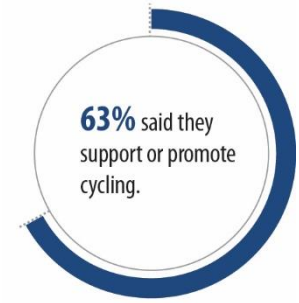
The results also show that in the interviewed bike shops, the average number of bicycles sold per month is around 58 units. It is interesting to note that, in those where the assembly is carried out, the average is slightly higher, from 59 units / month, against 55 units / month. Likewise, the establishments that work with assembly register a greater participation of the sale of bicycles in the total revenue. In these, on average, the sale of bicycle reaches 45% of sales, while, in those where there is no assembly, this percentage represents 41%[7].

[7] The sample includes only retail stores of bicycles, components and bicycle accessories. Magazines, markets, and department stores were not included in this survey.



Research with retailers also reveals that 90% of them perform repair services. In addition, 15% of the retail establishments also perform a rental service, showing once again how these activities are intertwined.

Finally, it is important to highlight the importance of this activity for the promotion of mobility by bicycle at the local level. Of all the workshops interviewed, 67% of them said they supported or promoted cycling. For example, night pedal groups.



3.4 REPAIRS

Another important branch of services related to the bicycle is the activity of Repairs. In Brazil, in all, in 2016, there were 399 enterprises and 641 jobs, according to RAIS

/ MTE data[8]. It is worth noting that, unlike commerce and mainly manufacturing, the *Repairs* business proportionally generates fewer jobs. On average, each establishment has 1.6 employees, while in manufacturing and retail the average is 23.4 and 2.4, respectively.

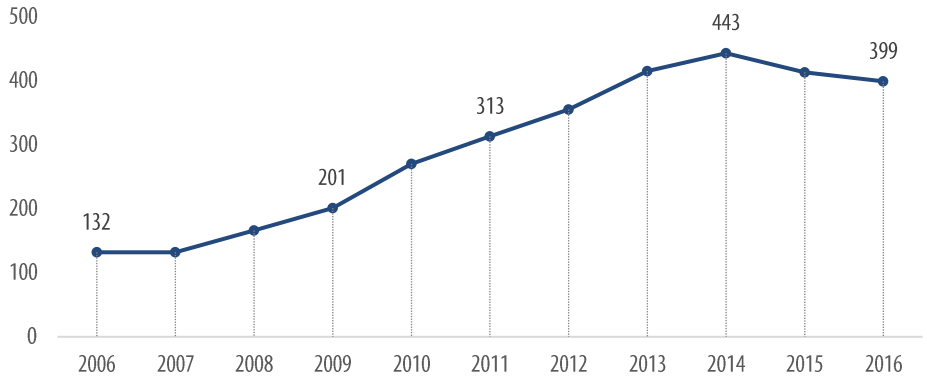


Chart 21. Number of bicycle repair shops in Brazil - 2006 to 2016

Source: RAIS/MTE.

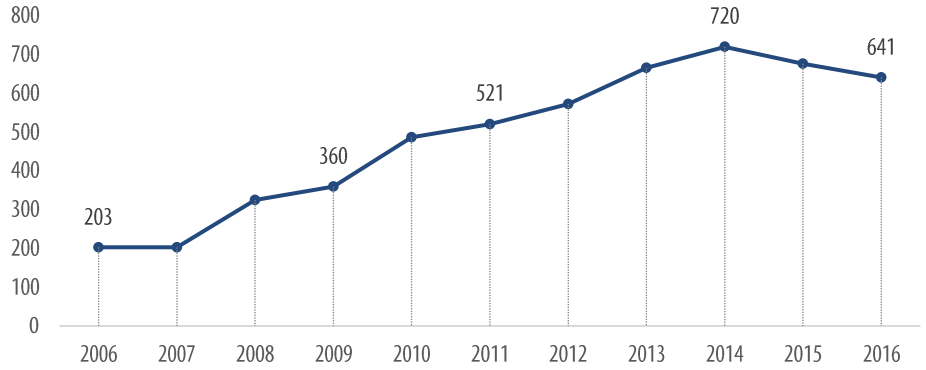


Chart 22. Number of jobs in the repair sector - 2006 to 2016.

Source: RAIS/MTE.

Although in a smaller amount compared to other services, bicycle repair is present in practically all the Units of the Federation, and the largest number, 107, is in the state of São Paulo. It is worth mentioning that the repair service is also performed by many

[8] 9529104 – Code CNAE Repair of Bicycles, Tricycles and Other Non-Motorized Vehicles.

establishments whose main activity is declared as sales. According to the survey conducted among retail stores, 76% were said to carry out repair services.

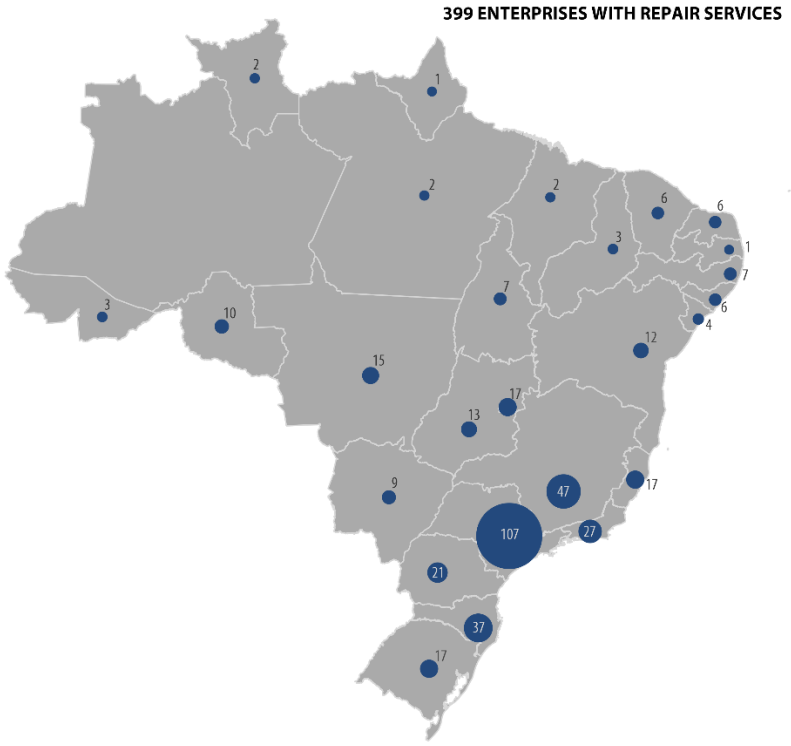


Figure 18. Number of enterprises with repair services by state.

Source: RAIS/MTE.

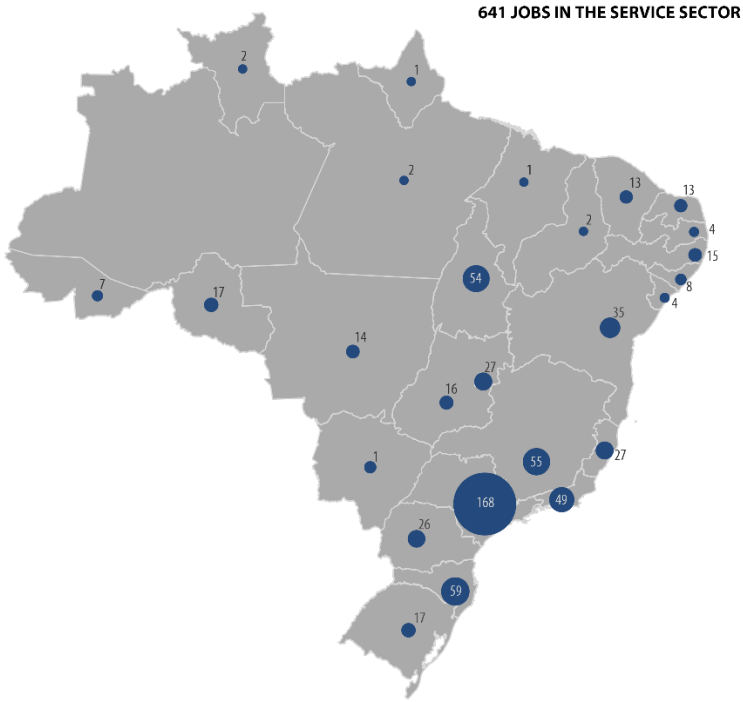


Figure 19. Number of jobs in the repair service by state.

Source: RAIS/MTE.

3.5 RENTAL

Rental corresponds to the leasing activity performed by companies specializing in temporary private use. Mainly but not only in tourism and leisure purposes. In this study, companies were considered that rent individual bicycles, without being bound to collective tours, tour packages and even to the public service of shared bicycles, the latter being treated with greater exclusivity in the homonymous topic within the dimension Public Policies (Chapter 4).

As a way of measuring the economic impact of the Rental activity, indicators were established that could comprehensively cover the amounts handled (revenue, main costs, etc.), as well as indirect impacts, such as the number of jobs generated. In this way, the following indicators were used, separated according to the methodology used: *Number of rental companies; Average number of rents / year; Amount charged per rental (R$); Average amount invested in maintenance / year (R$); Total revenue in rents / year (R$); Number of jobs generated.*

With the objective of constructing a national panorama, the idea was to obtain the total number of rental companies that currently exist in Brazil through an estimate. It was possible to identify in which sector of economic activity the bicycle rental service is located, although it was not possible to obtain disaggregated data on this activity. The activities registered under the code CNAE 77.21-7 (Rental of recreational and sports equipment), as well as the rental of bicycles, include, for example, the rental of leisure boats, canoes and sailing boats, or the rental of tables of billiards[9]. It was therefore found that, because of the nature of the classification of the activity, it is data incapable of satisfying the objectives of this study, although we have used two RAIS / MTE data for this branch in order to estimate some values.

In this sense, in order to obtain information on this subject, it was decided to carry out a survey with companies identified through the Internet and through the collaboration of industry partners. Thus, an initial mapping was carried out, identifying the

[9] In 2016, according to RAIS / MET data, Brazil had 886 enterprises that provided the service of renting recreational and sports equipment, where 2,621 people were employed. The salary paid in this activity, in that year, totaled R$ 41,023,662.24.

companies that offer such service in Brazilian capitals in order to obtain a national panorama of the offer of bicycle rentals.

The data regarding the economic impact of the activity were obtained through the application of an online form filled out by a person in charge of the company. Seeking to avoid obtaining values of a very particular reality, different rental companies were driven for comparison purposes and greater precision of the analysis. The values presented correspond to the responses obtained from the companies until the end of this study.

In the mapping carried out, it was noticed that the cities of Rio de Janeiro and São Paulo concentrate the largest number of rental companies. A total of 99 enterprises were identified, operating in all Brazilian capitals, except Rio Branco, Porto Velho and Goiânia, where no companies were identified that provided this type of service. Demonstrating the strong relationship with the tourism sector (excluding the cities of São Paulo and Brasília) there is a greater offer for this activity, mainly in the coastal cities, related to waterfront walks.

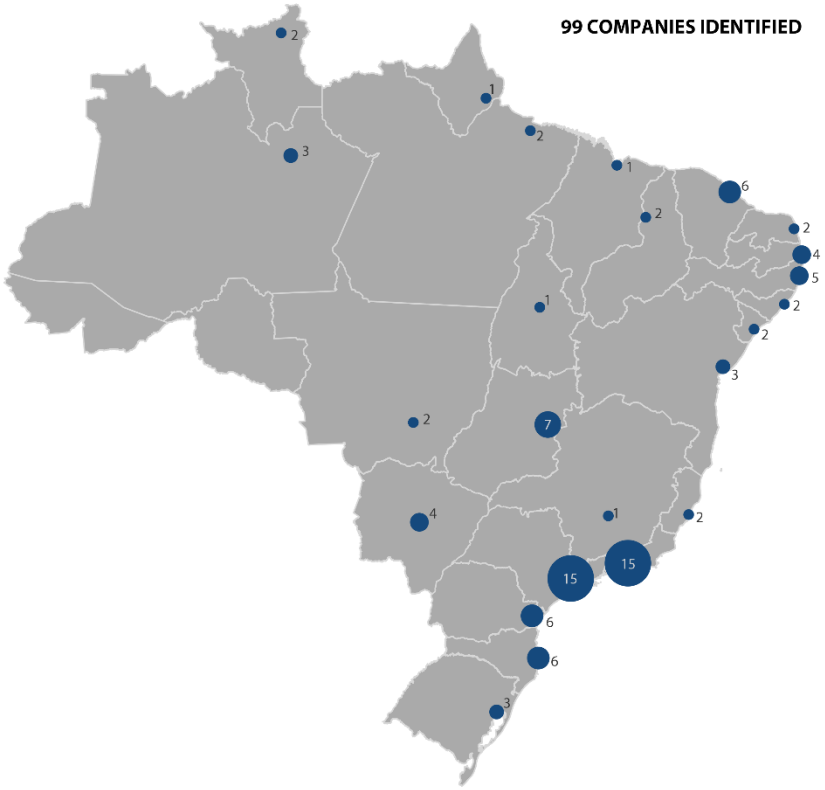
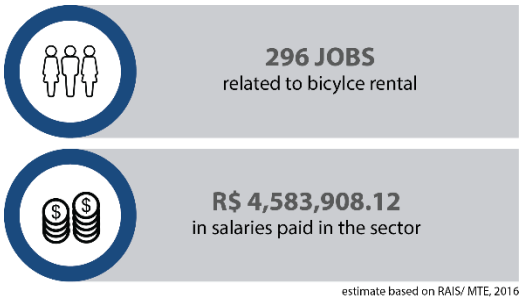


Figure 20. Bicycle rental companies identified by state.

Source: RAIS/MTE.

These 99 establishments represent 11% of those 886 in the recreational and sports equipment rental sector. Even though we are aware of the risks of inaccuracy, we use this percentage to estimate both the number of jobs and the wage bill. Considering these parameters, in 2016, Brazil would have approximately 296 people employed in the activity of renting bicycles, with a total salary mass of R$ 4,583,908.12.



In the case of Rio de Janeiro, where the largest number of companies have been found, we can observe a trend of concentration on the edge of the South Zone of the city, where the beaches with the greatest tourist appeal are located, possessing better cycle route infrastructure.

Another important piece of data singled out in this theme is related to the profile of the companies that perform the rental service. Most companies do not rent as a single activity, combining it with bicycle sales and repair services or tourist agency services. This is the case of companies in the retail industry. Of the shopkeepers interviewed in the role of retailers, around 15% stated that they rent their bicycles in their establishments.

Some companies also carry out the service in partnership with hotel chains, which may occur through the recommendation of the store, where the guest gains some type of advantage in the lease (reduction of value or less exigency of guarantees) or availability of the bicycle for guests directly at the hotel.

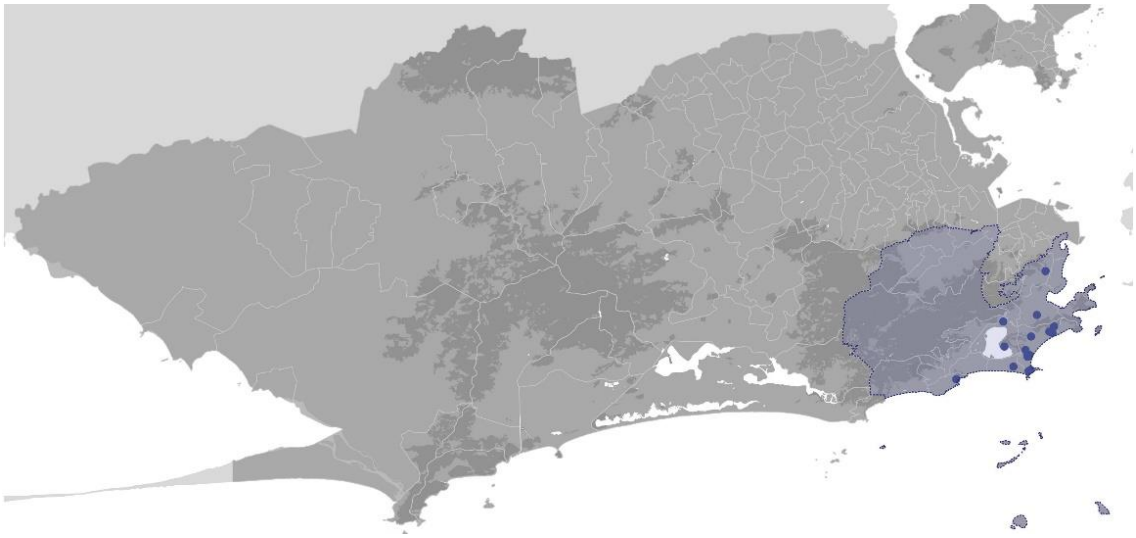


Figure 21. Distribution of bicycle rental companies in Rio de Janeiro

To better understand the nature of this activity, we applied an online questionnaire to a company that leases bicycles in partner hotels and in its own store in the Copacabana neighborhood, in the city of Rio de Janeiro.

The responses showed that the company rents an average of 180 bicycles per year, with approximately 15 rents per month, most of which are for groups of tourists. The amount charged for the rent is $ 15.00 for the period of one hour oR$ 70.00 for eight hours of rental, which is considered as a daily rate. The total revenue, on average, in rents per year is R$ 5,400. According to the company's manager, the maintenance value of the bicycles was not given because, with the current demand for the service, there is little need for maintenance of the bicycles which makes this value insignificant in the company budget.

It was also shown that the service has been used by the company for only two years and was driven by the Olympics based in Rio de Janeiro in 2016. At the occasion of the event, the value of rents was much higher than the average observed in the subsequent period. As a result, it is noticed that the economic movement of the activity is very related to the tourist flow.

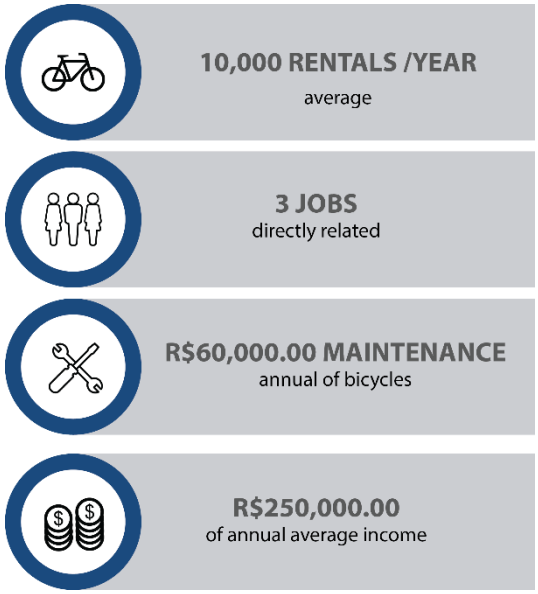
In the specific case analyzed, rent revenue corresponds to a low percentage of the company's total revenue, since rent is not the main activity performed, whose focus is on the sale and repair of bicycles. The guarantees requested at the time of rental, such as the security deposit, effect the revenue generated by the activity. The collection of

very high values reduces the number of customers, while the facilities offered through partnerships with hotels favor the increase of revenue. However, renting through hotels increases the need and costs involved in maintaining bicycles.

Another company contacted carries out the specific service of renting for hotels in Rio de Janeiro. Although based in Santa Catarina, this company operates in Rio de Janeiro through hotel partnerships, offering rental services to guests and, therefore, focusing specifically on the tourist public. Currently, the service provided by the company is present in 20 hotels, located on the edge of the South Zone of the state capital.

The data obtained indicates that the company makes more than 10 thousand locations per year, gaining a revenue of R$ 250,000.00 in the last year with the service. In this case, the company is dedicated exclusively to the rental activity and has the participation of the partner hotels to publicize the service. As in the other case discussed, the amount charged by the lease is R$ 15.00 per hour, following the average value observed in the city.

To sustain the service, the company invests approximately R$ 60,000.00 annually, investing in the repair and maintenance of the 101 bicycles used. By providing this service, the company currently generates only three (03) direct jobs. However, the employees of the partner hotels also work in the activity and were not counted in the answers since they were not part of the exclusive work force of the rental service and besides, are being paid directly by the hotel and not by the enterprise concerned.



The third company whose information was obtained through the questionnaire is located in the city of Franca, in the state of São Paulo. In this case, it is a company totally dedicated to cycling, but its main activity is the sale and repair of bicycles and accessories, with the rental service as a complementary activity. In this organization, the rental of bicycles is more targeted to a specific public in this sector, working with models for road cycling, mountain biking, etc., differing from other cases, where rent predominates for urban and tourist use. The company operates in the sector since 2009, currently counting on two stores in the city of Franca. However, the rental service was started in 2016.

Through the online form, data showed an approximate average of 160 locations in this first year of service offer. The company offers leases at R$ 15.00 per hour or also at R$ 60.00 per day. Hence, the revenue of R$ 6,000.00 was obtained for the interval considered only with the rents. For the maintenance of the service, the approximate amount of R$ 400.00 per year has been spent, relatively low compared to the revenue generated.

4 PUBLIC POLICIES

The **Public Policies** section considers the economic participation of the bicycle from the way it is treated in the public sphere, either directly, or in the provision of cycle route infrastructure by the implantation of cycle paths, cycle parking lots and bike park racks, either indirectly or in the public bicycle sharing service. In addition, Public Policies may also involve investments by public authorities in the elaboration of plans, programs and campaigns related to the encouragement and promotion of bicycle use[10]. In this section, three themes are presented: *Circulation Infrastructure*, *Parking Infrastructure* and *Public Shared Bicycles System*.

4.1 CIRCULATION INFRASTRUCTURE

Circulation Infrastructure includes the activities involved in the provision and maintenance of cycling infrastructure for cycling, such as cycle paths, cycle lanes and cycle routes. This activity shows itself to be the direct responsibility of the public authority, especially of the municipal sphere. Through the data collected, it is also possible to observe the possible impact of the bicycle on the public budget and its economic participation as a mode of urban transport to be encouraged by the state. Thus, information related to the investment for the implantation of new cycle paths and reference values for the maintenance of the same, were searched, seeking to illustrate a panorama that encompasses a good part of the Brazilian cycle network according to the availability of the data.

The extension (in km) of the cycle network has as reference source, the article published by the **G1**[11] news portal in 2017, which indicated the network mileage present in each Brazilian capital. Although there are other cities in which the *Circulation Infrastructure* presents significant extension in mileage, this study only used capital cities as a methodological selection for the analysis.

[10] By dealing with investments in the technical staff and external consultants for its elaboration, it was noticed the difficulty in discriminating the values employed for these activities themselves given the fact that these values tend to be collected in the way they are made available to the public. In this sense, the Public Policy sector did not consider this thematic bias in the present work.

[11] G1 (2017). In 3 years, cycling more than doubles its size in the capitals of the country. Economy, Feb. 18 2017. Available at: <http://g1.globo.com/economia/noticia/em-3-anos-malha-cicloviaria-mais-que-dobra-de-tamanho-nas-capitais-do-pais.ghtml> Accessed on 16 Aug. 2017.

The data used sums up different classifications of *Circulation Infrastructure*, so that the total extension includes all the usable routes, whether they are actually bike paths, whether they are cycle paths, cycle routes and shared lanes. Given the unavailability of this data by classification for most capitals, the values made here may result in over or underestimates of the values measured by equating, in value, infrastructures that require different levels of complexity of road intervention – such as segregated bicycle paths and shared lanes.

In order to estimate the value used in the implementation of the cycle route network of the different capitals, we sought to obtain the average costs for the implementation of *Circulation Infrastructure* by region of Brazil. The data was obtained by means of varied sources where there was indication of the value used in the construction of cycle paths and their corresponding mileage. Accordingly, Official Gazettes, town hall web-sites and related news articles were consulted that were published in the mainstream press so that we could construct this comparative.

Region	Average cost per km of implanted routes (R$)
North	**210,000.00**
Northeast	**-**
Central-West	**-**
Southeast	**570,000.00**
South	**315,400.00**

Table 5. Average cost per km of implanted routes (R$).

Although the data found did not allow the calculation of the precise costs for the implantation of the cycle route network of each region, it was possible to determine an approximate average of the values. It is noted that the Southeast Region presents the highest costs per kilometer of track for cyclists.

REGION	CITY	CYCLE ROUTES IN Km	AVERAGE VALUE PER Km (R$)	TOTAL (R$)
North	**Belém**	**88.40**	**210,000.00**	**18,564,000.00**
North	**Boa Vista**	**35.00**	**210,000.00**	**7,350,000.00**

North	Macapá	11.90	210,000.00	2,499,000.00
North	Manaus	20.50	210,000.00	4,305,000.00
North	Palmas	19.50	210,000.00	4,095,000.00
North	Porto Velho	20.60	210,000.00	4,326,000.00
North	Rio Branco	178.30	210,000.00	37,443,000.00
Northeast	Aracaju	67.00	330,000.00	22,110,000.00
Northeast	Fortaleza	204.60	330,000.00	67,518,000.00
Northeast	João Pessoa	40.70	330,000.00	13,431,000.00
Northeast	Maceió	42.10	330,000.00	13,893,000.00
Northeast	Natal	32.00	330,000.00	10,560,000.00
Northeast	Recife	41.70	330,000.00	13,761,000.00
Northeast	Salvador	145.10	330,000.00	47,883,000.00
Northeast	São Luís	18.00	330,000.00	5,940,000.00
Northeast	Teresina	41.90	330,000.00	13,827,000.00
Central-West	Brasília	420.10	320,000.00	134,432,000.00
Central-West	Campo Grande	89.70	320,000.00	28,704,000.00
Central-West	Cuiabá	39.90	320,000.00	12,768,000.00
Central-West	Goiânia	84.20	320,000.00	26,944,000.00
Southeast	Belo Horizonte	87.40	575,000.00	50,255,000.00
Southeast	Rio de Janeiro	441.10	575,000.00	253,632,500.00
Southeast	São Paulo	498.40	575,000.00	286,580,000.00
Southeast	Vitória	48.20	575,000.00	27,715,000.00
South	Curitiba	204.20	315,400.00	64,404,680.00
South	Florianópolis	41.00	315,400.00	12,931,400.00
South	Porto Alegre	47.00	315,400.00	14,823,800.00
BRASIL		3,008.50	332,081.48	1,200,695,380.00

Table 6. Investment in the implementation of the Circulation Infrastructure

In relation to the Brazilian capitals, the total investment estimate for the implantation of its bicycle route network is R$ 1,200,695,380.00. It is observed that Rio de Janeiro and São Paulo appear as the capitals where the largest investment in Circulation Infrastructure is made. Only the two capitals represent almost 45% of the total invested in Brazil.

The following table shows the Brazilian capitals that invest the most per inhabitant in the infrastructure of cycle route circulation, according to the estimated value in the implementation of the cycle route network disclosed in Table 5. It is interesting to note

that Rio de Janeiro and São Paulo, cities with the largest cycle network in Brazil, appear, respectively, in fourth and eleventh of the 27 cities listed.

	CITY	CYCLE ROUTES IN KM Km	TOTAL VALUE OF IMPLEMENTATION (R$)	NUMBER OF INHABITANTS	INVESTMENT PER CAPITA (R$)
1	Rio Branco	178.3	37,443,000.00	336,038	111.42
2	Vitória	48.2	27,715,000.00	327,801	84.55
3	Brasília	420.1	134,432,000.00	2,570,160	52.30
4	Rio de Janeiro	441.1	253,632,500.00	6,320,446	40.13
5	Aracaju	67	22,110,000.00	571,149	38.71
6	Curitiba	204.2	64,404,680.00	1,751,907	36.76
7	Campo Grande	89.7	28,704,000.00	786,797	36.48
8	Florianópolis	41	12,931,400.00	421,240	30.70
9	Fortaleza	204.6	67,518,000.00	2,452,185	27.53
10	Boa Vista	35	7,350,000.00	284,313	25.85
11	São Paulo	498.4	286,580,000.00	11,253,503	25.47
12	Cuiabá	39.9	12,768,000.00	551,098	23.17
13	Belo Horizonte	87.4	50,255,000.00	2,375,151	21.16
14	Goiânia	84.2	26,944,000.00	1,302,001	20.69
15	João Pessoa	40.7	13,431,000.00	723,515	18.56
16	Palmas	19.5	4,095,000.00	228,332	17.93
17	Salvador	145.1	47,883,000.00	2,675,656	17.90
18	Teresina	41.9	13,827,000.00	814,230	16.98
19	Maceió	42.1	13,893,000.00	932,748	14.89
20	Belém	88.4	18,564,000.00	1,393,399	13.32
21	Natal	32	10,560,000.00	803,739	13.14
22	Porto Alegre	47	14,823,800.00	1,409,351	10.52
23	Porto Velho	20.6	4,326,000.00	428,527	10.10
24	Recife	41.7	13,761,000.00	1,537,704	8.95
25	Macapá	11.9	2,499,000.00	398,204	6.28
26	São Luís	18	5,940,000.00	1,014,837	5.85
27	Manaus	20.5	4,305,000.00	1,802,014	2.39

Table 7. Investment in cycling infrastructure per inhabitant.

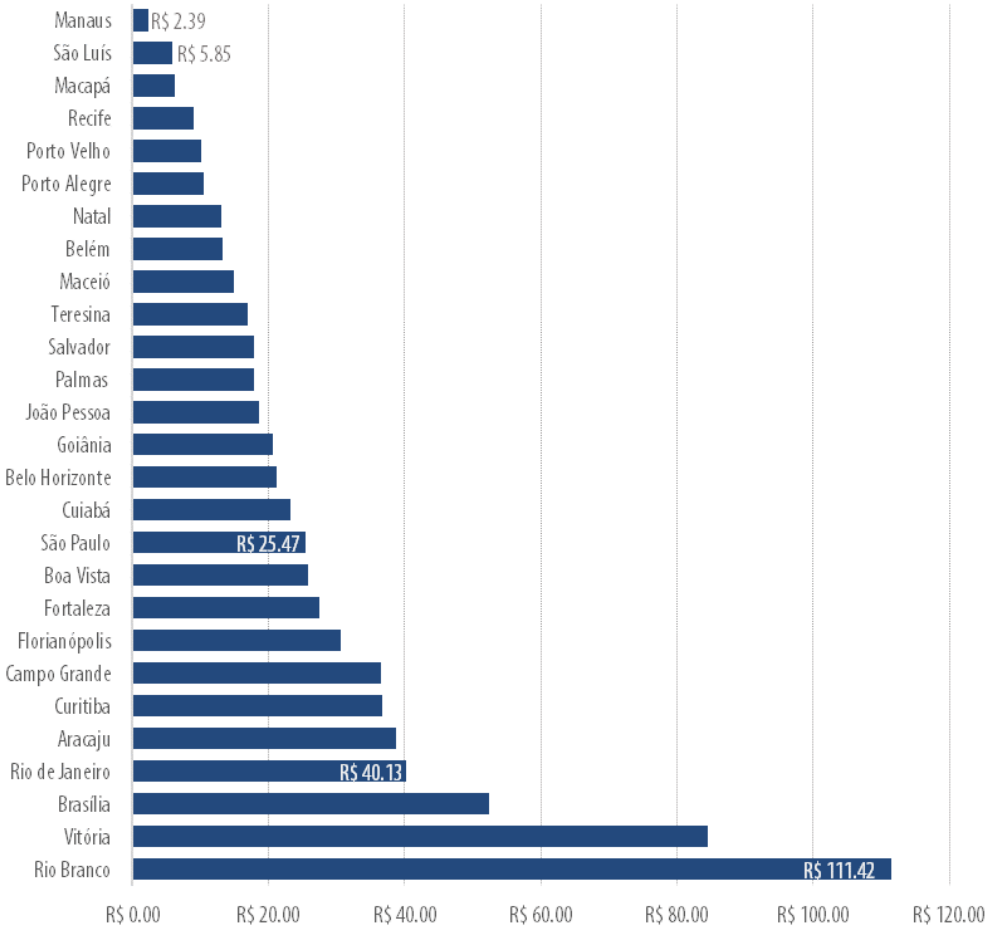


Chart 23. Investment in the cycle network per capita

The graphs below show the data presented previously distributed according to the major regions [12], relating them to the population found in the Brazilian capitals according to the 2010 Demographic Census (IBGE, 2010). In the same way, the difference between per capita investments in each region can be noted. The values referring to the capitals of the Southeast Region, although presenting higher total value invested, end up pointing to a per capita investment not so high if compared to the capitals of the other regions because of its large population contingent. In this context, the capitals of the Central-West Region stand out, presenting higher levels of investment according to the respective population.

[12] Classification according to IBGE (2010).

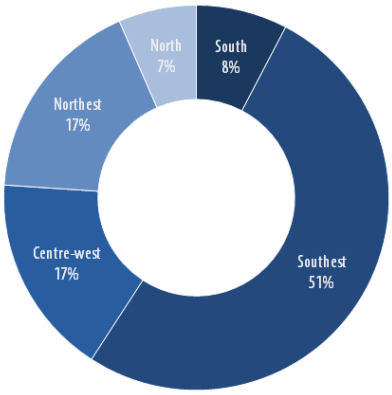


Chart 24. Percentage of investments in cycle route network by region

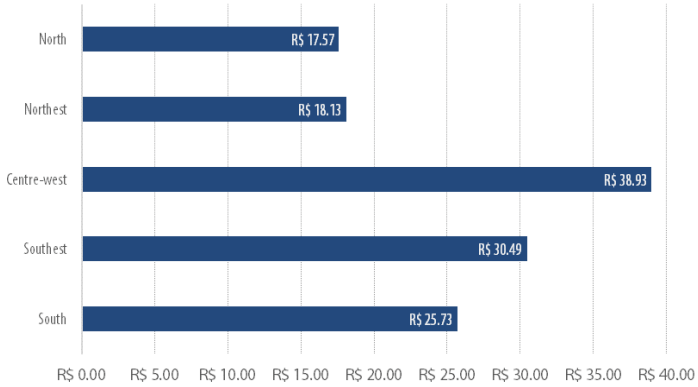


Chart 25. Investment in the cycle route network per capita by region

It is possible to observe a different relation when comparing the investments made in *Circulation Infrastructure* and the territorial extension of the municipalities. It is noted that, in this proportion – investments (R$) per km² of territory –, the municipality of Vitória stands out in the implementation of the cycle route network according to the size of its territory.

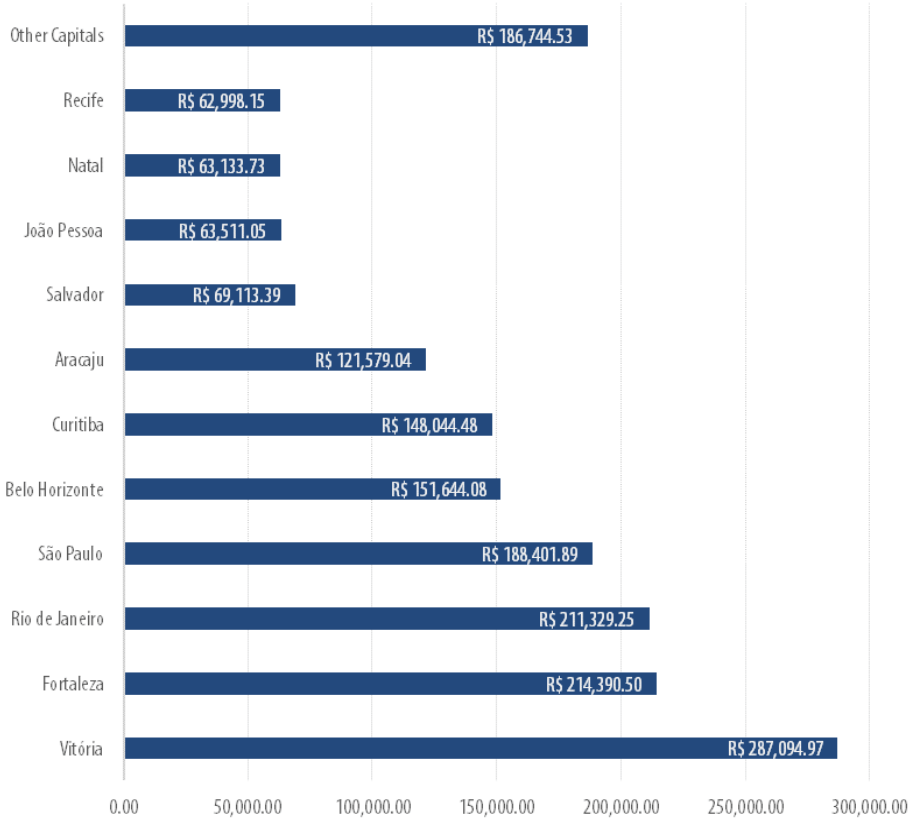


Chart 26. Investment in the cycle route network per km² of territorial extension in the Brazilian capitals

For a more precise approximation of the values that involve the implementation of the *Circulation Infrastructure*, the specific case of the city of Rio de Janeiro was verified. Observing the values invested in different cycle routes of the city, obtained through documentary research in official gazette and news in the press, obtained the average cost for implantation of *Circulation Infrastructure* of R$ 450,000 per kilometer. The value includes the implementation of the entire cycle route, including design and execution. Thus, through the System of Costs of Engineering Works and Services of Rio de Janeiro[13], adopted as reference of value for the city and published in the Official Gazette, it was possible to distinguish the average cost per kilometer of project and the average cost per kilometer of paving specific cycle path. In this case, the average cost of the cycle route project for the bike path type is R$ 2,415.33 per kilometer to be implemented, representing approximately 0.5% of the total value of the

[13] Transparency Portal. Town Hall of São Paulo. Available at: <http://transparencia.prefeitura.sp.gov.br/contas/Paginas/LeiOrcamentoAnual.aspx>. Accessed on 10 Aug. 2017.

infrastructure. Meanwhile, the cost for paving is 25 times higher, reaching the value of R$ 65,046.15 per kilometer implanted.

The rest of the value involved therefore includes other elements related to the bicycle path, such as signaling and lighting costs, among other structures. In some cases, the implantation of cycle paths may include works such as the construction of tunnels and overpasses, among other demands of each context. Thus, the implementation costs of the *Circulation Infrastructure* can reach three times the value indicated in this analysis. It should be noted that the total cost obtained represents an average, also varying according to the type of cycle route implemented, that can be either a bicycle path, a cycle lane or a shared route.

In the case of Sao Paulo, the city with the largest investment in *Circulation Infrastructure* with a total of 498.4 kilometers, the values are varied depending on the type of road or the need for complementary works. Through the georeferenced data of the city's cycle network, referring to the survey carried out by CET-SP (Traffic Engineering Company), it was possible to identify that 73% of cycle routes correspond to cycle lanes, with the remaining 27% corresponding to cycle paths.

Considering the bicycle routes established in São Paulo, it was possible to obtain, through consultation with CET-SP, the value used in some of these routes. In the cases of simpler implantation – without demanding large works –, the average cost was R$ 637,200 per kilometer. Even where the implantation involved greater complexity - in which there was, for example, demand for the execution of a tunnel for pipelines - the average cost exceeded R$ 1 million per kilometer implanted. In one of the cases analyzed, the amount invested in the development of the bike route project was R$17,397.00 per kilometer, revealing a cost seven times higher than the reference value found for Rio de Janeiro.

In addition, the cycling infrastructure requires investments in its maintenance, also considered as part of the amount spent by the public power in *Circulation Infrastructure*. In the city of São Paulo, the Annual Budget Law establishes an average value of R$ 1,003.21 per kilometer per year as the average value associated with the maintenance of the bicycle circulation routes. However, when looking at the case of the

Pinheiros River bicycle path, the bidding for the maintenance service foresees the average cost of R$ 171,428.57 per year per kilometer of bicycle route, demonstrating that the amounts invested in maintenance annually do not include all the existing network.

As pointed out by the panorama analyzed here, investments in *Circulation Infrastructure* can occur in quite different ways. The participation of this sector in public finances varies not only according to the extent of the cycle network but also according to the qualitative characteristics of the prioritized infrastructure. In addition, although the cities of Rio de Janeiro and São Paulo show higher investments in this area, other capitals, such as Rio Branco and Fortaleza, indicate greater attention with the *Circulation Infrastructure* within the public authority, with larger investments in proportion to the size of their population or the territorial limits they serve.

4.2 PARKING INFRASTRUCTURE

Parking Infrastructure includes the implementation and maintenance of infrastructure for stopping and storing bicycles in public areas and services, such as bike parking lots and bike park racks. It may be provided by public authorities or by partnerships with concessionaires managing other modes of transport, providing free access infrastructure for the population. Also included are the bicycle parking places in public street, although granted by the private initiative.

The indicators used in the analysis include, in general numbers, the provision of Parking Infrastructure, as well as the amounts handled in its implementation and maintenance. The following indicators were therefore considered: (i) Number of parking racks and bicycle parking lots; ii) Average cost of investment for implantation of bike racks (R$); iii) Total amount invested in bike racks and bicycle parking lots.

To obtain data on the number of bike parking racks and bicycle parking lots in Brazilian cities, it was necessary to use different sources. The publication "A Bicicleta no Brasil" (SOARES; GUTH; AMARAL et al., 2015) provided the indicated data for the cities of Aracaju and Recife, giving global numbers for both. In the case of Rio de Janeiro[14], the

[14] Map of Bicycle Parking of Rio de Janeiro: SIURB - RJ (Municipal Urban Information System) / Open geographic data of the Town Hall of Rio de Janeiro. Available at: <http://portalgeo-pcrj.opendata.arcgis.com/datasets?q=transporte&sort_by=relevance>. Access on 20 Sept. 2017.

values were obtained through the data sheets contained in the georeferenced mapping of such infrastructures, made available in an official page managed by the city of Rio de Janeiro. For the city of Salvador[15], the *Parking Infrastructure* records were obtained through the city's official website linked to the bicycle promotion campaign promoted by the municipal sphere.

It is noted that there is little availability of data referring to the subject in official sources published by the local public authority. This is because the provision of the Parking Infrastructure tends not to be carried out through the direct action of the public authority, but through incentives, recommendations and laws that guide the implementation of bike parking racks and bicycle parking lots by the private sector. Thus, although the provision of infrastructure is also a public policy action, its accounting and control are difficult to discriminate, and the amount invested is not necessarily linked to the public budget.

For the accounting of the infrastructures included in this theme, the collaborative cycling route maps produced by civil society through cycling activist organizations were used as an alternative source of consultation. However, since this source depends intrinsically on users' participation in feeding it, the data obtained may be undersized. Thus, data were obtained for the cities of Porto Alegre, Belo Horizonte and Fortaleza. The data for the city of São Paulo was obtained through consultation with CET-SP[16].

In order to obtain the average cost involved in the installation of bicycle parking lots and bike racks, an average of the values corresponding to each of them was used in the System of Costs of Engineering Works and Services of Rio de Janeiro, adopted as reference value in Rio de Janeiro, published in the Official Gazette. This average cost was then extrapolated to the other cities to obtain the total amount invested by the public power in each of them with respect to the Parking Infrastructure.

The data obtained reveal a great discrepancy in the provision of such infrastructures between the evaluated cities. Higher numbers are perceived in the cities of the Southeast Region, especially in Rio de Janeiro and São Paulo, with a greater number of

[15] Salvador goes by bike - Bike racks. Available at: <http://www.salvadorvaidebike.salvador.ba.gov.br/index.php/infraestrutura/paraciclos> Accessed on 12/08/2017

[16] Sao Paulo map of parking lots and parking racks: Cycle Route Infrastructure Map - CET SP. Available at: <http://www.cetsp.com.br/consultas/bicicleta/mapa-de-infraestrutura-cicloviaria.aspx>. Access on 20 Sept. 2017.

bicycle parking lots and bicycle park racks. This difference, however, can also be the result of the difference in the accounting of the data among the sources used.

In addition, the difference observed in the availability of Parking Infrastructure may also be associated with the posture adopted by the public power, which may be the main provider or only incentive of the implementation, then performed by other agents. This aspect may also result in a variation in the value committed by the state which, in turn, cannot be quantified by the methodology used here. For a more precise analysis, it would be necessary to obtain the specific values of each city, trying to understand whether or not there is a policy of encouraging the bicycle in these places. In the case of São Paulo, for example, a significant portion of the Parking Infrastructure is related to other transport modes, making it the responsibility of the management companies of this service. In this way, part of the investment is disconnected from the municipal budget, although the service provided is public.

According to the data obtained on the city of São Paulo, the municipality implemented until the year 2016 precisely 2,514 bicycle racks throughout the city of São Paulo. In addition, São Paulo also has 85 bike parking lots and bike racks related to mass transportation, such as the train and the subway. Also added to this list are the bike racks implanted by commercial, service and institutional establishments, encouraged to install this type of infrastructure according to the recommendations of the manual for the installation of bike racks, elaborated by CET-SP.

The average cost of implantation of bike racks by the city of São Paulo was R$ 250.00 per unit in 2015, increasing to R$ 300.00 the following year. With this, the total invested by the public authority in Parking Infrastructure in the city reached more than R$ 754,200.00. This value represents the largest investment identified in this category of infrastructure among the Brazilian capitals analyzed. Nevertheless, the value found corresponds to the implantation of bike racks, cheaper structures and of easy implantation, disregarding the higher cost of bicycle parking lots with more complex structures.

CITY	NUMBER OF BIKE PARKING LOTS AND BIKE RACKS	AVERAGE COST OF BIKE RACKS (R$)	TOTAL VALUE (R$)
Aracaju	**64**		**42,124.29**
Belo Horizonte	**65**		**42,782.35**

CITY	NUMBER OF BIKE PARKING LOTS AND BIKE RACKS	AVERAGE COST OF BIKE RACKS (R$)	TOTAL VALUE (R$)
Fortaleza	157		103,335.83
Porto Alegre	186		122,423.34
Recife	31		20,403.95
Rio de Janeiro	1058	658,19	696,367.14
São Paulo	2514	300,00	754,200.00

Table 8. Number, average cost and total value of bike parking lots and cycle racks

If it were possible to carry out a more detailed analysis through the number of available places and their average unit cost, the differences found in the costs could even be mitigated or accentuated. The absence of data can be considered as justification for the lack of maintenance regularity, which in some cases is non-existent.

Although the methodology employed does not indicate a precise panorama and national scale, it is possible to perceive that the Parking Infrastructure still shows little incorporation in public policies in most Brazilian cities. In many of them, the implantation of bike racks and bike parking lots takes place through private initiative and is also used as a marketing strategy for the argument of sustainability and socio-environmental responsibility as factors that add value to the brand of some companies. On the other hand, bicycle parking is often carried out in inappropriate places, such as poles and bars, where the security of the bicycle is improvised. Thus, despite the demand for bike racks and bicycle parking lots – ensuring safety to the cyclist and encouraging the use of this mode of transportation –, the public authority still invests little in this form of infrastructure in most Brazilian cities, reflecting the lack of more explanations on the subject.

4.3 Public Shared Bicycle System

Public Shared Bicycle System comprises the public service of shared bicycles operated by companies in the private sector, not representing the same scope of use of the bicycle treated in the *Rental* theme, of the section **Productive Chain**. This type of service has been consolidated as an important option of public transportation.

The indicators selected to represent this theme refer to the costs and investments made in the sector, involving private initiative and the public sphere. We therefore seek information on: *i) Total number of public shared bicycle systems in Brazil; ii)*

Average number of users of public bicycle systems shared in Brazil per year; iii) Average amount invested to implement the system (R$); iv) Average value invested in maintenance / year of the system (R$); v) Number of jobs generated by the service; and, vi) Total revenue generated by the service / year (R$).

To obtain a national panorama of shared bicycles, it was sought to map the total number of public systems in Brazil, as well as its coverage in each city through the number of stations and bicycles that make up each one of them. The data was collected through multiple sources, mainly considering data available on the internet, such as websites, or mobile application of each system.

The data related to the financial movement of the sector were obtained through the contact established with two companies operating the service to which were applied online forms (here identified as COMPANY 1 and COMPANY 2). These operators operate in several Brazilian cities with bicycle sharing services not only public but also private - corporate and in residential condominiums.

The following table indicates which Brazilian capitals already have shared public bicycles currently in operation.

CITY	SYSTEM	NUMBER OF DOCK STATIONS	NUMBER OF BICYCLES
Aracaju[17]	Caju Bike	20	200
Belem[18]	Bike Belém	11	110
Belo Horizonte[19]	Bike BH	40	382
Brasília[20]	Bike Brasília	40	400
Fortaleza[21/22]	Bicicletar/ Bicicleta Integrada	87	1150
Goiania[23]	Gyndebike	16	196
Manaus[2]	Manôbike	11	110
Porto Alegre[2]	Bike PoA	41	410
Recife[2]	Porto Leve/Bike PE	80	800
Rio de Janeiro[2]	Bike Rio	260	2600
Salvador[2]	Bike Salvador	41	480

[17] See Soares, Guth, Amaral et al. (2015).
[18] Data provided by the system operator (2017).
[19] ITDP Brazil (2016a). Shared bikes in Belo Horizonte. Available at: <http://itdpbrasil.org.br/bike-share-2016-bh/>. Accessed on 16 Aug. 2017.
[20] GOVERNMENT OF BRASILIA (2016). Shared Bicycle System. Secretary of State for Mobility of the Federal District. Available at: <http://www.semob.df.gov.br/programas-projetos/estudos-de-transporte-para-exploracao-do-bicicletas-de-aluguel-df.html>. Access on 16 Sept. 2017.
[21] FORTALEZA CITY COUNCIL (2017). Map of stations. Integrated Bicycle. Available at <http://www.bicicletaintegrada.com/mapaestacao.aspx>. Access on 16 Sept. 2017.
[22] SERTTEL (2018). Estação do Bicicleta Integrada inaugurada em Fortaleza, on 26 Apr. 2018. Available at: <http://www.serttel.com.br/estacao-do-bicicleta-integrada-inaugurada-em-fortaleza/>. Acessed on 06 Apr. 2018.
[23] GOIÂNIA CITY COUNCIL (2018). Mapa das estações. Gyndebike. Available at: <http://www.debikegoiania.com/mapaestacao.aspx>. Acessed on 06 May. 2018.

CITY	SYSTEM	NUMBER OF DOCK STATIONS	NUMBER OF BICYCLES
São Paulo[2/24]	Bike Sampa/Ciclo Sampa	277	2816
Vitória[25]	Bike Vitória	27	326
TOTAL		**951**	**9.980**

Table 9. Public bicycle system in Brazilian capitals

Regarding Brazilian capitals, the survey shows that there are 13 cities in total with Public Shared Bicycle Systems, totaling 906 stations throughout the country and 7,861 available bicycles. These data indicate that half of Brazilian capitals already have public bicycles shared in their territory. It is also possible to verify a large presence of such systems in the capitals of the Northeast Region, although the largest sharing systems are in the Southeast Region, especially in Rio de Janeiro and São Paulo.

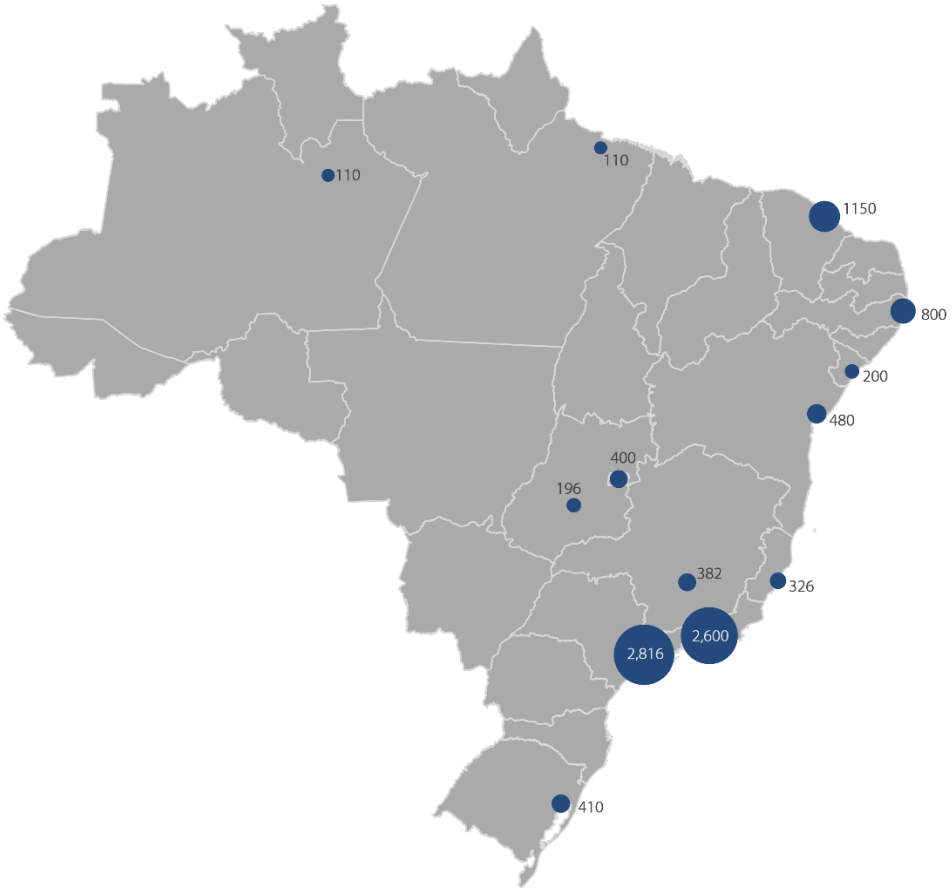


Figure 22. Sharing systems in capitals by total number of bicycles offered.

[24] CICLO SAMPA (2017). Estações. Available at: <http://www.ciclosampa.com.br/estacoes.php>. Acessed em 06 Oct. 2017.
[25] BIKE VITÓRIA (2018). Mapa das Estações. Available at: <http://www.bikevitoria.com/mapaestacao.aspx >. Acessed on 06 May. 2018.

In the Southeast, it is observed that all the capitals already have systems of bicycle sharing. Although in other regions, some capitals have robust systems with an expressive number of shared bikes, it is possible to observe that some capitals, such as São Luís and Curitiba, whose population exceeds 1 million inhabitants, still do not invest in the sector.

The following table shows the size of the systems (number of bicycles) and the population of each municipality where the service is present.

Region	City	Cycle Network (km)	System	Number of Stations	Number of Bicycles	Municiple Population (IBGE 2010)
Southeast	Rio de Janeiro	441.1	Bike Itaú	260	1951	6,320.446
Southeast	São Paulo	498.4	Bike Sampa/ CicloSampa	259/17	1596/216	11,253.503
Southeast	Belo Horizonte	87.4	Bike BH	40	382	2,375.151
Southeast	Vitória	48.2	Bike Vitória	5	50	327,801
Northeast	Aracaju	67	Caju Bike	20	200	571,149
Northeast	Salvador	145.1	Bike Salvador	40	400	2,675.656
Northeast	Recife	41.7	Porto Leve/Bike PE	80	800	1,537.704
Northeast	Fortaleza	204.6	Bicicletar/ Bicicleta Integrada	69/4	690/230	2,452.185
Central-West	Brasília	420.1	BikeBrasília	40	400	2,570.160
Central-West	Goiânia	84.2	Gyndebike	15	150	1,302.001
South	Porto Alegre	47	Bike Poa	40	400	1,409.351
North	Belém	88.4	Bike Belém	11	110	1,393.399
North	Manaus	20.5	Manôbike	11	136	1,802.014

Table 10. Public bicycle systems and population of the municipalities

In addition to the existing systems in the Brazilian capitals, Company 1, one of the main businesses operating this type of service, also manages other public and private shared bicycle systems. Most of the systems operated by Company 1 are in the state of São Paulo, in addition to a public system in the city of Juiz de Fora, in Minas Gerais, and two private systems: one in Nova Lima (MG) and the other in Londrina (PR). Table 11 shows the number of stations and bicycles in each of the public systems operated by Company 1.

It is noticed that in the state of São Paulo there is a greater presence of bicycle rental systems, also considering cities other than the capital of São Paulo. It is also seen that systems such as that of Sorocaba, in the interior of SP, surpass existing systems in some Brazilian capitals, both in number of stations and offered bicycles. Characterized as a public service, the sharing is carried out most of the time by concession to the operators. These, in turn, work together with sponsors, who pay the city hall a value related to the granting of use of a service and public space to publicize their brand.

			SHARED BICYCLES COMPANY 1	
Region	State	City	Stations	Bikes
Southeast	São Paulo	Sorocaba[26]	25	200
Southeast	São Paulo	Bertioga[27]	7	51
Southeast	São Paulo	Indaiatuba[28]	4	215
Southeast	São Paulo	Santos[29]	5	50
Southeast	Minas Gerais	Juiz de Fora[30]	1	30

Table 11. Sistemas Públicos operados pela EMPRESA DE BICICLETAS COMPARTILHADAS 1 fora das capitais

COMPANY 1 is currently responsible for the operation of important systems such as Bike Rio and Bike Sampa, the largest in Brazil. Between public and private, COMPANY 1 operates more than 20 sharing systems throughout Brazil, in addition to offering other bicycle-related services. For the most part, the projects are carried out in partnership with sponsors. Among them, we highlight Banco Itaú, sponsor of six of the 16 public systems in operation in the Brazilian capitals, five of them under the responsibility of COMPANY 1.

Although Banco Itaú is the main sponsor of public shared bicycle systems in Brazil, there are also systems sponsored by the Unimed health care company, operating in the cities of Vitória, Fortaleza, Goiânia and Juiz de Fora (MG). The 11 public systems administered by the company present different types of charges and fees. Thus, there are cities with the possibility of acquiring daily, monthly and / or annual passes, and in some systems, the bicycle can even be withdrawn free of charge, provided the user is already registered.

By operating systems of varying sizes, the annual number of users in the locations managed by COMPANY 1 varies greatly between cities. Among them, Bike Rio has an average of 600 thousand users per year, being the system of greatest demand

[26] SOROCABA CITY COUNCIL (2016). Integrabike, more bikes, stations and benefits to users. Agência Sorocaba Government of São Paulo, April 08. 2016. Available at: <http://agencia.sorocaba.sp.gov.br/integrabike-more-bicicletas-estacoes-e-beneficios-a-osuarios/>. Access on Oct 6. 2017.
[27] RIVIBIKE Tembici (2017). General information. Available at: <https://rivibike.tembici.com.br/>. Access on Oct 6. 2017.
[28] INDAIATUBA CITY COUNCIL (2016). PREFECTURE EXTENDS THE OPERATION OF THE ECOBIKE UNTIL 7PM WITH SUMMER TIME. Indaiatuba Government of São Paulo, October 17. 2016. Available at: <https://www.indaiatuba.sp.gov.br/relacoes-institucionais/imprensa/noticias/24792/>. Access on October 6, 2017.
[29] GO BIKE (2016). Santos / SP has shared bikes for children with retractable wheels. Available at: <http://vadebike.org/2016/11/aluguel-bicicletas-infantis-danoninho-bike-kids-santos/>. Access on October 6, 2017.
[30] Estação Unimed JF Tembici. Available at: <https://estacaounimedjf.tembici.com.br/>. Accessed on October 6, 2017.

operated by the company. In São Paulo, although Bike Sampa presents the same number of stations and bicycles corresponding to Rio, the average annual number of users represents less than half of the Carioca demand. Among other factors, this issue may be related to the existence of another smaller system of public bicycles in that city not operated by COMPANY 1.

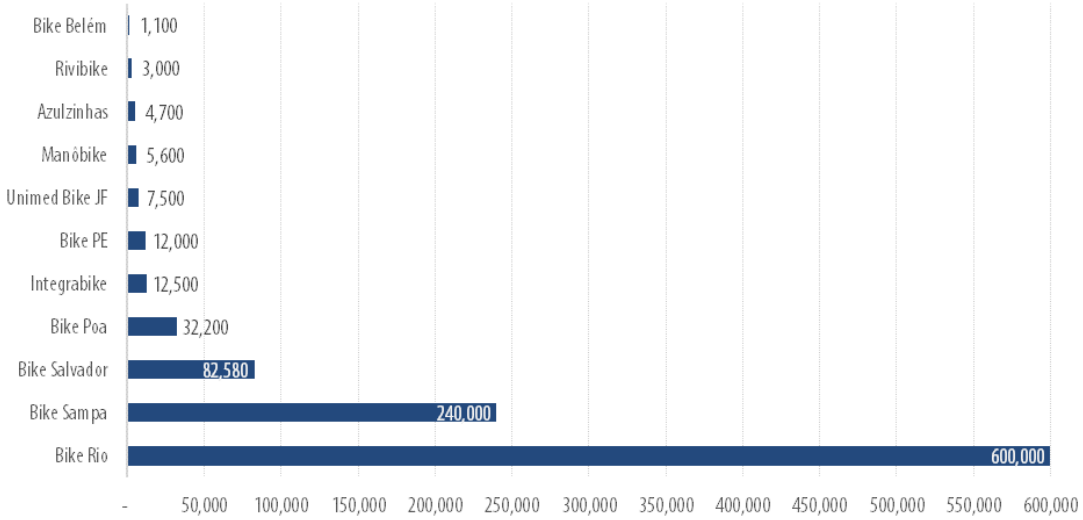


Chart 27. Number of users per system operated by the Company 1.

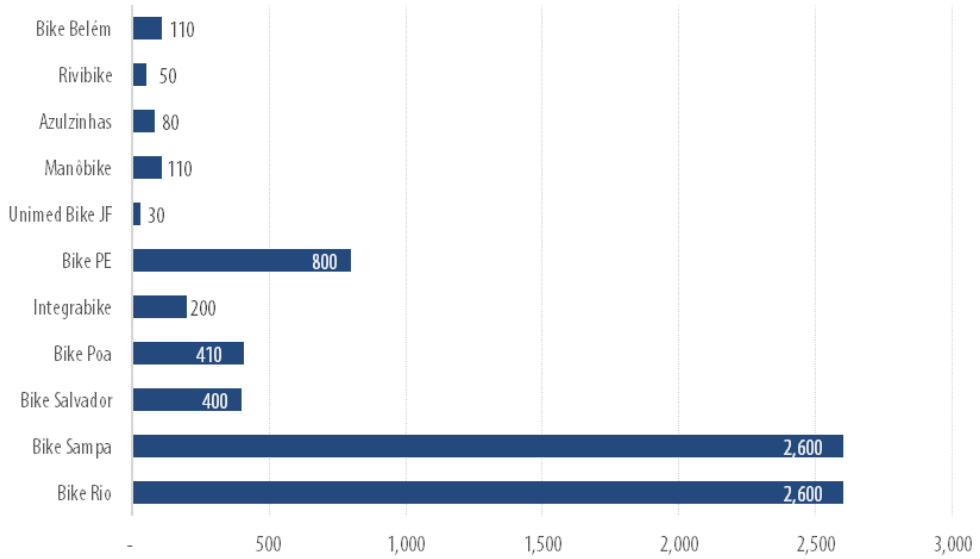
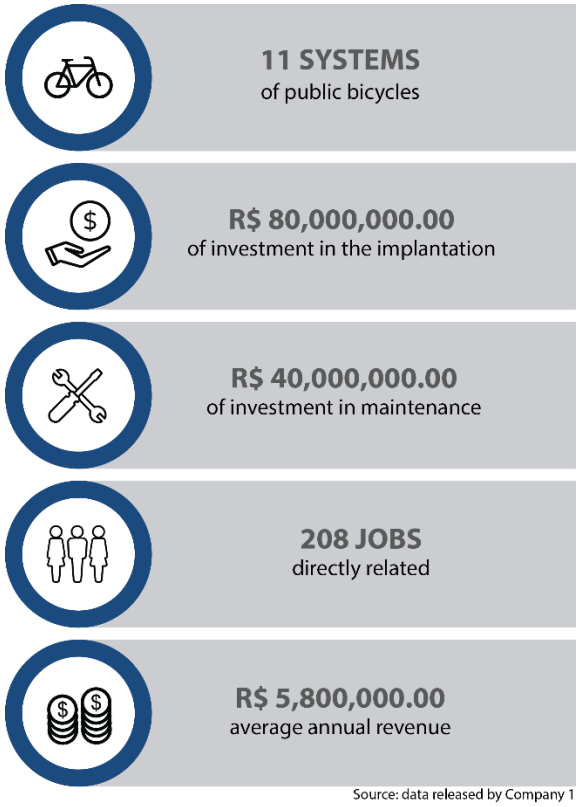


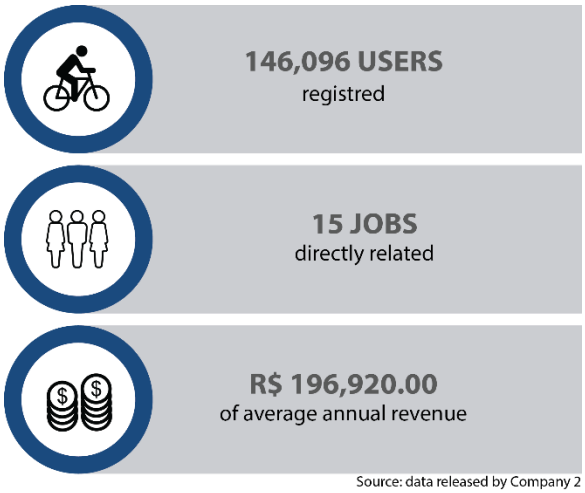
Chart 28. Number of bicycles available per system - Company 1.

For the implementation of the different systems, the company made an initial investment of R$ 80 million, considering only operations of a character public. In addition, the COMPANY 1 invests approximately R$ 40 million annually in the maintenance of the service, between repairs of bicycles and stations of all the systems it operates. Despite the costs involved in the activity, the company has an average annual revenue of R$ 5.8 million, which represents a high economic impact generated by the bicycle. In addition, the public systems operated by COMPANY 1 employ 208 employees in the different cities in which it operates. In its larger systems - Rio de Janeiro and São Paulo -, COMPANY 1 operates with up to 72 employees, while in the cases of Bertioga (SP) and Juiz de Fora (MG), which is also smaller, there is only one (01) employee involved.



COMPANY 2 also operates in Brazil, running several bicycle sharing systems not only in the public sector but also in corporate systems and universities. The company is operator of Bike BH, a public shared bicycle system in Belo Horizonte, whose data serves to clarify this theme.

At the time of writing Bike BH had 146,096 registered users. The system allows the purchase of three types of passes: daily (R$ 3,00), monthly (R$ 9,00) and annual (R$ 60,00). The average number of passes sold is 1,780 daily passes, 830 monthly passes and 60 passes per year. In addition, the company employs 15 people and has an average annual revenue of R$ 196,920.00. In the year 2016, it had revenue of R$ 244,083.00.



The *Public Shared Bicycle Systems* in Brazil are quite diverse, whether in scope, in size, or even in the format of their tariff. This also implies differences in the economic impact generated in each city that has this type of service. In addition, although they characterize a public service, where there is still little state action in the regulation and supervision of the systems so that quality and everything else that is involved in the operation of bicycle sharing is only in the charge of the operators. In the same way, there are few cases in which subsidies of the public authority to the activity are observed, acting as an incentive for the use of the bicycle or making the system more accessible by means of the reduction of the tariffs.

However, the prices of the passes in the different Brazilian cities where the service of shared bicycles exists are generally lower than the costs of other methods, denoting an economically interesting alternative in terms of transportation. Even so, the activity presents good profitability for the operating companies that, as can be seen from the data collected, have grown each year in revenue generated. Not to mention that the activity provides income to the state through the payment of grants related to the use

of sponsors' brand in the systems. Therefore, it can be said that it is an activity with a high economic impact related to a public service linked to the bicycle.

5 TRANSPORTATION

The **Transportation** section considers the economic participation of the bicycle from the way it is used in the domestic sphere - i.e., the personal use of the bicycle - and in the commercial sphere – i.e., the way it is used to perform services that depend on the bicycle as a means of transport, not as a product. In this dimension, two themes are presented: *Personal Use* and *Cyclologistics*.

5.1 PERSONAL USE

Personal Use is equivalent to the use of the bicycle as a person's own property to carry out work-to-work travel, among other trips motivated by leisure, shopping, etc. For this theme, a case study was carried out with five families from different socioeconomic levels residing in the metropolitan region of Rio de Janeiro and in which at least one of the members accepted using a bicycle as a means of transportation.

The data was collected through an interview, where two online questionnaires were used:

1) **Family Profile of Socioeconomic Stratification and Consumption**[31]

This questionnaire was inspired by the suggested model for Socioeconomic Stratification and Consumption in Brazil, by Professors Wagner Kamakura (Rice University) and José Afonso Mazzon (FEA / USP), based on the IBGE Family Budget Survey (POF) and published by the Brazilian Association of Research Companies (ABEP). Their objective was to characterize the socioeconomic profile of the families interviewed to establish the differentiation between them in these parameters in a second moment.

[31] Available at: <http://www.abep.org/Servicos/Download.aspx?id=01>. Acessed on August 02, 2017.

2) Profile of Family Composition and Travel Behavior

This second questionnaire was created by LABMOB and its objective was to identify the profile of the family composition[32] of the households interviewed and their travel behavior based on a routine week. For the latter, the respondent was asked to describe the dynamics of locomotion for each day of the week for each member (including him or herself), including other essential information to classify a pattern of commuting travels:

A. Mode of Transport

Objective: To identify who uses the bicycle in the family.

B. Reason

Objective: To discover the motivation of the travel (work, shopping, leisure, etc.)

C. Travel

Objective: To measure the distance traveled and time spent on each displacement. The calculation of the distance - in kilometers - and the time spent - in minutes and hours - was estimated by the researchers of this project through simulations of routes for each method via parameters established by Google Maps, always considering the suggestions of faster routes.

D. Method

Objective: To classify the travels accomplished as they were carried out individually or collectively (trips that have been carried out simultaneously and in the same way by more than one member of the family, such as private car trips).

[32] Available at: <https://goo.gl/forms/xYzoe2KMH1UCVIsu2>.

LABMOB
Laboratório de Mobilidade Sustentável

ALIANÇA BIKE
Associação Brasileira do Setor de Bicicletas

PROJETO ECONOMIA DA BICICLETA NO BRASIL
USO PESSOAL - MEMBRO 1B - MARIDO (RESPONDENTE PRINCIPAL)

Dia da Sem	Moda	Finalidade	Origem	Destino	Km	empo Gasto (	Acompanhado?	nibus	nibus (Br.	Carro (P	Carro (E	Táxi (P	Táxi (E	Uber (P	Uber (Br	il
SEGUNDA-FEIR	Bicicleta	Ida trabalho	Praça Afonso Pena	Centro	4,6	21		3,60		2,15		20		14		
SEGUNDA-FEIR	Bicicleta	Ida trabalho	Centro	Glória	2	13		3,60		0,93		12		10		
SEGUNDA-FEIR	Bicicleta	Buscar filha na creche	Glória	Maracanã	6,8	26	Filha	3,60		3,17		34		25		
SEGUNDA-FEIR	Bicicleta	Volta pra casa	Maracanã	Praça Afonso Pena	2	6		3,60		0,93		9		8		
TERÇA-FEIRA	Bicicleta	Ida trabalho	Praça Afonso Pena	Centro	4,6	21		3,60		2,15		20		14		
TERÇA-FEIRA	Bicicleta	Ida trabalho	Centro	Glória	2	13		3,60		0,93		12		10		
QUINTA-FEIRA	Bicicleta	Buscar filha na creche	Glória	Maracanã	6,8	26		3,60		3,17		34		25		
TERÇA-FEIRA	Bicicleta	Volta pra casa	Maracanã	Praça Afonso Pena	2	6	Filha	3,60		0,93		9		8		
QUARTA-FEIRA	Bicicleta	Ida trabalho	Praça Afonso Pena	Centro	4,6	21		3,60		2,15		20		14		
QUARTA-FEIRA	Bicicleta	Ida trabalho	Centro	Glória	2	13		3,60		0,93		12		10		
QUARTA-FEIRA	Bicicleta	Buscar filha na creche	Glória	Maracanã	6,8	26	Filha	3,60		3,17		34		25		
QUARTA-FEIRA	Bicicleta	Volta pra casa	Maracanã	Praça Afonso Pena	2	6		3,60		0,93		9		8		
QUINTA-FEIRA	Bicicleta	Ida trabalho	Praça Afonso Pena	Centro	4,6	21		3,60		2,15		20		14		
QUINTA-FEIRA	Bicicleta	Ida trabalho	Centro	Glória	2	13		3,60		0,93		12		10		
QUINTA-FEIRA	Bicicleta	Buscar filha na creche	Glória	Maracanã	6,8	26		3,60		3,17		34		25		
QUINTA-FEIRA	Bicicleta	Volta pra casa	Maracanã	Praça Afonso Pena	2	6	Filha	3,60		0,93		9		8		
SEXTA-FEIRA	Bicicleta	Ida trabalho	Praça Afonso Pena	Centro	4,6	21		3,60		2,15		20		14		
SEXTA-FEIRA	Bicicleta	Ida trabalho	Centro	Glória	2	13		3,60		0,93		12		10		
SEXTA-FEIRA	Bicicleta	Buscar filha na creche	Glória	Maracanã	6,8	26		3,60		3,17		34		25		
SEXTA-FEIRA	Bicicleta	Volta pra casa	Maracanã	Praça Afonso Pena	2	6	Filha	3,60		0,93		9		8		
DOMINGO	Bicicleta	Lazer	Jardim Oceânico	Barra de Guaratiba	30,2	120		3,60		14,09		87		67		
DOMINGO	Bicicleta	Lazer	Barra de Guaratiba	Barra da Tijuca	30,2	120		3,60		14,09		87		67		

Figure 23. Weekly travel behavior form (portuguese).

After collecting the data through the utilization of the above-mentioned questionnaires, the families' weekly bicycle travel behavior was monetized from the opportunity cost by using the following modes in exchange:

Standard of car that uses 1 liter of gasoline every 9 km traveled, considering the value of R$4.20 for the liter in the city of Rio de Janeiro

Current rate in the city of Rio de Janeiro (R$ 3,60); in the city of Niterói (R$ 3,70); and in the city of Tanguá (R$ 4,00).

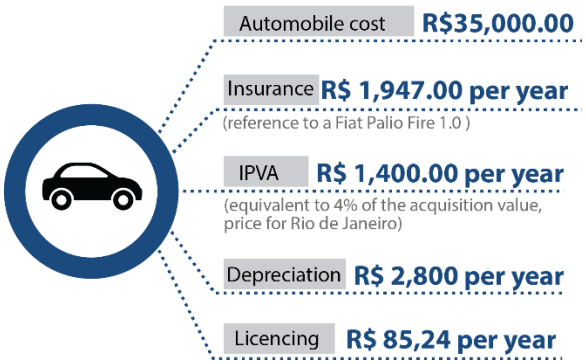
Price calculated based on a Uber fare between the known localities of origin and destination in Rio de Janeiro. *Source:Uber.*

Price calculated based on a non-promotional taxi fare between the known localities of origin and destination in Rio de Janeiro. *Source: 99 Táxis.*

To calculate the expenditure of car use, it is important to include related costs, such as acquisition cost, insurance, Motor Vehicle Property Tax (IPVA), depreciation, licensing and compulsory insurance, among others. To carry out this calculation, the infographic[33] produced by Professor Samy Dama of the Business Administration School of the Getúlio Vargas Foundation (FGV) was used as reference for the G1 news portal in June 2016. The following values were used for the calculation:

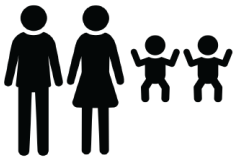
[33] Available at: <http://especiais.g1.globo.com/economia/seu-dinheiro/calculadoras/2017/carro-taxi-uber/>. Accessed on 04 Dec. 2017.

He is also presenter of the program Current Account (Globo News), commentator of Radio Globo and TV Globo in the hourly news broadcasts, SP1 and Jornal da Globo.



5.1.1. FAMILY A

FAMILY PROFILE



Family A resides in the Santa Rosa neighborhood, in the city of Niteroi, and has four members: a couple (male - Subject 1A and female - Subject 2A) and two children under three (03) years of age. The couple has completed university education. The family income is over 20 minimum wages. Subject 1A is a civil engineer and the Subject 2A dentist. Both were employed at the time of the execution of this case study.

WEEKLY TRAVEL BEHAVIOR

The household of Family A has 02 (two) bicycles, one of them a 'Sense Breeze' (Pedelec - pedal electric cycle) and another one for children, and 01 (one) private car. Member 1A stated that he is the only user of the bicycle as a means of transportation, and that his eldest 3-year-old son regularly travels with him in the child bike seat.

Among the methods mentioned as most used for the weekly displacement of Subject 1A, aside from the bicycle, are Uber, by ferry[34], and the private car. From Monday to Friday, the displacement between the cities of Niteroi and Rio de Janeiro is varied and / or integrated with the use of these modalities. It is worth mentioning that at least once a week the Subject 1A makes this journey in a private car, totaling about 23 km spent in 33 minutes, when traffic conditions are favorable.

[34] Public maritime transportation service offered between the cities of Niterói and Rio de Janeiro.

On other days, the trip is done by bicycle and in an integrated way to the ferries. Eventually, the bicycle of Subject 1A stays overnight in the Center of Niteroi, next to the ferry port. In these circumstances, he says that he leaves his house in the Santa Rosa neighborhood, and goes to the Niteroiense center by Uber (3.7 km), where he embarks with the bicycle on the ferry. On occasions when the bike is not left overnight outside the house, Subject 1A leaves from Santa Rosa to the ferry station by bike.

Arriving in Rio de Janeiro, Subject 1A pedals from the ferry station to the region of Lapa, in the central region where he works, totaling a journey of 2.7 km spent in approximately 13 minutes. He takes the same route on the way back to Niteroi, where Subject 1A pedals to the neighborhood of São Domingos (2,1 km) to fetch the eldest son at school. From there, his son travels with him in the child bike chair, usually making the return trip to the Center of Niteroi to find the rest of the family at his wife's work location (Subject 2A). On this occasion, Subject 1A keeps his bicycle parked in the Center and goes to the residence, in Santa Rosa, in the private car of the family, a means of transport used daily by his wife. On weekends, Subject 1A primarily drives with the family by car for leisure purposes.

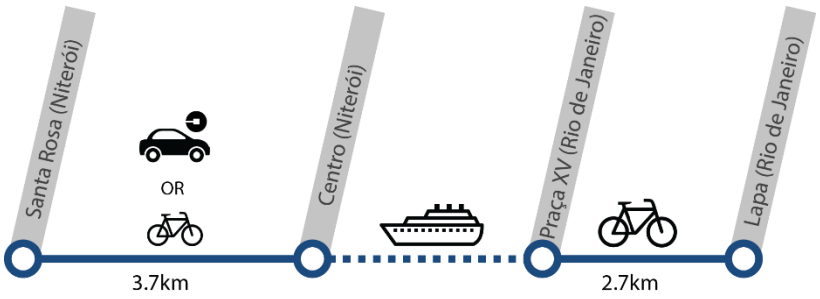


Figure 24. Itinerary to work – Subject 1A.

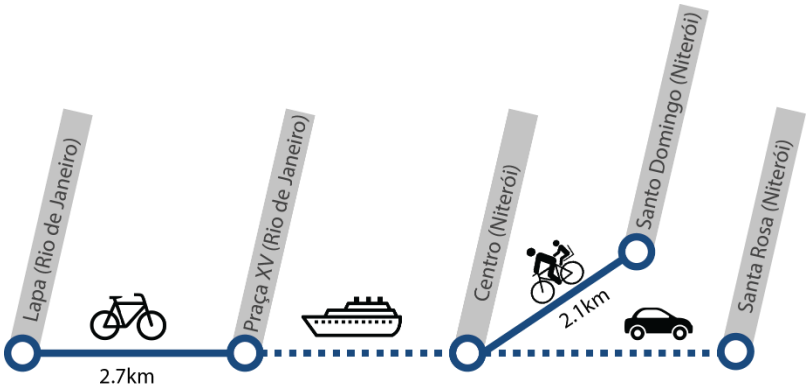


Figure 25. Itinerary returning home – Subject 1A.

The wife (Subject 2A) announced that she did not use the bicycle as a means of transport, mainly using the car and Uber for her weekly movements. On weekdays, the car is used to make a trip between the Santa Rosa neighborhood and the Niteroi Center, as well as taking the oldest child to school in the São Domingos district. The youngest one-year old daughter goes to work with her mother. Trips taken by the family take place on weekdays for the objective of returning to the residence, as well as on weekends for excursions, shopping and visiting relatives.

- In the proportional division of Subject 1A, the bicycle and the car have equal participation, with 38% each, 20% by ferry and 4% by Uber.
- In the proportional division of Subject 2A, the car has a complete participation in the travel profile, divided between 78% by private car and 22% by taxi / car ride applications.
- In the trips performed by bicycle by Subject 1A, 23.5% were carried out in the company of the child.
- In the bicycle trips of Subject 1A, about 41% were performed in an integrated way with the Rio-Niterói ferries as part of the daily round trip.

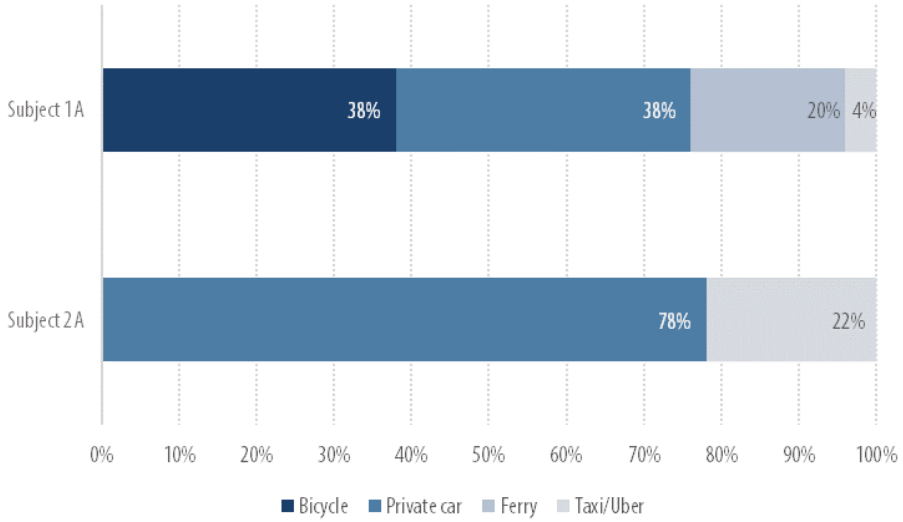


Chart 29. Proportional division of Family A

- Per year, it is estimated that Member 1A - the only cyclist in the household – cycles approximately 2,395.2 km.
- If the total number of journeys by bicycle by Subject 1A were by bus, the household would have an annual cost of R$ 2,976.00 added to the transportation budget; by taxi, R$ 11,136.00; by Uber, R$ 10,032.00; for a private car, R$ 9,987.46 (fuel, R$ 1,176.00 / year - related costs, R$ 8,811.46 / year)[35].

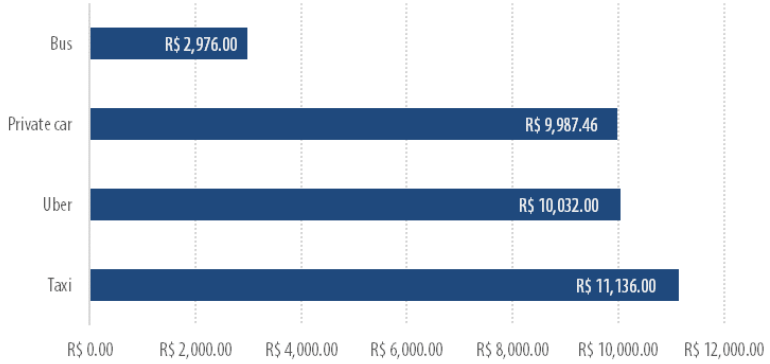


Chart 30. Expenses from other modalities to replace bicycle trips

[35] Since the family already owns a car and will eventually use it, especially the Subject 2A, the related costs included in this value should be seen only as illustrative, since they are already paid by this household regardless of the modal shift bicycle-car.

5.1.2. FAMILY B

FAMILY PROFILE

Family B resides in the Tijuca neighborhood, in the Northern Zone of Rio de Janeiro, and has three members: a couple (male - Subject 1B and female - Subject 2B) with a daughter of 3 years old. The adult couple has incomplete higher education and has a monthly average income range of between four and 10 minimum salaries. Subject 1B works as an entrepreneur (associate in a gastronomy business) and freelancer (production of events and activities related to athletics), while Subject 2B is a university academic and self-employed.

WEEKLY TRAVEL BEHAVIOR

The household interviewed has 3 bicycles, separated into one road bike and two basic ones, and one private car. Subject 1B also said that he is only the most frequent user of the bicycle as a means of transport, considering that regularly the 2-year-old daughter travels with him in the child bike seat.

The methods most used for the weekly displacement of Subject 1B, besides the bicycle, include the private car and Uber. According to information provided by the interviewee, public transport vehicles, such as the bus and the subway, are also used on rainy days or in adverse weather conditions to make trips, although the use of the bicycle is predominant. On a daily basis, Subject 1B moves from the Afonso Pena Square, in the Tijuca neighborhood, to the Center of Rio and to the neighborhood of Glória, where the two commercial ventures to which he works as an entrepreneur in the gastronomy business operate.

The route between Afonso Pena Square and the Center corresponds to approximately 4.5 km. The route from the Center to Glória is smaller: 2 km. On the way home, Subject 1B moves from Glória to the Maracanã neighborhood (6.8 km), where he seeks his 3-year-old daughter at the day care center. From there, he returns home with her, in Afonso Pena Square, located 2 km away from Maracanã. Outside working days, the bicycle is generally used by Subject 1B

on Sundays, but for sporting purposes. The interviewee claimed to be enthusiastic about Olympic activities such as running and cycling, which is why he travels long bicycle routes between Jardim Oceânico and Barra de Guaratiba, on the edge of the West Zone of Rio de Janeiro - approximately 60.5 km total for the round trip.

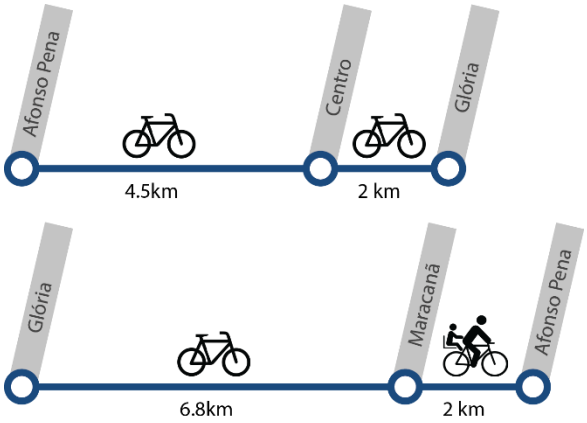


Figure 26. Round trip of Subject 1B during the week

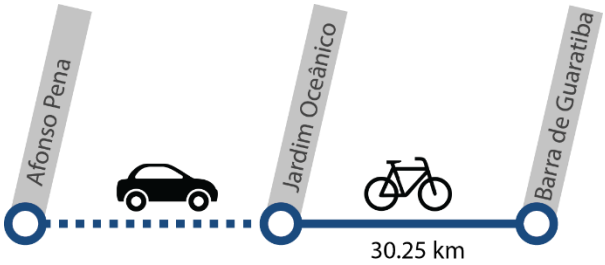


Figure 27. Round trip of Subject 1B at weekends

The wife (Subject 2B) claimed to be an occasional user of the bicycle as a means of transportation preferring, for her weekly travels, the transport on foot, private car, bus and Uber. Family trips usually take place by private cars on Saturdays and Sundays for excursions, shopping and visiting relatives.

- In the proportional division of Subject 1B, the bicycle has a 78% share as a method used against 11% of Uber and the individual car each.

- In the proportional division of Subject 2B, 65% of the trips are realized on foot, against 13% in private cars, 16% in Uber and 6% in buses.

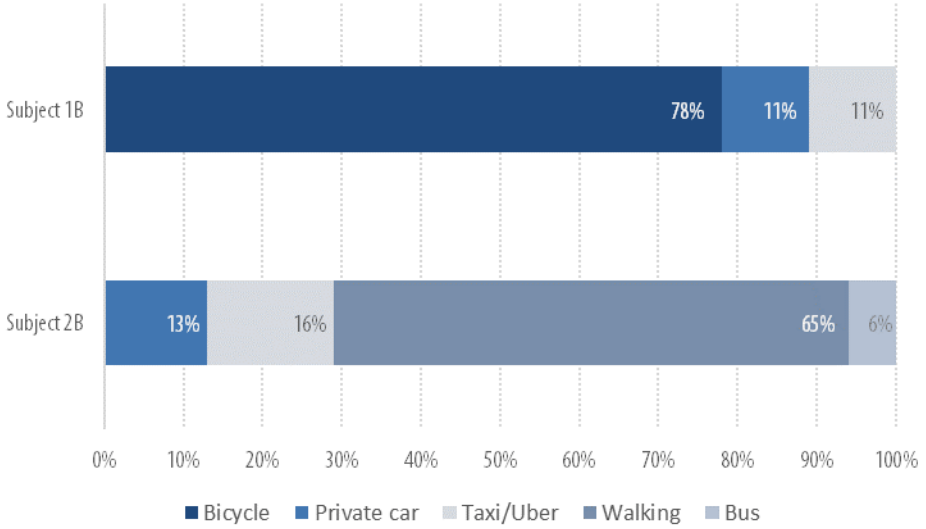


Chart 31. Proportional division of Family B

- Of bicycle trips made by Subject 1B, 22.7% were realized in the company of his daughter.
- Of bicycle trips made by Subject 1B, about 90% were performed as part of the daily commute.
- Per year, it is estimated that Member 1B - the only cyclist presented by the household - cycles 9,763.2 km.
- If the total number of journeys made by bicycle by Subject 1B were by bus, the household would have an annual cost of R$ 3,465.60 added to the transportation budget; by taxi, R$ 24,048.00; by Uber, R$ 18,384.00; by private car, R$ 14,340.91 (fuel, R$ 4,536.00 / year - related costs, R$ 9,804.91 / year[36]).

[36] Since the family already owns a car and will eventually use it, the related costs included in this value should be seen only as illustrative, since they are already paid by this household regardless of the modal shift bicycle-car.

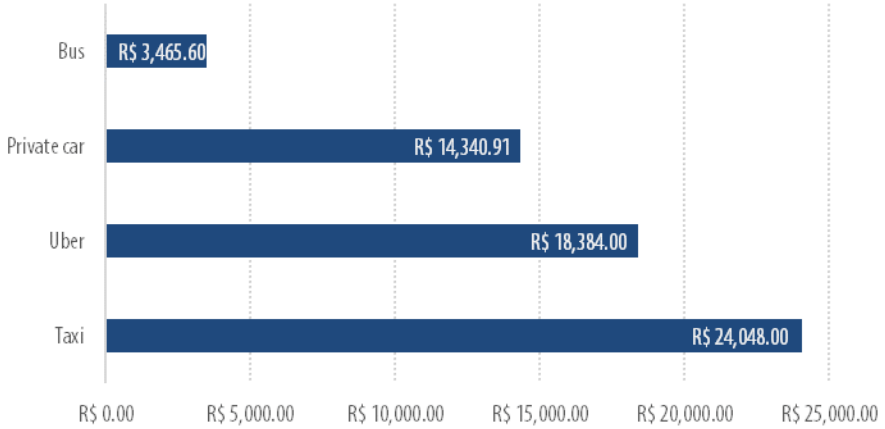


Chart 32. Expenses from other modalities to replace bicycle trips (Family B)

5.1.3. FAMILY C

FAMILY PROFILE

Family C resides in the Gamboa neighborhood, the central region of Rio de Janeiro, and has two members: a couple (man - Subject 1C and woman - Subject 2C). Subject 1C has incomplete higher education and Subject 2C complete higher education, counting on a monthly average income range between four and 10 minimum wages. Subject 1C is an individual microentrepreneur in activities of sonorization and musical production, while Subject 2C is a teacher of plastic arts at a school in the municipal network of Belford Roxo, municipality of the metropolitan region of Rio de Janeiro.

TRAVEL WEEKLY BEHAVIOR

The household interviewed has two bicycles, separated into one road bike and another basic bicycle, and one private car. Subject 1C also stated that he is the only user of the bicycle as a means of transportation. Subject 2C is an occasional bicycle user. Among the methods most used for the weekly travel of the Subject 1C, in addition to the bicycle, are the Light Rail Vehicle (VLT), the bus, private car and transport by foot. Daily, Subject 1C moves from Gamboa neighborhood to Urca neighborhood (12 km), where the university where he is studying is located. This route is carried out both by bicycle and through the combination of the VLT and buses. The bicycle is also used by the Member 1C for leisure purposes and / or for domestic

activities. The routes are limited between Gamboa and Lapa (3.3 km), Glória (4.3 km) and Botafogo (10.9 km).

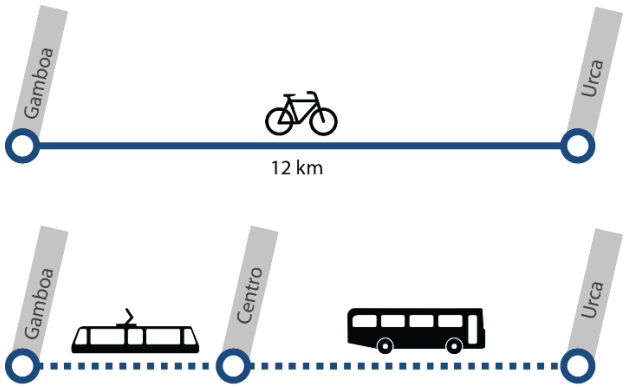


Figure 28. Modal options of Subjec 1C during the week.

The wife (Subject 2C) claimed to be a random user of the bicycle as a means of transportation, with commuting on foot, the private car and the VLT, predominant in her weekly itinerary. The trips made jointly by Subject 1C take place in a private car on Saturdays and Sundays for excursions, shopping and visiting relatives.

- In the proportional division of Subject 1C, the bicycle has a 28% share as a method used against 32% of the bus, 16% of the car and 12% of the VLT and separate foot transport.
- In the proportional division of Subject 2C, 68% of the trips are carried out in private cars, against 10% walking, 11% by bicycle and 11% by VLT.

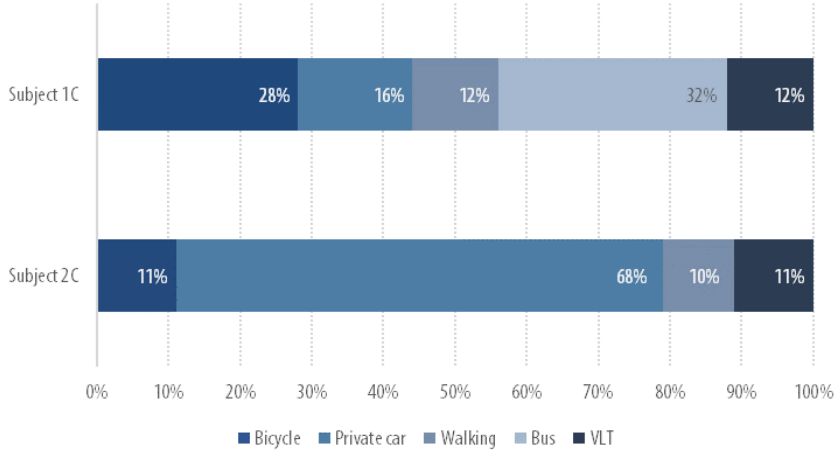


Chart 33. Modal Division of Family C

- Per year, it is estimated that the members of the household cycle 2,928 km.
- If the total number of journeys made by bicycle by Subject 1C was by bus, the household would have an annual cost of R$ 1,276.80 on the transportation budget; by taxi, R$ 8,160.00; by Uber, R$ 6,144.00; and by private car, R$ 1,176.00.
- If the total number of trips made by bicycle by Subject 2C were made by bus, the household would have an annual cost of R$ 1,094.40 on the transportation budget; by taxi, R$ 1,728.00; by Uber, R$ 1,248.00; and by private car, the same value attributed to Subject 1C [37].
- In total for the household, the annual cost would be: bus (R$ 2,371.20), taxi (R$ 9,888.00), Uber (R$ 7,392.00) and private car (R$ 10,858.15, R$ 1,176.00 fuel / year and R$ 9,682.15 related costs / year) [38].

[37] Since the percentage of trips made by Subject 2C by bicycle was in the company of Subject 1C - in this sense, only a cost for fuel, already allocated in the calculations of Subject 1C, would be counted.
[38] Since the family already owns a car and eventually uses it, the related costs included in this value should be seen only as illustrative, since they are already paid by this household regardless of the modal shift bicycle-car.

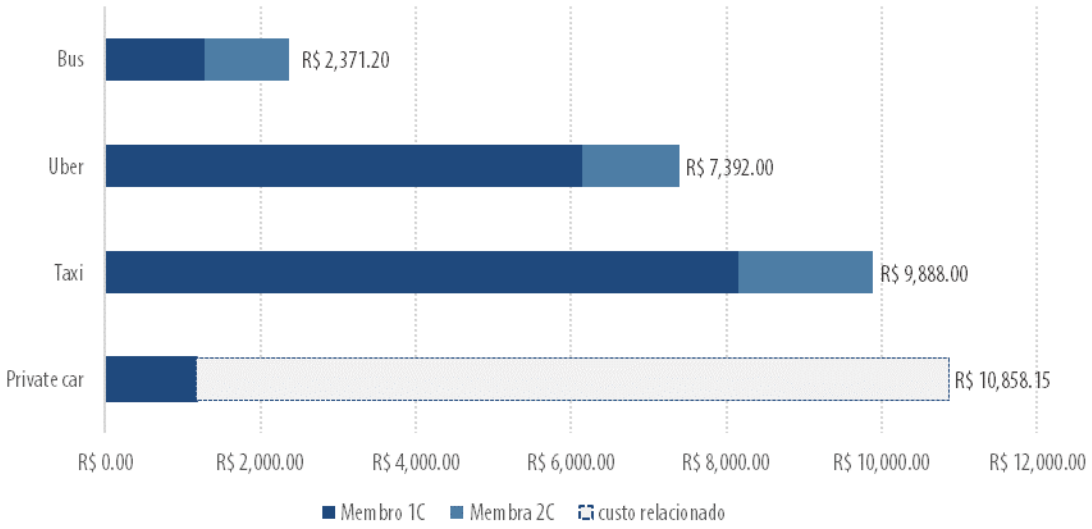


Chart 34. Expenses from other methods in place of bicycle trips (Family C)

5.1.4. FAMILY D

FAMILY PROFILE

Family D resides in the União Park, located in the Maré Complex[39], and has four members: a couple and two adult children. Respondents to this questionnaire were the father (subject 1D), the daughter (Subject 2D) and the son (Subject 3D). Both children are adults in their 20s and 30s. The education levels of the family members are: elementary school I complete / fundamental II incomplete (Subject 1D - father) and complete secondary education (Subjects 2D and 3D), counting on a monthly average income range of up to two minimum wages. Subject 1D is retired, while Subjects 2D and 3D say they are students.

WEEKLY TRAVEL BEHAVIOR

[39] The Maré Complex, or simply Maré, so called by the city of Rio de Janeiro, is a neighborhood that conglomerates 16 low-income locations of which the União Park is part. According to Nunes de Souza (2005), Maré is considered the largest favela area in Rio de Janeiro, with 132,176 people in 2000 and surpassing the Complexo do Alemão (65,637) and Rocinha (56,313). See more: NUNES DE SOUZA, Maria Julieta. Notes on the Tide: an understanding. R. B. Urban and Regional Studies, v. 9, n. 1, pp. 53-68, May. 2007.

The domicile interviewed has 3 (three) bicycles, all of them as a basic type. Subject 1D, 2D and 3D claimed to be regular users of the bike, without using other modes.

Daily, Member 1D uses the bicycle to move from União Park to the neighborhood of Bonsucesso (2.4 km), where he claimed to transport his 8-year-old granddaughter to school in the child bike seat[40]. Another type of daily commuting by bicycle is to make purchases and domestic chores between the União Park and the Penha neighborhood (6.5 km), a journey in approximately 20 minutes. This route is usually accompanied by the Subject 2D, who claimed to help in the sharing of the load of bags on the bicycles. The bicycle is used for leisure purposes at weekends, especially on Sundays, between Parque União and the neighborhood of Madureira (13.9 km).

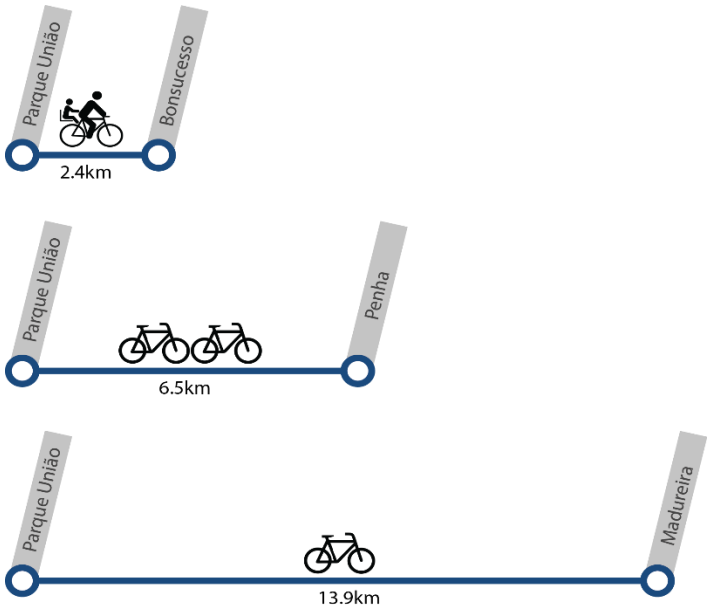


Figure 29. Typical itineraries of Subject 1D

The Subject 2D tends to carry out many routes within the Mare Complex itself for work, study and leisure purposes. For these routes, we consider a distance equivalent to 2.3 km for each stretch from origin to destination. The exception is the trip to the Penha neighbourhood (6.5

[40] For the values referring to this route, we use as hypothetical basis a distance between the streets Via A Dois, 41-71 - Maré, Rio de Janeiro - RJ, 21046-140 and Rua São Jerônimo, 38 - Maré, Rio de Janeiro - RJ , 21044-251 via Google Maps.

km), usually in the company of the father, for domestic shopping and housework, and to Ilha do Fundão (4.6 km), where she attends English course classes once a week. Over the week-end, the respondent claimed to go to the city of Niteroi for a trip, that she combines with the ferry boats.

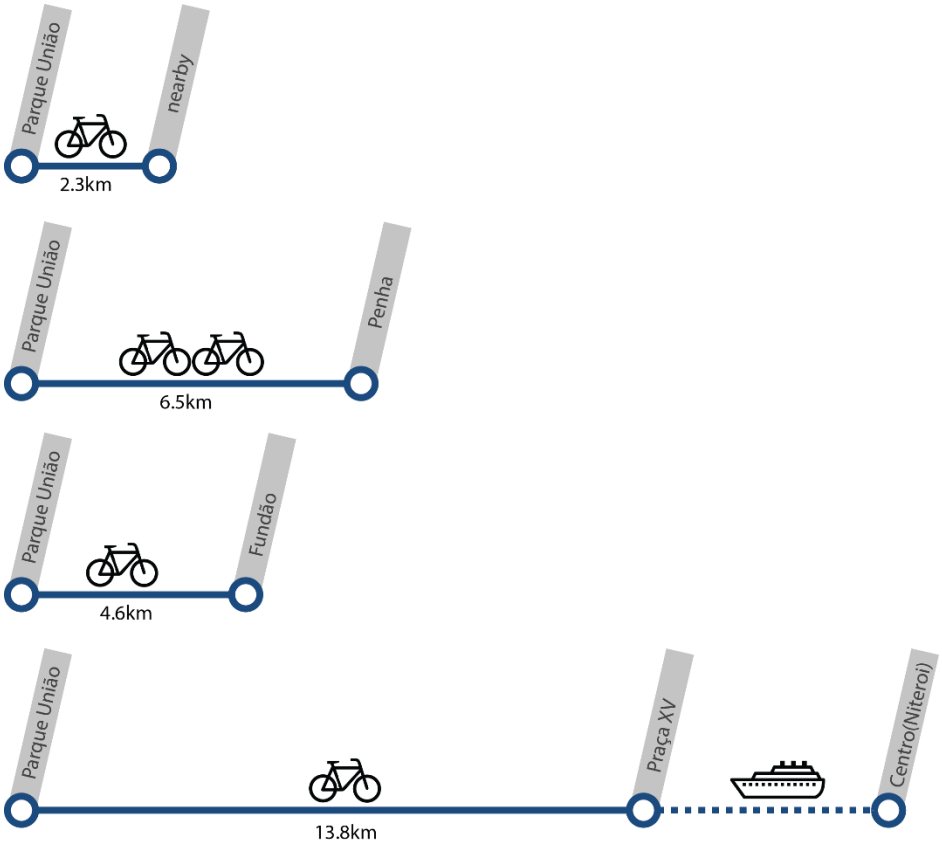


Figure 30. Typical itineraries of Subject 2D

Finally, the Subject 3D claimed to travel only on Saturdays to attend a school course within the Maré Complex itself (2.3 km) and driving school training on Governor's Island (8.7 km).

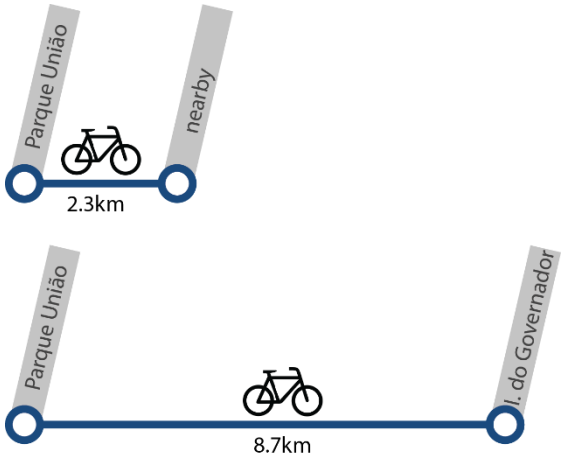


Figure 31. Typical itineraries of Subject 3D

- In the proportional division of all subjects, the bicycle has full participation in the modal used for travel.
- Per year, it is estimated that all the members of the household cycle 12,072 km.
- If the total number of journeys made by bicycle by Subject 1D were made by bus, the household would have an annual cost of R$ 4,665.60 on the transportation budget; by taxi, R$ 24,192.00; by Uber, R$ 17,856.00; and by private car, R$ 2,513.28.
- If the total number of trips made by bicycle by Subject 2D were made by bus, the household would have an annual cost of R$ 4,492.80 on the transport budget; by taxi, R$ 20,256.00; by Uber, R$ 15,024.00; and by private car, R$ 1,945.92.[41]
- If the total number of trips made by bicycle by Subject 3D were made by bus, the household would have an annual cost of R$ 873.60 on the transportation budget; by taxi, R$ 6,480.00; by Uber, R$ 4,608.00; and by private car, R$ 552.41.
- For the total of the household, the annual cost would be: bus (R$ 10,032.00), taxi (R$ 50,928.00), Uber (R$ 37,488.00), and private car (R$ 14,742.23, R$ 5,010.98 fuel/year and R$ 9,731.25 related costs/year)[42].

[41] Two of the Subject 2D's biking trips were held in the company of the father (Subject 1D); in this sense, we deduct the value of the fuel that would be spent on this trip by the Subject 2D, allocating it only in the Subject 1D calculations - if the two would move in the same car.
[42] Considering that the family has only one (01) car and that it is used by all the members in their trips.

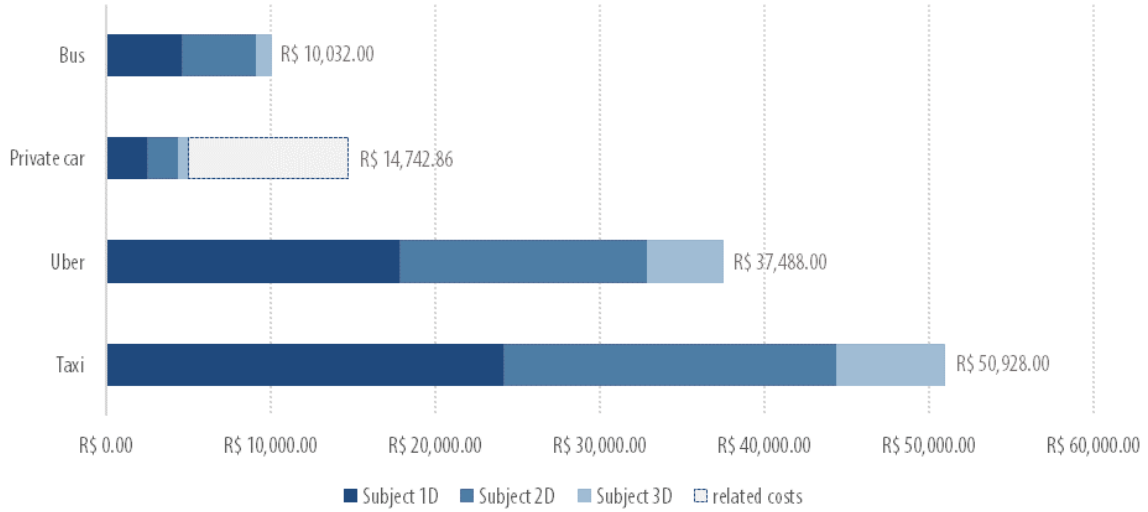


Chart 35. Expenses from other methods to replace bicycle trips (Family D)

5.1.5. FAMILY E

FAMILY PROFILE

Family E resides in Bandeirantes II neighborhood, in the municipality of Tanguá, at the most eastern end of the metropolitan region of Rio de Janeiro. The household has six members: a couple, three teenage children and a nephew. The mother (Subject 1E) was the respondent of this questionnaire, who also gave information to this research about the habits of travel of the husband (Subject 2E) and the children and nephew (Subjects 3E, 4E, 5E and 6E). The couple has elementary school I education complete and middle school incomplete and have a monthly average income range of up to two minimum wages. Subject 1E cares for children in the municipality of Tanguá. Subject 2E works as a plasterer in the municipality of Rio Bonito (RJ).

WEEKLY TRAVEL BEHAVIOR

The household interviewed has 6 bicycles, one for each family member, all considered as basic. Subject 1E claimed that all members of the family are regular users of the bicycle and do not use any other method of transport.

From Monday to Friday, the itinerary of the heads of the household corresponds to the following set of trips: while the Subject 1E moves from the Bandeirantes II neighborhood to the Centro de Tanguá (2.7 km) to go to work, a distance that takes of seven minutes, Subject 2E travels by bicycle for approximately 13.7 km to the municipality of Rio Bonito, taking an average of 43 minutes to travel. The children and the nephew (Subjects 3E, 4E, 5E and 6E) travel daily by bicycle from the neighborhood of Bandeirantes II to the Municipal School Professor Zulquerina Rios. For this route, we consider an average of 1 km of travel between the point of origin and destination[43]. At weekends, all six members of the Family E use the bicycle to visit relatives between the neighborhood of Bandeirantes II and Pinhão (1.8 km). According to the main respondent, the trip occurs on Saturday and everyone stays overnight in the Pinhão neighborhood, from where they return on Sunday to their residence in Bandeirantes II.

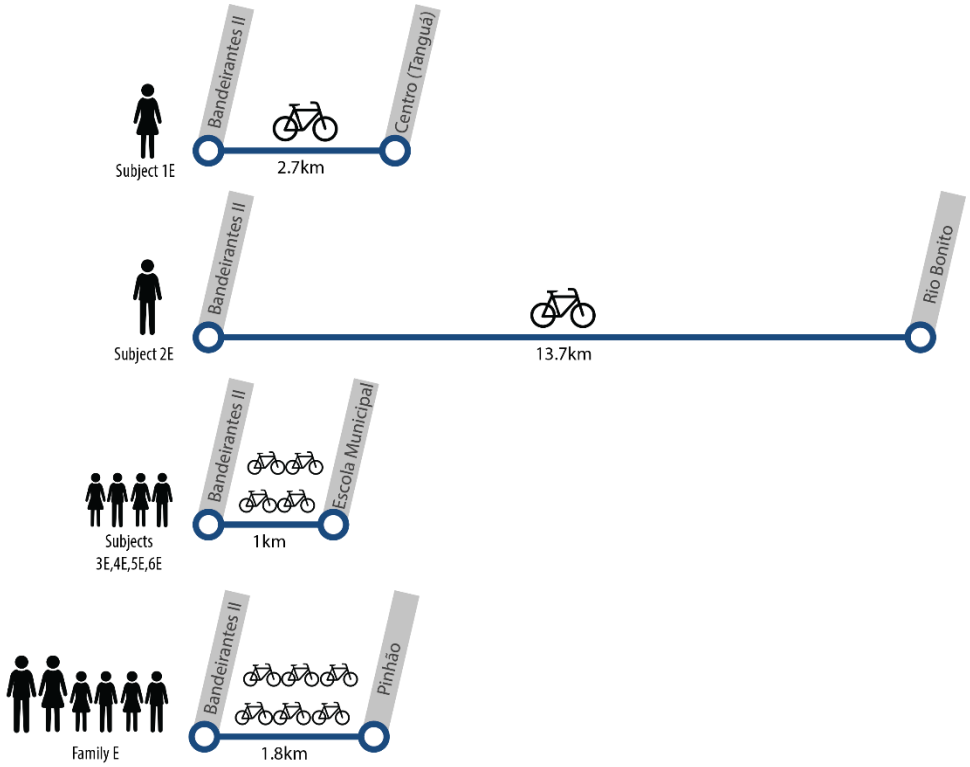


Figure 32. Typical itineraries of Family E

[43] For the values referring to this route, we used as hypothetical basis a distance between the locality Bandeirantes, Tanguá - RJ, 24890-000 to the Municipal School Prof Zulquerina Rios, R. Sessenta e Nove - Bandeirantes II, Tanguá - RJ, 24890-000.

In the proportional division of all subjects, the bicycle participates fully as a means of transport used for travel. On rainy days, the bicycle can be replaced by walking.

- Per year, it is estimated that the household cycles 8,870.4 km.
- If the total number of trips made by bicycle by Subject 1E was by bus, the household would have an annual cost of R$ 2,486.40 on the transportation budget; and by private car, R$ 672,00.
- If the total number of journeys by bicycle by Subject 2E was by bus, the household would have an annual cost of R$ 2,304.00 on the transport budget; and by private car, R$ 3,134.48.
- If the total number of journeys by bicycle by Subjects 3E, 4E, 5E and 6E were by bus, the household would have an annual cost of R$ 9,216.00 on the transportation budget; and by private car, R$ 174.14.
- The total of the household annual cost would be: bus (R$ 14.006.40) and private car (R$ 13,730.29, of which R$ 3,980.62 fuel / year and R$ 9,749.67 are related costs per year).

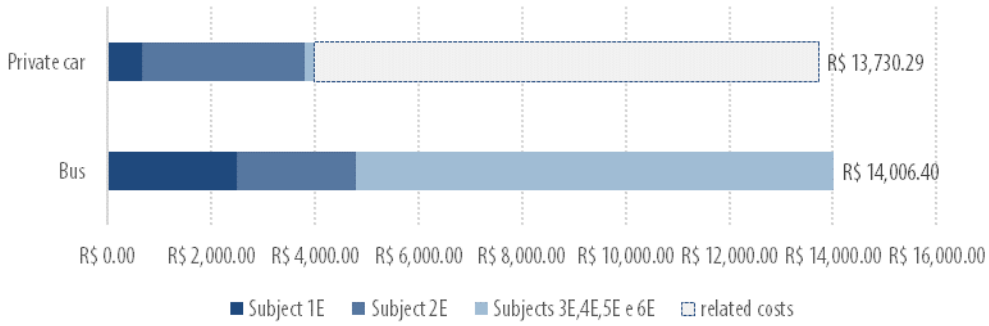


Chart 36. Expenses from other methods to replace bicycle trips (Family E).

5.1.6. OBSERVATIONS

Among the cases studied, it should be noted that the weekly participation in bicycle use tends to be higher in lower income families than in higher classes. This finding is in line with other

studies carried out on the use of cycling as a means of transportation in Brazil, as is the case of the Profile Survey of the Brazilian Cyclist, conducted in 2015.

The cases of families D and E, who pointed out that they have no other means of locomotion but the bicycle, differ from other cases in that the use of alternative modalities is more present in the higher classes. The most plausible explanation is the fact that the three highest income brackets, in view of their homes being in more central areas, have greater financial resources and transportation alternatives than the two less favored households.

In addition, it is important to highlight that the bicycle, for the higher income families, tends to symbolize the choice for a certain lifestyle, while for the lower classes it can be a solution to the daily commutes given the budget constraints and/or public transport infrastructure of the places where they reside. This leads us to speculate about the possible ability of families D and E to carry out modal shift in cases of socioeconomic rise or increase in income. The travels reported by the Subject 3D, for example, support this hypothesis, as she cycles 8.7 km between the Mare Complex and Governor's Island for driving school training.

In another view of the study, it is noticed that the travel pattern is more variant and complex in the three higher classes than in the last two cases, which declared to follow a more usual commuting routine. Moreover, although the bicycle has an expressive participation in the complete or partial processes of the commuting movements of the households studied, it loses prominence on weekends and / or joint family trips in the three highest domiciliary strata.

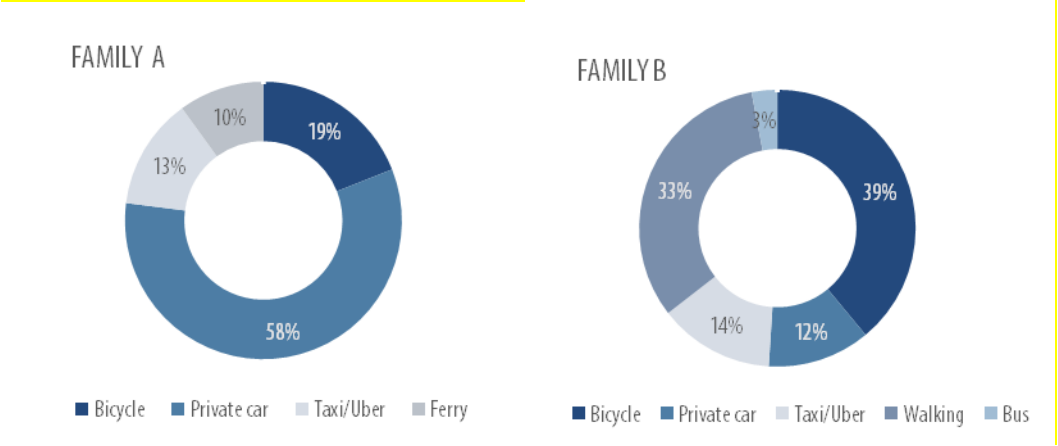
Another issue to be reflected on this finding concerns the fact that, in these households, only one member claimed to be a frequent user of the bicycle - in general, the male.

In families A and B, who have children under 5 years of age, the participation of the male is even more evident. Thus, the non-sharing of their respective spouses with such a lifestyle implies the use of more hegemonic modalities in the collective travels for leisure purposes, like the private car.

In this study, it is also interesting to observe the conjugation of the bicycle with public transport modes, such as the bus, the VLT and even the transport on foot, with greater participation in intermediate families - B and C. This scenario underlines the importance of intermodality for the efficiency and effectiveness of the valorization of the active transport in the realization of the more capillary daily movements.

In the case of Family E, it should be noted that mobility conditions are not equivalent to those of other cases, being in areas with higher social indicators and greater transport supply. Special attention should be given to the Family D, which, despite residing in a socially precarious place because it is part of a complex of underprivileged communities, is at the same time located in the city of Rio de Janeiro, where there is relatively greater supply and alternative services even if it is a peripheral area.

Therefore, the case of the Family E presents more expressive peculiarities, since the municipality of Tanguá has socioeconomic indicators much lower than those of the city of Niterói and Rio de Janeiro and another population reality (32,703 inhabitants). According to data from the IBGE[44], Tanguá has the lowest HDI of the Metropolitan Region (0.654) when compared to Rio de Janeiro (0.799) and Niterói, which has the highest HDI of the RM (0.837).



[44] Available at: <http://cidades.ibge.gov.br/xtras/perfil.php?codmun=330575>. Access in Sep 04. 2017

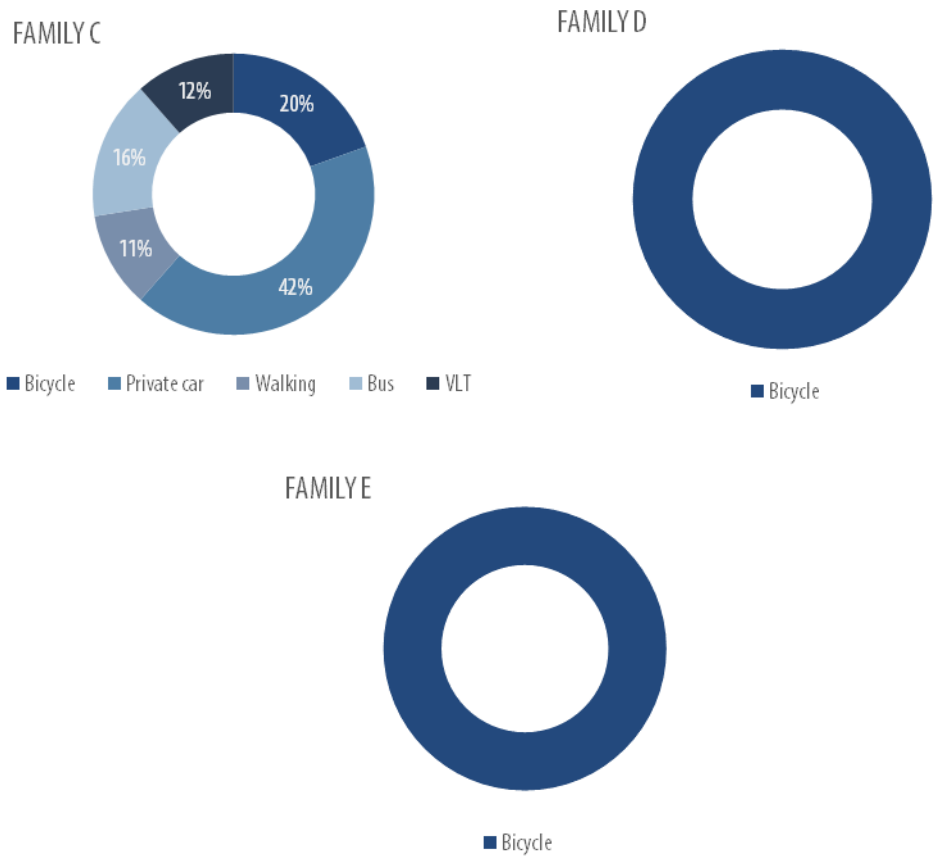


Chart 37. Modal Division by family

Thus, the municipality of Tanguá does not have the same equivalence of transport services as Rio de Janeiro and Niterói, denoting the impossibility of calculating the costs of transportation services by taxi or Uber, for example. Considering this scenario, the cost of bus transportation in Tanguá is higher (R$ 4.00) than in Rio de Janeiro (R$ 3.60) and Niterói (R$ 3.70). This demonstrates the reasons why the bicycle has exclusive participation as a means of transportation in Family E: not so much for the lifestyle, but specially for the lack of alternative options of locomotion in that urban space and by the family's financial restrictions.

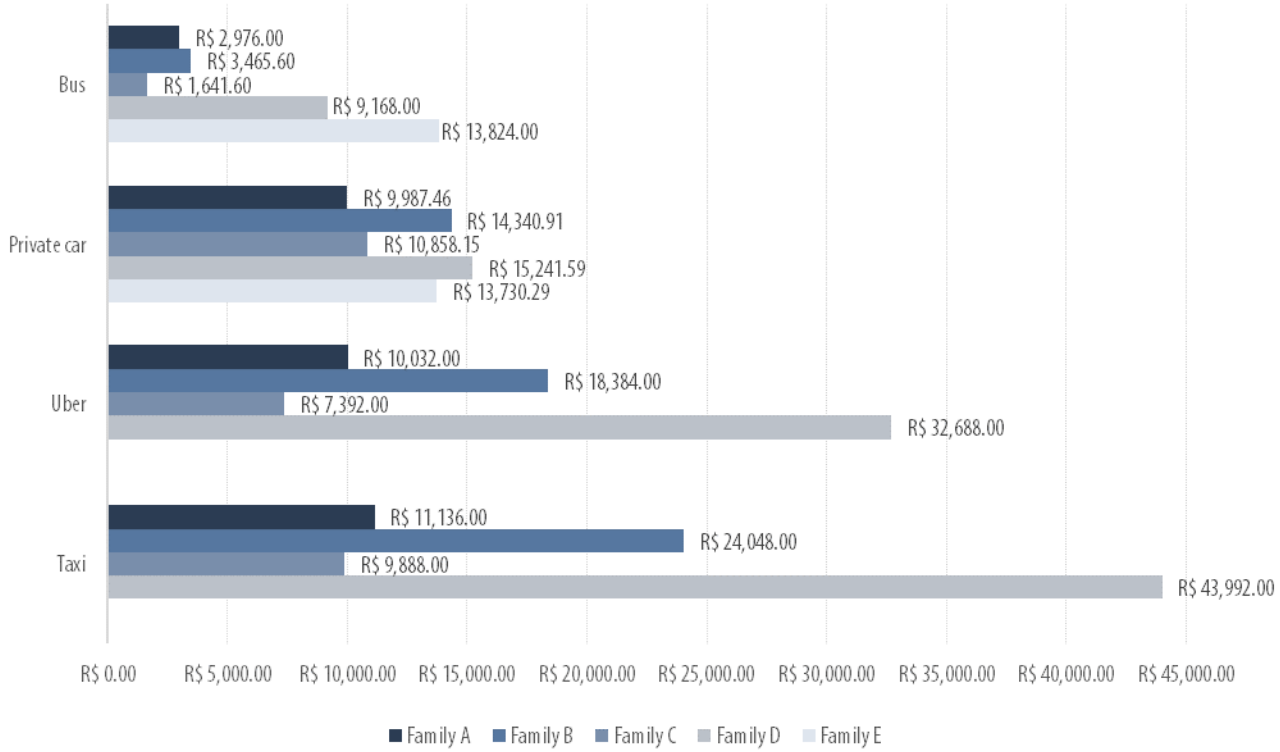


Chart 38. Expenses from other methods that replace bicycle trips

5.2 CYCLOLOGISTICS

Cyclologistics refers to the use of the bicycle as a means of transport for the provision of services, delivery of goods and development of professional activities during working hours. In its capacity, it comprises two aspects:

a) Delivery service: when the bicycle is used to deliver goods and services from an economic agent to a customer. Examples are urban logistics companies that provide bike courier services as an alternative to *motoboys* (motorcycle courier delivery) and commercial establishments that deliver goods to the customer.
b) Corporate transport: when the bicycle is used as a means of transportation that is essential for the movement of its employees during working hours.

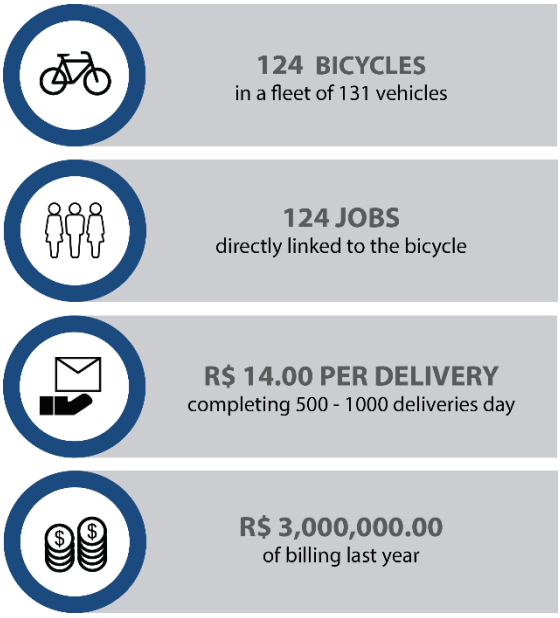
Since this is an activity not captured by official statistics, two case studies were conducted with the objective of obtaining a better knowledge of this subject, with emphasis on Cyclologistics as a delivery service. It was sought to gather basic information on: *i) Number of total vehicles used by the company; (ii) Number of bicycles; iii) Number of cyclist-workers; (iv) Number of deliveries per day; v) Percentage of deliveries per bicycle; vi) The average value of deliveries, among others complementary.*

The first study was carried out with an urban logistics company located in the city of São Paulo. The data was collected using an interview with the person in charge of the enterprise. First, the project was presented and then the data referring to the indicators pointed out in this document was requested.

The company interviewed was launched in 2010 and has as its area of action in the metropolitan region of São Paulo, targeting professional and private individuals. Carrying out express deliveries by sustainable means of transportation such as bicycles and electric vehicles. They deliver documents, small packages, invitations, magazines, gifts, medicines. The interviewee stated the possibility of requesting specific cyclists for exclusive full-time deliveries.

Currently, it has 600 clients, a general staff of 144 people, sales of R$ 3 million and market value around R$ 4 million. The organization has 131 vehicles total, in which 124 of these are bicycles, that make 95% of the deliveries made by the company. The number of deliveries per day varies between 500 and 1,000 with an average value of R$ 14.00 each. Considering these parameters, it would have a total billing between R$ 7,000 and R$ 14,000 reals per day, without deducting the charges and other expenses.

It is interesting to note that, even with the availability of electric vehicles, the most predominant type of vehicle in the fleet of this company is the bicycle. This data can be revealing as to the possible low cost of maintenance of bicycles, as well as its potential flexibility to access areas with high urban density such as that of Greater São Paulo. Presumably, the success of the venture in that locality expresses the potential for growth and success of this type of business in other metropoles of the country.



Source: Data reported by the company.

The second study had the objective of counting commercial establishments (wholesalers and retailers) with deliveries made by bicycles within a territorial range located in the district of Bom Retiro, São Paulo, characterized by the sub-centre profile - where there is a significant concentration of services and trade (VILLAÇA, 1998)[45]. For a quantitative approach to this case, the study used as a method of data collection a structured interview model applied to all commercial establishments in Bom Retiro.

The interviews were conducted between October and December 2017 by three researchers. A total of 1,701 retail and wholesale stores were visited. Of this total, it was verified that 698 establishments deliver and 114 of them do it by bicycle and/or tricycle.

[45] This study was organized in partnership with the Brazilian Bicycle Industry Association (Aliança Bike), under the general coordination of Daniel Guth in the duplication of methodology previously developed by Active Transport for the counting of commercial establishments that deliver by bicycle in Copacabana, Rio de Janeiro. Cf. Calculation of commercial establishments with bicycle deliveries in Copacabana. NGO Active Transport, 2011.

Type of vehicle	Number of Establish-ments	Total % of enterprises
By foot, hand cart trolley	222	31.8
Car, truck, *kombi, carreto,* van	145	20.7
Bicycle, tricycle	114	16.3
Motorcycle, *motorboy*	35	5
Others (Post, parcel)	245	35.1
TOTAL	761*	108.9*

Table 12. Entregas por meio de transporte no Bom Retiro

* The percentage exceeds the total number of enterprises (698) and exceeds 100%, as there are enterprises that deliver with more than one means of transport.

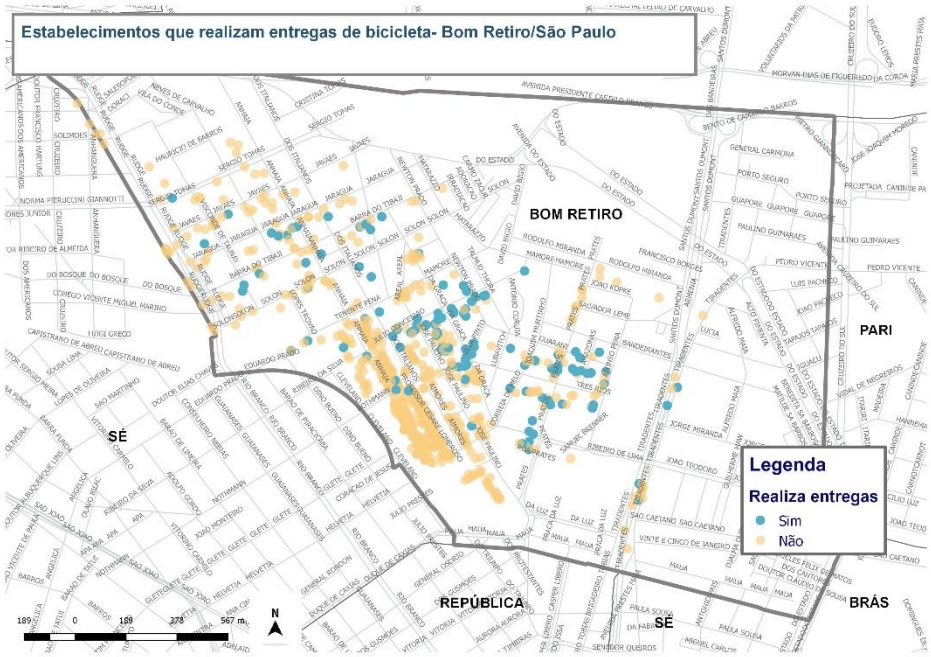
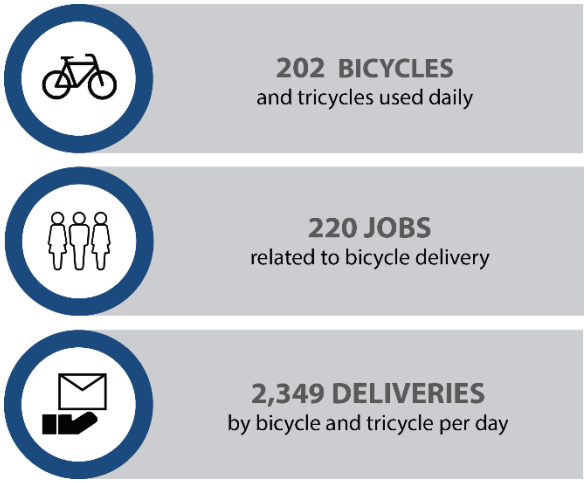
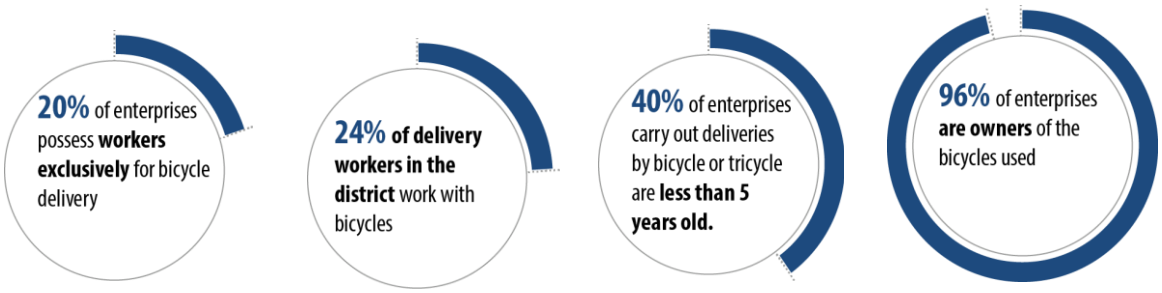


Figure 33. Establishments that carry out bicycle deliveries (Bom Retiro, SP).

According to the survey, the commercial enterprises of Bom Retiro make a total of 2,349 deliveries per day by bicycle and tricycle - an average of 20.6 deliveries per enterprise. In all, 202 bicycles and tricycles are used by 220 workers, 215 of these (97%) men and only 3% women.



It was verified that 20% of the establishments count on employees who work exclusively on bicycle delivery. In all, 53 people work with deliveries, which corresponds to 24% of all delivery personnel in the district. In addition, more than 40% of establishments that deliver bicycle and tricycle deliveries have been doing so for less than five years. It was also interesting to note that 96% of the establishments declared ownership of the bicycles used for delivery.



Among the commercial profiles, kinitting and crocheting stores are responsible for more than 30% of all deliveries made in Bom Retiro.

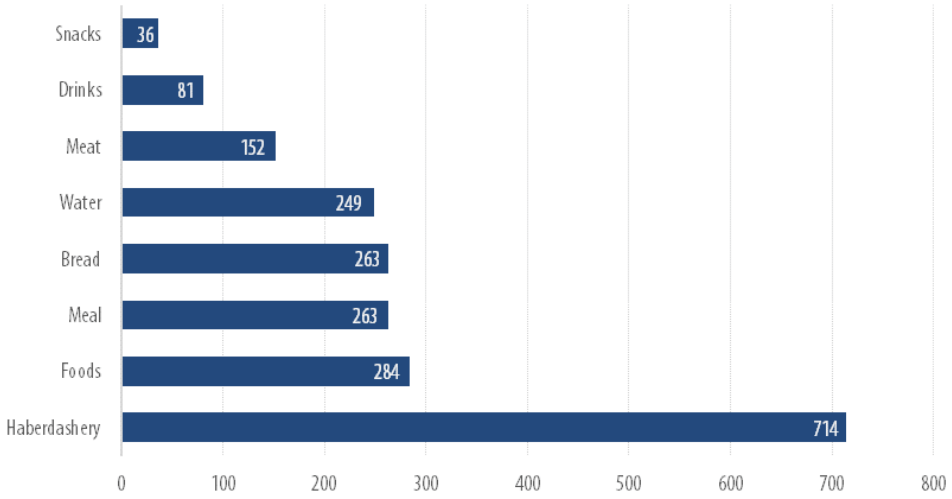


Chart 39. Average daily bicycle deliveries by type of product in the Bom Retiro neighborhood.

There were several reasons enterprises choose to make bicycle and/or tricycle deliveries. The overwhelming majority (87.7%) said that this method is faster and more practical, followed by economic reasons (7.8%). The rest indicated other reasons or did not answer. Finally, it was verified that 91.2% of the establishments do not charge any value for the completion of deliveries by bicycle or tricycle, against 3.5% that charge up to R$ 5.00, 1.7% charge depending on the location of delivery and the rest did not answer.

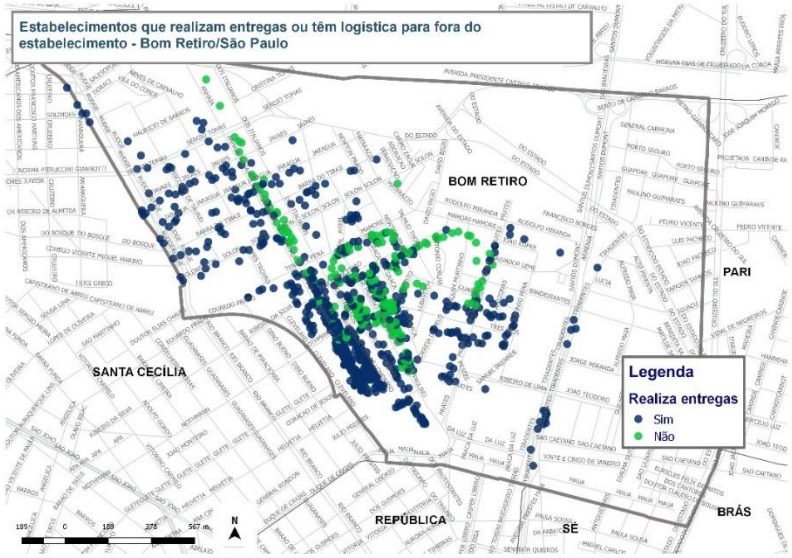


Figure 34. Establishments that deliver by bicycle or have off-site logistics.

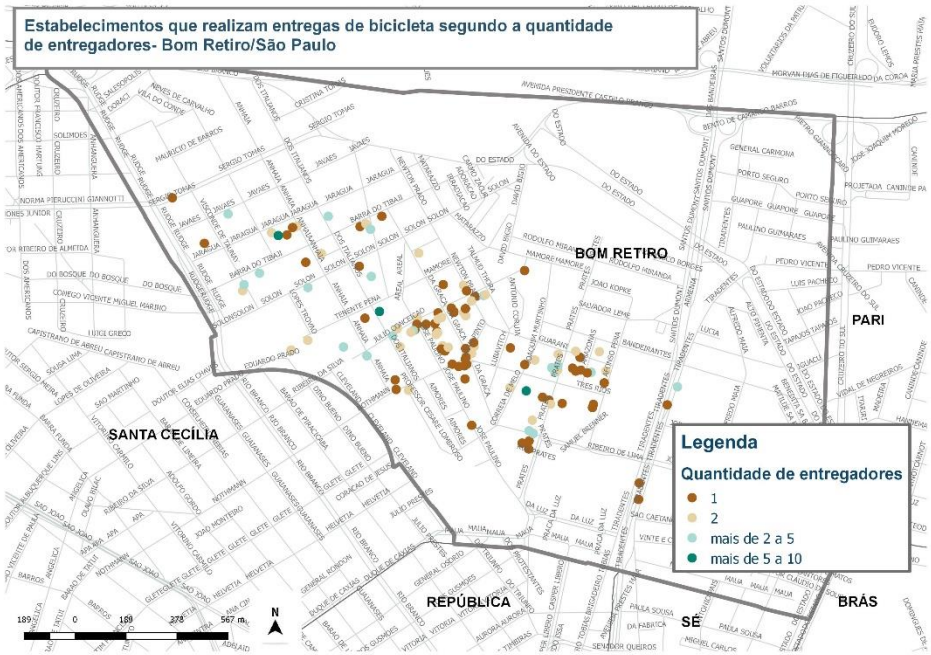


Figure 35. Enterprises that carry out bicycle deliveries according to the number of delivery workers (Bom Retiro, SP).

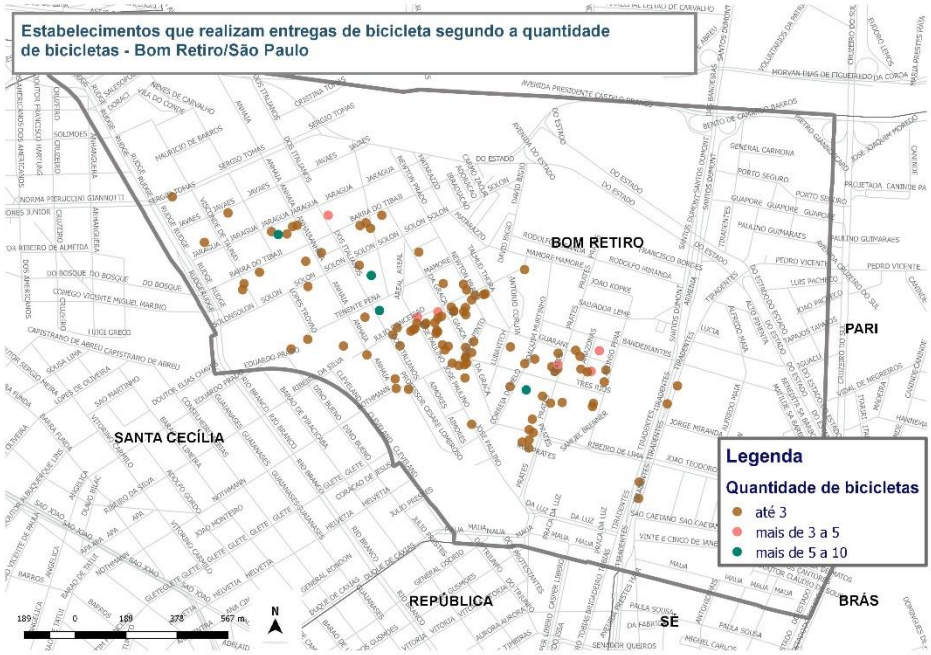


Figure 36. Enterprises that carry out bicycle deliveries according to the number of bicycles (Bom Retiro, SP).

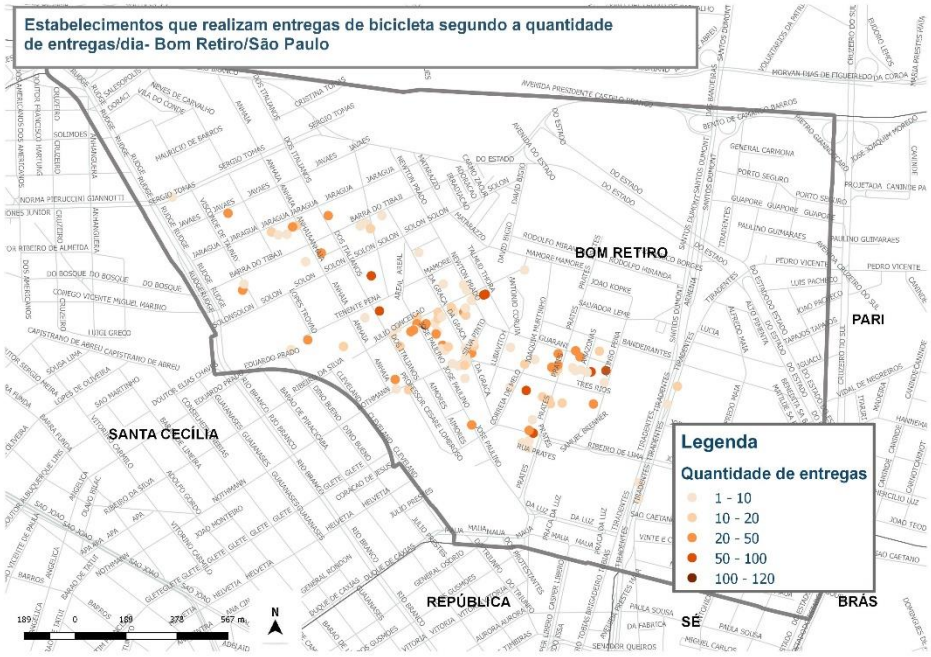


Figure 37. Establishments that carry out bicycle deliveries according to the number of deliveries per day (Bom Retiro, SP).

The Bom Retiro case study denoted the importance of bicycle participation for economic purposes in a context where the use of motorcycles, automobiles and even trucks could appear as predominant or as unique options. According to the similar study carried out by Active Transport in 2011, in the Copacabana neighborhood, in Rio de Janeiro, the numbers and data presented here are also extremely relevant to think about the importance of the role of sub-centers - as tertiary poles of local importance - in the promotion of active mobility. The concentrated agglomeration of services in a given isolated area is a direct inducement to the coming and going of people and goods whose movements are favorable to the use of the bicycle or mobility on foot, especially if these sub-centers are located near residential areas.

6 RELATED ACTIVITIES

In the section called **Related Activities**, we discuss the economic participation of the bicycle in activities related to the use, consumption and / or incentive of the bicycle in five themes: *Cycloactivism*, *Research and Innovation*, *Cyclotourism*, *Cycloentrepreneurism,* and *Sporting Events*.

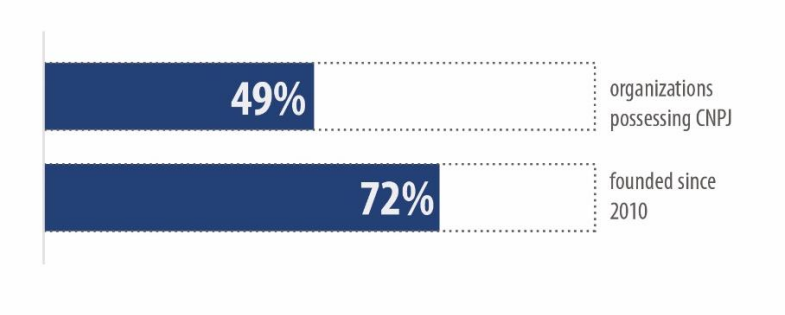
6.1 CYCLOATIVISM

Cycloactivism comprises of activities carried out by private non-profit organizations that provide public services in support and promotion of the use of the bicycle as a means of transportation. Concerning the understanding of the Bicycle Economy, we seek to investigate three basic facts about this activity: *i) public investment; (ii) private investment; and iii) the number of persons employed.*

The focus of the survey was on the organizations and groups, formal or otherwise, that act in the promotion of mobility by bicycle, especially in the urban areas. It is important to emphasize that these bodies do not make up a single and homogeneous universe. By bringing together different individual demands, they also express different ways of acting. Therefore, in addition to raising data about the economic dimension of Cycloactivism, we seek to raise other characteristics about the strategies of action.

The survey was carried out in two stages. In the first, we identify those organizations currently active in Brazil. For this, it was fundamental the collaboration of the Union of Cyclists of Brazil (UCB), which provided the list of its members. From this list, we conducted a survey that consisted of sending an electronic form to each of the bodies identified in the list of UCB, as well as parallel surveys also on the Internet, allowing us to map the organizations involved.

In the second stage, the participants were asked to respond to questions put in the online form, containing information on: the date of foundation, formalization (existence of CNPJ or not), fields of action, number of people involved in the work of the body, revenue from public and private financing programs, among others.



Altogether, 55 active bodies were identified, acting or that acted in 2016 in actions in favor of mobility by bicycle in Brazil. The map below shows the distribution by the Federation Units.

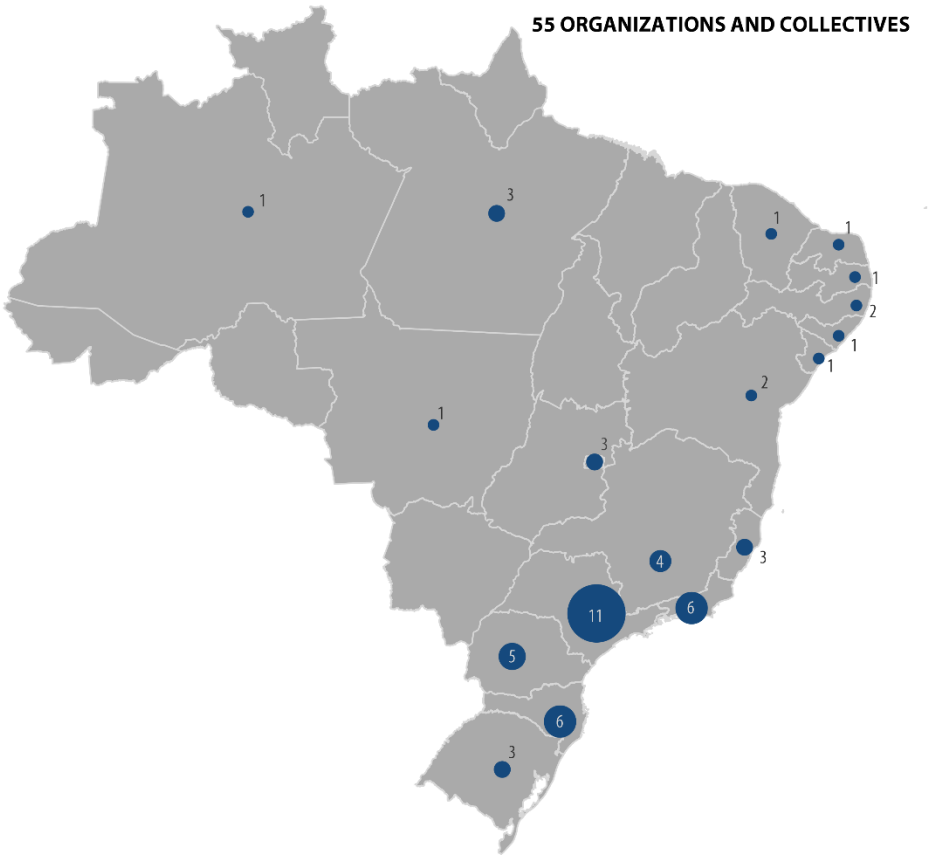


Figure 38. Number of collectives and organizations by State.

Chart 40 shows the diversity of performance of these bodies. All participants, for example, are involved in "project design". In "Marketing actions and training of Human Resources", 86% and 84% stated, respectively, to work in these fields.

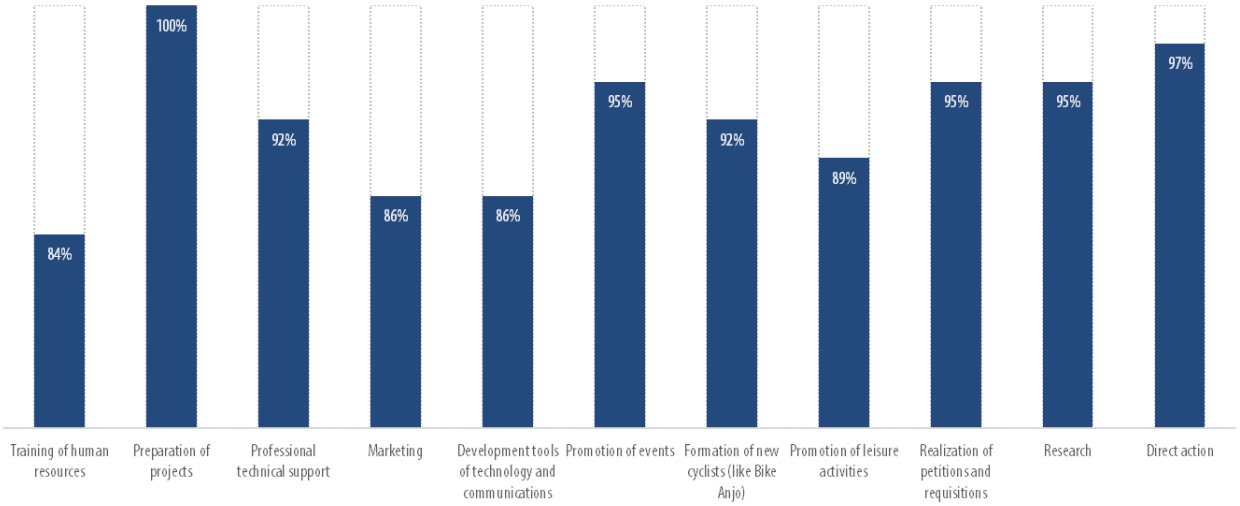


Chart 40. Areas of activity of Cycloactivism.

In 2016, these bodies received around R$ 5.1 million in revenues from public and private financing programs, or from the sale of products and the promotion of events.

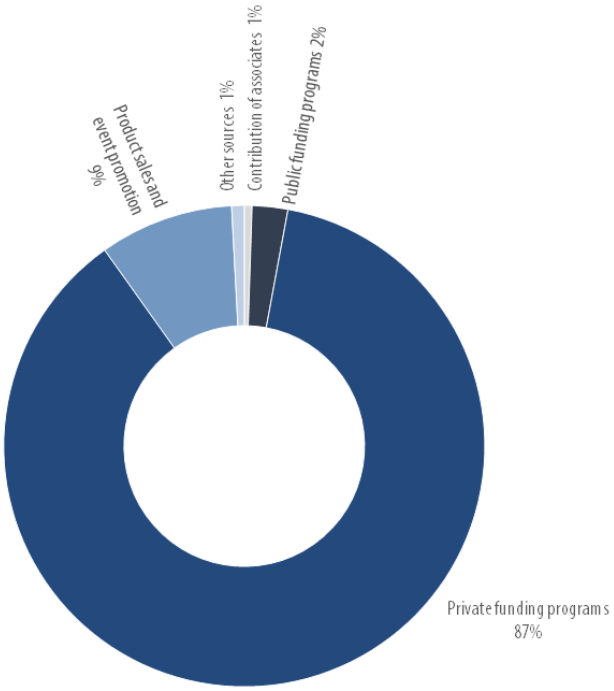


Chart 41. Incomes of the cycleactivist organizations and collectives according to the source in 2016.

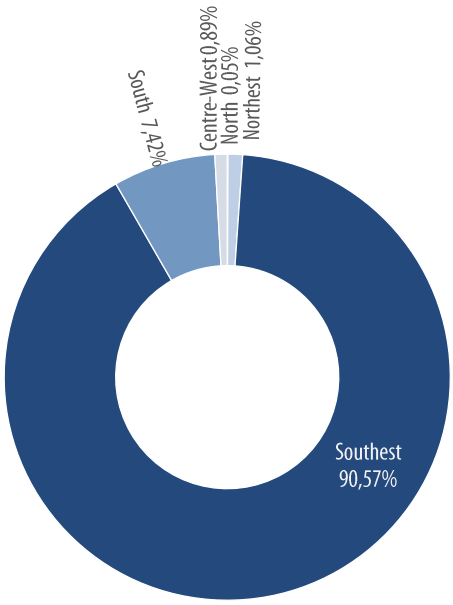


Chart 42. Total revenue of Cycloactivism organizations and collectives by Major Regions.

In Cycloactivism, most people were voluntarily involved in temporary activities carried out by organizations throughout the year. Due to this peculiar characteristic, care must be taken not to confuse the work process in the cycleactivist activities with that developed in the traditional economy. Despite the prevalence of unpaid work, more than R$ 1.3 million in 2016 was spent for the payment of persons employed in this activity.

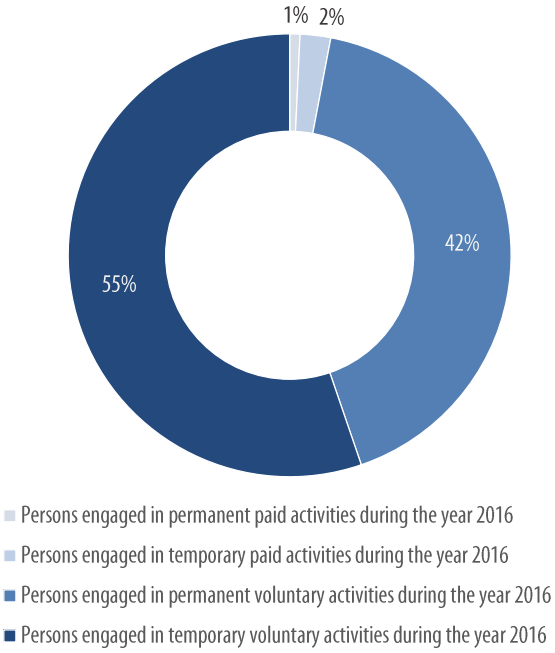


Chart 43. People involved in *Cycloactivism* by the type of category – 2016.

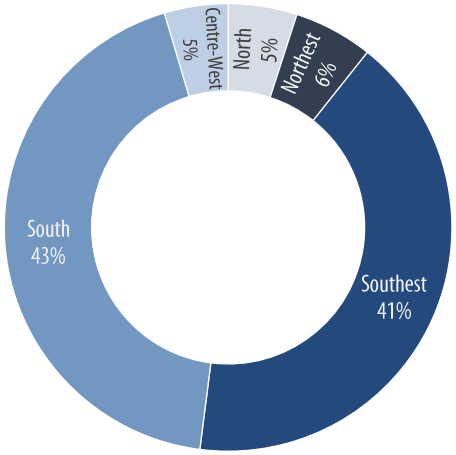


Chart 44. People involved in *Cycloactivism* by Major Regions – 2016.

6.2 RESEARCH AND INNOVATION

Research and Innovation constitutes a theme that includes the Brazilian field of scientific production in which the bicycle has participation as a direct or indirect object of study.

Information on Research and Innovation was collected in two steps. The first consisted of a survey of the Plataforma Lattes database of the National Council for Scientific and Technological Development (CNPq), which sought to identify researchers-doctors who work or had worked in the last ten years (2007 onwards) with the theme of active transport focused on the bicycle. This step included three phases of search: a) for research projects; b) by published articles; and c) "Doctorate and asters students" involved in the topic. In relation to the projects, after collecting this information, a list was created with information that allowed the accomplishment of the following steps: name of the coordinator, email of the person in charge and period of realization.

In the second step, an email was sent to each project coordinator requesting, among other things, information on the total amount of public and / or private funding of the research in question, which allowed us to estimate the total value of the investment. However, it should be mentioned that the study encountered limitations due to something inherent in this type of survey, which depends very much on the willingness and availability of informants to fill out the online form.

According to the data found, between 2007 and 2017, 124 bicycle research projects were carried out in Brazil. These projects were distributed in 16 of the 27 Units of the Federation and involved 270 researchers, regarding doctors, masters, doctoral students, master's students and undergraduates. Altogether, approximately R$ 3.7 million were mobilized to finance these research projects.

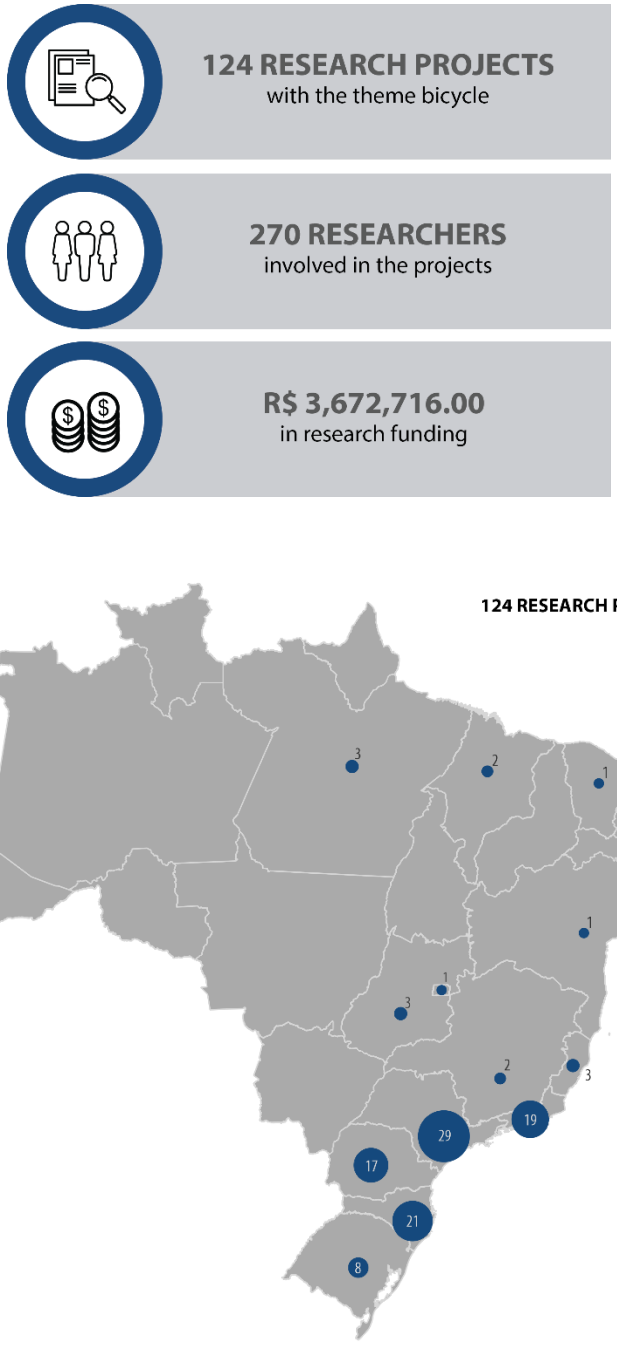


Figure 39. Number of research projects by State.

Figure 40. Research institutions with projects with the theme Bicycle.

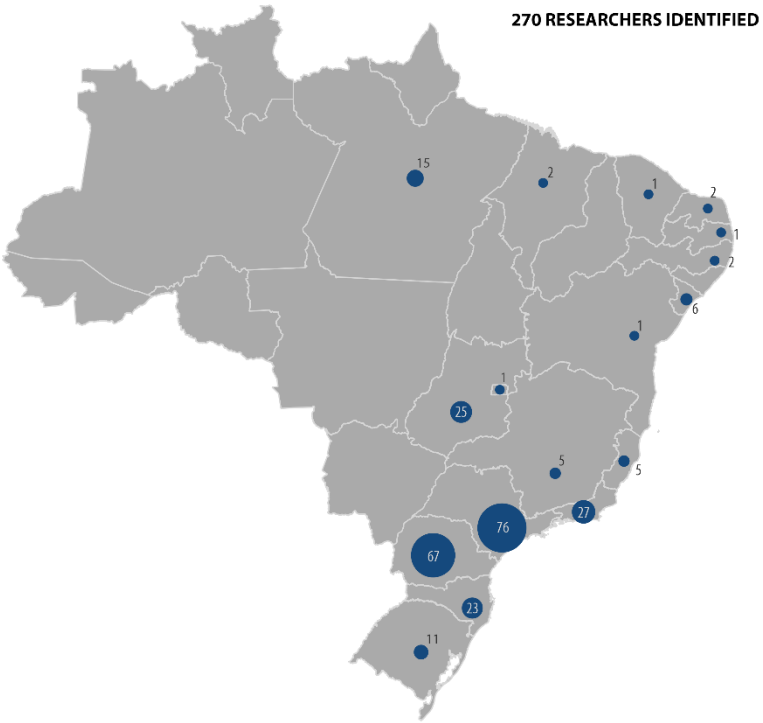


Figure 41. Number of researchers by State.

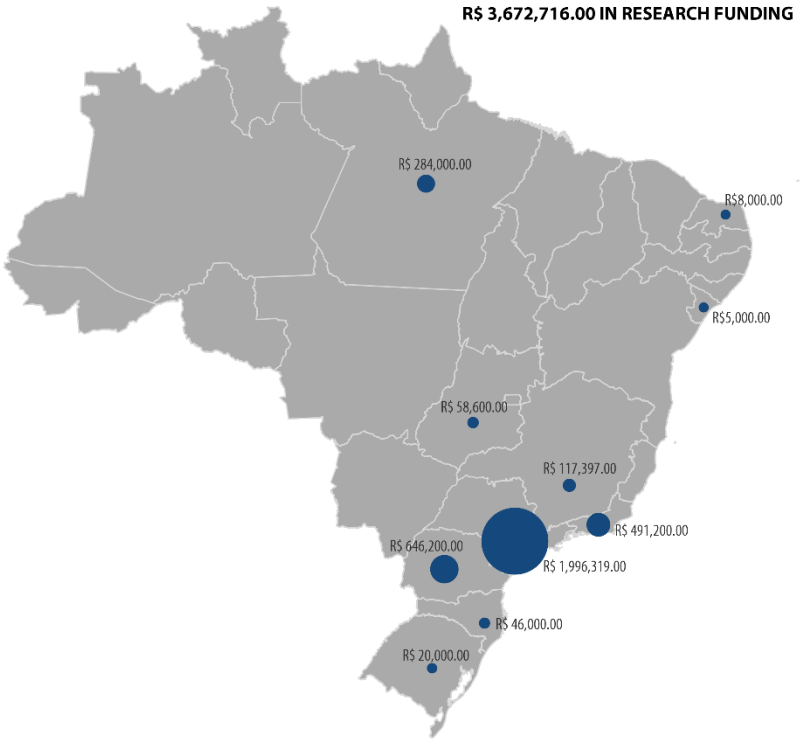


Figure 42. Research funding figures by State.

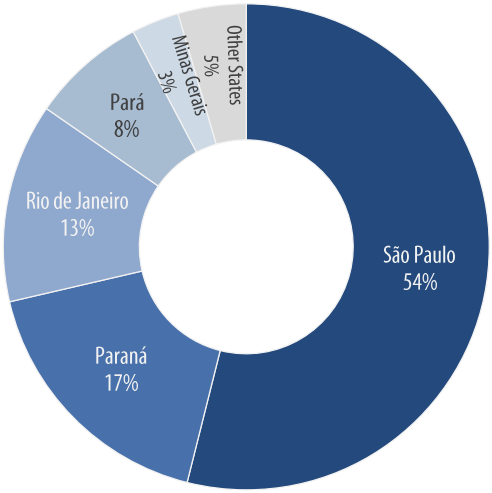


Chart 45. Percentage by State in the amount invested in research.

6.3 CYCLOTOURISM

Cyclotourism involves the use of the bicycle as a fundamental tool for locomotion of an individual during a day-long recreational excursion or a longer duration holiday trip (LUMSDON, 2000; LAMONT, 2006; FAULKS, 2007).

According to the Ministry of Tourism (2012), *Cyclotourism* was encouraged in 53 Brazilian municipalities, which received R$ 20.2 million for the construction of bicycle lanes between 2001 and 2011. From the figures reported by the Ministry of Cities, there are already more than 2,500 km of cycle paths and cycle lanes in the country. However, this coverage is still developing for the 75 million bikes that exist today in Brazil (ANTP, 2015).

Although the scheme of bicycle route infrastructure development in Brazil is less than expected according to the current national guidelines related to urban development and tourism, the revenues of Brazilian adventure tourism and ecotourism companies, a market segment linked to *Cyclotourism*, only grows . From R$ 491.5 million in 2008 to R$ 515.9 million in 2009, (not far in time from our actual reality?) an increase of 21%, therefore, according to data from the (MTur), in partnership with the Brazilian Association of Ecotourism and Adventure Tourism Companies (Abeta).

However, all the indicators on the impact of tourism are admittedly difficult to produce due to the very definition of Tourism and the multi-sectoral character of the activities considered in it and also by the inexistence of an economic branch in which this diversity of activities can be easily recognized and grouped to enable these quantifications. This becomes even more blurred when it comes to segmentation of the tourism market (Adventure Tourism and Ecotourism). Cycle tourism in Brazil still presents some degree of informality of the economic activities related to the marketing of products and services in this segment. However, at least it is possible to identify, besides the large numbers mentioned above, the circuits of *Cyclotourism* in Brazil, as did ANTP (2015).

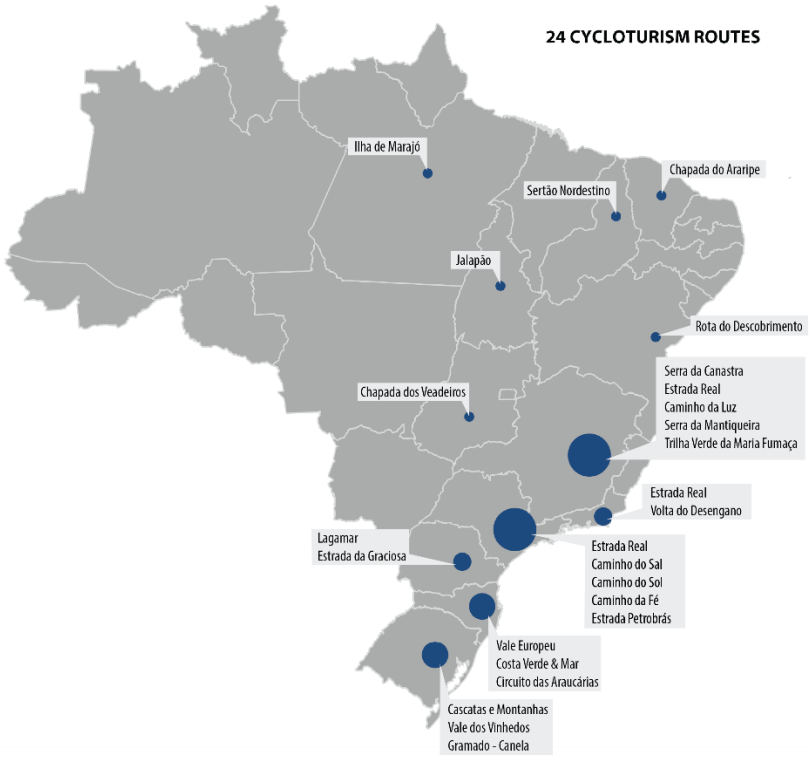


Figure 43. Mapping of Cyclotourism in Brazil.

Source: Adapted from Aliança Bike (2017).

Among these, the Cyclotourism Circuit of the European Valley, located in the tourist region of the same name in Santa Catarina, stands out. This circuit was founded in 2006 through a partnership between the Cycling Club of Brazil, the Vale das Águas Tourism Association and the Inter-Municipal Consortium of the Vale Medio do Itajaí. The great diversification of the offer touristic of the Vale Europeu is catalyzed by the development of the activity of Cycling. Among the 17 cities that make up the tourist region of the European Valley, there are the following distinctions:

1. Apiúna [1]
2. Ascurra [1]
3. Benedito Novo [1]
4. Blumenau
5. Botuverá [2]
6. Brusque
7. Canelinha
8. Doutor Pedrinho [1]
9. Gaspar [2]
10. Guabiruba [2]
11. Indaial [1]
12. Nova Trento
13. Pomerode [1]
14. Rio dos Cedros [1]
15. Rodeio [1]
16. São João Batista
17. Timbó [1]

¹ Covered by the Circuit and consortium members of CIMVI.

² Only CIMVI consortium members.

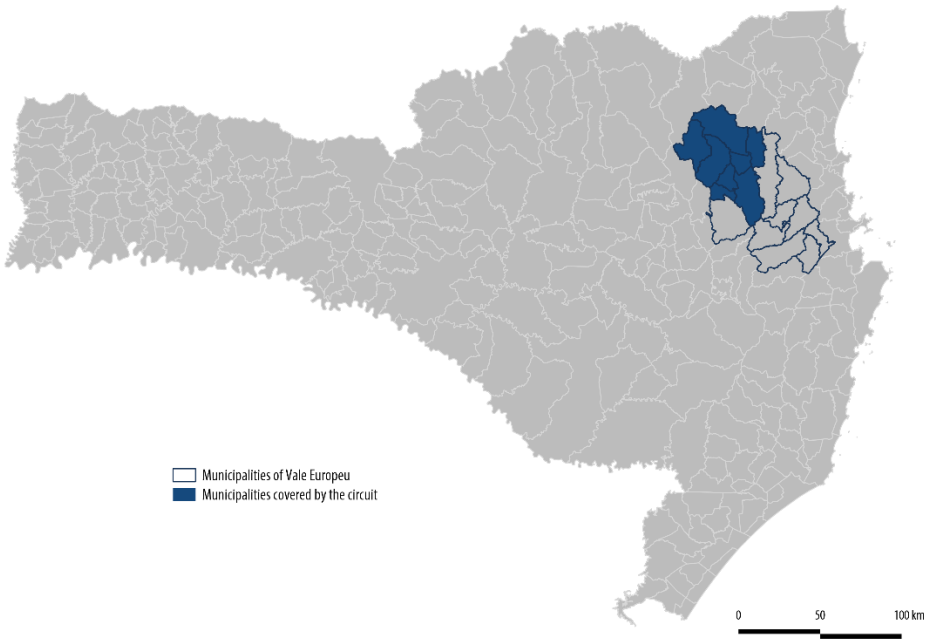


Figure 44. Municipalities of the tourist region of the Vale Europeu and covered by the circuit in the state of Santa Catarina.

Source: Adapted de MTUR (2017).

The literature on the subject points out that three major factors are important in the analysis of a cycle tour:

a) entry terminals: transport access structures which have pro-bicycle facilities in some way. For example: airports, bus stations, ports and train stations.

b) cycle routes: the routes used (whether they are structured or not) by cyclists to move between cities, and can be classified in local, regional, state and national;

c) cycling hubs: cities belonging to a circuit (or serving as a gateway to other circuits) that have a basic infrastructure to meet the needs of a cyclist when traveling by the cycle routes. Based on a set of seven elements: attractiveness of the route, means of accommodation, facilities for cyclists (bicycle rental, repair workshops, receptive community, etc.), access by

public transport, attractive and safe cycling network, signalization of routes, mapping of routes.

In relation to the profile of demand, the need for a secondary data source is evident by the possibility of interweaving the most different information about the route users with the analysis factors established in the survey of tourist offer. In the absence of data previously collected and / or made available by the local actors, there is a need to structure recommendations for future profile surveys to consolidate a historic series faithful to the reality of the bicycle touring circuits already existing in Brazil.

The indicators were subdivided into two groups: the first one related to the tourist offer, containing the analysis factors "Entry terminals", "Cycle routes" and the elements of the "Cycling Hub"; and the second concerning tourist demand, analyzing separately the profile of the existing demand and the evolution of the non-competitive event held annually in the circuit, the Velotour.

6.3.1. Presentation and Data Analysis

6.3.3.1. Offer touristic of Vale Europeu

Circuit Total of municipalities: 9
Total routes: 7 (one per day) = 287,1 km
Total number of hotels: 43
Total number of restaurants: 10
Total Operators: 7

6.3.3.2. Entry Terminals

The state of Santa Catarina has three international airports (Joinville, Navegantes and Florianópolis), two seaports (Itajaí and Porto Belo) and a comprehensive national and regional highway in Blumenau (neighboring municipality to the destinations of the circuit that also serves as gateway for visitors arriving by this mode of transportation).

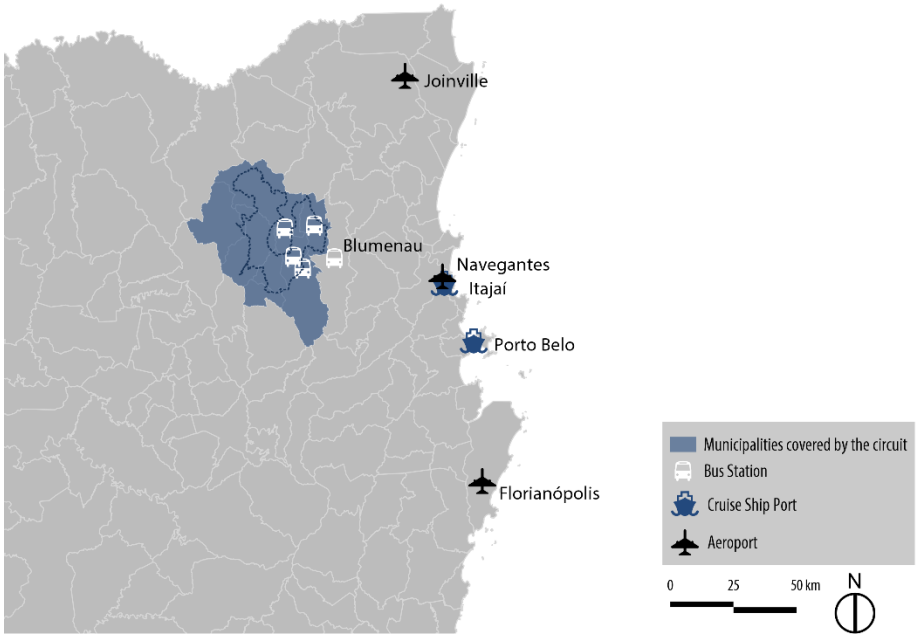


Figure 45. Survey on the entry terminals in the State of Santa Catarina involving the Vale Europeu.

Entry terminal	Quantity	Characteristic
Joinville Airport	**519,062**	**Movement of passengers/2016**
Navegantes International Airport	**1,471.037**	**Movement of passengers/2016**
Florianópolis International Airport	**3,536.435**	**Movement of passengers/2016**
Port of Itajaí	**Yes**	**Attraction of cruise chips**
Piero of Porto Belo	**Yes**	**Attraction of cruise chips**
Highway Terminal of Blumenau	**National**	**Travel coverage**

Table 13. Characteristics of entry terminals studied.

Source: INFRAERO (2017); local source.

6.3.3.3. CYCLE ROUTES

The total route of 287.1 km is divided into seven small itineraries in which each of them has a recommendation of municipality as an overnight destination. It is understood that the vast

majority of visitors follow this already pre-established roadmap. Thus, it is possible to estimate in which cities there is a greater expense by targeting the means of lodging.

	Distance	Origin	Destination	Overnight in
Day 1	45km	Timbó	Pomerode	Pomerode
Day 2	40.1km	Pomerode	Indaial	Indaial
Day 3	26.9km	Indaial	Rodeio	Rodeio
Day 4	41.1km	Rodeio	Doutor Pedrinho	Doutor Pedrinho
Day 5	40km	Doutor Pedrinho	Alto Cedros	Rio dos Cedros
Day 6	41km	Alto Cedros	Palmeiras	Rio dos Cedros
Day 7	53km	Palmeiras	Timbó	Timbó

Table 14. Official itinerary of the cycletour of the Vale Europeu

Fonte: CIMVI (2016).

6.3.3.4. CYCLISM HUB

ATTRACTION OF DESTINATION

Studying the categories of each municipality of the Vale Europeu tourist region on the Ministry of Tourism's tourist map, it is possible to observe a large percentage of municipalities in category D, followed also by categories C and E – Blumenau being the only tourist destination in category B (no municipality belongs to category A in this region). This reality demonstrates the opportunities for the municipalities to rise in categories and become more visible nationally and internationally, especially to the destinations neighboring the circuit, which can benefit from a constant increase of the flow of tourists from the diversification of offer within the region.

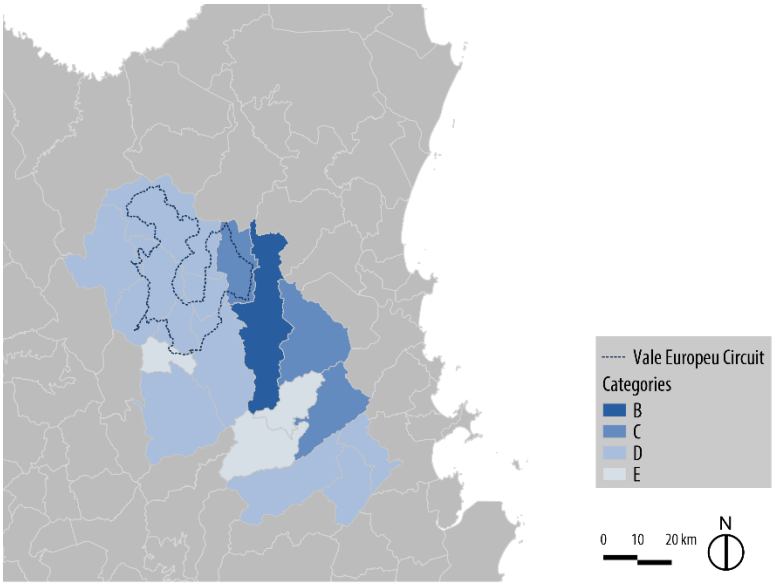


Figure 46. Tourist categorization of the municipalities of the tourist region of the Vale Europeu.

Source: Elaborated from MTUR (2017).

Municipality	Category	Overnight suggestion
Rio dos Cedros	D	2 days
Timbó	D	2 days
Pomerode	C	1 day
Indaial	D	1 day
Rodeio	D	1 day
Doutor Pedrinho	D	1 day
Apiúna	D	0 day
Benedito Novo	D	0 day
Ascurra	E	0 day

Table 15. Survey of the municipalities involved in the itinerary with their respective categorizations and numbers of nights officially recommended.

Source: Elaborated from MTUR (2017); CIMVI (2016).

ACCESS BY PUBLIC TRANSPORTATION

Cities covered by the circuit with road terminals:

- Timbo Bus Station
- Indaial Road Terminal

- Pomerode Bus Station
- Rio dos Cedros Municipal Bus Station.

Municipality	Category	Overnight suggestion	Bus Terminals
Rio dos Cedros	D	2 days	1
Timbó	D	2 days	1
Pomerode	C	1 day	1
Indaial	D	1 day	1
Rodeio	D	1 day	None
Doutor Pedrinho	D	1 day	None
Apiúna	D	0 day	None
Benedito Novo	D	0 day	None
Ascurra	E	0 day	None

Table 16. Survey of the bus terminals by municipality involved in the circuit

The cities covered by the circuit that own the road terminals are the potential hubs of attraction and concentration of cyclotourists - also called a cycling hub - and have the largest economic movement among the cities of the circuit because of the largest tourist infrastructure that should have.

MEANS OF ACCOMMODATION

The lodging facilities involved with the circuit officially associate with the consortium and association representatives and follow a series of requirements to become "friends" of the bicycle. The chart below indicates the number of hotels officially promoted by the circuit as opposed to those located in the tourist services provider's registration system of the Ministry of Tourism (MTUR), CADASTUR.

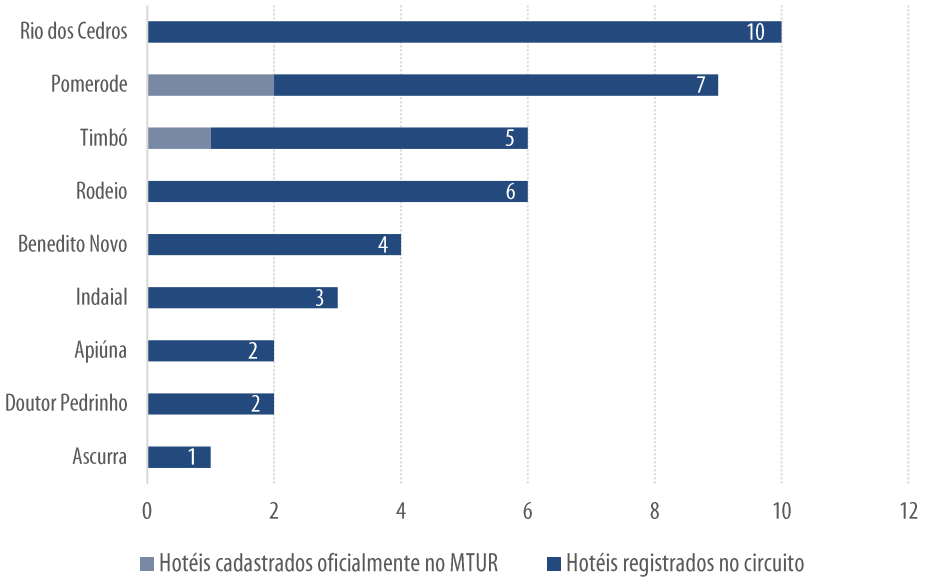


Chart 46. Survey of the means of accommodation officially registered in the circuit and registered with the MTUR by CADASTUR.

Table 17 shows the municipalities and their respective overnight recommendations in the proposed itinerary and, so, estimates the costs spent in accommodation per person when completing the circuit.

Municipality	Overnight Suggestion	Average Fare		Estimated value per capita	
		SGL*	DBL*	SGL*	DBL*
Rio dos Cedros	**2 days**	**355**	**355**	**710**	**355**
Timbó	**2 days**	**191**	**257**	**382**	**257**
Pomerode	**1 day**	**178**	**230**	**178**	**115**
Indaial	**1 day**	**63**	**114**	**63**	**57**
Rodeio	**1 day**	**90**	**180**	**90**	**90**
Doutor Pedrinho	**1 day**	**n/a**	**n/a**	**n/a**	**n/a**
Apiúna	**0 day**	**n/a**	**n/a**	**-**	**-**
Benedito Novo	**0 day**	**n/a**	**n/a**	**-**	**-**
Ascurra	**0 day**	**72**	**165**	**-**	**-**

Legend: SGL – Single; DBL – Double room; n/a – Data not available.
****Reference values (November/2017)***

Table 17. Price variation and estimated values per capita in each municipality directly involved with the circuit.

Source: Own elaboration based on the rates published by the main indexes of online booking systems.

FACILITIES FOR CYCLISTS

In terms of analysis of the facilities for cyclists, it is possible to include receptive tourist operators and restaurants, which have a session of enterprises registered in the circuit, as well as the accessories stores and cycling apparel.

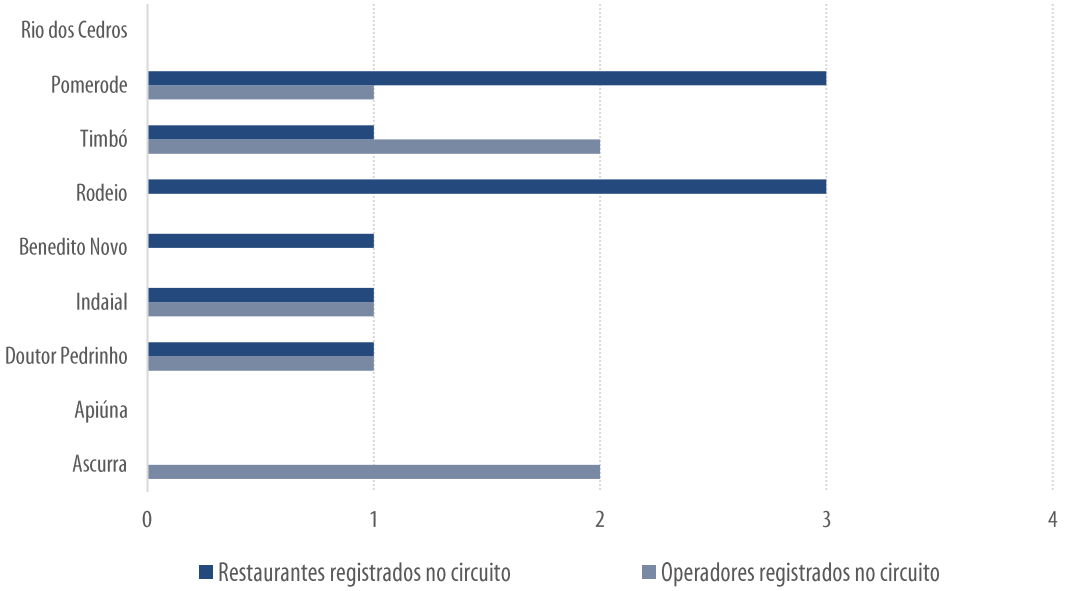


Chart 47. Survey of operators and restaurants registered in the circuit

Source: Prepared from CIMVI (2016).

Within the framework of *Cyclotourism*, there are also indications of the positive impact on the bicycle sales sector in some of the municipalities, indicating another potential multiplier effect in the local economy.

6.3.3.5. VISITOR PROFILE

After a technical visit to observe on-site the Vale Europeu Circuit, it was noted that even with a well-developed infrastructure and a well-established destination promotion plan, there is no structuring or data collection on visitors for the production of a historic series since its inauguration date. The data that was present for analysis is from the year 2015 through a statement of responsibility that visitors have the option of signing at the start of the circuit. Despite being informed of an average annual visit of 2,000 accredited visitors (a similar number of

visitors are estimated to have completed the circuit without the official registration), in the calculation for the high season period of 2015 and 2016 (delimited in the six months between November and April), a total of 439 respondents were obtained - which may be considered sufficient for a 95% confidence test and a 5% sample error. With this, it was possible to reach the geographical distribution of the origin states of the circuit users - highlighting the great representativeness of the states of Santa Catarina, Paraná and São Paulo, with more than two-thirds of the total number of visitors to the circuit.

FEDERAL UNIT	(%/TOTAL)
Santa Catarina	30%
Paraná	24%
São Paulo	23%
Rio Grande do Sul	8%
Minas Gerais	7%
Bahia	3%
Distrito Federal; Rio de Janeiro	2%
Pernambuco; Ceará; Mato Grosso do Sul; Rio Grande do Norte; Roraima; Tocantins	< 1,0%
Sample total:	439 participants

Table 18. Origin of visitors by federal unit.

Source: Prepared from CIMVI (2017).

Thus, the need to implement and make feasible production procedures and data collection in a continuous way to understand the travel habits and socio-demographic profile of the visitors of this and other newer cycling circuits - making it possible to understand changes already occurring and predict market trends so that managers, companies and local people can prepare and innovate their supply sustainably.

6.3.3.6. ANALYSIS OF THE VELOTOUR

The Velotour started during the period of Carnival, taking advantage of the number of free days of the holiday for the participation of interested parties. However, with the growing demand for the circuit during the year (as well as for Velotour itself) and especially during the Carnival period, it was not possible to hold the event for this period and it began to be held

from 2016 in the month of November. This fact indicates the growth of the circuit and the greater demand for the use of hotel infrastructure and support.

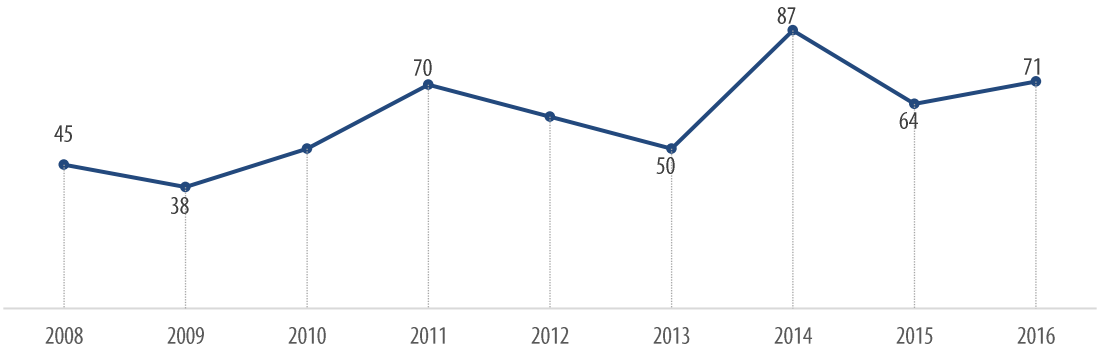


Chart 48. Evolution of the number of participants in Velotour since the first edition.

Source: Clube de Cicloturismo (2008; 2009; 2010; 2011; 2012; 2017).

Based on the 2016 edition of Velotour, there is a large concentration of participants from the state of São Paulo (represented by more than a third of the total).

FU	Percentage
SP	35%
RJ	13%
SC	11%
PR	10%
TO	8%
PE	7%
DF	4%
AL	3%
BA	3%
RN	3%
ES	1%
MG	1%

Table 19. Proportion of Velotour 2016 participants per federal unit of origin

Source: Clube de Cicloturismo (2017).

Age group	Percentage
Less than 15 years	1%
Between 16 and 25 years	1%
Between 26 and 35 years	13%
Between 36 and 45 years	23%
Between 46 and 55 years	34%
Between 56 and 65 years	23%
More than 65 years	6%

Table 20. Proportion of Velotour 2016 participants by age group.

Source: Clube de Cicloturismo (2017).

Regarding the age group, the predominance of participants over 36 years is evident. Mainly considering that a third of the total of participants is between 46 and 55 years, which is close to the average age group of the Profile of the Brazilian Cycle-tourist of 2008.

6.4 CYCLOENTREPRENEURSHIP

Cycloentrepreneurship corresponds to the activity in which the bicycle is used as the central object for entrepreneurial practices, generating income and employment. In this theme, the practices that use the bicycle as an image or artistic representations, such as the scenography use in commercial activities and the like, are excepted.

In recent years, the expansion of bicycle culture has driven different types of business. The bicycle as the central object of entrepreneurial practices is observed in the publishing market, in mobile applications, clothing and tourism agencies, as well as food bikes and bike cafes. Magazines such as the **Bicycle, Bike Action and Cyclomagazine**, among others, make up a segment of print journals that find cycling enthusiasts in their target audience, especially for sports and consumer purposes.

The segment of mobile phone applications for cyclists, although still led by foreign companies and developers, indicates that it is another promising field for *Cycloentrepreneurship*. An example is the registered Bike application, developed by a national startup launched in February 2014 with the purpose of registering bicycles to facilitate their return to the owners in case of theft. From information provided by **UOL** in September 2015, the application has a turnover

of R$ 40 thousand monthly, counting on 47 thousand registered customers and records on average 6 thousand new ones per month. The founder says that 87 bicycles had already been able to be returned to the owners thanks to the service, which was also used by the Federal District Military Police[46].

The clothing sector for cyclists, traditionally specialized in clothing specific to sports, has also expanded its niche market for the urban segment. In another article published by **UOL**[47] in 2015, reporter Afonso Ferreira presented the activity of the Sao Paulo company, Velo Clothing, that have launched a collection of clothes made with synthetic fibers aimed at cyclists who go from bike to work. Shorts to wear under skirts, pants with knee openings, and garments that seek to protect against solar rays – inhibiting the bad odor - were initiatives of this company, whose initial investment was R$ 100 thousand. At the time of publication of the report, the company sold, on average, 60 pieces per month, with prices ranging from R$ 30 to an ankle clip, which prevents the trouser hem from twisting into the chain wheel of the bicycle, at R$ 380 for a rain cape cover adjustable to the body.

Other examples are tourist agencies that offer cycle routes and companies specializing in deliveries made by bicycles- the business model inspired by the bike courier service. These types of cycle enterprises, already mentioned and analyzed in other themes developed in this study (see *Rental* and *Cyclologistics*), in general, correspond to initiatives that also generate franchises, especially in cases of bike couriers.

In turn food bikes are also an important business model in Brazil. Even though many of these enterprises profit from the image of the bicycle and/or the adaptation of their structure as a sales stand, they need the support of a car for transport of stock, and other materials. On the other hand, there are cases in which the bicycle is used both as a sales stand as well as a transport vehicle. Doce Menino Doce, a food bike for 'Brigadeiros', located in the city of Tubarão, in Santa Catarina, was featured in material published by the same series of UOL articles in August of 2015[48]. This family venture, invested R$ 4,500 to renovate a tricycle that is pedaled by one of the family members for the sale of the products along the streets of Tubarão.

[46] Available at: <https://economia.uol.com.br/empreendedorismo/noticias/redacao/2015/09/28/start-up-que-registra-bike-fatura-r-40-mil-e-ajuda-a-policia-no-df.htm>. Accessed in Dec 19, 2017.
[47] Available at: <https://economia.uol.com.br/empreendedorismo/noticias/redacao/2015/03/10/empresa-faz-roupa-que-inibe-mau-cheiro-para-ciclista-ir-de-bike-ao-trabalho.htm>. Accessed in Dec 19, 2017.
[48] Available at: < https://economia.uol.com.br/empreendedorismo/noticias/redacao/2015/08/13/aos-10-garoto-cria-food-bike-de-brigadeiro-para-estudar-fora-e-une-familia.htm>. Accessed in Dec 19, 2017.

According to information disclosed, the company has legal status and is authorized by the city hall to make sales as a street vendor. At the beginning of each month, sales reach 50 boxes a day, dropping to about 30 boxes per day after the 10th of every month. On rainy days, the "cycloentrepreneurs" claim not to go out by bike to sell the candy, sold in boxes with four units and costing R$ 10 each.

With this work, we have developed two case studies to understand the functioning and economic indicators of the cycloenterprise model known as bike cafe. The bike cafes are a mix of bicycle park and gourmet coffee, and they also offer repair services. Variations of this type of cycloenterprise can provide services such as parking shower, (parking with a shower for the cyclist) establishing itself as an atmosphere of conviviality for cyclists, with the promotion of events and meetings.

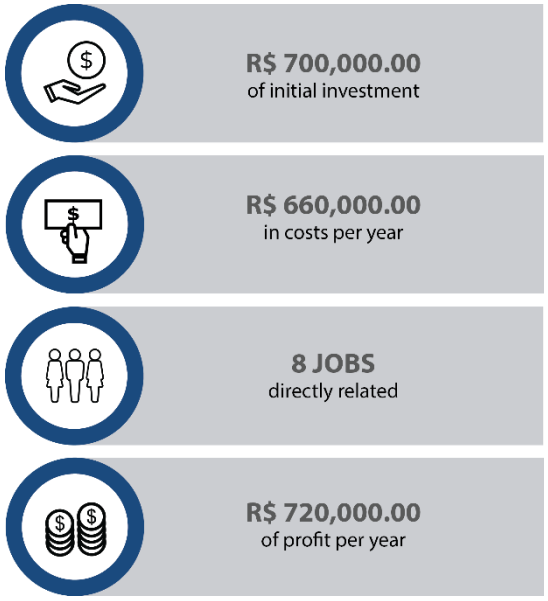
The information collected to represent this theme were: *i) Initial investment (R$); ii) Expenditures / year (R$); iii) Jobs; and iv) Revenue / year (R$).* The study was carried out with two bicycle cafes located in the city of São Paulo (Bike Café 1) and Rio de Janeiro (Bike Café 2). The data was collected in the form of a verbal interview with the respective managers for these cycloenterprises; a face-to-face interview, in the case of Rio de Janeiro, and another by phone, in the case of São Paulo. In these interviews, the project was presented and then the data requested referring to the indicators pointed out in this document.

BIKE CAFÉ 1

It is a multifunctional cycloenterprise inaugurated in 2013 in the West Zone of São Paulo. The space includes a bicycle shop, a shop for accessories and equipment focused on urban cycling and a cafe / restaurant. The Bike Café 1 also offers the service of assembly and adaptations for bicycles, as well as space for social and cultural events dedicated to the theme of the bicycle and of active transport in general.

According to information provided by the management of this cycloenterprise, Bike Café 1 had an initial investment of R$ 700 thousand, currently counting on eight employees, monthly revenue of R$ 60 thousand and general monthly expenses around R$ 55 thousand. Taking into account only these parameters for the calculation of the profit in a period of 12 months,

would have an approximate profit of R$ 720 thousand a year and costs of R$ 660 thousand a year.



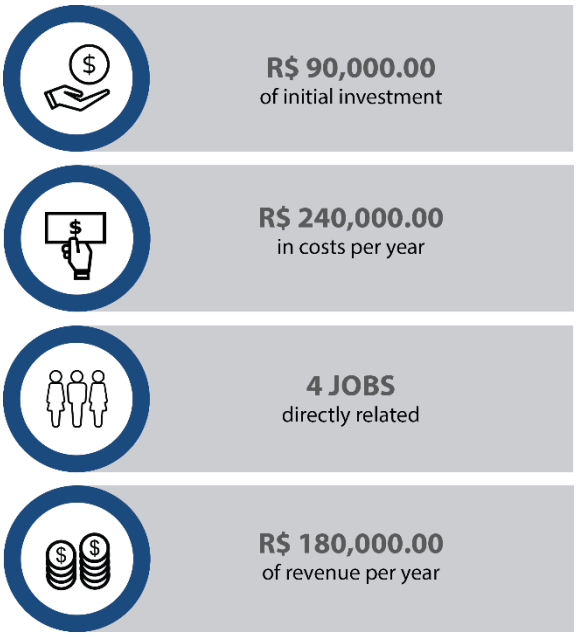
Source: data provided by BIKE CAFÉ 1.

BIKE CAFÉ 2

The Bike Café 2 is a cycloenterprise inaugurated in 2015 with a direct focus on the parking service for bicycles with changing rooms and bathroom located in a 19th century townhouse in the Center of Rio de Janeiro. It has capacity for 50 bicycles and provision of special places with service of recharge for electric bicycles. Parking and their respective services can be used for a daily fee or by purchasing monthly plans: parking (R$ 100), parking + bath (R$ 150), parking + bath + towel (R$ 170).

During the year 2015, Bike Café 2 started to operate an accessory store (on the ground floor of the house) and a space for coffee and restaurant on the top floor of the same with four employees, one of them employed part time. With an initial investment of R$ 90 thousand, one of the partners stated that, although the parking system was the core of the business, at the time of the interview 60% of the revenue would come from coffee, 30% from the store and only 10% from the parking. In objective terms, Bike Café 2 claimed to have monthly

revenue of R$ 15 thousand, but expenses of R$ 20 thousand, which would generate a deficit of R$ 5 thousand in monthly invoicing and R$ 60 thousand a year.



Source: Data provided by Bike Café 2.

The difficulties experienced by Bike Café 2 were justified by the interviewee due to problems of localization of the cycle-enterprise. According to him, the address of the property, located in the core of the Old Center of Rio de Janeiro (Campo de Santana), but far from the Financial Center (Castelo, Cinelândia and surroundings), would not be able to reach the target audience. As an argument, it was shown that, in July 2017, the Bike Rio Café had approximately ten monthly clients (70% of them paid for the common parking package), while per week, the cycle-enterprise only received five daily clients – an average of one per day.

6.5 Sporting Events

Sporting Events include all types of tournament, competition, celebration etc. in which the bicycle appears as a direct or indirect justification. In this section, we analyze specifically the bicycle-related sporting events. These events are held all over Brazil, especially the

competitive circuits of specific modes such as mountain biking, cross-country, bicicross, on the road etc.

During 2016, 203 official bicycle-related sport events were held in Brazil (Brazilian Cycling Confederation). For the estimation of the amount generated / consumed in these events, the information regarding the International Mountain Bike Cup of 2017 was collected, which served as reference value for our estimates. The 2017 International Mountain Bike Cup was held in four stages, each in a city (Araxá, São João del Rey, Congonhas, Minas Gerais, and São Paulo of the same state), with a total of 4,100 participants.

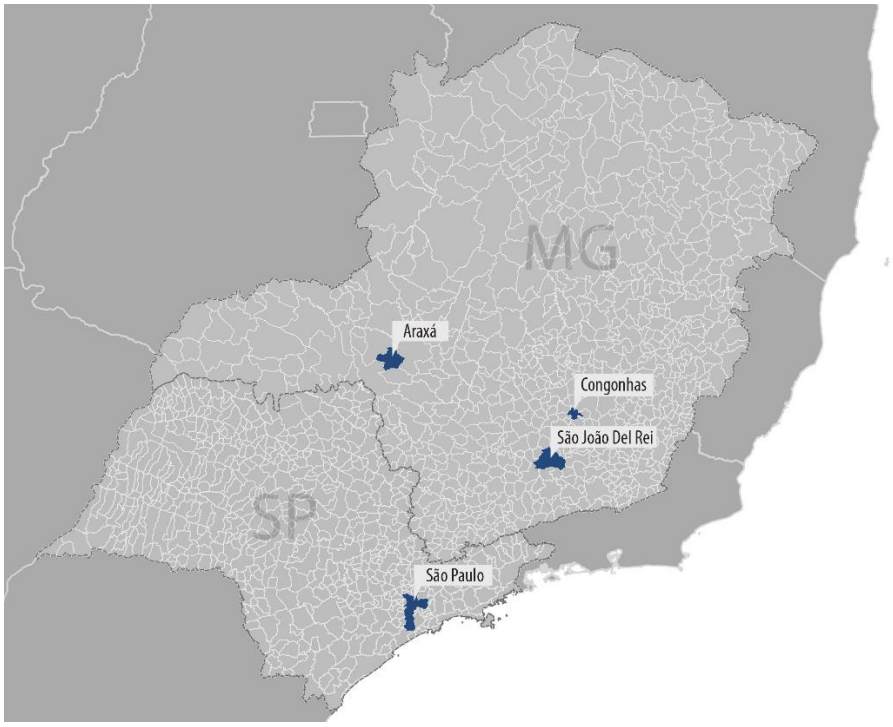


Figure 47. Map of cities included in the International Mountain Bike Cup.

The information was given to this study by the organization of the event and used to quantify the average value that each participant spent on it. This average value was used as a reference for estimating the possible value per capita spent on each of the other 202 official events that occurred in Brazil in 2016.

The values of the cost of the stage carried out in Araxá are divided into three funding groups (1) Aid from public authority, (2) Private sponsorships and (3) Registration fee paid by participants according to modality. As percentages, the values were distributed in 25% (1), 50% (2) and 25% (3).

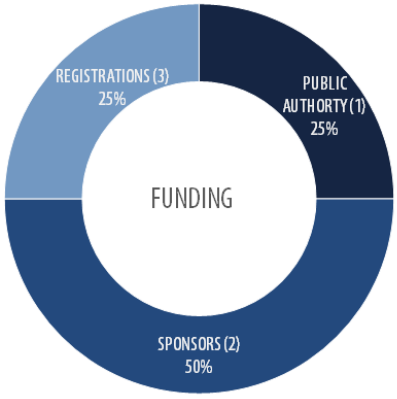


Chart 49. Participation in the revenue of the event by financier.

The registration fee was R$ 150.00 for professional participants, totaling 35% of registrations, and R$ 95,00 for amateurs, comprising of the remaining 65%, as seen in the table below:

STAGE	NUMBER OF PARTICIPANTS	REGISTRATIONS CIMTB (R$) (35%)	REGISTRATIONS AMATEURS (R$) (65%)	TOTAL VALUE CIMTB (R$) R$ 150	TOTAL VALUE AMATEURS (R$) R$ 95	SUM OF THE VALUES CIMTB + AMATEURS (R$)
Araxá	**1,500**	**525.00**	**975.00**	**78,750.00**	**92,625.00**	**171,375.00**
São João del Rey	**800**	**280.00**	**520.00**	**42,000.00**	**49,400.00**	**91,400.00**
Congonhas	**1,200**	**420.00**	**780.00**	**63,000.00**	**74,100.00**	**137,100.00**
São Paulo	**600**	**210.00**	**390.00**	**31,500.00**	**37,050.00**	**68,550.00**
TOTAL				**215,250.00**	**253,175.00**	**468,425.00**

Table 21. Sum of values per step and totals.

The methodology employed added up the number of entries, multiplying it by the individual cost, respecting the proportions provided by the organization of the event. In this way, the total amount of R$ 468,425.00 was obtained in registrations for the four stages.

Considering the information of the organization of the event that identifies the amount of the registrations as representative of 25% of the value of the total expenses of the event, the stage of Araxá collects approximately R$ 171,375.00, being the largest of the four in number of participants. It is assumed that the total value of the 2017 International Mountain Bike Cup event in the Araxá stage, based on the figures described above, will be R$ 685,500.00, considering the amount of the registration of this stage of R$ 171,375,00, corresponds to 25% of the total.

Also based on the information that the registration of participants corresponds to 25% of the registrations and totals R$ 468,425.00, it is estimated that the total cost to organize the International Mountain Bike Cup of 2017 will be R$ 1,873.700.00. Through this amount, it is possible to estimate the cost of R$ 457.00 per participant.

With regard to the workforce during the event, the organization reported an estimated 300 people working for each of the stages of the event, among the employees, skilled labourers, volunteers and third parties. According to the organization, the average cost of each worker is R$ 150.00 for each weekend of the event. Thus, each stage of the International Mountain Bike Cup held on weekends employs a total of 1,200 people, totalling approximately R$ 180,000.00, according to the table below.

STAGE	TOTAL NUMBER OF WORKERS	AVERAGE WAGE PER WORKER	TOTAL EVENT LABOUR COST
ARAXÁ	300	150	R$ 45,000.00
SÃO JORGE	300	150	R$ 45,000.00
CONGONHAS	300	150	R$ 45,000.00
SÃO PAULO	300	150	R$ 45,000.00
		SUM	R$ 180,000.00

Table 22. Total event labor cost.

Impact on the hotel network

The city of Araxá, home to one of the stages of the 2017 International Mountain Bike Cup, has 37 hotels[49], one of them being Tauá Resort, where the event is located. The hotel features 505 beds, all of which are occupied by the event, indicating a 100% occupancy rate, according to information provided by the hotel's reservations department. After consultation on the tariff applied to the participants of the event, it was found that the special package for the event, with lodging from Friday to Sunday (including all meals), would amount to approximately R$ 884,00 in single occupancy and R$ 1,178.00 in double occupancy, as we organized in the table below:

TYPE OF OCCUPANCY	STYLE OF ROOM	NUMBER OF ROOMS	BEDS/ROOM	SPECIAL PACKAGE C.I.MTB (R$) (FRIDAY TO SUNDAY)	TOTAL VALUE (R$)
Double	**Solarium**	**22**	**44**	**1,178.00**	**25,916.00**
Double	**Standard**	**110**	**220**	**1,178.00**	**129,580.00**
Double	**Superior Double**	**91**	**181**	**1,178.00**	**107,198.00**
Single	**Superior Single**	**20**	**20**	**884.00**	**17,680.00**
Single	**Suite Luxor**	**22**	**22**	**884.00**	**19,448.00**
Single	**Suite Special**	**10**	**10**	**884.00**	**8,840.00**
Single	**Suite Noble**	**6**	**6**	**884.00**	**5,304.00**
Single	**Suite Presidential**	**1**	**1**	**884.00**	**884.00**
Single	**Suite Governmental**	**1**	**1**	**884.00**	**884.00**
TOTAL		**283**	**505**		**315,734.00**

Table 23. Sum of values per stage and totals.

Thus, a total lodging value of R$ 315,734.00 was estimated for 505 beds, totaling R$ 625.22 for two days of lodging with full pension, that is, R$ 312.61 per day. If we consider the existence of 1,500 participants in the Araxá stage, it can be estimated that the hotel network, including full pension services, collects around R$ 468,915.00 per event day in Araxá.

[49] Source: TripAdvisor and Google. Consultation held on Oct. 8, 2017.

Other relevant information concerns the guests of the cyclists participating in the event. The organization of the event identifies that each participating cyclist has between three and six guests. Thus, it was decided to use three guests per cyclist as the base measure for calculation. With this, it is estimated that the city of Araxá will receive during the event 4,500 guests, who only spend the cost of lodging and pension, without the cost itself of participation in the event.

Estimate for the total of Brazilian events

For national events, a survey was performed in 40 of the 203 events that occurred in Brazil in 2016 (19.7%). Of these 40 events, the number of participants can be identified as 15.

Figure 48. Map of the distribution of the 15 cycling sport events recognized by the study.

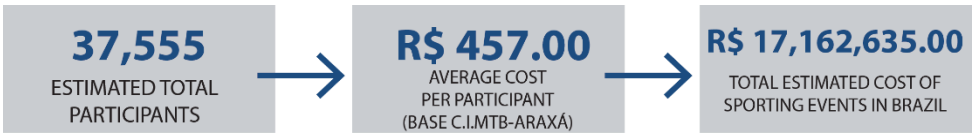
	EVENT	LOCAL	DATE	PARTICIPANTS
1	Copa Sul Master de Ciclismo Estrada	São Bento do Sul/Campo Alegre/ Rio Negrinho – SC	Jan 24, 2016	51
2	X Corrida Cidade de Macapá	Macapá – AP	Feb 07, 2016	70
3	GP Sesc Verão de Ciclismo	Sorocaba – SP	Feb 28, 2016	420
4	7º GP Mega 94	Campo Grande – MS	March 13, 2016	190
5	Volta Ciclística Internacional da Cidade de Guarulhos	Guarulhos – SP	March 20, 2016	120

6	Volta Ceará de Ciclismo	Eusébio – CE	Apr 03, 2016	300
7	Subida do Morro da Cruz	Florianópolis – SC	Apr 03, 2016	293
8	Volta Ciclística Internacional do Rio Grande do Sul	Rio Grande do Sul – RS	Apr 04, 2016	176
9	Tour de Santa Catarina	Santa Catarina – SC	Apr 24, 2016	62
10	GP Rainha do Brejo de Ciclismo	Guarabira – PB	Apr 24, 2016	100
11	Copa Nordeste	Aracaju – SE	May 01, 2016	213
12	Grande GP de Ciclismo	Belo Horizonte – MG	May, 01 2016	150
13	28º GP de Nova Andradina MS	Nova Andradina – MS	May 01, 2016	74
14	DESAFIO DO TOUR	Enseada de Botafogo – Rio de Janeiro – RJ	Nov 27, 2016	400
15	8º Desafio Internacional Serra do Tepequém	Amajari – RR	May 08, 2016	150
			TOTAL PARTICIPANTS	2,769
			AVERAGE PARTICIPANTS PER EVENT	185

Table 24. Average participants per event.

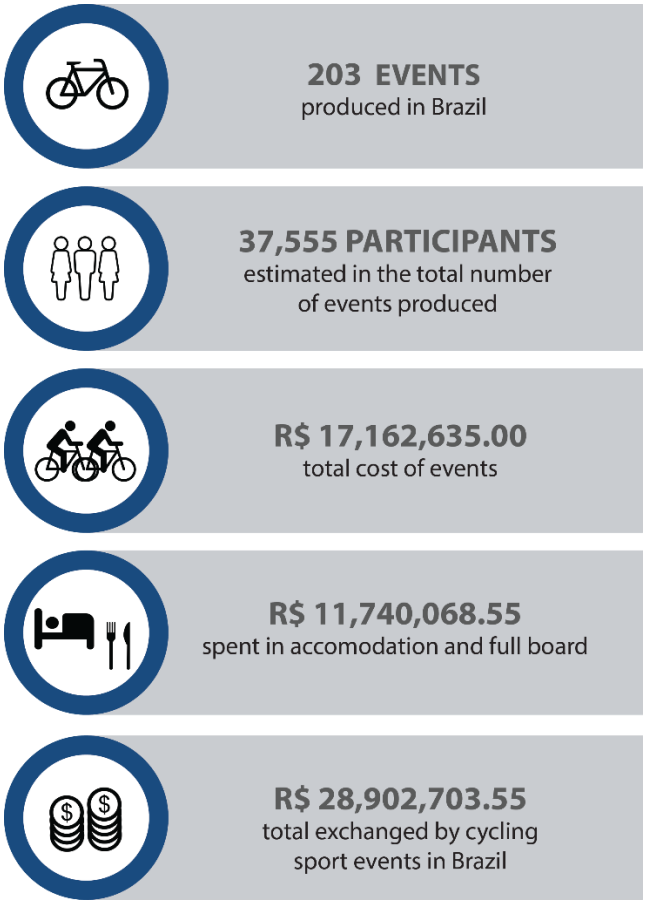
Thus, considering the 203 official events in Brazil with an estimated average of 185 participants per event, our estimate totals 37,555 participants.

Based on the value of the event in Araxá, it was estimated that the cost of each participant in a bicycle-related sports event is R$ 457.00.



Still considering the average expenditure per sportsman with hotel and full board based on the values of the Tauá Resort, in Araxá, it is estimated that the value for each participant is R$ 312.61 per day. Based on an estimated 37,555 participants in *Sporting Events* in 2016, a total expense of R$ 11,740,068.55 was calculated.

Considering the number of guests visiting the International Mountain Bike Cup in the Araxá circuit (average number of three guests per cyclist), it is estimated that the 37,555 cyclists participating in sporting events have 112,665 companions. Taking into account the cost of accommodation of R$ 312.61 per day with full board in the Araxá circuit, the same considered for cyclists and non-cyclists, it is estimated that the total amount spent by the guests is R$ 35,220,205.65.



Regarding the two main values, that is, the cost of the event per participant added to the total cost for the participant with lodging and full pension, a total amount of R$ 28,902,703.55 was handled by *Sporting Events* in Brazil in 2016.

7 BENEFITS

The **Benefits** sector investigates the direct and indirect impacts of the bicycle economy on the environment by the reduction of polluting gas emissions, for example. It encompasses two themes: *Climate and Energy* and *Health.*

7.1 CLIMATE AND ENERGY

Climate and Energy shows the benefits of the impact of the bicycle's use in the reduction of the emission of polluting gases based on the following indicators: *i) Annual pollutant emission rate avoided in Brazil (t / year); and (ii) Fuel economy (gasoline and diesel) for total miles traveled per year.*

For the calculation of the annual pollutant emission rate avoided in Brazil (t / year), the document "National Inventory of Atmospheric Emissions by Road Automotive Vehicles 2013: base year 2012", published by the Ministry of the Environment, which estimates the national emissions of air pollutants and greenhouse gases in this segment of cargo and passenger transport. In this publication, the pollutants considered were those regulated by the Air Pollution Control Program for Automotive Vehicles (PROCONVE): carbon monoxide (CO), nitrogen oxides (NOx), non-methane hydrocarbons (NMHC), aldehydes (RCHO), material particulate matter (PM), as well as greenhouse gases such as methane (CH4), carbon dioxide (CO2) and nitrous oxide (N2O).

The calculation (19) for measuring the annual emission rate of the pollutant is determined by multiplying the current fleet of vehicles (number of vehicles - Fr), the intensity of use of the vehicle of the model year considered, expressed in terms of (km / year - Iu), and the emission factor of the pollutant considered, expressed in terms of the mass of pollutants emitted per kilometer (g / km - Fe), being specific for the model year of the vehicle considered and depending of the type of fuel used:

$$\mathbf{E = Iu \times Fr \times Fe}$$

In this sense, the aim was to quantify the rate of pollutant gases avoided in the period of one year by the universe of Brazilian cyclists. In order to do so, two scenarios were considered:

one in which the equivalent intensity of urban buses (Diesel fleet) is compared, and another in which it is compared with that of private cars. The number of Brazilian cyclists were estimated through the participation of the bicycle in the list of modalities used in the country, and this share corresponds to 4% in cities with more than 60 thousand inhabitants (ANTP). The projection of the Brazilian population in 2017 by the IBGE is estimated at approximately 208 million people[50]. Therefore, we consider in these calculations the hypothesis that there are 8,320,000 cyclists in the country (4% of the total).

A. INTENSITY OF USE (FR)

For this data, we consider the average value of mileage traveled per cyclist from the data collected in the survey of the Profile of the Brazilian Cyclist (2015), coordinated by the NGO Active Transport in partnership with LABMOB and the Metropolis Observatory. The values for the city of Rio de Janeiro were used as reference.

The average daily travel time reported by participants was divided into four time intervals: less than 10 minutes, 10-30 minutes, 30-60 minutes and more than 60 minutes. The estimate of the mileage traveled by cyclists was then calculated from the premise that the interval corresponding to 10 to 30 minutes tends to be performed in approximately 5 km, according to studies by Heinen et al. (2010), Rietveld and Daniel (2004) and ANTP (s.d.).

Thus, we calculate the estimate in kilometers for the other ranges from the calculation of the average of these and then the approximate ratio through the reference value of 5 km. Since the data collected by the Brazilian Cyclist Profile survey (2015) considered cycling habits in a one-day period, we adapted these numbers to the reality of one year in order to provide the calculation units (5 working days = 4 weeks = 1 month / 48 weeks = 12 months = 1 year).

In the table below, we exemplify the methodology of calculation of intensity of use, focusing on the city of Rio de Janeiro based on data from the Brazilian Cyclist Profile survey (2015). A total of 968 participants were interviewed. Of these, 56.6% indicated that they took bicycle routes for a duration of 10 to 30 minutes, 27% of routes lasting less than 10 minutes, 13.3% of journeys of 30 to 60 minutes, and 2.1 % routes over 60 minutes.

[50] Available at: <https://ww2.ibge.gov.br/apps/populacao/projecao/>. Accessed on Nov. 08, 2017.

Time interval	Average interval (min)	Average distance traveled (km per total cyclists per year) → Intensity of Use	%	Cyclists (Sample)	Média de distância percorrida (km por ciclista por dia)	Average distance traveled (km per cyclist per year) → Intensity of Use
< 10 min	5	78,300	27	261	1,25	300
10 to 30 min	20	656,400	56.6	547	5	1,200
30 to 60 min	45	348,300	13.3	129	11,25	2,700
> 60 min	60[51]	97,536	2.1	20	20,32	4,877
No answer	–	–	1	10	–	–
	TOTAL	1,180,536				

Table 25. Calculation of the intense of use (km per year).

B. FLEET CIRCULATING IN THE CITY OF RIO DE JANEIRO (FR)

An average occupancy rate of 50 people per vehicle was used as the base to calculate the equivalent number of cyclists in bus numbers (VASCONCELLOS, 2000). In this way, the fleet measured was calculated from the division of the number of cyclists for each time interval by that occupation rate. The table below exemplifies the calculation of the equivalence of cyclists on buses to the city of Rio de Janeiro.

[51] In this time interval, it was not possible to calculate an average as in the others; therefore, the value of 60 minutes was used.

Time interval	Average interval (min)	Average distance traveled (km per cyclist per day)	Cyclists	%	Equivalent cyclists in buses –> Fr (Fleet)
< 10 min	5	1.25	261	27	5
10 to 30 min	20	5.00	547	57	11
30 to 60 min	45	11.25	129	13	3
> 60 min	60	20.32	20	2	0.40
No answer	–	–	10	1	–

Table 26. Equivalency of cyclists in buses fleet.

NB: For each 261 cyclists traveling an average of 1.25 km per day, in an approximately 5-minute ride, an equivalent fleet of 5 buses (Diesel) is required. Or: for every 547 cyclists traveling an average of 5 km per day, in an approximately 20-minute ride, an equivalent fleet of 11 buses (Diesel) is required.

To calculate the equivalence of the number of cyclists in the number of private cars, a standard of average occupancy of one person per vehicle was used as criterion. In this way, the bicycle fleet would be equivalent to the private car fleet.

C. EMISSION FACTOR OF POLLUTANT EXAMINED (FE)

The emission factors of the pollutants examined for urban buses (diesel only) and private cars were consulted in the "National Inventory of Atmospheric Emissions by Road Vehicles 2013: base year 2012". For the purpose of this subject, the numbers in the table below represent the average aggregate value of each pollutant for the type of vehicle considered.

Urban bus (only Diesel)[52]	Fe (g/km)
CO (carbon monoxide)	1.774
NO (nitric oxide)	4.85
NHMC (non-methane hydrocarbons)	0.216
MP (particulate material)	0.158
CH_4 (methane gas)	0.06
CO_2 (carbon dioxide)	88.3
Private car[53]	**Fe (g/km)**
CO (carbon monoxide)	0.48
NO (nitric oxide)	0.062
RHCO (aldehydes)	0.00825
NHMC (non-methane hydrocarbons)	0.0775
MP (particulate material)	0.025
CH_4 (methane gas)	0.011
CO_2 (carbon dioxide)	24.8

Table 27. Emission factors of pollutant gases.

Source: National Inventory of Atmospheric Emissions by Road Automotive Vehicles 2013: base year 2012.

The value of the emission factor considered for private cars is shown in the inventory per model-year. For this work, the figures referring to the model year correspond to an average age of 9 years for the vehicle fleet in Brazil. Therefore, the model-year 2016 (SINDIPEÇAS, 2017).

The annual emission rate of the pollutant gas to be taken into account by each cyclist was calculated by reference to the fleet number and the average distance traveled (km per cyclist per year - intensity of use) corresponding to each time interval multiplied by the factor of emissions (g / km) of the pollutant gas concerned. In addition to these rates at time intervals in grams per year, the total annual emission rate of the pollutant gas to be measured as kilograms per year was calculated.

For the calculation of the fuel economy (gasoline and diesel) per km / wheel, the average distance traveled by cyclists (km / year) was calculated based on data from Rio de Janeiro and the following costs:

[52] See National Inventory of Atmospheric Emissions by Road Automotive Vehicles 2013: base year 2012 (p. 42-44).
[53] Idem (p. 33).

Average consumption of 9km/L, taking the value R$ 4.20/L in the city of Rio de Janeiro.

Average consumption of 3km/L, taking the value of R$ 3.68/L in the city of Rio de Janeiro.

Figure 49. Average fuel consumption for private cars and buses[54] [55].

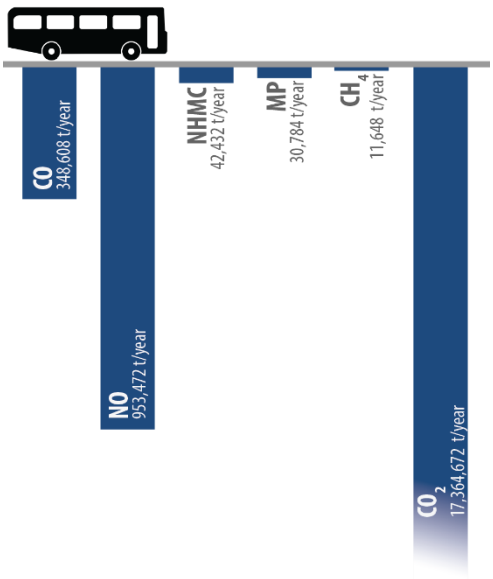
In view of what was presented, we looked to quantify the rate of pollutant gases avoided in the period of one year by the universe of Brazilian cyclists. To do this, two scenarios were reviewed: one in which it is compared with the equivalent volume of urban buses (Diesel fleet) and another in which it is compared with that of private cars.

Buses

Pollutant gas	Fe (g/km)	E = annual total rate of pollutant gas emission avoided (kg / year) in the Rio de Janeiro sample	Brazilian Cyclists (4% of the population)	E = annual total rate of pollutant gas emission avoided (kg / year) in the Brazil sample
CO (carbon monoxide)	1.774	41.9	8,320,000	348,608
NO (nitric oxide)	4.85	114.6		953,472
NHMC (non-methane hydrocarbons)	0.216	5.1		42,432
MP (particulate material)	0.158	3.7		30,784
CH_4 (methane gas)	0.06	1.4		11,648
CO_2 (dioxide carbon)[56]	88.3	2,087.1		17,364,672

Table 28. Buses (Diesel): rate of polluting gases avoided in a period of one year by the universe of Brazilian gas.

[54] Fuel consumption per bus obtained from the publication available at: <http://www.marcopolo.com.br/website/ebook/volareclub/Ed_033/files/assets/basic-html/page25.html>. Accessed on 08 Nov. 2017.
[55] The established value of the litre was checked at gas stations in the city of Rio de Janeiro in July 2017. An estimate can also be checked on this website: <http://www.precodoscombustiveis.com.br/postos/bairro/2616/ rj / rio-de-janeiro / tijuca / page / 2? order = petrol>.
[56] Average emission factor of 265 grams per litre of diesel converted to 88.3 grams per kilometer (average consumption of 3km / L).



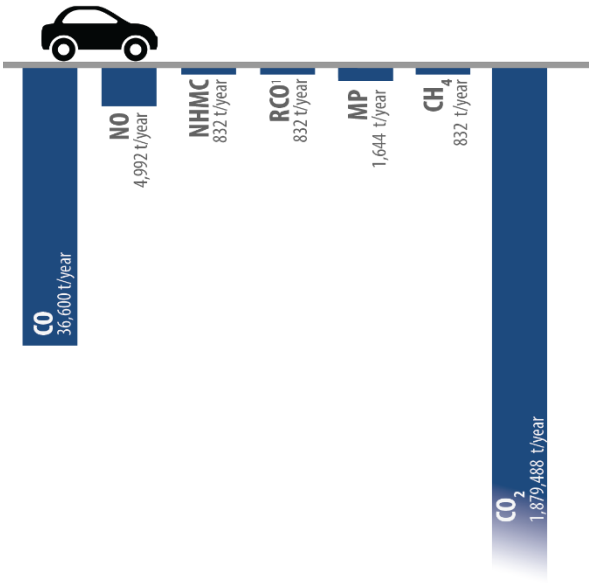
NB: If the intensity of bicycle use in Rio de Janeiro were equivalent to that of buses (Diesel), we would have a total CO emission rate of 41,9 kg per year. Therefore, the use of the bicycle, in these parameters, avoids a total CO emission rate corresponding to 41,9 kg per year (Table 28). In an estimate for Brazil, this rate would be 348.608 t/year.

Private car

Pollutant gas	Fe (g/km)	E = annual total rate of pollutant gas emission avoided (kg / year) in the Rio de Janeiro sample	Brazilian Cyclists (4% of the population)	E = annual total rate of pollutant gas emission avoided (kg / year) in the Brazil sample
CO (carbon monoxide)	0.48	4.4	8,320,000	36,608
NO (nitric oxide)	0.062	0.6		4,992
NHMC (non-methane hydrocarbons)	0.0775	0.1		832
RHCO (aldehydes)[57]	0.00825	0.1		832
MP (particulate material)	0.025	0.2		1,664
CH_4 (methane gas)	0.011	0.1		832
CO_2 (dioxide carbon)	24.8[58]	225.9		1,879,488

Table 29. Private cars: rate of polluting gases avoided in a period of one year by the universe of Brazilian gas.

[57] Based on the road inventory, it was not possible to calculate the RHCO (aldehydes) value for buses, only for private cars.
[58] Average emission factor of 224 grams per liter of diesel converted to 24.8 grams per kilometer (average consumption of 9 km / L).



NB: If the intensity of bicycle use in Rio de Janeiro were equivalent to that of private cars, we would have a total CO emission rate of 4.4 kg per year. Therefore, the use of the bicycle, in these parameters, avoids a total CO emission rate corresponding to 4.4 kg per year (Table 29). In an estimate for Brazil, this rate would be 36,600 t/year.

	Average Value Economized by the Cyclist in RJ (R$)	Average Value Economized by the Cyclists in Brazil (R$)
Bus – Fuel: Diesel	R$ 9.61	R$ 80,003,788.80
Private car – Fuel: Petrol	R$ 35.00	R$ 291,200,000.00

Table 30. Fuel economy (petrol and diesel) for total kilometers driven per year

It is imperative to point out that these estimated figures should not be used to define actions, projects or any other more in-depth considerations on the subject, but to sensitize quantitatively the debate. On the other hand, the results found also prompt discussion of the Brazilian energy agenda.

Since the First World Climate Conference in Geneva in 1979 to the Paris Agreement of 2015, Brazil's participation in observing and investigating the effects on its climate has taken place on several fronts and engagements. At this last conference, ratified in 2016, a new agreement was adopted with the central objective of strengthening the global response to the threat of climate change and strengthening the capacity of countries to deal with the impacts of these changes. Approved by 195 countries to reduce greenhouse gas emissions in the context of

sustainable development, Brazil undertook to reduce emissions by 37% below 2005 levels by 2025 and by 43% by 2030[59].

However, efforts for more sustainable development still face the challenge of abandoning old practices in favor of more economic ones. In a report published by the Greenhouse Gas Emissions Estimate System (SEEG), launched in October 2017 by the Climate Observatory, it was verified that in 2016 the country had issued 2,278 billion gross tons of carbon dioxide (CO2), compared to 2.091 billion in 2015. In summary, a 12.3% increase compared to a reduction of 7.4 points in the Gross Domestic Product (GDP), which fell by 3.8% in 2015 and 3.6% in 2016.

In addition to the reduction of deforestation and the expansion of low-carbon agriculture to all agriculture and livestock as alternatives for sustainable development (only to list some), the modal shift scenario in the terms discussed in Climate and Energy also contributes to an improvement in the reduction of the emission of carbon dioxide. In the period of one year, bicycle use avoids a total emission rate of 1,879,488 tons of carbon dioxide for private cars and 17,364,672 for buses of the Diesel fleet per year. Respectively, these values correspond to 0.08% and 0.76% of the 2,278 billion gross tons emitted in the total by the country.

Other greenhouse gases, such as CH4 (methane gas) and CO (carbon monoxide), reveal another view. Based on the total emission of methane gas measured for the year 2015, equivalent to 17,582,916 tons, the use of the bicycle avoids a total emission rate corresponding to 0.004% for private cars and 0.066% for buses of the diesel fleet per year. For the total amount of CO (carbon monoxide) issued in 2015, according to the SEEG report (2017) of 12,102,412 tonnes, the use of the bicycle avoids a corresponding total emission

[59] Available at: <http://www.mma.gov.br/clima/convencao-das-nacoes-unidas/acordo-de-paris/item/10710>. Acessed on Dec. 14, 2017.

7.2 HEALTH

Health equals the benefits related to the impacts of bicycle use on improving national public health. Faced with the level of sophistication and complexity required to monetize the impacts of the use of the bicycle in Health, we resort to the state of the art of this subject in the Brazilian scientific field as an input for more detailed quantification in future studies.

According to the material analyzed in this survey, it is essential to consider mobility policies as health policies insofar as active transportation is a viable and economical way to address many of the issues of national public health improvement in the medium and long term. Supported by more effective public policies in favor of cycling as a means of transportation, such as the implementation of infrastructure and improvement of the bicycle route system (LANZIOTTI and SILVA, 2017), it would be possible to develop a stimulating scenario to propagate various benefits and positive externalities.

A study published by Eueliton Coelho Jr., Genivaldo Teixeira Vilas, Karem KP da Silva and Rafael Viana Pereira (2015) emphasizes that the use of the bicycle - as a practice of physical exercise - reduces the risk of obesity, improves conditioning and circulation of blood rate, dealing with problems related to anxiety and even allowing the development of larger neurons that work directly on tasks of memory and learning. Not to mention the impacts on reducing the risks of chronic diseases such as heart disease, stroke, type 2 diabetes and some cancers.

Other benefits, such as increased self-esteem, mood, sleep quality and perceived vigor, as well as reduced risk of stress, depression, dementia and Alzheimer's disease, should also be considered. Even though it is not a scientific publication in its own right, Elly Blue's Bikenomics - How the Bike Can Save the Economy (2016) also brings a good overview of this issue by gathering interesting scientific data on the impacts of cycling on individual health, especially in inhibiting diabetes.

At the macroeconomic level, the researchers Simone Miraglia and Nelson Gouveia (2014) highlight the positive externality of bicycle use as a probable reduction in the level of absenteeism at work and the generation of a higher income for the citizen and the country due to the costs that would have to be spent on the treatment of diseases, injuries and deaths related to the incidence of urban mobility dominant in Brazil.

Currently, this situation indicates that the share of motorized transport in the emission of air pollutants corresponds to 90%, coming from all light passenger vehicles, light commercial vehicles and heavy vehicles that circulate throughout the city. The annual cost of these effects is equivalent to 7.5% of the GDP of São Paulo (ESTEVES; BARBOSA; SILVA et al., 2004). In affecting the quality of life of the population, can come a principle increase in risks that permeate the objective reality of people cycling around the city, as Jeroen Johan Hartog, Hanna Boogaard, Hans Nijland and Gerard Hoeck (2011) argue, from the University of Utrecht in the Netherlands.

Simone Miraglia and Nelson Gouveia (2014) commented that the number of deaths attributed to the exposure of people to particulate matter (PM) in 29 Brazilian metropolitan regions amounts to 20,050. In the same way, a study conducted by Laís Fajersztajn, Mariana Veras and Paulo Saldiva (2014), the Laboratory of Experimental Atmospheric Pollution, of the Faculty of the University of São Paulo (USP), indicates that air pollution is responsible for reducing the average life expectancy of the population of São Paulo in 3.5 years.

In another study that looks at cadavers received by the Death Checking Service (SVO) maintained by USP, this same group of researchers has been measuring the amount of carbon in the lung, while investigating the patient's life. One of the aims of this research is to develop imaging techniques that help identify the cause of death less invasively than by a conventional autopsy. Preliminary results on the necropsies studied and published by the press in December 2017[60] show, in numbers, the problem of pollution caused by non-active means of transport: inhaling São Paulo air for a period of two hours can have impacts equivalent to that of a smoker in the period of 30 years (Pesquisa FAPESP Magazine, No. 229, No. 241).

Even with these risks, several other studies show that using the bicycle at this juncture can cancel out the harmful effects of air pollution. The study "Can Air Pollution Negate the Health Benefits of Cycling and Walking?", published in the journal Preventive Medicine in June 2016 and produced by the Department of Nutrition of the Faculty of Public Health of the University

[60] Available at: <https://noticias.uol.com.br/saude/ultimas-noticias/estado/2017/12/05/respirar-ar-de-sao-paulo-por-2-horas-no-transito- and-equal-to-smoke-a-cigarette.htm>. Accessed on Dec 21. 2017.

of São Paulo (FSP-USP) in a partnership with foreign researchers[61], found that in cities with pollution levels similar to those in São Paulo, in 98% of cases, the health benefits of walking or cycling would only be overcome by the harmful effects of exposure to air pollution after 16 and 7 uninterrupted hours, respectively.

The same finding is endorsed by research conducted by a group of researchers linked to USP (including professor Paulo Saldiva), Uninove and the Oswaldo Cruz Foundation, published in July 2012 in the journal Medicine in Science and Sports Exercise titled "Anti- inflammatory Effects of Aerobic Exercise in Mice Exposed to Air Pollution". The results showed that people who practice physical exercise exposed to pollution had levels of lung inflammation much lower than those observed in sedentary people under the same pollution and very close to those who exercised in cleaner air.

In this way, it is possible to observe the existence of a debate that criticizes the predominance of motor vehicles and air pollution as factors that may be detrimental to the health of the cyclist, on the other hand, pointing out that the act of cycling should be encouraged precisely to reduce these factors. According to the results of the Profile Survey of Who Uses the Bicycle in the City of São Paulo (2015), little more than half of the trips made in São Paulo take, on average, up to half an hour daily. In this sense, riding on a bicycle, even in highly problematic environmental conditions such as in São Paulo, for example, does not pose serious risks in the context of how and for how long people move in this reality Brazilian. Not to mention the fact that it is highly recommended both for the benefits inherent to the regular practice of any physical exercise, and for its more sustainable contribution to the urban environment.

[61] The study involved professionals from the University of Cambridge and Imperial College London, the UK, the University of Zurich, Switzerland, the University of Edinburgh, Scotland, and the Center for Research in Environmental Epidemiology, Spain.

8 REFERENCES

ALTERMODAL – Transport & Mobility Department. **The Bicycle Economy in France**. Cycling: an economic driving force. In: Velo–City, Different Gears, Same Destination. Copenhagen, june 22–25, 2010.

BICYCLE FEDERATION OF WISCONSIN; WISCONSIN DEPARTMENT OF TRANSPORTATION. **The Economic Impact of Bicycling in Wisconsin**. s.d.

BLUE, E. **Bikenomics**. Como a bicicleta pode salvar a economia. Rio de Janeiro: Babilônia Editorial, 2016.

BRAGA, A.; BÖHM, G. M.; PEREIRA, L. A.; SALDIVA, P. Poluição atmosférica e saúde humana. **REVISTA USP**, São Paulo, n.51, p. 58–71, setembro/novembro 2001.

BROWN, C. B. **The Economic Impacts of Active Transportation in New Jersey**. New Jersey: Alan M. Voorhees Transportation Center, 2012.

CICLOCIDADE; TRANSPORTE ATIVO; OBSERVATÓRIO DAS METRÓPOLES et al (2015). **Perfil de Quem Usa Bicicleta na Cidade de São Paulo**. Apresentação. Disponível em: <https://www.ciclocidade.org.br/biblioteca/pesquisa–ciclocidade/file/106–pesquisa–perfil–de–quem–usa–bicicleta–na–cidade–de–sao–paulo–apresentacao>. Acesso em 17 dez. 2017.

CICLO SAMPA (2017). Estações. Disponível em: <http://www.ciclosampa.com.br/estacoes.php>. Acesso em 06 out. 2017.

COELHO JR., E.; VILAS, G. T.; PEREIRA DA SILVA, K. K.; PEREIRA, R. V. Impactos positivos das implementações de ciclovias, ciclofaixas e faixas compartilhadas no município de São Paulo. **Anais...** In: XVII Encontro Internacional sobre Gestão Empresarial e Meio Ambiente, 2015.

COLORADO DEPARTMENT OF TRANSPORTATION (CDOT). **The Economic Impact of Bicycling in Colorado**. Summary of Findings. s/d.

COMISSÃO EUROPÉIA. **Cidades para Bicicletas, Cidades de Futuro**. Luxemburgo: Serviços das Publicações Oficiais das Comunidades Europeias, 2000.

ESTEVES, G.; BARBOSA, S.; SILVA, E.; ARAÚJO, P. D. Estimativa dos efeitos da Poluição Atmosférica sobre a Saúde Humana: alguns possibilidades metodológicas e teóricas para a cidade de São Paulo. Associação Nacional de Pós–Graduação e Pesquisa em Ambiente e Sociedade. In: **Encontro da Associação Nacional de Pós Graduação e Pesquisa em Ambiente e Sociedade**. São Paulo, ANPPAS, 2004. p.1–20, Ilus, tab.

EUROPEAN CYCLISTS FEDERATION (ECF). **Annexes to the Study on Jobs and Job Creation in the European Cycling Sector**. Disponível em: <https://ecf.com/sites/ecf.com/files/Annexes%20to%20the%20Study%20on%20Jobs%20and%20Job%20Creation%20in%20the%20European%20Cycling%20Sector.pdf>. Acesso em 02 jun. 2017.

EUROPEAN CYCLISTS FEDERATION (ECF). **Cycling Works. Jobs and Job Creation in the Cycling Economy**. October 2014.

EUROPEAN CYCLISTS FEDERATION (ECF). **THE EU CYCLING ECONOMY**. Arguments for an integrated EU cycling policy. Report. December 2016.

FAJERSZTAJN, L.; VERAS, M.; SALDIVA, P. Como as cidades podem favorecer ou dificultar a promoção da saúde de seus moradores?. **Estud. av.**, São Paulo , v. 30, n. 86, p. 7–27, Apr. 2016 .

FAULKS, P**. Cycle Tourism in Australia:** an investigation into its size and scope. CRC for Sustainable Tourism Pty Ltd, 2007.

FERREIRA, E. A. **Integração com o Transporte Não–Motorizado**. In: Integração nos Transportes Públicos. ANTP, 2007

FIORAVANTI, C. Paulo Saldiva: Por uma cidade mais saudável. **Revista Pesquisa Fapesp**, 241, mar. 2016.

FOLHA VITÓRIA (2016). Bike Vitória inaugura últimas estações e disponibiliza 200 bicicletas. **Folha Vitória**, 16 jun. 2016. Disponível em: <http://www.folhavitoria.com.br/geral/noticia/2016/06/bike–vitoria–inaugura–ultimas–estacoes–e–disponibiliza–200–bicicletas.html>. Acesso em 16 set. 2017.

G1 (2014). Saiba como alugar bicicletas pelo sistema BikePoa em Porto Alegre. **G1 Rio Grande do Sul**, 24 set. 2014. Disponível em: <http://g1.globo.com/rs/rio–grande–do–sul/noticia/2014/09/saiba–como–alugar–bicicletas–pelo–sistema–bikepoa–em–porto–alegre.html>. Acesso em 16 set. 2017.

G1 (2016). Fortaleza ganha nove novas estações de bicicletas compartilhadas. **G1 Ceará**, 18 abr. 2016. Disponível em <http://g1.globo.com/ceara/noticia/2016/04/fortaleza–ganha–nove–novas–estacoes–de–bicicletas–compartilhadas.html>. Acesso em 16 set. 2017.

G1 (2017). Em 3 anos, malha cicloviária mais que dobra de tamanho nas capitais do país. **Economia**, 18 de fev. 2017. Disponível em: <http://g1.globo.com/economia/noticia/em–3–anos–malha–cicloviaria–mais–que–dobra–de–tamanho–nas–capitais–do–pais.ghtml>. Acesso em 16 ago. 2017.

GADELHA, C. A. G. Desenvolvimento, complexo industrial da saúde e política industrial. **Rev. Saúde Pública**, n. 40, pp. 11–23, 2006.

GIRARDI, G. Respirar ar de São Paulo por 2 horas no trânsito é igual a fumar um cigarro. Colaboração de Priscila Mengue e Júlia Marques. **O Estado de S. Paulo**, 05 dez. 2017. Disponível em: <https://noticias.uol.com.br/saude/ultimas–noticias/estado/2017/12/05/respirar–ar–de–sao–paulo–por–2–horas–no–transito–e–igual–a–fumar–um–cigarro.htm>. Acesso em 21 dez. 2017.

GOVERNO DE BRASÍLIA (2016). Sistema de Bicicletas Compartilhadas. **Secretaria de Estado de Mobilidade do Distrito Federal**. Disponível em:

<http://www.semob.df.gov.br/programas–projetos/estudos–de–transporte–para–explora-cao–do–sistema–de–bicicletas–de–aluguel–df.html>. Acesso em 16 de setembro de 2017.

HARTOG, J.; BOOGAARD, H.; NIJLAND, H.; et al. Do the Health Benefits of Cycling Outweigh the Risks? **Ciência & Saúde Coletiva**, 16(12), p. 4731–4744, 2011.

ITDP Brasil (2016). **Bicicletas Compartilhadas em Belo Horizonte**. Disponível em: <http://itdpbrasil.org.br/bike–share–2016–bh/>. Acesso em 16 de agosto de 2017.

ITDP Brasil (2016b). **Bicicletas Compartilhadas:** Planejamento e desempenho. Disponível em: <http://itdpbrasil.org.br/bike–share–2016–planejamento/>. Acesso em 16 set. 2017.

LAMONT, M. **Reinventing the Wheel:** Definitional Discussion of Bicycle Tourism. Journal of Sport & Tourism, 14:1, pp. 5–23, 2009.

LANZIOTTI, T. M.; SILVA, A. S. "Multiescalas de análise urbana para sistemas cicloviários". Pós, Rev. Programa Pós–Grad. Arquit. Urban. FAUUSP. São Paulo, v. 24, n. 44, pp. 12–26, set–dez 2017.

LEAGUE OF AMERICAN BICYCLISTS. **Bicycling Means Business:** The Economic Benefits of Bicycle Infrastructure. s/d.

LONDON SCHOOL OF ECONOMICS (LSE). **The British Cycling Economy**. 'Gross Cycling Product Report. Written by Alexander Grous. 2011.

LUMSDON, L. Transport and Tourism: Cycle Tourism – A Model for Sustainable Develop-ment? **Journal of Sustainable Tourism**, v. 8, n. 5, 2000.

MANO BIKE (2017). Mapa das estações. Disponível em: <https://manobike.tem-bici.com.br/mapaestacao.aspx>. Acesso em 16 set. 2017.

MARQUES, F. A morte explica a vida. **Revista Pesquisa Fapesp**, 229, mar. 2015.

MIRAGLIA, S. G. E. K.; ABE, K. C. **Avaliação de Impacto em Saúde (AIS):** coletânea de casos no Brasil. São Paulo: s. n., 2017, 286p.

MIRAGLIA, S. G. E. K.; GOUVEIA, N. Custos da poluição atmosférica nas regiões metropoli-tanas brasileiras. **Ciência & Saúde Coletiva**, 19 (10), p. 4141–4147, 2014.

NATIONAL BICYCLE DEALERS ASSOCIATION (NBDA). **2015 Retail Study**. 2015. Disponível em: < http://nbda.com/product/nbda–2015–nbda–specialty–bicycle–retail–study–pdf–469.htm>. Acesso em 02 jun. 2017.

NATIONAL BICYCLE DEALERS ASSOCIATION (NBDA). **Industry Overview 2015**. 2015. Disponível em: <http://nbda.com/articles/industry–overview–2015–pg34.htm>. Acesso em 02 jun. 2017.

NATIONAL BICYCLE DEALERS ASSOCIATION (NBDA). **U.S. Bicycle Market**. 2015. Disponível em: < http://nbda.com/articles/u.s.–bicycle–market–2015–pg196.htm>. Acesso em 02 jun. 2017.

NUNES DE SOUZA, M. J. Apontamentos sobre a Maré: uma compreensão. R. B. **Estudos Urbanos e Regionais**, v. 9, n. 1, pp. 53–68, mai. 2007.

OBSERVATÓRIO DO CLIMA (2017). Emissões de GEE do Brasil e suas implicações para políticas públicas e a contribuição brasileira para o Acordo de Paris. **Documento–síntese (1970–2015**). Disponível em: <http://seeg.eco.br/wp–content/uploads/2017/10/RelatoriosSeeg2017–Sintese_final.pdf>. Acesso em 20 dez. 2017.

PIMENTEL, A. O método da análise documental: seu uso numa pesquisa historiográfica. **Cadernos de Pesquisa**, n. 114, pp. 179–195, nov. 2001.

PREFEITURA DE FORTALEZA (2017). Mapa das estações. Bicicleta Integrada. Disponível em <http://www.bicicletaintegrada.com/mapaestacao.aspx>. Acesso em 16 set. 2017.

PREFEITURA DE INDAIATUBA (2016). PREFEITURA ESTENDE FUNCIONAMENTO DA ECOBIKE ATÉ 19H COM HORÁRIO DE VERÃO. **Indaiatuba Governo de São Paulo**, 17 out. 2016. Disponível em: <https://www.indaiatuba.sp.gov.br/relacoes–institucionais/imprensa/noticias/24792/>. Acesso em 6 out. 2017.

PREFEITURA DE SÃO PAULO (2016). Lei de Orçamento Anual. **Portal da Transparência**. Disponível em: <http://transparencia.prefeitura.sp.gov.br/contas/Paginas/LeiOrcamentoAnual.aspx>. Acesso em 10 ago. 2017.

PREFEITURA DE SOROCABA (2016). Integrabike, mais bicicletas, estações e benefícios aos usuários. **Agência Sorocaba Governo de São Paulo**, 08 abr. 2016. Disponível em: <http://agencia.sorocaba.sp.gov.br/integrabike–mais–bicicletas–estacoes–e–beneficios–aos–usuarios/>. Acesso em 6 out. 2017.

PREFEITURA DO RIO DE JANEIRO (2017). Tabelas – com encargos patronais – JUNHO/2017. **Controladoria Geral do Município**. Disponível em: <http://prefeitura.rio/web/cgm/exibeconteudo?id=7259253>. Acesso em 10 ago. 2017.

PROCHNIK, V. "Firma, Indústria e Mercados". In: HASENCLEVER, L.; KUPFER, D. **Organização industrial**. Rio de Janeiro: Editora Campus, 2002.

RIETVELD, P.; DANIEL, V. **Determinants of Bicycle Use: Do Municipal Policies Matter?** Transportation Research Part A, p. 531–550, 2004.

RIVIBIKE Tembici (2017). **Informações Gerais**. Disponível em: <https://rivibike.tembici.com.br/>. Acesso em 6 out. 2017.

ROSENBERG ASSOCIADOS. **O Uso de Bicicletas no Brasil:** qual o melhor modelo de incentivo? Relatório. Abril, 2015.

SOARES, A. G.; GUTH, D.; AMARAL, JP. et al. **A Bicicleta no Brasil**. São Paulo: D. Guth, 2015. Disponível em PDF: <https://drive.google.com/file/d/0BwvFbiUNG-POrd3FBTnh3M3NhMnM/view>. Acesso em 14 nov. 2017.

TAINIO, M.; NAZELLE, A. J.; GÖTSCHI, T.; KAHLMEIER, S. et al. "Can air pollution negate the health benefits of cycling and walking?" **Preventive Medicine**,

TENDÊNCIAS – CONSULTORIA INTEGRADA. **Análise Econômica do Setor de Bicicletas e Suas Regras Tributárias**. Relatório. Outubro, 2013.

THE CITY FIX BRASIL (2012). **Qualidade do Ar:** fazer esporte em meio à poluição é melhor que ficar parado. Por Maria Fernanda Cavalcanti. Disponível em: <http://thecityfixbrasil.com/2012/12/11/qualidade–do–ar–fazer–esporte–em–meio–a–poluicao–e–melhor–que–ficar–parado/>. Acesso em 12 jan. 2018.

TRANSPORTATION RESEARCH BOARD. Active transportation: implementing the benefits (temática). **TR News**, n. 280, mai./jun., 2012.

VÁ DE BIKE (2016). **Santos/SP Tem Compartilhamento de Bikes Infantis com Rodinhas Retráteis.** Disponível em: <http://vadebike.org/2016/11/aluguel–bicicletas–infantis–danoninho–bike–kids–santos/>. Acesso em 6 out. 2017.

VÁ DE BIKE (2016). **Poluição do Ar Anula os Benefícios da Pedalada?** por Renato Lobo. Disponível em: <http://vadebike.org/2016/11/bicicleta–poluicao–saude–estudo/>. Acesso em 12 jan. 2018.

VASCONCELLOS, E. **Transporte Urbano nos Países em Desenvolvimento:** reflexões e propostas. São Paulo: Annablume, 2000.

VERMONT AGENCY OF TRANSPORTATION. **Economic Impact of Bicycling and Walking in Vermont**. Final Report, 6 jul. 2012.

VIEIRA, R. P.; TOLEDO, A. C.; ALMEIDA, F. M.; SALDIVA, P. et al. "Anti–inflammatory effects of aerobic exercise in mice exposed to air pollution". **Med Sci Sports Exerc.**, v. 44, n. 7, pp. 1227–34, jul. 2012.

VILLAÇA, F. **Espaço Intra–urbano no Brasil**. São Paulo: Studio Nobel/FAPESP/Lincoln Institute, 1998.

WE ARE CYCLING UK. **Cycling UK Campaigns Briefing**. Report. July, 2016.

YIN, R. K. **Estudo de Caso:** planejamento e métodos. 5a edição. Porto Alegre: Bookman, 2015.