Journey from home to work: the use of modes of transport and time in the city of Fortaleza

Deslocamento casa-trabalho: o uso dos modais e do tempo na cidade de Fortaleza

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Abstract

The article analyzes data from a research carried out in Fortaleza, with the objective of reflecting on the home-work journey and its socio-spatial characteristics, and also on the relationship between modes of transport and time. It shows concentration of jobs in the central area (north--east) and population concentration in a west--south peripheral belt, with a tendency towards monofunctionality. This points to the spatial mismatch that affects the poor population, penalized by long, time-consuming journeys on public transport. The research demonstrates that the upper classes benefit from shorter and faster journeys from home to work, while the public transport system suffers from disorganization and inefficiency, and the Integration Bus Terminals add much more time to the home-work journey.

Keywords: urban mobility; modes of transport; spatial mismatch; cities; city of Fortaleza.

Resumo

Este artigo analisa os dados de pesquisa realizada em Fortaleza, com objetivo de refletir sobre o deslocamento casa-trabalho e suas características socioespaciais, bem como sobre a relação entre modais de transporte e tempo. Demonstra a concentração de postos de trabalho na zona central (norte-leste), enquanto há concentração populacional num cinturão periférico oeste-sul, com tendência à monofuncionalidade. Isto aponta para o spatial mismatch que acomete a população mais pobre, penalizada ainda com jornadas mais longas e demoradas no transporte público. A pesquisa demonstra como as classes altas são beneficiadas com jornadas mais curtas e rápidas, ao passo que o sistema público de transporte sofre de desorganização e ineficiência e os terminais rodoviários de integração adicionam muito mais tempo à jornada casa-trabalho.

Palavras-chave: *mobilidade urbana; modais de transporte; spatial mismatch; cidades; Fortaleza.*

The daily life of any great metropolis is marked by the flow of people in its streets, consisting of a vital aspect, but at the same time problematic. In an incresingly extensive and dense urban agglomerations, how to ensure that populations of literally millions of people move from one neighborhood to another, from one zone to another, to work every day, within acceptable limits of comfort, price and time?

At a historic moment, when the planet become mostly urban for the first time – according to data from the United Nations, in 2014, half of the world's population lived in large urban clusters, and that number reached the 55% four years later (UN, 2018) –, ensuring good urban mobility policies is one of the biggest challenges.

This problem demands research that allows the understanding of the social elements of this problem and proposes solutions that contemplates the human aspects involving the way subjects move around in large cities. In this sense, the Laboratory of Studies in Politics, Education and City (Lepec), of the Federal University of Ceará, performed an investigation into urban mobility in Fortaleza, the capital of Ceará and fifth most populous city of the country, seeking to understand the displacements, the means of transport used, the profile of users and the way they use public spaces.

The research encompassed a broader project,[1] however, this article proposes to analyze the commute between work and home, seeking to understand how factors such as time use and family income are related to means of transport. For this, questionnaires were applied to passers-by based on a random sampling design, while public policies for urban mobility were monitored, especially those of the Municipality of Fortaleza. Commuting from home to work was privileged due to the understanding of it as an important indicator of the flow of people, since a considerable portion of the population commutes daily, and also, something that stood out in the data, as will be seen.

The results allow reflection on how cities are guided by policies that benefit private cars (aided by investment in the construction of new roads, tunnels, viaducts, etc.) to the detriment of the public transport system, which, despite some recent qualification – at least in the case studied – ends up pushing its users to long and time-consuming journeys on their daily commute to work. In this sense, despite this specific focus, it is not so far from Villaça's (2009) concerns about the internal dynamics of metropolises.

Methodological design of the research and cartography of the city

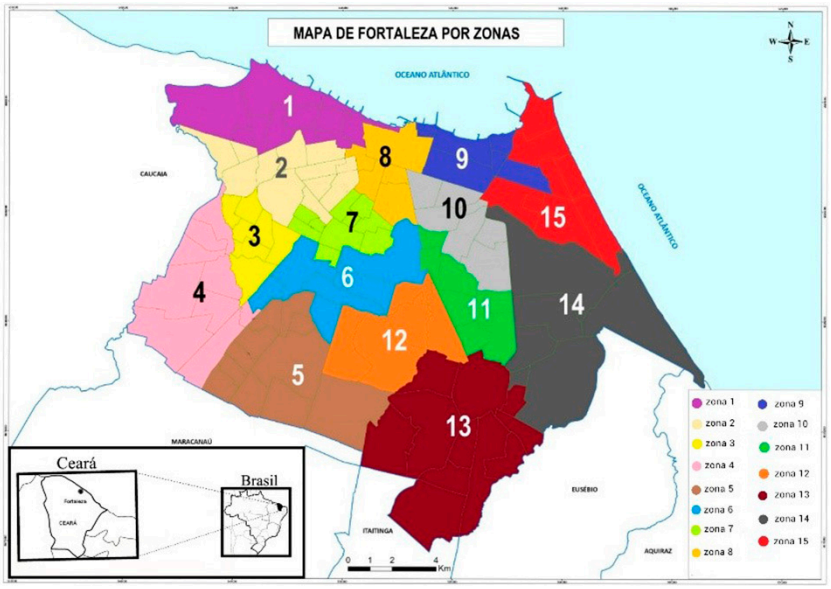
The research uses data from a survey held in Fortaleza between August and November 2019, using 388 questionnaires applied based on a non-probabilistic sample calculation, considering a population of 2,669,342 (IBGE, 2019), with a confidence level of 95%, with a 5% margin of error. The forms were applied in person by 12 applicators on roads and public squares, transport terminals, bus stops, parking lots of large commercial establishments, and places with a large flow of passers-by. Data

were tabulated in an electronic form on the *Google Forms* platform and analyzed using *Microsoft Excel* and *SPSS software*.

In order to qualify the results, a sample stratification procedure was adopted based on four variables: sex, age group, daily mean of transport used (prioritizing the polarity of public and private transport) and geographic distribution in the city. In this last point, it was decided to develop a new territorial division, since the official cartography was not considered satisfactory. In 2019, Fortaleza was divided into seven Regional Executive Secretariats (SERs), which acted as subprefectures. However, this configuration covers vast and heterogeneous territories, and is only an administrative division, not carefully based on historical or social characterizations.

The alternative regionalization built for the research aimed that the distribution of forms could match with the social specificities that mark the city. For this, the municipality was divided into 15 zones (Figure 1), comprising 6 to 13 neighborhoods in each, with accumulated populations varying between 80,000 and 330,000 inhabitants. The idea was

Figure 1 – Zoning of Fortaleza built by the survey



Source: edited by the authors on the Fortaleza Neighborhood Map (Ipece, 2019).

not to create homogeneous blocks in terms of area or population, but clusters guided by their histories of land occupation, political struggles, social relations, socioeconomic profiles, etc., drawing upon the authors' previous experience in urban research (Accioly and Nogueira, 2015; Aragão et al., 2008; Costa and Amora, 2015; Iplanfor, 2015).

The territorialization created for the research proved to be correct, since, in December 2019, after the fieldwork, the Municipality of Fortaleza forwarded a bill to the Legislative Chamber proposing the new division of the city into 39 territories, grouped into 12 new Regionals, claiming to be better for political management. The map of the 12 new SERs bears many similarities to the 15 research zones, a "coincidence" that confirms, to some extent, the logic of the present division.[2]

The questionnaire had 32 objective questions and was prepared with a view to filling it out quickly and easily, as it would be applied in situations of displacement; it contemplated social characterization (city and neighborhood of residence, age, gender, skin color, family income, level of education, work status); forms of daily commuting; uses of public spaces in the city in general and in the neighborhood in particular; and challenges and fears faced in displacement. The set of responses enables multiple looks and analyzes in development by the research group.

Chart 1 – Territorialization built for research

Zone	Neighborhood polo	Number of neighborhoods in the zone	Old SER*	Zone population (2010 Census)	HDI/ Neighborhood polo (2014)
1	Barra do Ceará	13	I	334.990	0,215
2	Antônio Bezerra	11	III	234.475	0,348
3	Henrique Jorge	6	III	140.276	0,283
4	Bom Jardim	9	V	297.997	0,194
5	Mondubim	10	V	243.514	0,232
6	Parangaba	6	IV	119.659	0,418
7	Montese	10	IV	119.923	0,472
8	Centro	6	I, IV, VII	82.581	0,556
9	Aldeota	6	II	109.264	0,866
10	Tauape	6	II	91.789	0,491
11	Cidade dos Funcionários	7	VI	89.408	0,571
12	Passaré	6	VI	89.903	0,224
13	Messejana	11	VI	219.534	0,375
14	Edson Queiroz	6	VI	85.922	0,350
15	Praia do Futuro	8	II	133.815	0,167

*Based on pre-2019 split.
Source: constructed by research, from Iplanfor (2015).

Regarding everyday journeys, the team used the diagram with symbols created for Carneiro's research (2020), which allowed, at the time of the interview, to quickly note down various details of the journey and the multiple means used, describing the need for walking, use of transport (public or private), passing through integration bus terminals, changing means, etc.

As written, the sample construction was guided by stratification in gender, age group, mean of transport and geographic distribution, seeking to maintain proportionality regarding the reference data from the *2010 Census* (in the case of gender distribution, age group, territory) and others on the use of means of transport. In September 2020, the city's vehicle fleet was of 1.149 million units, 613,054 of these were cars (Denatran, 2020); distributed over a road network of only 2,900 km (Frota..., 2014), which means that if all vehicles were lined up on the streets at the same time, there would not be room for all in the municipal territory.

The public transport system, on the other hand, is mainly made by buses, with a fleet of 1,751 vehicles in 2019, according to Sindiônibus (Em meio..., 2021). A gradual decrease in the number of passengers was observed even before the Covid-19 pandemic: according to a report by *Diário do Nordeste* (Mesmo..., 2017), the monthly average of passengers had fallen from 24.7 million to 22.8 million between 2012 and 2016, respectively.

The decrease responded to a national trend: data from the *Yearbook* of the National Association of Urban Transport Companies (NTU, 2017) pointed to a decrease in the number of passengers in the country between 2014 and 2017, with small growth in 2018, which remained stable in 2019. Both the article and the *Yearbook* pointed to the alternative transport option as a cause, such as travels using apps or means such as the subway and bicycles. In December 2019, the period close to the data collection, the number of bus users in Fortaleza was 21.6 million passengers/month (Número..., 2021).

From these numbers, the proportionality of private and public transport users was constructed in order to guide the organization of interlocutors into profiles. To ensure randomness and improve the quality of the sample, the profiles were distributed proportionally to the data (division by sex, age group, zone population, estimated number of public and private transport users) and raffled, resulting in goals to be followed in field by the applicators, to fill in each of the variables: for example, in zone 1, by drawing lots, it was necessary to interview 7 women between 15 and 29 years old, users of public transport; 4 men of the same age group and mean; 6 women from 30 to 49 years old in the same mean; 3 more women aged between 30 and 49 using private transport; thus, successively, totaling 33 interlocutors in the zone. To ensure the diversity of respondents and the purposes of travel, the interviews were carried out in the morning, afternoon, and evening shifts, and on all days of the week.

As can be seen, for the application, the means were classified in a binary way (public and private) to facilitate the sample design. For the “public transport” profile, interviews were conducted with passers-by at points with a high concentration of users of this system: strategic bus stops or integration bus terminals. In turn, interviews with private car users were carried out in places of concentration of vehicles, such

as close to commercial corridors (where there are parking spaces), large avenues, or parking lots of commercial establishments and services, such as large supermarkets and shopping malls.

As the interviewees were approached in a situation of displacement, housing coinciding with the area of the interview was not guaranteed, but since Fortaleza is, like most large cities, polycentric in nature (Silva and Gonçalves, 2012; Accioly and Nogueira, 2015),[3] the circulation of people meets strategic limitations and is guided by housing and place of work (or study). Even though there was a notable coincidence between the home zone and the interview zone (42.3% of the sample), the approach expansion to all 15 zones would enable a reduction of the possible distortion generated by the fact that the subjects were in movement at the time of the interview was considered during the methodological planning. This assumption came true when we realized that the division of the sample by housing in the 15 zones remained relatively proportional to their population, with zones 1, 4, 5 and 13 as the most populous, which is close to the reality shown in Chart 1.

Similarly, approaching a passer-by at the exit of a large supermarket was not a guarantee that he would travel by private car, which enabled the diversity of the sample in other motorized means (such as motorcycles or app trips). This approach was also valid for commuting at the time of the interview, which did not necessarily coincide with the mean used for work or study.

Urbanization and land occupation

The problem of the urban world can be analyzed from many standpoints, and the perspective we adopted here is guided both by attention to the subjective impacts of life in the big city, studied from Simmel (1967) to Speck (2017), and to the dynamics of mobilized inequalities in managing its existence (Lefebvre, 2013; Harvey, 2014); regarding the consequences of all this expressed in land occupation (Duhau and Giglia, 2016). The first element to consider in this question is its scope: 1 in every 8 inhabitants of the planet lives in one of the 33 existing megacities (UN, 2018), that is, massive urban agglomerations with vast territorial extension and more than 10 million inhabitants, according to the United Nations.

Although life in these urban agglomerations is dramatic, from the point of view of infrastructural limitations and their socioeconomic consequences, the difficulties of spatial organization in cities with smaller population cannot be ignored. The expansion of urbanization does not stop at the political or traditional limits of cities, creating a conurbation that challenges municipal management and directly impacts the lives of its inhabitants. Brazil is part of this in a peculiar way, with its more than 210 million inhabitants (IBGE, 2019); urban population rate of 84.7% (EducaIBGE, 2019); adding

17 municipalities with more than 1 million residents and another 25 with more than 500 thousand people.

Capitalist changes at the end of the 20th century, the transition to the 21st and the rise of neoliberalism strongly impacted the dynamics of cities with the expansion of the power of real estate capital in line with the decrease of social policies, including housing (Harvey, 2014). Brazil experienced this with some peculiarities, with its late capitalism and economic dependence on central countries, but, in the topic that most interests us here, urban mobility, there are some points to explore. Maricato (2015) analyzes how the self-construction of homes by excluded layers of the population contributed to capitalist accumulation, producing a pre-modern or pre-capitalist mode of production of cities that focused essentially on the fringes of their territories, placing the populations of the lowest rents away from central areas. This distance has a great effect on urban mobility. At the same time, says Maricato (ibid.), there was a systematic exchange of investment from collective to individual transport, even more so in recent decades, within the infrastructure packages that created programs such as the Growth Acceleration Program (PAC).

At the same time, the Brazilian government invested massively in subsidies for car consumption, including for the lower middle classes, as a strategy to deal with the 2008 economic crisis, which contributed to transforming the country into the fourth largest car market in the world in 2013 (Lima Filho, 2013). This reminds us of Villaça's (2009) considerations on how not only the transport of goods, but also that of people, needs to be analyzed in the dynamics of cities, including because it is configured as consumption and demand for specific infrastructure, on roads, viaducts and tunnels.

Authors such as Gehl (2015) or Speck (2017) show that, when analyzing mobility in cities, not only motorized transport should be considered, but especially the quality of the walkability level, that is, the infrastructure available for walking. After all, as discussed by Gehl (2015), mobility becomes efficient in a large city when there is the possibility of integration between various means (which should add efficient public transport systems and "clean" vehicles, such as bicycles), with walking serving as the final stage, which impacts not only sociability (creating community relationships), but also the economy, an aspect emphasized by Speck (2017).

For this, it is necessary to create, as well as maintain, good sidewalks, walkways, and pedestrian paths for the passerby population. However, despite constant investments in recent years – the works of BRTs and the binaries installed by Fortaleza always include the requalification of sidewalks –, the general quality of pedestrian routes and accessibility is still poor, as diagnosed by studies on roads, sidewalks and squares of Azevedo (2016) and Santiago, Santiago and Soares (2016). In a national survey on the quality of sidewalks (Mobilize Brasil, 2019), Fortaleza ranked 26th among the 27 Brazilian capitals, and is therefore a city hostile to walkability.

When analyzing the development of cities in the 20th century, Duhau and Giglia (2016) highlight the cases of the United States, where there was a decentralization, through the suburbs destined for the middle and upper classes, and the consequent emptying of the central zone; while, in the metropolises of Latin

America, in a context of peripheral Fordism and substitution of imports, there was a slightly different expansion, with the concentration of the middle and upper classes in central zones, at the same time that extensive popular peripheries were created in the distant and intercity regions. According to Villaça (2009), who notes the tendency of Brazilian metropolises to concentrate the rich classes in specific areas, it is possible to clearly see this in São Paulo (with its "rich" region immediately south of the Center), Rio de Janeiro (in which the Center serves almost as an appendix to the south zone); and this was definitely the case for Fortaleza (Pequeno, 2015).

Founded at the beginning of the 17th century by Portuguese settlers, seeking to consolidate the Northeast coast against foreign invasions (Farias, 2012), the occupation was consolidated in zone 8 (to use the territorialization that we built in this study – see Figure 1) and maintained slow growth.[4] In the first third of the 20th century, in search of distinction (Bruno and Farias, 2012), the elites moved slightly to the east (towards zone 9), giving rise to the Aldeota area, which concentrates the offer of commerce and services, but it also serves as housing for the privileged classes (Pequeno, 2015), fitting the Latin American model. Hence, no less than 8 of the 10 neighborhoods with the highest average nominal income (Iplanfor, 2015) are allocated in zones 9 and 10. Beyond that, there is the formation of a large belt of low-income suburbs and precarious infrastructure from west to south, corresponding to zones 1 to 5 and 13 (see Figure 1).

What is peculiar about Fortaleza is that the area between zones 10, 11 and 14 remained a geographic void – a region of rivers, lakes, and forests – until it suffered an occupation movement, from the end of the last century, resulting in both degraded areas and in new "noble" regions (Pequeno, 2015). Reflecting this, while the west-south belt conurbates impoverished areas in the municipalities of Maracanaú and Caucaia; the east-south portion creates upper-class enclaves also conurbated Eusébio (Accioly and Nogueira, 2015). Lima et al. (2021) analyze this more recent movement, based on the notion of spatial segregation, which adopts a voluntary characteristic for the upper classes and compulsory for the lower classes, realizing the problematization of urban sprawl caused by the double movement.

Thinking about urban mobility, the expansion of occupation from the central zone to the impoverished west and the enriched east was not planned and faces three physical obstacles to the integration of the city. The first is a legacy of the past, in which products and capital flowed from the countryside to the capital along old roads that became the main avenues (Farias, 2012), maintaining the north-south direction, which guarantees a set of relatively fast roads, connecting the center to the industrial corridors of the Metropolitan Region of Fortaleza (RMF) and to the flow of goods coming from other regions of the state. On the other hand, internal east--west integration is quite precarious (Lima Filho, 2019): there is no internal east-west connection ring road, which forces the growing demand of people from the peripheries to move around following labyrinthine routes to the central areas.

The second connection obstacle is physical: the late occupation of zone 14 contributed to the preservation of the Cocó River and the creation of its ecological park. In

Figure 2, it is possible to visualize it as an arc to the east and to notice the decrease of human occupation in a vast region in the immediate vicinity, especially to the south. Obviously, maintaining such a green area is positive on the one hand; but, on the other hand, it makes the flow in its extensive surroundings much more difficult, precisely when that region suffers a development spurt in recent decades. In an almost complementary way, the third obstacle is the presence of Fortaleza International Airport in the geographic center (zone 6), preventing east-west and north--south connections. It is visible in Figure 2 in the center of the image (next to Parangaba and above CE-401).

In addition to the internal dynamics, it is necessary, albeit quickly, to mention the connection with the Metropolitan Region of Fortaleza (RMF), which has more than 4 million residents (IBGE, 2019), distributed in 19 municipalities, of which three (Caucaia, Maracanaú and Maranguape) have more than 100 thousand inhabitants. The RMF concentrates three industrial poles,[5] but despite the offer of jobs in the cities of origin, the commuting movement towards Fortaleza is still significant: 23.1% of the employed population in Maracanaú and 32.9% of Caucaia (Accioly and Nogueira, 2015). Reflecting this, the capital city still accumulates 43.8% of the state's GDP (Ipece, 2018).

Figure 2 – Aerial photo of Fortaleza – 2022

Source: Google Maps.

Places of residence and work destination

The research focused in knowing how the mobility dynamics of the population of Fortaleza occurs in everyday life, in particular, how the means were used and the inferences that can be made from the places of residence and work, associated with other elements, such as income. The survey approach was chosen not only because it provided primary data, but, fundamentally, because it would make it possible to focus on the human aspect that sometimes feels almost absent from the cold numbers in a table. Thus, despite being a quantitative research, the objective was to understand the impact of urban dynamics and public mobility policies on people (and in their daily lives), paying attention to the elements highlighted by Lefebvre (2013) and Harvey (2014) regarding the right to the city and the consequences of capital inequality in such a context.

Let us start, therefore, with the general profile of the sample. As for sex and age group, it more or less responded to the representation of the Census, with a slight female majority (55.4%) and a concentration of the public under 50 years old (75%); bringing, still, a majority of mestizos (56.2%); almost half (47.4%) with average monthly family income between 1 and 2 Brazilian minimum salaries (i.e., between US$230 and 460, approximately); and three quarters having work occupation (71.7%).

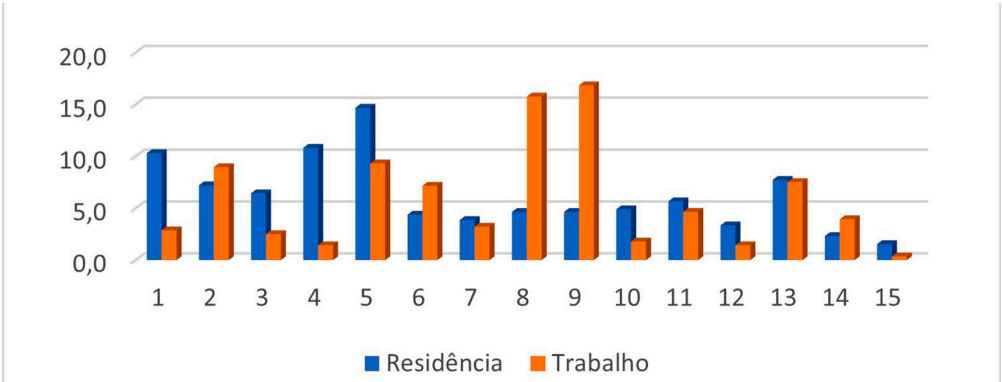
The fact that the research was carried out with people traveling around the city seems to have contributed to the increase in the proportion of employed individuals: at the time of the interview, the reason for travelling for 30.2% of them was to go to work, while 27.5% were shopping or using a service. Only 6.4% moved for leisure, for example.

As for housing, due to the nature of the application, the interface between home and workplace gave rise to some interesting reflections. Graphic 1 shows the correspondence between the sample and the demographic data, with zones 1, 4 and 5 having the largest population groups, while the rates for the workplace are different. In some zones, such as 1, 3, 4 and 5 (all in the west), the number of residents is much greater than the number of interviewed workers who circulate through them. On the contrary, in zones 8 (Center region) and 9 (Aldeota), unsurprisingly, the contingent of workers in transit is much larger than that of the residents interviewed, as these are the regions with the greatest supply of jobs.

Corresponding to the data in Chart 1, the most populous neighborhoods in the sample are located on the outskirts of the city, forming the west-south belt, with the first stratum occupied by zones 1, 4 and 5 (each retaining more than 10% of sample workers); and a second extract with zones 2, 3 and 13 (ranging between 6.4 and 7.7% of residences). According to the *2010 Census* (Iplanfor, 2015), this belt has more than 1.4 million inhabitants, and its nature in our research indicates an internal pendular movement with a working mass leaving the west-south region towards the center-east to work every day.

It is at this point that land occupation creates an interface with economic distribution and the consolidation of labor flows. Therefore, although we assume that Fortaleza is a polycentric city (Silva and Gonçalves, 2012; Costa and Amora, 2015),

Graphic 1 – Residence and work destination by zone



Source: authors' survey, in 2019.

there is still a concentration of trade and services (and therefore jobs) in zones 8 and 9 A central neighborhood in this region, Aldeota has mixed occupation: first, it is an upper middle class residence, as it appears as the 5th neighborhood with the highest average monthly income in the city (Iplanfor, 2015), while the 1st and 3rd positions in the ranking are immediate neighbors (Meireles and Cocó, respectively). Second, it is a trade and services corridor (with emphasis on the banking system and a network of hospitals and medical clinics), which can be numerically observed in official data (Paitt, 2014; Fortaleza em Mapas, 2018).

Because of this, it is a region of great circulation and the focus of daily traffic jams. The challenges are recognized by the government: a study by the City Hall (Paitt, 2014) reveals that, although the surroundings of Aldeota have only 3 km² and are home to 2% of the city's population, it corresponds to 77.8% of the municipal GDP. Such concentration has an obvious impact on mobility: it concentrates 16% of the flow of private vehicles, 18% of public transport lines and 30% of its users.[6]

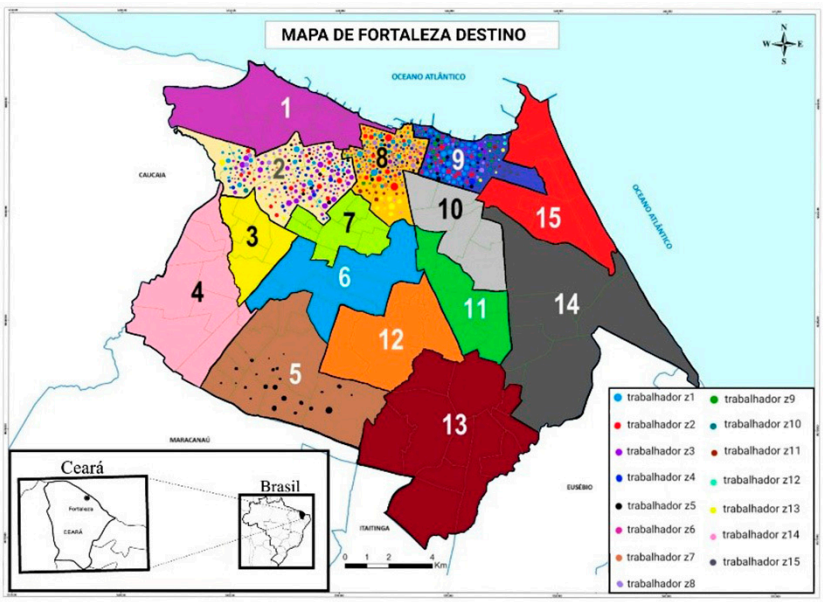
Lima et al. (2021) draw attention to the phenomenon of spatial mismatch, in which there is opposition between the space of residence and where the jobs are located. In line with our results, the authors demonstrate that, despite the Aldeota region (zone 9) being an area of residence for high-income classes, its characteristic of offering jobs is given to both these and the lower classes. This offer is related to the commercial, institutional and services concentration in the region, but also to the phenomenon of the demand for domestic workers (cleaners, day laborers, doormen, security guards, caretakers, babysitters etc.) generated by those high-class housing, as we presented in another research (Gonçalves et al., 2020).

The discrepancy between job offers and housing territory of the lower classes (which occupy the west-south belt) generates the need to shift the peripheral fringes towards the central region polarized in zone 9, but which also radiates to zone 8.

Our research demonstrated the phenomenon, as can be seen in Graphic 1, in which zones 8 and 9 accumulate 32.6% of the sample's employment destinations. However, despite this primacy, there are other work destination clusters identified by the forms: a second level with zones 2 and 5 (with 9.3% and 9% of the work destinations in the sample, respectively); and a third level with zones 6 and 13 (7.2% and 7.5%). And, although it is not negligible that these six zones concentrate 65.6% of the work destinations in the sample and that the first two levels accumulate more than a half, the geographic distribution forms a clear stain of agglutination of zones 2, 8 and 9, bringing together 41.6% of the work destinations, as can be seen in Figure 3.

Each of these regions seems to point out its own dynamics of job generation. This is clear in zone 2 (Antonio Bezerra region), which has the Bezerra de Menezes avenue corridor, which provides a wide range of commerce and services, including banking. Both the core neighborhoods of zones 6 (Parangaba) and 13 (Messejana) were autonomous municipalities in the past (Lima, 2006) and even today maintain an commercial vocation independent from Centro-Aldeota (Costa e Amora, 2015),

Figure 3 – Map of zones by destination to work



Source: edited by the authors on the Fortaleza Neighborhood Map (Ipece, 2019).

with the addition that zone 6 also houses the airport. Silva and Gonçalves (2012) even place Antônio Bezerra, Parangaba and Messejana as part of the city's other polycentric nuclei. Understanding why zone 5 (Mondubim) was highlighted was more difficult. Apparently, it is the result of local centers of commerce and services, such as Conjunto Esperança and Prefeito José Walter, both born from large public habitation programs from the seventies. This topic may be the subject of future studies.

When we cut out the areas of residence, the result is quite revealing of the city's complex mobility dynamics. Based on the *2010 Census* microdata, Lima et al. (2021) point to the trend of monofunctional peripheries in Fortaleza, that is, with neighborhoods mainly aimed at the residence of the lower classes, as opposed to the job offer concentrated in the central region.

However, this soil occupation dynamic still responds to some peculiarities. Some coincident degree of residence and destination (for occupation) was noted for 26.5% of the workers in the sample, indicating relatively short movements, especially in zones 1, 4, 5, 11 and 12, each with more than 50% of residents working in neighborhoods of the area itself.

The zones that concentrated the largest number of exogenous workers in terms of housing were 2, 8 and 9, being, therefore, the ones that most demand dislocations and precisely those that created the stain of Figure 3. Although they also maintain a certain degree of residence (13.6%, 12.8% and 18.6%, respectively), they have a more heterogeneous flow than the others zones and, therefore, are the main mobilizers of residents from other zones.

The way they impact on mobility to work, however, is different. Zone 2 concentrates workers from neighboring regions (zones 1 and 3) or relatively close (zone 4), creating a cluster of neighborhoods in the western region integrated by residence and work. Technically also in the west, zone 8 especially influences neighborhoods in that region, with most of its workers coming from zones 1, 2, 4 and 7.

Work destination champion, zone 9 also mainly receives workers coming from the west, from zones 1, 2 and 8; however, those who work there come from more diverse origins (from almost all zones), and it is important to note that zones 3, 4 and 5 form a secondary emission block of workers who need to cross the city to reach their workplace.

The data also show that the expansion of housing and services to zone 14 is beginning to bear fruit: although in percentages that are still small (ranging between 12% and 20%), this region is a job destination for residents of zones 6, 9, 10, 13 and 15, i.e. mostly on the east side.

Journey time from home to work

Considering that 73.5% of the workers in the sample need to leave their housing area to go to work, and that the area of zones 2, 8 and 9 concentrates 41.6% of these subjects' destinations, there is a strong tendency for a spatial mismatch, which has direct implications on urban mobility and the time required for such a displacement.

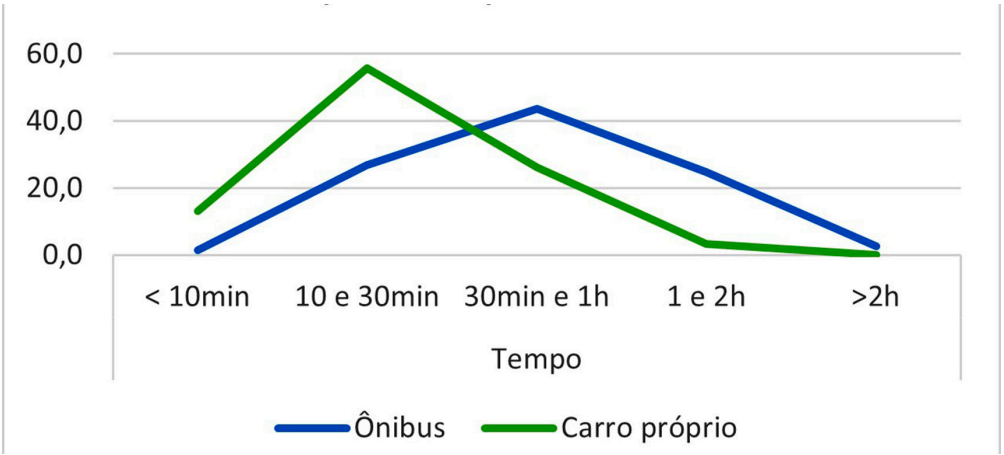
The distribution of the sample by means was more or less polarized between users of public transport (58.5%) and private transport (18.8%), responding, to a certain extent, to the indication of the application itself, as described in the methodology, but it were registered users of other means, albeit in small numbers.[7]

However, even though the focus of the article is the polarity between public and private transport, we cannot fail to quickly mention the walking mean, after all, 95% of the workers in the sample reported doing on foot a part of their journey to work. Thus, although "only" 7.4% used exclusively this modal, walking is something necessary for the overwhelming majority of people when using any modal.

On the other hand, the sidewalks of Fortaleza present a precarious and inadequate reality when walking, full of irregularities and obstacles, although some bring tactile identification or access ramps. In the assessment by Mobilize Brasil (2019), the city was ranked second to last among Brazilian capitals, with an average of 4.53. Thirteen evaluation criteria were used (inclination, width, barriers, existence of urban furniture, etc.) and, although the transversal slope criterion reached a score of 7.39, others presented very poor indicators, such as the existence of urban furniture and squares (2.90) and maps and signposts (0.10).

There is a clear inequality in the pedestrian structure when cuts are made by areas: the three best evaluated sidewalks are in

Graphic 2 – Modal by home-work time



Source: authors' survey, in 2019.

zone 9, all destined for the tourist sector and the upper classes living, while the three worst sidewalks are in zones 7 and 6 (Mobilize Brazil, 2019).[8]

When we consider journeys from home to work, one of the main factors to evaluate is the time required to complete it. Most workers in the sample do not require much: 12.6% require less than 10 minutes, and 35.5% between 10 and 30 minutes, a range of 34.6% requires a time between 30 to 60 minutes. We consider high, however, the rate of 17.3% who spend more than 1 hour.

What draws attention are the differences in travel time when we stratify them by means: 27.3% of bus users needed more than 1 hour in thehome to work journey, reaching 10 percentage points more than the average; while only 3.3% of private car users used the same amount of time.

This means that car users benefit in terms of time spent on their daily journeys, despite traffic jams. Although there are public policies aimed at reducing the bus journey time, this does not seem to be reflected horizontally in the general picture of the sample. Since 2012, Fortaleza has had a BRS (Bus Rapid Service) system, that is, preferential lanes for public transport, which other vehicles can only access to perform conversions. As of 2014, the BRT (Bus Rapid Transit) was also implemented, which are exclusive bus lanes, structured in isolated corridors and equipped with small stations. Figueroa (2012) studied this model and identified it as originating from urban interventions in Curitiba, in the late 1980s, from there expanding to other Brazilian cities (São Paulo, Rio de Janeiro, Porto Alegre) and being adopted in the large Latin American metropolises at the turn of the century, such as Buenos Aires, Santiago, Lima, Bogota and Mexico City.

In Fortaleza, between 2014 and 2018, two BRT corridors were built (on Avenida Bezerra de Menezes, zone 2; and on Avenida Aguanambi, zone 8), totaling just over 4 kilometers at a cost of BRL 477 million. Despite the real gain in speed of the collectives within the exclusive lanes – the City Hall of Fortaleza even announced that the BRT in Bezerra de Menezes increased the average speed of its buses from 12 km/h to 18.3 km/h (Corredor..., 2018), fact that undoubtedly impacts the travel time of passengers –, the high investment required to implement the system acts as a strong impediment to the continuity of the policy.

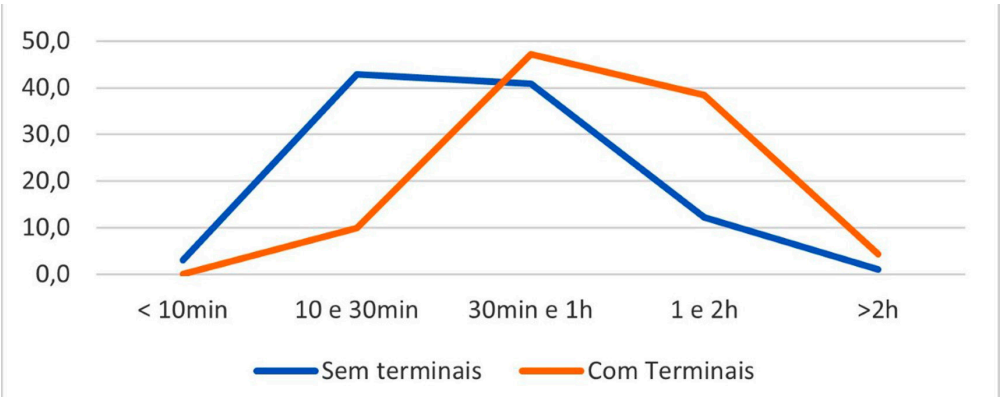
As we analyzed in another study (Lima Filho, 2019), the Expresso Fortaleza project, launched in 2014, stipulated the initial construction of eight BRTs in the city, but was later reduced to only four, of which only two were built. The *Fortaleza 2040* planning (Iplanfor, 2018) stipulated a network of approximately 110 kilometers of BRTs. However, considering that it is an intrusive type of work (affecting and blocking high-flow roads), time-consuming (an average of two kilometers built per year) and expensive (at a cost of more than 100 million per kilometer), the BRT presents a great achievement challenge. This is in line with what Figueroa (2012) says, who does not consider the BRT a suitable model for large metropolises and that, normally, it works only in very specific stretches of cities.

With the low capillarity of the BRTs and the limited efficiency of the BRS (which put vehicles subject to traffic), the additional time is a constant for public transport users, even more so in view of the internal commuting movement. And the way in which Fortaleza's public transport system is organized obliges 50.5% of the users in the sample to change directions (transfer), and 38.5% of those who use two buses or more took more than 1 hour to travel from home to arrive at work. That is, 11 percentage points more than the average for that modal.

The situation is even worse when the interchange of vehicles is made through integration terminals. This equipment, organized as road hubs, allow the exchange of lines without having to pay for another ticket, and, in 2019, there were seven of them in the city.[9] In this way, public transport meets the logic of terminals distributed in "strategic" locations, collecting the flow of people coming from the outskirts of the peripheries and directing them on routes oriented to trade and service conglomerates. The problem is that the terminals are not geographically well distributed, with, on the one hand, a concentration of four of them within a radius of just 6 kilometers in zones 4 and 6; on the other hand, the dispersion of the others in the distant zones 1, 9 and 13. The terminals mimic the methodology of the subway in their own way, however, motorized vehicles have less capacity to absorb new passengers, which added to the weak distribution, makes the system slow and inefficient and adds more than reasonable time to travel.

The range of terminal users is significant within the sample: 23.7% of those who go out to work or 48.4% of bus users. When we isolate bus users who do not use the terminals, we see that 13.2% needs more than 1 hour to

Graphic 3 – Bus user by time (home-work)



Source: authors' survey, in 2019.

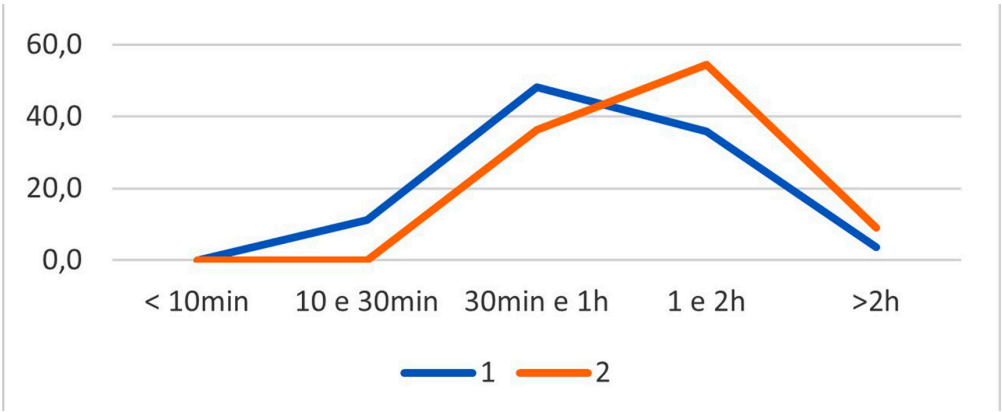
complete the trip. Compared to those who use the equipment, the same time is required for 42.9%. As you can see in Graphic 3, despite some similarity in the curves, they are basically opposite in terms of time distribution, always accumulating more for those who use the terminals.

In the sample, a small portion needed to use not just one, but two terminals on the way to work (12% of those using the equipment), and, in these cases, the addition of time was also proportionally greater. As shown in Graphic 4, 39.5% of those using one terminal and 63.6% of those using two terminals spent more than 1 hour on their journey.

Even though a portion of the users of two terminals actually cover longer distances (which are reflected in more time), the poor geographic distribution of equipment contributes to the fact that, even over medium distances (or short ones, as in the cases of the Parangaba and Lagoa terminals, separated by only one kilometer in a straight line), some users need to pass through two terminals to get to work.[10]

The dynamics of time spent by workers using public transport is related to other variables: unsurprisingly, they had a lower income and 65.9% of users of public transport reported living with a family income of less

Graphic 4 – Number of terminals by time (home-work)



Source: authors' survey, in 2019.

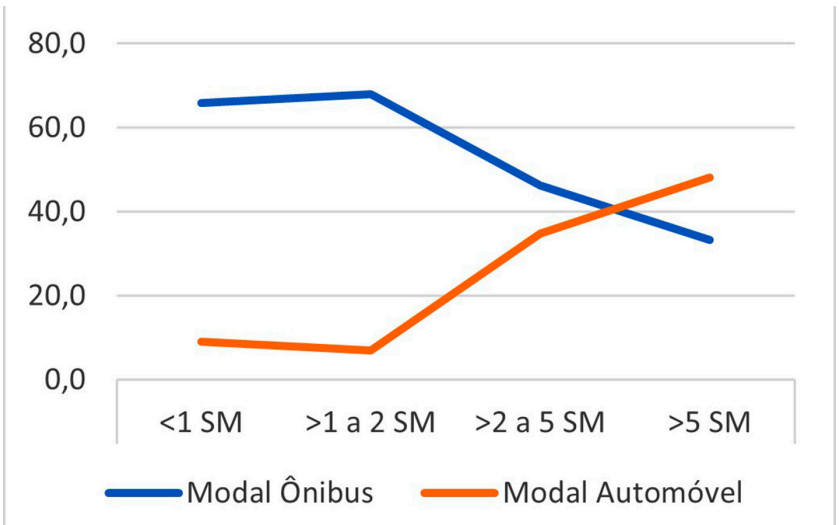
than 1 Brazilian minimum salary, against 9.1% of cars users. Conversely, among those with incomes greater than 5 Brazilian minimum salaries, 48.1% traveled by car and 33.3% traveled by bus. Graphic 5 displays the percentage of income by modal and how the curve is mirrored between the two types.

In this analysis, we prioritized the binary comparison between public transport (bus) and private automobile (car) users, however, the sample also recorded data from other means, such as motorcycles, bicycles, subways, hitchhikers, app users or taxi and even those who make their main journeys on foot. It is important to point out that the low number of subway users' respondents (0.9%) indicates that the investigation did not satisfactorily reach this type of subject or that they are few in relation to the others.

However, as the interviews were conducted with passers-by, it would be expected that underground users would show up. Therefore, it is possible that the low frequency of this modal is related to its incipient use. Although officially inaugurated in 2012, Metrofor (as it is called the Fortaleza Subway) is the result of a complex political process, whose project began in the 1980s, and the execution of the works dragged on for 14 years until the inauguration of the first section. In 2019, there were two lines (South and West) in operation and, after applying the questionnaires, the third one (the VLT/Light Rail Vehicle, an electric surface train) entered the testing phase.

Our hypothesis is that the low frequency of subway users in the sample is related to the limited access of this modal to the neighborhoods of Fortaleza. The Metrofor South Line broke usage records in 2019, with an annual average of 10 million users (Transporte..., 2020). This means that, seven years after being inaugurated, the system still occupied only 9.7% of its capacity (Linha..., 2019).

Graphic 5 – Family income by modal



Source: authors' survey, in 2019.

At the same time, the wide coverage of bus access to neighborhoods points to the greater use of this modal with the already mentioned number of 21.6 million users in August 2019 (Número..., 2021). Therefore, considering the period of data collection, the annual users of the subway corresponded to only half of the monthly public of the buses.

The frequency of bus users decreased significantly during the Covid-19 pandemic, reaching its lowest point in May 2020, with an audience of 4.9 million monthly users (ibid.), but it grew back, reaching 13, 6 million people in August 2021, i.e., 66% of the demand of two years earlier.

Finally, it is worth mentioning that Fortaleza is in the headlines in terms of urban mobility because of its bicycle system, based on a municipal public policy put into action since 2013. In addition to an extensive network of bicycle lanes and tracks, the city has a system relatively robust bikeshare system, with 188 stations, even though the system expansion process only took place after data collection. In any case, our studies suggest the growth of users of this modal, and the data seem to reflect this, with 6.2% of those who go to work using bikes for this purpose. The use of this modal is the object of investigation in other studies (Lima Filho and Rebouças, 2019).

Final considerations

This article analyzed data from a survey on urban mobility carried out in the city of Fortaleza, associated with the construction of a differentiated territorialization of 15 zones or clusters of neighborhoods, with the objective of reflecting on the dynamics of the journey between work and home from the housing regions and its socio-spatial characteristics; and the relationship between uses of transport means and time.

The data collected in our research shows that, in a situation of displacement at the time of collection, the majority of the sample individuals moved for reasons of work and to use services/commerce, pointing out that the use of the city's means is more marked for "professional" or consumer reasons, leaving little room for leisure and conviviality.

Confirming previous studies, the labor distribution in the city meets the socioeconomic organization. As Fortaleza concentrates the supply of shops and services in a central area, it is there that the greatest number of jobs are located: zones 8 (Centro) and 9 (Aldeota). In addition to this concentration, there is a cluster of secondary work destinations, in zones 2 (Antônio Bezerra), 5 (Mondubim), 6 (Parangaba) and 13 (Messejana). Zones 8, 9 and 2 are also those that receive the most exogenous population, that is, workers who do not live there. This means that the majority of the sample needs to move from their zones of origin to the concentrated destination of the central zones, straining the home-work trajectories.

In a more or less opposite way, the city's population concentration occurs in other regions: in the sample, especially in zones 1 (Barra do Ceará), 4 (Bom Jardim), 5 and 13. However, it was noticed that some zones concentrate much more resident population than work destination for the sample, as is the case of zones 1 (Barra do Ceará), 3 (Henrique Jorge) and 4 (Bom Jardim).

These results demonstrate how the city points to a tendency towards monofunctional land use in the peripheral fringes, dedicated essentially to the residence of the low-income classes, while job opportunities are concentrated in the central area, which has mixed occupation, and is also home to the upper classes. This characteristic indicates that higher-income residents have job offers at shorter distances, while the low-income population suffers from the spatial mismatch, which is the territorial mismatch between housing and the workplace.

In parallel to this phenomenon, the city suffers from a process of urban sprawl, in which there is a spatial self-segregation of the population, both high and low income, as noted by Lima et al. (2021). However, the first group voluntarily migrates to fortified enclaves in the form of horizontal condominiums in a southeastern region, emigrating in part to the municipality of Eusébio; while the low-income population is compulsorily pushed to the western and southern fringes, in areas bordering the municipalities of Caucaia and Maracanaú, as a result of the economic dynamics and real estate capital that make the cost of living in those central areas increasingly higher (Pequeno, 2015).

In this way, the trend towards residential monofunctionality in peripheral neighborhoods, the spatial mismatch and spatial segregation result in the low-income population living increasingly far from the places where they work, which, in our sample, was represented by 73.6 % of workers needing to leave their home zones to go to work. Bearing in mind that the low-income population mostly uses public transport for this, we see the space-time tension acting in the form of long and time-consuming journeys.

The time factor was one of the major concerns of the study and an increase in time was demonstrated in relation to the public transport modal, especially when there was a need to use bus terminals. Taking as a reference the expenditure of more than one-hour journey from home to work, the difference between private cars and public transport users was of 24 percentage points; and, when we cut out the bus users who had to use terminals, the accumulation of time increases according to the need to use one or two of these pieces of equipment.

Therefore, the inverse proportion between income and use of means is clear when considering the polarity between public and private transport. The higher the income, the lower the probability of using public transport, which demonstrates that bus users have lower income and are penalized by spending more time travelling to work.

At the same time, the government seems to invest much more in equipping road infrastructure for private vehicles, qualifying roads and building viaducts and tunnels, even though investment in more efficient public transport systems has been perceived in recent years (such as the BRT) and in the bicycle network, which can provide alternative means of daily transport.

However, in general, public action reinforces the penalization of the poorest population, who spend more time in their daily travels to get to work; while the region where

the upper classes live is precisely the one that enjoys the best road network and the best public transport connection.

The city of Fortaleza replicates the Latin American model of metropolises with urban sprawl and spatial segregation of the poorest to the fringes or peripheries, while public policy actions to improve public transport are still very incipient. Even though it speeds up travel, the BRT is very restricted, and the traditional terminal system ends up making travel more difficult and time-consuming.

If the high cost of building new BRTs is prohibitive, the recommendation to the public authorities would be to invest in cheaper and more inventive solutions to make moving from the outskirts to the center more agile, such as the total integration of the public transport system (by one-pass tickets style), including the metro, as well as a study of available lines and ways to make them more efficient.

Making the trip to work for people living in the periphery faster and more comfortable would be a great achievement in itself compared to the current reality, even if this is quite far from the construction of a walkable city (Speck, 2017), in which the subject can enjoy with quality (Gehl, 2015) the public space that is available. In some places of Fortaleza, such as Aldeota and Meireles neighborhoods (both in zone 9), it is possible to enjoy public spaces that come very close to these humanistic ambitions of experiencing the city. But, again, they are located in wealthy neighborhoods for the use of the high-income population.

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Notes

(1) The research is part of a Lepec research project that involves themes such as urban mobility, uses of public space and public policies, of which this selection was presented here. The data bring other results that can be further explored.

(2) "The new regionalization was created by complementary law n. 278 of December 23, 2019. Decree n. 14,590, of February 6, 2020, brought the renaming of Regionals, with new maps. On December 31, 2020, through decree no. 14,899, the then mayor Roberto Cláudio published the new regulation of the administrative structure and the transition process of the Regionals". Translate by us from (Entenda..., 2021, s/p).

(3) Silva and Gonçalves (2012) name 10 centralities in Fortaleza: the traditional Center (zone 8) plus the neighborhoods Aldeota (zone 9), Montese (7), Messejana (13), Parangaba (6), Benfica (also in zone 8), Barra do Ceará (1), São Gerardo and Antônio Bezerra (both in zone 2) and Edson Queiroz (14). The authors associate the formation of these centralities with the emergence of large shopping malls, which serve as mobilizers of the tertiary and real estate sectors. Accioly and Nogueira (2015) and Pequeno (2015) also mention shopping malls as this type of mobilizer for the Metropolitan Region. From this, we could consider that other poles would be emerging since then, as in Papicu (zone 9), in addition to the reinforcement of existing centers with new developments. However, in addition to shopping malls, we account for other factors for the establishment of these other centers, associated with the so-called "street commerce", as the cases of Messejana, Montese and Antônio Bezerra are exemplary.

(4) In colonial times, Fortaleza was the seat of political power in Ceará, but it did not hold wealth, and other cities mobilized the economy through livestock production; and it only gained economic importance with the development of cotton agriculture in the context of the industrial revolution, especially in the second half of the 19th century (Lima, 2006; Farias, 2012). The area corresponding to zones 5, 6 and 13 (Mondubim, Parangaba, Messejana) were other municipalities, which ended up engulfed by the capital.

(5) Namely: Pecém Industrial and Port Complex, in São Gonçalo do Amarante and Caucaia; the Industrial District of Maracanaú (which is already conurbated in Maranguape and Pacatuba); and the southern industrial corridor (Eusébio, Aquiraz, Horizonte, Pacajus). See Accioly and Nogueira (2015).

(6) The data from Paitt (2014) refer to a geographical section called the "Aldeota Square", a region comprising a specific portion of Aldeota and near neighborhoods that concentrate such indices, all in zone 9.

(7) The valid percentage of sample distribution, regarding the use of other means to work was: on foot (7.4%), motorcycles (6.5%), bicycles (6.2%), hitchhiking (1.5%), subway (0.9%) and cars by application or taxi (0.3%). It is worth noting that ridesharing and app use are still carried out by car, so the rate of use of this modal (regardless of whether or not they are drivers) was 20.6%.

(8) The best sidewalks are on Avenida Beira-Mar (neighborhood Meireles), on Iracema Beach and at the Centro Dragão do Mar de Arte e Cultura, one of the main tourist facilities in the city. The worst are in the Damas, Itaoca and Parangaba neighborhoods (the first two in zone 7 and the last one in zone 6). The national assessment considered sidewalks that provide access to public facilities, such as transport services, squares, educational institutions and public safety, health, culture, leisure and the executive, legislative and judicial branches (Mobilize Brasil, 2019).

(9) The Integrated Transport System of Fortaleza (SIT-FOR) was implemented in the early 1990s and is only now being expanded. The existing terminals in 2019 were: Parangaba, Lagoa (both in zone 6), Conjunto Ceará, Siqueira (both in zone 4), Papicu (zone 9), Messejana (zone 13) and Antônio Bezerra (zone 2). While this text was being written, two others were delivered: in the José Walter (zone 5) and José de Alencar (zone 14) neighborhoods.

(10) In a preliminary non-validated survey, we even found a user who needed to go through three terminals to get to work, but in the sample collected, the maximum was the use of two equipments.

Referências

ACCIOLY, V. M.; NOGUEIRA, C. M. L. (2015). "Região Metropolitana de Fortaleza: movimentos pendulares e configuração espacial". In: COSTA, M. C. L.; PEQUENO, R. (orgs.). *Fortaleza: transformações na ordem urbana*. Rio de Janeiro, Letra Capital/ Observatório das Metrópoles, pp. 283-304. Coleção Metrópoles: Território, Coesão Social e Governança Democrática, Série Estudos Comparados.

ARAGÃO, E. F. et al. (2008). *Fortaleza e suas tramas: olhares sobre a cidade*. Fortaleza, EdUECE.

AZEVEDO, M. do S. M. de (2016). *Caminhar na cidade: uma reflexão sobre o uso das calçadas em Fortaleza como estrutura de mobilidade do pedestre*. Dissertação de mestrado. Fortaleza, Universidade Estadual de Fortaleza.

BRUNO, A.; FARIAS, A. de (2012). *Fortaleza: uma breve história*. Fortaleza. Demócrito Rocha.

CARNEIRO, G. L. S. (2020). *"De burca ou de biquíni": direto à cidade, mobilidade urbana e assédio de rua em Fortaleza/CE.* Dissertação de mestrado. Fortaleza, Universidade Federal do Ceará.

CEARÁ (2022). *Parque Estadual do Cocó*. Governo do Estado do Ceará, Secretaria de Meio Ambiente. Disponível em: https://www.sema.ce.gov.br/gestao-de-ucs/parques/parque-estadual-do-coco_/. Acesso em: 8 mar 2022.

COSTA, M. C. L.; AMORA, Z. B. (2015). "Fortaleza na rede urbana brasileira: de cidade à metrópole". In: COSTA, M. C. L.; PEQUENO, R. (orgs.). *Fortaleza: transformações na ordem urbana*. Rio de Janeiro, Letra Capital/ Observatório das Metrópoles, pp. 31-76. Coleção Metrópoles: Território, Coesão Social e Governança Democrática, Série Estudos Comparados.

DENATRAN (2020). *Frota de Veículos – 2020*. Brasília, Ministério de Infraestrutura/ Denatran. Disponível em: <https://www.gov.br/infraestrutura/pt-br/assuntos/transito/conteudo-denatran/frota-de-veiculos-2020>. Acesso em: 31 out 2020.

DUHAU, E.; GIGLIA, A. (2016). *Metrópoli, espacio público y consumo*. Ciudad de México, Fondo de Cultura Económica.

EDUCAIBGE (2019). *Conheça o Brasil: população.* Disponível em: https://educa.ibge.gov.br/jovens/conheca-o-brasil/populacao/18313-populacao-rural-e-urbana.html. Acesso em:5 out 2019.

FARIAS, A. (2012). *História do Ceará*. Fortaleza, Armazém Cultural.

FIGUEROA, V. (2012). "La política pública del Transantiago: implicancias conceptuales y metodológicas para um estúdio de caso". In: OLAVARRÍA, M. (ed.). *Cómo se formulan las políticas públicas en chile?* Tomo 3. El Transantiago. Santiago de Chile, Universitaria.

FORTALEZA EM MAPAS (2018). *Territoriais: área edificada: comercial; serviços*. Fortaleza, Fortaleza em Mapas. Disponível em http://mapas.fortaleza.ce.gov.br/#/. Acesso em: set 2018.

GEHL, J. (2015). *Cidade para pessoas*. São Paulo, Perspectiva.

GONÇALVES, D. N.; LIMA FILHO, I. P.; SANTOS, H. R. R.; FREITAS, R. M. F. (2020). Estar em isolamento social: quando a desigualdade atua como fator. *Aval: Revista Avaliação de Políticas Públicas,* v. 3, n. 17, pp. 151-169.

HARVEY, D. (2014). *Cidades rebeldes*. São Paulo, Martins Fontes.

IBGE (2019). *IBGE Cidades: Fortaleza – Panorama*. Rio de Janeiro, Instituto Brasileiro de Geografia e Estatística/IBGE Cidades. Disponível em: https://cidades.ibge.gov.br/brasil/ce/fortaleza/panorama. Acesso em: 17 mar 2019.

IPECE (2016). Análise comparativa da taxa de motorização do Ceará, Nordeste e Brasil – 2011 a 2016. *Ipece Informe*, n. 118. Fortaleza, Instituto de Pesquisa e Estratégia Econômica do Ceará.

_____ (2018). *Produto Interno Bruto Municipal: análise do PIB dos municípios Cearenses – 2002, 2010, 2014 e 2015*, n. 1. Fortaleza, Instituto de Pesquisa e Estratégia Econômica do Ceará. Disponível em: http://www.ipece.ce.gov.br/wp-content/uploads/sites/45/2018/10/PIB_dos_Municipios_Cearenses_2002_2015.pdf. Acesso em: 22 out 2018.

_____ (2019). *Ceará em Mapas. Caracterização Territorial – Limites e Regionalizações: Mapa dos bairros de Fortaleza*. Fortaleza, Governo do Estado do Ceará/Instituto de Pesquisa e Estratégia Econômica do Ceará. Disponível em: http://www2.ipece.ce.gov.br/atlas/capitulo1/11/140x.htm. Acesso em: 7 out 2019.

IPLANFOR (2015). *Fortaleza 2040: Iniciando o diálogo por uma Fortaleza de oportunidades, mais justa, bem cuidada e acolhedora*. Fortaleza, Prefeitura Municipal de Fortaleza/Iplanfor, v. 2, n. 1, ano II.

LEFEBVRE, H. (2013). *O Direito à Cidade*. São Paulo, Centauro.

LIMA, C. F. (2006). "Cidades do Ceará: origens, transformações e perspectivas". In: CAMPOS, F. (ed.) *Anuário do Ceará 2006.* Fortaleza, Jornal O Povo, pp. 394-452.

LIMA, L. S.; LOUREIRO, C. F. G.; SOUSA, F. F. L. M.; LOPES, A. S. (2021). Espraiamento urbano e seus impactos nas desigualdades socioespaciais da acessibilidade ao trabalho em Fortaleza. *Transportes*, v. 29, n. 1. Anpet-Associação Nacional de Ensino e Pesquisa em Transportes.

LIMA FILHO, I. P.; REBOUÇAS, G. F. (2019). “Mobilidade urbana e ciclismo: o uso do sistema de bicicletas compartilhadas em Fortaleza”. In: BARREIRA, I. A. F.; GONÇALVES, D. N. (orgs.). *A cidade sob o chão do espaço público.* Fortaleza, Expressão Gráfica.

LIMA FILHO, I. P. (2013). “Mobilidade urbana, trânsito e infraestrutura: pensando sociologicamente as intervenções de uma subsede da Copa do Mundo”. XVI CONGRESSO BRASILEIRO DE SOCIOLOGIA. GT 02: Cidades. Salvador, Brasil.

_____ (2019). “A mobilidade urbana e suas políticas: a crise do trânsito em Fortaleza e o BRT”. In: LOPES, G. L.; BARBOSA, W. F. (orgs.). *Cidades em ação: perspectivas interdisciplinas sobre o espaço urbano e seus usos.* Imperatriz-MA. Ed. IFMA.

MARICATO, E. (2015). *Para entender a crise urbana.* São Paulo, Expressão Popular.

MOBILIZE BRASIL (2019). Calçadas do Brasil: Relatório Final, Campanha 2019. S.l.

NTU (2017). *Anuário da Associação Nacional de Empresas do Transporte Urbano: 2016-2017*. Brasília, Associação Nacional das Empresas de Transportes Urbanos/NTU.

PAITT (2014). Binário Santos Dumont/Dom Luís – Resumo da análise, 17 de março. Documento em PDF. Fortaleza, PMF/ Plano de Ações Imediatas de Transporte e Trânsito.

PEQUENO, R. (2015). “Condições de moradia e desigualdades socioespaciais: o caso de Fortaleza”. In: COSTA, M. C. L.; PEQUENO, R. (orgs.). *Fortaleza: transformações na ordem urbana*. Rio de Janeiro, Letra Capital/ Observatório das Metrópoles. Coleção Metrópoles: Território, Coesão Social e Governança Democrática, Série Estudos Comparados.

SANTIAGO, Z. M. P.; SANTIAGO, C. Q.; SOARES, T. S. (2016). Acessibilidade no espaço público: o caso das praças de Fortaleza. *Ergodesign & HCI.* Rio de Janeiro, v. 2, n. 2, ano 4, pp. 32-39.

SILVA, J. B. da; GONÇALVES, T. E. (2012). Urbanização e produção da cidade: Shopping Centers na dinâmica de novas centralidades em Fortaleza-CE. *Geosul.* Florianópolis, v. 27, n. 53, pp. 63-88.

SIMMEL, G. (1967). “A metrópole e a vida mental”. In: VELHO, O. G. (org.). *O fenômeno urbano*. Rio de Janeiro, Zahar.

SPECK, J. (2017). *Cidade caminhável*. São Paulo, Perspectiva.

UN (2018). World urbanization prospects: the 2018 revision. Key Facts. Nova York, United Nations.

VILLAÇA, F. (2009). *Espaço intra-urbano no Brasil.* São Paulo, Studio Nobel/Fapesp/Lincoln Institute.

Notícias

CORREDOR expresso na Av. Bezerra de Menezes recebe as linhas 071 - Antônio Bezerra/Mucuripe e 079 - Antônio Bezerra/Náutico. Prefeitura Municipal de Fortaleza: Notícias, 6/9/2018. Disponível em: https://www.fortaleza.ce.gov.br/noticias/tag/BRT#:~:text=A%20Divis%C3%A3o%20de%20Monitoramento%20da,do%20corredor%20exclusivo%20de%20%C3%B4nibus. Acesso em: 2 fev 2022.

CRESCIMENTO da frota de veículos impacta mobilidade. Diário do Nordeste, Caderno Cidade, 5/9/2018. Disponível em: http://diariodonordeste.verdesmares.com.br/cadernos/cidade/crescimento-da-frota-de-veiculos-impacta-mobilidade-1.1995255. Acesso em: 5 set 2018.

EM MEIO à pandemia, empresas de transporte coletivo de Fortaleza vendem parte da frota de ônibus, Diário do Nordeste, Caderno Metro, 27/2/2021. Disponível em: https://diariodonordeste.verdesmares.com.br/metro/em-meio-a-pandemia-empresas-de-transporte-coletivo-de-fortaleza-vendem-parte-da-frota-de-onibus-1.3053386. Acesso em: 17 mar 2021.

ENTENDA a nova territorialização administrativa de Fortaleza. Prefeitura Municipal de Fortaleza, Notícias – Gestão, 7/1/2021. Disponível em: https://www.fortaleza.ce.gov.br/noticias/entenda-a-nova-territorializacao-administrativa-de-fortaleza. Acesso em: 8 dez 2021.

FROTA de veículos já é maior do que toda a malha viária de Fortaleza. Diário do Nordeste, Caderno Metro, 19/1/2014. Disponível em: https://diariodonordeste.verdesmares.com.br/editorias/metro/frota-de-veiculos-ja-e-maior-que-toda-a-malha-viaria-de-fortaleza-1.795887. Acesso em: 7 mar 2020.

LINHA Sul do metrô de Fortaleza só transporta 9,7% do total projetado de passageiros, G1-Globo. Ceará, 5/8/2019. Disponível em: https://g1.globo.com/ce/ceara/noticia/2019/08/05/linha-sul-do-metro-de-fortaleza-so-transporta-97percent-do-total-projetado-de-passageiros.ghtml. Acesso em: 8 mar 2022.

MESMO com melhorias, transporte coletivo perde passageiros, Diário do Nordeste, Caderno Metro, 2/9/2017. Disponível em: https://diariodonordeste.verdesmares.com.br/metro/mesmo-com-melhorias-transporte-coletivo-perde-passageiros-1.1814406. Acesso em: 2 abr 2019.

NÚMERO de passageiros de ônibus em Fortaleza chega a 66% da demanda pré-pandemia, O Povo, Notícia, 3/11/2021. Disponível em: https://www.opovo.com.br/noticias/fortaleza/2021/11/03/numero-de-passageiros-de-onibus-em-fortaleza-chega-a-66-da-demanda-pre-pandemia.html. Acesso em: 8 mar 2022.

TRANSPORTE por meio de metrô e VLTs cresce 26% em 2019. Governo do Estado do Ceará: Secretaria de Infraestrutura, Metrofor, 14/1/2020. Disponível em: https://www.metrofor.ce.gov.br/2020/01/14/transporte-por-meio-de-metro-e-vlts-cresce-26-em-2019/. Acesso em: 8 mar 2022.

TRANSPORTE público em Fortaleza deve mudar após estudo. Diário do Nordeste, Caderno Metro, 22/12/2019. Disponível em: https://diariodonordeste.verdesmares.com.br/editorias/metro/transporte-publico-em-fortaleza-deve-mudar-apos-estudo-1.2190721, acesso em 22 dez. 2019.

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