10 Transport legacy of mega-events and inequalities in access to opportunities in Rio de Janeiro

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Abstract

For the past two decades, Rio de Janeiro has justified bidding to host sports mega-events based on the promises of creating a lasting infrastructure legacy for local communities and overcome its persistent transportation and social problems. This chapter investigates the social and distributional impacts of the transport legacy of the 2014 Football World Cup and the 2016 Olympic Games in Rio de Janeiro. It examines who benefited from Rio's transport legacy, looking at how recent transport policies implemented in the city have impacted accessibility to jobs, schools and healthcare facilities by public transport for people of different income levels. The results show that the potential accessibility gains from the transport legacy in Rio were generally offset by a reduction in bus service levels and that, contrary to the official discourse, this legacy has exacerbated rather than reduced socio-spatial inequalities in access to opportunities.

There has been a long debate about whether sports mega-events, such as the FIFA World Cup and the Olympic Games, can boost the local economies of host cities and foster urban development (Chalkley & Essex, 1999; Gratton et al., 2005; Hiller, 2000). Nevertheless, local and national governments often justify bidding to host such events based on the promises of creating a lasting infrastructure legacy for local communities (Paddison, 1993; Rubalcaba-Bermejo & Cuadrado-Roura, 1995; Zhang & Zhao, 2009). This strategy of using mega-events to fast-track urban development is commonly backed by pro-growth discourses (Burbank et al., 2002) and relies on the assumption that all local residents benefit from the trickle-down effects of economic growth and improvements to urban infrastructure (Baade, 1996; Baade & Matheson, 2004; Jones, 2001; Kasimati, 2003; Müller, 2015).

A similar story can be told about Rio de Janeiro. Rio's history of bidding to host mega-events is characterized by heavy emphasis on using such events as opportunities to accelerate urban development and overcome persistent urban problems (Gaffney, 2010; Silvestre, 2012). The adoption of this mega-event strategy in Rio dates at least to the mid-1990s, with the elaboration of the city's strategic

plan in 1996 and the 1997 bid to host the 2004 Olympic games (Rio de Janeiro, 1996; Santos, 2013). Since then, Rio won the bids to host the 2007 Pan American Games, the 2014 FIFA football World Cup and the 2016 Summer Olympic Games. These events mobilized an investment of approximately U$5.7 billion in the city's public transport system between 2010 and 2016. Spreading the benefits of the new transport infrastructure to Rio's local population – not just those visiting the sports events – was an integral and crucial part of the legitimization process of these investments ~~these investments~~ (Kassens-Noor et al., 2016). According to Rio's candidature files to host the World Cup and the Olympics, this expansion in public transport infrastructure was one of the main legacies of recent sports mega-events as it would help the city overcome its socially fragmented urban development and improve transport conditions, particularly for poor marginalized neighborhoods (BOC, 2009; Brazil, 2009; Rio de Janeiro, 2008). If one takes these official documents with skepticism (or perhaps because of it), it is extremely important to assess the extent to which the transport legacy promised in these documents has actually improved the transport conditions of the local population and for whom.

In this chapter, I examine the social and distributional impacts of the transport legacy of the 2014 Football World Cup and the 2016 Olympic Games in Rio de Janeiro, trying to identify which socioeconomic classes benefited the most from Rio's transport legacy. This legacy involved the expansion of public transport infrastructure including the extension of a subway line, the construction of a light-rail system and two new bus rapid transit (BRT) corridors. These policies also included a reorganization of bus lines to accommodate the new infrastructure and streamline the transport network. Shortly after the 2016 Olympics, however, these transport investments were followed by an economic crisis that led to a drop in passenger demand and cutbacks in service levels in the city. This study analyzes how these policies recently implemented in Rio between 2014 and 2017 have changed the number of healthcare facilities, schools and jobs accessible by public transport to the population of different income levels. It answers the question of whether and to what extent these policies have changed socio-spatial inequalities in access to opportunities in the city.

Scholars have devoted little attention to the equity implications of the transport legacies of mega-events, overlooking the distributive aspects of who benefits from these new transport developments.[1] A good exception to this is the study of the transport legacy of the 2010 FIFA World Cup in South Africa by Pillay and Bass (2008), who argued that improvements to the transport system was spatially concentrated and offered limited benefits to poor peripheral urban areas. Most of the literature on mega-events and urban transportation has focused on the short-term challenges of delivering transport services during the realization of the events in terms of traffic management and contingency plans to address peak demand and congestion (Currie & Shalaby, 2012; Hensher & Brewer, 2002; Liu et al., 2008; Mao, 2008; Minis & Tsamboulas, 2008; Robbins et al., 2007; Silva & Portugal, 2016; Xu & Gonzalez, 2016). However, the experience of previous Olympic Games between 1992 and 2012 (Barcelona, Atlanta, Sydney, Athens and London) has shown that only a few of the transport measures adopted during the

events are sustained beyond the immediate years following the Games (Kassens-Noor, 2010, 2013). This research advances previous studies by conducting a careful analysis of how the transport legacy of two major sports mega-events in a city in the Global South have impacted local communities of different social classes in terms of improving their accessibility to essential activities, including health services, schools and job opportunities.

Transport legacy, accessibility and equity

In 2003, the International Olympic Committee started officially requesting that candidate cities include legacy concerns in their bid proposals. Since then, the idea of leveraging mega-events to fast-track urban development in host cities has gradually been consolidated into the mega-events agenda (Gold & Gold, 2008; Leopkey & Parent, 2012; Tomlinson, 2014). The word legacy, however, often lacks conceptual consistency in bidding documents and across the academic literature (Andranovich & Burbank, 2011; Cornelissen et al., 2011; Preuss, 2007). The notion of a transport legacy, in particular, can relate, for example, to the role that mega-events can play in driving changes in management practices, regulation or institutional policies, including the adoption of intelligent transport systems (ITS), the reorganization of transit routes and so on. Transport legacies can also be created, for example, when mega-events lead to or fast-track more tangible physical changes in the transport system, such as through the renovation of public transport fleets or the building or expansion of transport infrastructure such as roads, subway systems and airports (Kassens-Noor, 2010). Nonetheless, these changes to the transport system, either in the form of physical and infrastructural modifications or in the form of how the transport systems of host cities are governed and managed, are not ends in themselves.

Transport investments only become valuable to the extent that they improve living standards in the communities where they are implemented (Banister, 2002; Cervero, 2013). The benefits of transport legacies can come to fruition, for example, when they contribute to making urban mobility systems more environmentally sustainable, safe, inclusive and efficient, thus improving the everyday transport conditions of local residents and their environment. A major component of transport legacy relies therefore on the effectiveness of transport projects in improving urban accessibility.

Accessibility can be broadly conceptualized as the ease with which people can reach places and opportunities, or conversely, a characteristic of places and opportunities in terms of how easily they can be reached by the population (Kwan, 1998; Neutens et al., 2010). Accessibility is a central concern in transportation equity for various reasons. Transport accessibility is critical for individuals to reach out-of-home activities to satisfy basic needs. Improving accessibility is a necessary, though not sufficient, condition for the expansion of people's freedom of choice and ability to reach services and opportunities such as employment, healthcare and education (Church et al., 2000; Delmelle & Casas, 2012; Kaplan et al., 2014). Moreover, the idea of transport accessibility helps us explicitly incorporate a

geographical dimension into the moral concern over inequality of opportunities, a central concern in distributive justice (Pereira, Schwanen, et al., 2017). For these reasons, accessibility can be considered a key concept to critically evaluate the impact of transport legacy from a distributive justice perspective.

A distributive justice discussion on who benefits from the transport legacies of mega-events is important for several reasons. These events often involve substantial public investments in infrastructure projects where the local population generally has little involvement in the relevant decision-making processes. The evaluation of mega-events and transport investments are traditionally based on cost–benefit analysis (Flyvbjerg & Stewart, 2012), which has been widely criticized for not taking into account the distributive aspects of who reaps the benefits and who bears the costs of such investments (van Wee, 2012). Finally, transport legacies can substantially change the organization of urban space. It thus becomes crucial to evaluate whether the way in which governments mobilize these legacies could minimize or exacerbate socio-spatial inequalities in access to opportunities.

An important framework to evaluate the distributional effects of institutions and policies on social inequalities is provided by John Rawls (Rawls, 1999, 2001), whose work has been influential in urban planning (Basta, 2015; Fainstein, 2010; McKay et al., 2012) and transport studies (Langmyhr, 1997; Pereira, Schwanen, et al., 2017; van Wee, 2012; Viegas, 2001). In a recent paper, Pereira et al. (2017) draws on Rawls's two principles of justice to guide the fair allocation of governmental investments in transport infrastructure and services to improve people's accessibility, which can be extended to the transport legacy of mega-events. Following the first principle, transport projects can only be considered fair if their implementation respects people's basic rights and liberties, such as the physical and psychological liberty and integrity of the person. Contrary to a utilitarian argument, the violation of such rights and liberties cannot be justified on the grounds of the 'greater good' of improving accessibility levels of large numbers of people. Following the second principle, *transport policies should* prioritize improving the accessibility levels of disadvantaged groups whose transport conditions are systematically undermined by morally arbitrary factors (such as being born in a poor family or having a disability). For this framework, more important than the level of inequality observed in a society at a given point in time, is whether and how public policies contribute to reducing such inequalities and promote fairer and more inclusive cities by improving accessibility for the least well off.

The transport legacy of mega-events in Rio de Janeiro

Rio de Janeiro is the second largest city in Brazil, located in the southeast region of the country. In 2010, the municipality of Rio de Janeiro housed more than half of the population of the metropolitan area of over 12 million inhabitants, and it had an average population density similar to that of Greater London, with approximately 5.5 thousand inhabitants per km². Most of the city's population lives in the eastern half of the city, where large concentrations of population are found in the northeast and along the coast in the southeast of the city.

Rio is one of the richest cities in the Global South, yet it also stands out as one of the most unequal cities in the world in terms of income distribution, with a Gini coefficient of 0.62 (PNUD et al., 2013). Compared with other major cities included in the UN-HABITAT report (2010), the level of income inequality in Rio de Janeiro is close to that observed in Cape Town, Bogotá and Lagos (Gini between 0.61 and 0.67) and higher than in cities such as Santiago, Mexico City, Nairobi and Hong Kong (Gini between 0.53 and 0.55). These inequalities are largely reflected nowadays in the spatial distribution of income groups in the city. A characteristic that distinguishes the spatial pattern of urban segregation in Rio from other cities is the presence of shantytowns (*favelas*), which occupy cheaper land in hilly areas across the city, not only in the periphery. Because of topographical conditions and vulnerability to hazards such as mud slides, these hilly areas were not attractive to the formal housing market and were historically occupied by low-income populations. Some of the poor people living in the central favelas are in a relatively advantageous position from an accessibility standpoint because they face relatively shorter physical distances to some of the core areas of employment (Ribeiro, 2017; Ribeiro et al., 2010).

A territorial expression of this income inequality in Rio de Janeiro is its socially fragmented urban space (Préteceille & Cardoso, 2008; Ribeiro et al., 2010) and the uneven provision of transport infrastructure (Câmara & Banister, 1993). Like in many other cities in the Global South, transport conditions in Rio are extremely poor. In the past two decades, Rio has witnessed increasing congestion levels coupled with a substantial increase in car traffic, giving it one of the highest average commute times among global cities (Pereira & Schwanen, 2013). The city's public transport system stands out as one of the most expensive in the world (UN HABITAT, 2013), and its governance structure has been widely criticized for being fragmented and lacking transparency (Costa et al., 2015; Matela, 2017). Urban mobility conditions in Rio are particularly poor in peripheral areas towards the northwest of the city, where the public transport network has limited connectivity (Rodrigues, 2013) and where low-income communities present significantly lower levels of participation in out-of-home activities (Motte-Baumvol & Nassi, 2012). A peculiar characteristic of Rio's transport landscape is the way the city's marked topography has strongly shaped where urban infrastructure, including large-capacity transport corridors, can and cannot be built.

In recent years, however, the city of Rio has undergone major urban transformations in the run-up to host mega-events, including the FIFA World Cup in 2014 and the Olympic Games in 2016. These events fast-tracked considerable investments in the city's public transport system (Gaffney, 2010; Rodrigues & Legroux, 2015). Between 2012 and 2017, approximately U$5.7 billion was invested to build a new light rail system in the city center, a subway extension and four new BRT corridors, one of which is still in the construction phase. To some extent, most of these projects are aligned with the long-term urban planning of Rio, since they are generally located in regions of the city that had already been identified as structural transport corridors in previous city plans since 1965, although with different choices of transport modes and routes (Pereira, 2018b). According to recent

official documents, the aim of those investments was to create a high-capacity transport ring connecting key areas in the city where most of the sports competitions would take place and, above all, to benefit "low-income workers, who live in the most distant neighborhoods and spend more time in traffic" (Brazil, 2009, p. 54).

Shortly after the Olympics, though, the city was hit by a severe economic crisis followed by rising unemployment rates and a drop in the number of passengers in the public transport system (França, 2016; Rodrigues, 2017). This led the government to adopt austerity measures, including substantial cuts in the budget of the Transportation Secretariat (Magalhães & Rodrigues, 2017), and some bus companies went bankrupt (Borges, 2016; Zarur, 2017; Zuazo et al., 2017), affecting transport service levels in various parts of the city. The austerity measures adopted in Rio's public transport systems resonate well with the experience of many local authorities around the globe but particularly in developing countries, which often need to invest and manage their transport systems under severe budgetary constraints. These measures raise often serious uncertainties about how the transport conditions of the population is affected in different parts of the city.

Since their opening, those new transport projects have been the focus of criticism for being over budget and under investigation for possible corruption schemes (Cuadros, 2016; Fonseca, 2017; Sandy, 2016). Different authors have claimed that those Olympic projects involved little social participation and transparency (Sánchez & Broudehoux, 2013). Others point to the fact that those investments are limited to the boundaries of the city of Rio and do not tackle the wider transport needs of the metropolitan area as a whole (Kassens-Noor et al., 2016; Rodrigues & Legroux, 2015). A series of studies have also found that many BRT stations present barriers to people with physical disabilities, buses are frequently overcrowded and that BRT corridors are generally poorly integrated with other transport modes (Hughes & Leshner, 2013; ITDP Brasil, 2013, 2014, 2015).

Finally, the negative effects of evictions and displacements that the recent transport policies implemented in Rio had on the local community should not go unnoticed. While the displacement of low-income communities to create space for new transport investments is not an exception of projects to host mega-events such as in Rio (Kassens-Noor & Kayal, 2016; Melo, 2017; Stewart & Rayner, 2016), the magnitude of the investments related to these events can lead to much larger number of families affected (Davis, 2011; Porter et al., 2009; Silvestre & de Oliveira, 2012). According to official figures in Rio, 2,125 families were evicted from their homes between 2009 and 2015 to create space for the transport infrastructure projects related to mega-events (Rio de Janeiro, 2015). Grassroots organizations and the press have denounced that such evictions often involved the violation of human rights in local communities with coercive and violent practices (CPCORJ, 2015; Gaffney, 2015a; Kommenda, 2016). The locations of the evictions enforced between 2009 and 2012 were largely concentrated along the routes of the transport investments. From a social justice standpoint (Rawls, 1999), the violation of individuals' basic rights and liberties cannot be justified even if the transport investments bring large benefits to a greater number of people.

In summary, Rio's public transport network has undergone both significant network expansion and service contraction in a relatively short period of time, giving a unique opportunity to assess the impacts that the transport legacy of recent mega-events have had on people's access to various types of activities. The choice of focusing on inequalities in access to opportunities by income is motivated because of the extremely high levels of income inequality observed in Rio Janeiro and because low-income people are typically dependent on public transport services. Given the urban characteristics of Rio de Janeiro and these recent transformations in its transportation system, Rio is a timely case study to investigate the distributive effects of transportation policies and from which to draw lessons for other cities, particularly in the Global South.

Methodology

The research methods and data used in this research as well as its advantages and limitations are discussed in more detail by Pereira (2018a). For now, this section provides a brief overview of the methods used in the accessibility analyses that make up the core element of this chapter. It may be skipped for those not interested in technicalities.

Data sources

The latest Brazilian population census (2010) has been used to extract information on the spatial distribution of Rio's resident population by income levels *at fine spatial scale* (IBGE, 2016; Ipea et al., 2015). Land use information, including geolocated data healthcare facilities, has been downloaded from Rio's open data portal (www.data.rio). The analysis included 304 healthcare facilities providing primary and ambulatory care and hospital services free of charge through the public health system (SUS). Healthcare facilities are categorized in SUS according to the level of complexity of the services they provide according to the costs and technological complexity involved (Brazil, 2007). Low-complexity services include, for example, basic dental treatment and general practice, while services such as diagnostic radiology and small surgeries are considered of medium complexity. High-complexity services include hemodialysis, intensive care and cancer treatment, among others. According to the data, some facilities provide health services at more than one level of complexity, in which case the facility was included in the accessibility analysis at both levels.

Data on the spatial distribution of public high schools come from the School Census conducted by the Brazilian Ministry of Education. Meanwhile, data on jobs come from RAIS, a national register organized by the Ministry of Labor and Employment with information on all public and private establishments and the socioeconomic characteristics of their employees working in the formal labor market. Due to data constraints, this study does not consider informal jobs, which represented approximately 36% of all jobs in January 2016. Nonetheless, the 2003 household travel survey of Rio shows that the numbers of formal and informal

jobs in each traffic zone are correlated at 0.78 (Pearson correlation, statistically significant at 0.001), suggesting that the spatial distribution of formal and informal jobs in the city is not radically different, which should not radically affect the conclusions of this study.

Data on Rio de Janeiro's road networks and pedestrian infrastructure come from OpenStreetMap. Finally, data on Rio's public transport system have been provided by Fetranspor (Federation of Passenger Transport Companies in Rio de Janeiro) for the months of April 2014 and March 2017. These data included detailed geolocated information of routes, stops and timetables of the public transport system organized in General Transit Feed Specification (GTFS) format. The available GTFS data are limited to the city of Rio de Janeiro and it does not cover the entire metropolitan area. Moreover, the data provided by Fetranspor only go back as far as April 2014 and do not cover the previous years, which limits the time horizon of the before-and-after analyses presented here. Accessibility analyses based on static GTFS are based on the level of public transport services officially scheduled by transport authorities. Consequently, accessibility analyses based on this type of dataset do not consider the variability of travel-time estimates due to unplanned factors such as traffic accidents or non-recurrent congestion levels. Recurrent congestion, nonetheless, is normally taken into account by transport authorities in the planning of timetables, so this should not be a critical problem.

Accessibility analysis

Two different accessibility analyses were conducted for this research. The first analysis looks at transport accessibility from the perspective of activity places (Dijst et al., 2002) and estimates how the transport policies implemented in Rio between 2014 and 2017 changed the number of people from different income levels that could access healthcare facilities via public transport under 30 minutes. In the second analysis, accessibility is examined from the household perspective (Dijst et al., 2002). This analysis estimates how recent transport policies in the city have impacted people from different income groups in terms of the number of schools and job opportunities they could reach from their homes via public transport under 60 minutes in 2014 and in 2017. Each analysis examines the policies from a different angle, assessing how they changed social and spatial inequalities in people's access to healthcare facilities, schools and job opportunities. In both cases, accessibility estimates are calculated using a before-and-after comparison of Rio's transport network (2014–2017) and a quasi-counterfactual scenario to isolate the effects of newly added infrastructure from the reorganization and cuts of transport services. Together, the analyses presented here complement each other, building a robust evaluation of the transport legacy of mega-events in Rio. The next four paragraphs detailed technical aspects of the methodology developed here.

As a first step for the accessibility analyses, the municipality of Rio was divided using hexagonal grid of 500 meters. Next, travel-time estimates between every pair of grid cells by public transport and walking were calculated using

OpenTripPlanner (OTP), an open-source routing engine. Several travel-time matrices were estimated departing every 20 minutes between 7 am and 7 pm to account for fluctuations in service availability at various times of the day. It yields travel-time estimates at point level of door-to-door trips that consider walking time from the point of departure to a public transport stop, waiting time for the vehicle, actual travel time through the transport network including any transfers, and the walking time from the transport stop to the destination. It also takes into account trip departure times and how the temporal variations in the availability of public transport services influence travel-times estimates.

The second step was to combine the travel-time matrices with the geolocated data on population, healthcare facilities, schools and jobs to calculate accessibility levels. In both analyses, accessibility was measured using place-based cumulative-opportunity measures. This allowed us to calculate for every grid cell of Rio (1) the number of people from different income levels that could access healthcare facilities via public transport and (2) the number of schools and job opportunities that people from different income levels could reach from their homes via public transport.

This type of cumulative-opportunity measure takes into account the complex spatial and temporal connectivity of a multimodal transport network and its interaction with land use patterns. However, these metrics do not capture the influence of affordability issues or personal characteristics such as age, gender or physical disability on accessibility estimates (Geurs & van Wee, 2004; van Wee & Geurs, 2011) and may generally underestimate inequality levels (Kwan, 1998; Neutens et al., 2010). Nonetheless, this is the most common metric used by researchers and transport agencies when assessing the accessibility impacts of transport policies (Boisjoly & El-Geneidy, 2017; Manaugh et al., 2015). A few of the advantages of this metric are that it is relatively easy to communicate to policymakers and stakeholders and that it is computationally less expensive and can be more easily integrated into policymaking processes than other measures such as gravitational or space-time accessibility metrics.

In the final step of the analyses, a before-and-after comparison of Rio's transport system was conducted in which the spatial distribution of the population and its income distribution, as well as the location of schools and jobs were kept constant. This assumption allowed us to isolate the effect of the new transport investments on the variations in accessibility levels between 2014 and 2017. The assumption disregards land-use changes in that may have occurred over the period, but such changes tend to occur over timescales considerably exceeding those of the current analysis (Lago, 2000; Ribeiro, 2014); changes during the 2010–2017 period are thus unlikely to have significantly affected the overall results of the current analysis. Finally, accessibility changes were also estimated under a quasi-counterfactual scenario to isolate what would have been the sole effect of the new transport investments. This scenario simulates as if all public transport services provided in April 2014 would have been kept constant, without any reorganization of regular bus lines or reduction in service levels. In this scenario, the only changes to Rio's public transport system would have been the addition of the

new infrastructure, that is, the BRTs Transcarioca and TransOlímpica and the new subway and light-rail lines.

Results

Access to healthcare facilities

Figure 10.1 shows for the year how long it would take (in minutes) to travel by public transport and walking from reach each grid cell to the closest healthcare facility providing services of low, medium and high complexity. In 2017, approximately 94% of Rio's population could reach at least one facility providing low-complexity services under 30 minutes. Under the same time, facilities providing medium- and high-complexity services could be reached by 81% and 72% of the population, respectively. The figure gives a good sense of how the distribution of healthcare facilities vis-à-vis the public transport network varies across space and how access to public health services tend to be much lower in the west and particularly in the urban fringes of the city.

Looking specifically at how recent transport policies have changed the population's access to health services, Figure 10.2 shows how the size and the income composition of the population within a 30-minute catchment area of healthcare facilities has changed between 2014 and 2017 and how it would have changed in the quasi-counterfactual scenario. Overall, close to 96% of Rio's population could reach at least one of the 224 health clinics providing low complexity services under 30 minutes in 2014. This number slightly declined to 94.5% in 2017. The proportion of the city population that could reach at least one medium-complexity facility dropped from 85% to 81% between 2014 and 2017, while access to high-complexity facilities decreased from 79% to 73% in the period.

The first thing to note here is that accessibility to health services is relatively high in Rio.[2] This is explained to some extent by the spatial planning of healthcare in the region (Rio de Janeiro, 2014). Healthcare planning in Rio has been relatively successful in redistributing low- and medium-complexity healthcare facilities across the city. Because those facilities are fairly distributed across the city, even significant modifications in the transport systems as the ones observed in Rio would lead to relatively small changes to the catchment areas of those facilities. The quasi-counterfactual scenario, for example, suggests that even if the city had not been hit by an economic crisis, the new investments alone would have had only a marginally positive effect, increasing by a few thousands the number of people who could reach healthcare facilities.

Furthermore, the reduction in access to healthcare facilities observed between 2014 and 2017 is a result of the combination of the transport policies implemented in Rio during this period. The reorganization of bus routes and the reduction in service frequency in some parts of the system have given rise to many complaints from users (Magalhães & Rodrigues, 2017; O Globo, 2016; Rodrigues, 2016). Lowering service frequency not only reduces people's choice of departure time but also increases average waiting time at bus stops at the expense of travel

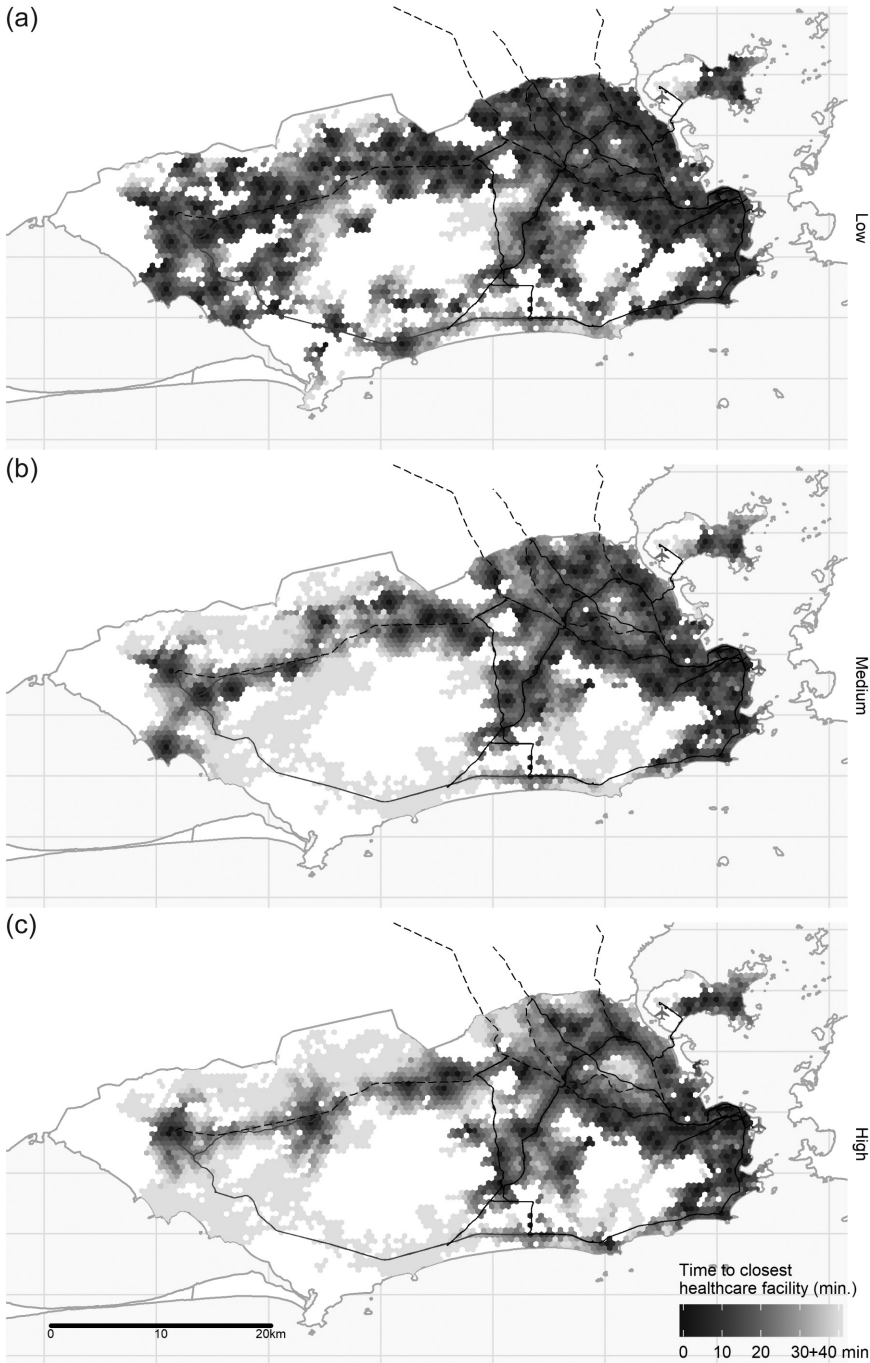

Figure 10.1 Travel Time by Public Transport and Walking to the Closest Healthcare Facility Providing Services of Different Complexity Levels, Rio de Janeiro, 2017

Source: Elaborated by the author

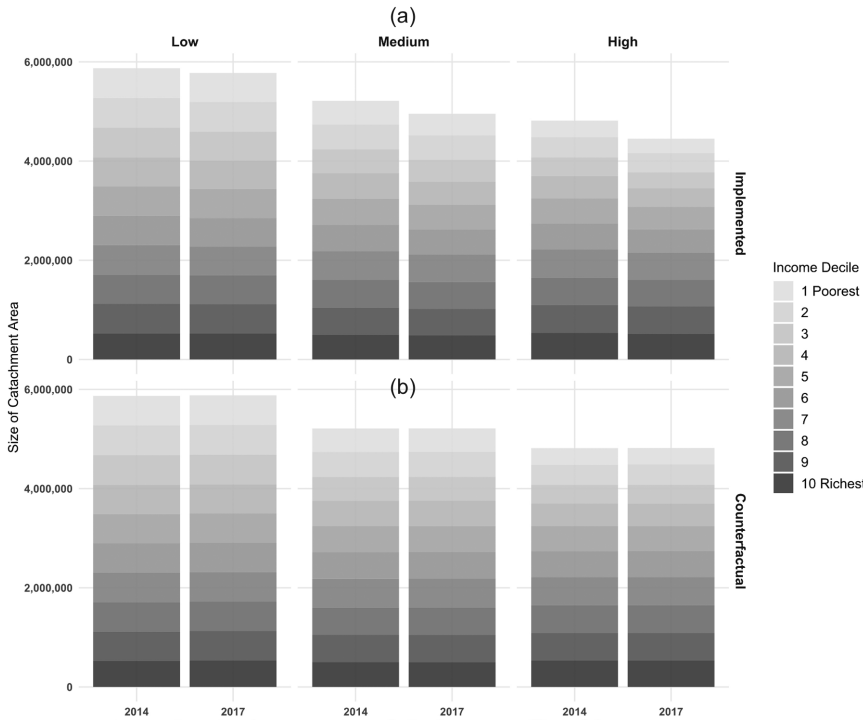

Figure 10.2 Population Size and Income Composition within a 30-Minute Catchment Area of Healthcare Facilities by Service Complexity, Rio de Janeiro, 2014–2017

Source: Elaborated by the author

time inside the vehicle, thus reducing the distances covered and the area that is accessible.

Finally, the reduction in service levels have not affected all income classes in the same way (Figure 10.3). Recent changes in Rio's transport system have made medium- and high-complexity healthcare facilities more accessible to higher-income groups while at the same time reducing accessibility to the poor. This is to some extent because most of these facilities are located in relatively wealthier regions of the city.

Access to jobs and schools

Figure 10.4 shows the number of jobs and schools accessible from each grid cell via public transport and walking less than 60 minutes in 2017. For both types of opportunities, accessibility levels vary substantially across space and are greater along the train and subway lines and part of the new Transcarioca

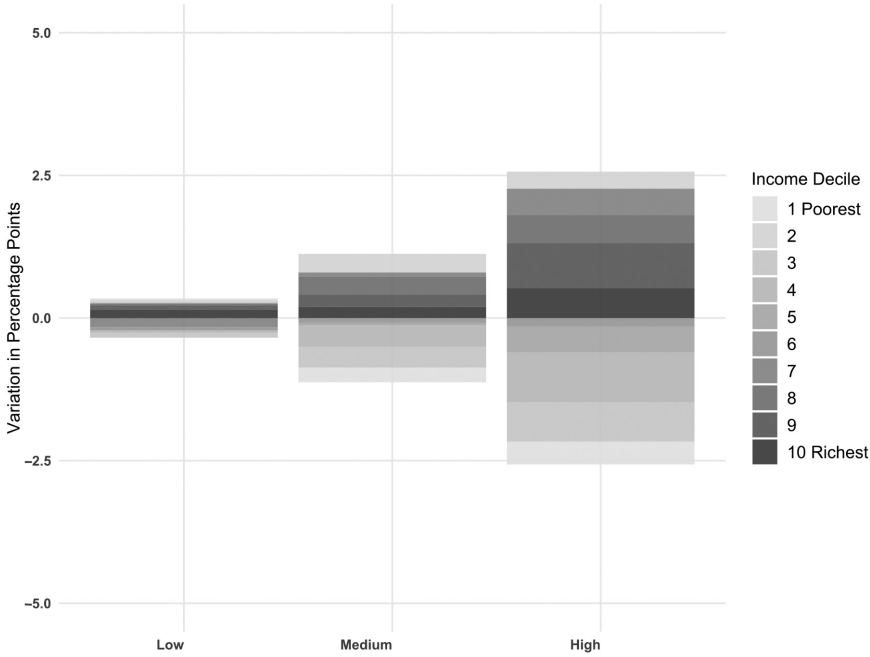

Figure 10.3 Variation in the Population Size (by Income) within a 30-Minute Catchment area of Healthcare Facilities (by Service Complexity), Rio de Janeiro, 2014–2017

Source: Elaborated by the author

BRT line. These accessibility estimates are also largely shaped by the unequal distribution of land use activities. The historical development of Rio, with high concentration of employment close to the city center, helps explain, for example, why residents in the west region of the city have such low levels of access to opportunities. On the other hand, this issue has been relatively minimized by the spatial planning of public schools, which has been relatively successful in allocating public high schools more evenly across the city compared with the distribution of jobs.

The overall results suggest that average access to jobs and schools by public transport dropped approximately −4.5% and −6.1% between 2014 and 2017, respectively, in the city of Rio. In the quasi-counterfactual scenario, the analysis shows that new infrastructure investments alone could have increased average access to jobs and schools by approximately 13.4% and 11.7%, respectively. These findings suggest that the reorganization of bus lines and cuts in service levels had an important effect offsetting the positive impacts of the new transport infrastructure in the short term.

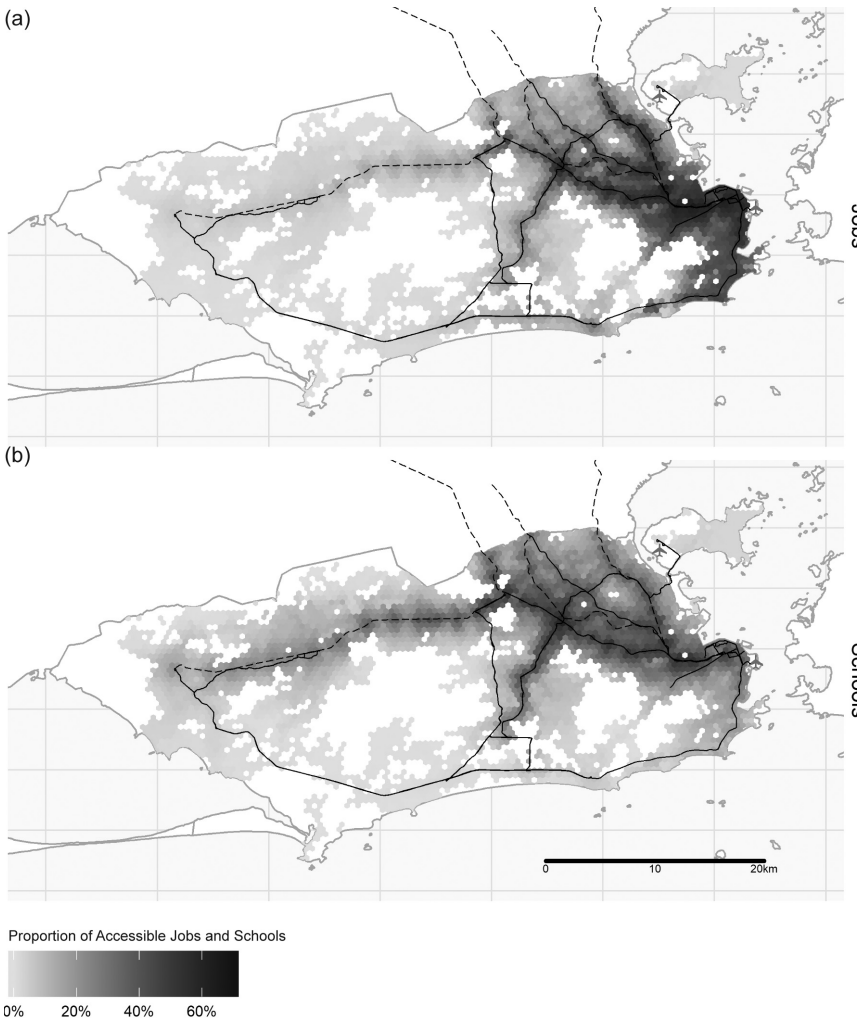

Figure 10.4 Median Proportion of Formal Jobs and Schools Accessible within 1 Hour by Public Transport and Walking Between 7 am and 7 pm, Rio de Janeiro, 2017

Source: Elaborated by the author

These are average numbers that can hide heterogeneity in the distribution of accessibility impacts. Figure 10.5 below uses box-plots to show the differential impact that recent policies had or could have had on the accessibility levels of different income groups. The infrastructure investments coupled with policies implemented between 2014 and 2017 have generally undermined people's access to schools and job opportunities, but this negative effect was larger for lower-income groups. Even if the city had not been hit by an economic crisis, the results of the quasi-counterfactual

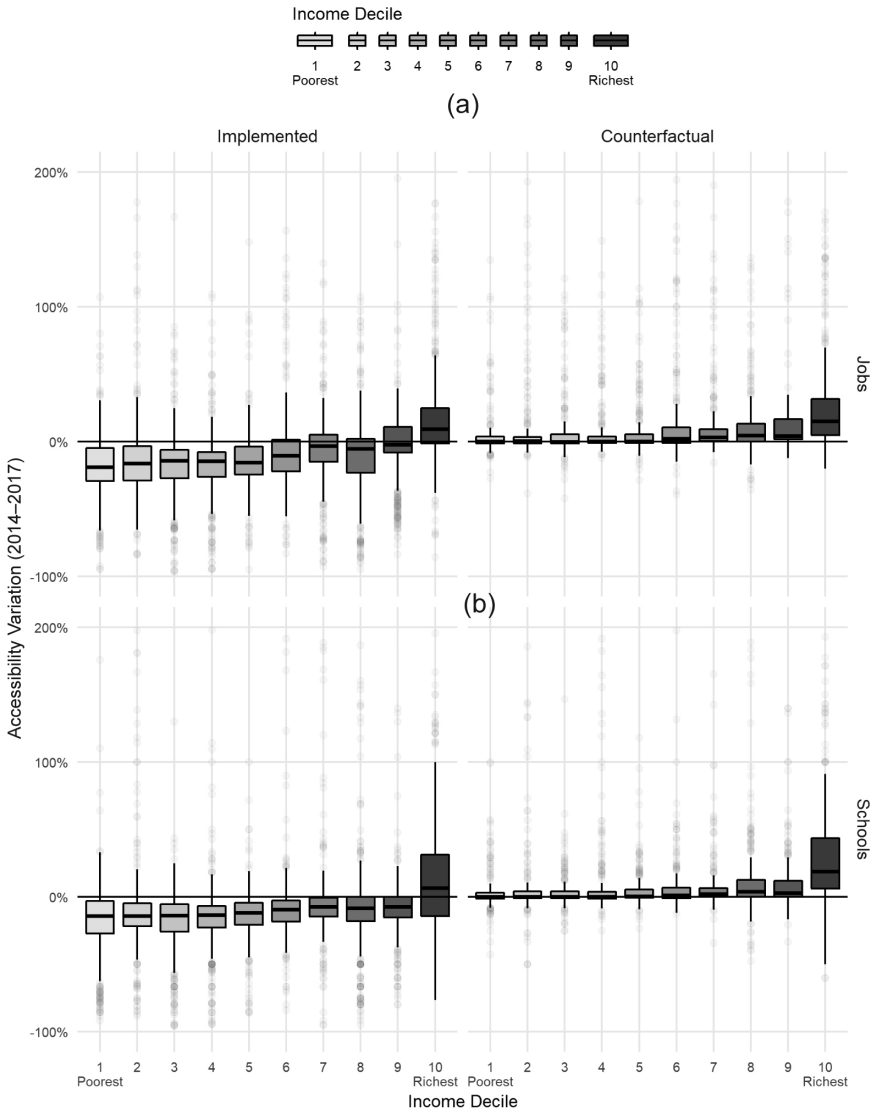

Figure 10.5 Distribution of Changes in Accessibility to Jobs and Schools via Public Transport and Walking by Income Groups Between 2014 and 2017 Under Implemented and Quasi-counterfactual Scenarios, Rio de Janeiro

Source: Elaborated by the author

scenario show that accessibility gains would have accrued mostly to the rich. In summary, accessibility impacts varied greatly within and between income levels, but they indicate that overall accessibility benefits were larger for higher-income groups and increased inequalities in access to opportunities.[3]

Conclusion

Despite a common 'urban boosterism' discourse around mega-events, these events have generally brought questionable benefits to socially disadvantaged groups of host cities (Hiller, 2006; Minnaert, 2012; Müller, 2015; Smith, 2009). Concerns over distributive justice focusing on who benefits from mega-event legacies have generally received little attention in assessments of the impacts of mega-events (Short, 2008; Whitson & Horne, 2006). However, it is important to acknowledge that the benefits and costs arising from mega-events legacies are rarely equally distributed among members of society and, moreover, that the same legacy might have positive effects for some groups and negative effects for others (Chappelet, 2012).

In this study, I have analyzed the distributional effects of the transport legacy of recent mega-events in Rio, namely, the 2014 FIFA football World Cup and the 2016 Summer Olympics. The study looked specifically at how recent transport policies implemented in the city have affected accessibility to health facilities and to schools and jobs of the population from different income levels. Both analyzes included a before-and-after comparison of Rio's transport network (2014–2017), considering the accessibility effects of the expansion of transport infrastructure as well as the reduction in bus service levels that followed the economic crisis that hit the city after the Olympics. Additionally, this chapter included quasi-counterfactual analyses that allowed to empirically separate the effects of newly added infrastructure from the reorganization and cuts in transport services caused by the recent economic meltdown.

The findings of this research suggest that, had the city not been hit by the economic crisis, the transport investments implemented in Rio between 2014 and 2017 would have only marginally improved people's access to healthcare facilities. Nonetheless, the expansion of transportation infrastructure alone would have significantly increased the number of jobs and schools accessible to the population. Nonetheless, the subsequent rationalization of bus routes and reduction in service levels aggravated by the economic crisis have generally offset the short-term accessibility benefits from Rio's transport legacy in a way that particularly penalizes the poor. As a result, most high-complexity healthcare facilities have become less accessible via public transport and average access to jobs and schools dropped by approximately 4.5% and 6.1% between 2014 and 2017.

Moreover, the accessibility benefits from the recent cycle of investments and disinvestments in Rio generally accrued to middle- and higher-income groups. While in 2014, the level of access to jobs was 84% larger for the richest 20% than for the poorest 20%, this difference rose to 116% in 2017. Even if the city had not been hit by the economic crisis, recent transport investments related to mega-events would have led to higher accessibility gains for wealthier groups and reinforced rather than reduced socio-spatial inequalities in access to opportunities. In any scenario, these results contradict the official discourse of Rio's transport legacy and point to a distribution of accessibility benefits that can be considered inequitable from a distributive justice point of view.

While it is unrealistic to expect that transport policies equally benefit every neighborhood in a city, from a social justice point of view, the least one would expect is that these policies would improve the transport conditions of people in the worst-off position and not reinforce inequality (Pereira et al., 2017). Nonetheless, the findings of this study suggest that the transport legacy of recent mega-events in Rio have had inequitable outcomes. If anything, the transport policies implemented in Rio de Janeiro between 2014 and 2017 have violated basic rights with the forced eviction of families and further exacerbated socio-spatial inequalities in access to opportunities. This is consistent with other urban planning regimes in Rio that, since its strategic plan in the late 1990s, have generally privileged urban development policies in wealthier areas of the city at the expense of poorer communities (Gaffney, 2015b; Ribeiro et al., 2010; Santos, 2013).

Together, these findings provide important insights about the implications of the legacy of mega-events and transport inequalities. On the one hand, it is fair to say that the mega-events agenda of Rio de Janeiro helped the city leverage substantial investments to expand its urban and transportation infrastructure. On the other hand, the apparent alignment of this relative abundance of resources with the long-term developmental goals of Rio has clearly been an insufficient condition to create a positive legacy for poorer communities. The fact that those transport investments remained limited within the administrative boundaries of the municipality of Rio de Janeiro indicates how the transport planning in the region in recent years has been influenced by the short-term needs of the events. It points to how the state of Rio de Janeiro missed the opportunity to use the political momentum around recent mega-events to deliver transport investments that could better integrate the large poor communities living in the peripheral municipalities and overcome the fragmentation of metropolitan planning.

The findings of this study also draw attention to how the subsequent reorganization and cuts in transport services intensified inequalities in access to opportunities in Rio. The reduced investments in Rio de Janeiro's public transport network after the 2016 Olympics have offset the short-term accessibility benefits from recent infrastructure expansion, with particularly detrimental effects on the accessibility levels of poor neighborhoods. These changes in service levels were in part a result of a market-driven reorganization of bus lines or companies in response to a reduction in passenger demand due to the rise of unemployment in the city, but they were also partially planned by the local government to accommodate the newly added infrastructure and streamline the transport system. While the construction of new transport infrastructure attracts extensive media attention and is discursively constituted as the legacy of mega-events, much less attention has been paid to what happened to the level of transport services across the city after the events had ended. The study of Rio illustrates for transport agencies that the reorganization of bus lines in terms of routes, frequency and so on can in some cases be as effective in reshaping accessibility levels as the expansion of physical infrastructure. To deliver a positive legacy, future policies need to look beyond the spatial allocation of new infrastructure and its connection to land use and the rest of the transport network. Careful attention also needs to be paid to whether the

service levels are sustained and how the subsequent reorganization of feeder lines impacts people's access to opportunities. These factors should not be neglected in discussions around transport legacies of mega-events and around the impacts of transportation projects more broadly. As the case of Rio has shown, the positive effects of transport investments can be deeply affected by unexpected economic problems and the austerity measures that follow, with particularly negative consequences for the poor.

Notes

1 The terms 'equity' and 'distributive justice' are used interchangeably throughout this chapter.
2 It is important to mention, though, these healthcare facilities are not all interchangeable because they do not necessarily provide the same services. Future studies could advance this research by providing detailed analyses of accessibility to particular types of treatment that demand more frequent trips to the hospitals, such as hemodialysis, physical rehabilitation and so on.
3 The association between accessibility gains and income was tested using more robust statistical methods, including spatial cluster and spatial regression analyses. The results are presented in full in the original publications (Pereira, 2018a; Pereira, Banister, et al., 2017), and they corroborated the finding that the transport legacy of mega-events in Rio promoted larger accessibility benefits for wealthier groups.

References

Andranovich, G., & Burbank, M. J. (2011). Contextualizing Olympic Legacies. *Urban Geography*, *32*(6), 823–844. doi:10.2747/0272-3638.32.6.823

Baade, R. A. (1996). Professional Sports as Catalysts for Metropolitan Economic Development. *Journal of Urban Affairs*, *18*(1), 1–17. doi:10.1111/j.1467-9906.1996.tb00361.x

Baade, R. A., & Matheson, V. A. (2004). The Quest for the Cup: Assessing the Economic Impact of the World Cup. *Regional Studies*, *38*(4), 343–354. doi:10.1080/03434002000213888

Banister, D. (2002). *Transport Planning* (2nd ed.). London: Spon and Routledge.

Basta, C. (2015). From Justice in Planning toward Planning for Justice: A Capability Approach. *Planning Theory*, 1473095215571399. doi:10.1177/1473095215571399

BOC. (2009). *Rio de Janeiro's Candidature File to host the 2016 Olympic and Paralympic Games* (No. 1, 2 and 3). Brazilian Olympic Committee. Retrieved from www.rio2016.com/en/organising-committee/transparency/documents

Boisjoly, G., & El-Geneidy, A. M. (2017). How to Get There? A Critical Assessment of Accessibility Objectives and Indicators in Metropolitan Transportation Plans. *Transport Policy*, *55*, 38–50. doi:10.1016/j.tranpol.2016.12.011

Borges, B. (2016, December 5). *Auto Viação Bangu decreta falência no Rio*. Retrieved October 5, 2017, from http://noticias.band.uol.com.br/cidades/rio/noticias/100000806203/auto-viacao-bangu-decreta-falencia-apos-semana-turbulenta

Brazil. (2007). *Assistência de Média e Alta Complexidade no SUS* (No. 9). Brasília: Conselho Nacional de Secretários de Saúde. Retrieved from http://bvsms.saude.gov.br/bvs/publicacoes/colec_progestores_livro9.pdf

Brazil. (2009). *Caderno de Legados Urbano e Ambiental. Rio 2016 Cidade Candidata*. Sport Ministry. Retrieved from www.esporte.gov.br/arquivos/rio2016/cadernoLegadosUrbanoAmbiental.pdf

Burbank, M. J., Andranovich, G., & Heying, C. H. (2002). Mega-Events, Urban Development, and Public Policy. *Review of Policy Research*, *19*(3), 179–202. doi:10.1111/j.1541-1338.2002.tb00301.x

Câmara, P., & Banister, D. (1993). Spatial Inequalities in the Provision of Public Transport in Latin American Cities. *Transport Reviews*, *13*(4), 351–373. doi:10.1080/01441649308716857

Cervero, R. (2013). Linking Urban Transport and Land Use in Developing Countries. *Journal of Transport and Land Use*, *6*(1), 7–24. doi:10.5198/jtlu.v6i1.425

Chalkley, B., & Essex, S. (1999). Urban Development through Hosting International Events: A History of the Olympic Games. *Planning Perspectives*, *14*(4), 369–394. doi:10.1080/026654399364184

Chappelet, J.-L. (2012). Mega Sporting Event Legacies: A Multifaceted Concept. *Papeles de Europa*, *25*, 76.

Church, A., Frost, M., & Sullivan, K. (2000). Transport and Social Exclusion in London. *Transport Policy*, *7*(3), 195–205. doi:10.1016/S0967-070X(00)00024-X

Cornelissen, S., Bob, U., & Swart, K. (2011). Towards Redefining the Concept of Legacy in Relation to Sport Mega-Events: Insights from the 2010 FIFA World Cup. *Development Southern Africa*, *28*(3), 307–318. doi:10.1080/0376835X.2011.595990

Costa, M. A., Santos, M. A., Rahy, I. S., . . . Silva, L. F. F. T. da. (2015). *Caracterização e Quadros de Análise Comparativa da Governança Metropolitana no Brasil: análise comparativa das funções públicas de interesse comum (Componente 2) – RM do Rio de Janeiro* (Relatório de Pesquisa). Rio de Janeiro: Institute for Applied Economic Research-Ipea. Retrieved from www.ipea.gov.br/portal/index.php?option=com_content&view=article&id=26361

CPCORJ. (2015). *Rio 2016 Olympics: The Exclusion Games: Mega-Events and Human Rights Violations in Rio de Janeiro Dossier*. Rio de Janeiro: Comitê popular Copa e Olimpíadas Rio: World Cup and Olympics Popular Committee of Rio de Janeiro. Retrieved from https://comitepo pulario.files.wordpress.com/2016/03/dossiecomiterio2015_eng1.pdf

Cuadros, A. (2016, August 1). The Broken Promise of the Rio Olympics. *The Atlantic*. Retrieved from www.theatlantic.com/international/archive/2016/08/building-barra-rio-olympics-brazil/493697/

Currie, G., & Shalaby, A. (2012). Synthesis of Transport Planning Approaches for the World's Largest Events. *Transport Reviews*, *32*(1), 113–136. doi:10.1080/01441647.2011.601352

Davis, L. K. (2011). International Events and Mass Evictions: A Longer View. *International Journal of Urban and Regional Research*, *35*(3), 582–599. doi:10.1111/j.1468-2427.2010.00970.x

Delmelle, E. C., & Casas, I. (2012). Evaluating the Spatial Equity of Bus Rapid Transit-Based Accessibility Patterns in a Developing Country: The Case of Cali, Colombia. *Transport Policy*, *20*, 36–46. doi:10.1016/j.tranpol.2011.12.001

Dijst, M., Jong, T. de, & Eck, J. R. van. (2002). Opportunities for Transport Mode Change: An Exploration of a Disaggregated Approach. *Environment and Planning B: Planning and Design*, *29*(3), 413–430. doi:10.1068/b12811

Fainstein, S. S. (2010). *The Just City*. Ithaca: Cornell University Press.

Flyvbjerg, B., & Stewart, A. (2012). *Olympic Proportions: Cost and Cost Overrun at the Olympics 1960–2012* (SSRN Scholarly Paper No. ID 2238053). Rochester, NY: Social Science Research Network. Retrieved from http://papers.ssrn.com/abstract=2238053

Fonseca, P. (2017, August 3). Brazil Police Arrest Ex-Rio Infrastructure Head in Olympics Graft Probe. *Reuters*. Retrieved from www.reuters.com/article/us-brazil-corruption-olympics-idUSKBN1AJ2NY

França, R. (2016, December 11). Ônibus perdem passageiros durante a crise. *O Globo*. Retrieved from https://oglobo.globo.com/rio/onibus-perdem-passageiros-durante-crise-20625497

Gaffney, C. (2010). Mega-Events and Socio-Spatial Dynamics in Rio de Janeiro, 1919–2016. *Journal of Latin American Geography*, *9*(1), 7–29. doi:10.1353/lag.0.0068

Gaffney, C. (2015a). Gentrifications in Pre-Olympic Rio de Janeiro. *Urban Geography*, Vol. 37, 1132–1153. doi:10.1080/02723638.2015.1096115

Gaffney, C. (2015b). The Mega-Event City as Neo-Liberal Laboratory: The Case of Rio de Janeiro. *Percurso Acadêmico*, Vol. 4(8), 217–237.

Geurs, K., & van Wee, B. (2004). Accessibility Evaluation of Land-Use and Transport Strategies: Review and Research Directions. *Journal of Transport Geography*, *12*(2), 127–140. doi:10.1016/j.jtrangeo.2003.10.005

Gold, J. R., & Gold, M. M. (2008). Olympic Cities: Regeneration, City Rebranding and Changing Urban Agendas. *Geography Compass*, *2*(1), 300–318. doi:10.1111/j.1749-8198.2007.00080.x

Gratton, C., Shibli, S., & Coleman, R. (2005). Sport and Economic Regeneration in Cities. *Urban Studies*, *42*(5–6), 985–999. doi:10.1080/00420980500107045

Hensher, D. A., & Brewer, A. M. (2002). Going for Gold at the Sydney Olympics: How Did Transport Perform? *Transport Reviews*, *22*(4), 381–399. doi:10.1080/01441640110121112

Hiller, H. H. (2000). Mega-Events, Urban Boosterism and Growth Strategies: An Analysis of the Objectives and Legitimations of the Cape Town 2004 Olympic Bid. *International Journal of Urban and Regional Research*, *24*(2), 449–458. doi:10.1111/1468-2427.00256

Hiller, H. H. (2006). Post-Event Outcomes and the Post-Modern Turn: The Olympics and Urban Transformations. *European Sport Management Quarterly*, *6*(4), 317–332. doi:10.1080/16184740601154458

Hughes, C., & Leshner. (2013). *Impact Analysis of Transoeste Bus Rapid Transit System in Rio de Janeiro*. Rio de Janeiro: ITDP Brasil.

IBGE. (2016). *Grade Estatística 2010*. Retrieved from http://mapas.ibge.gov.br/interativos/grade.html

Ipea, UNPD, & FJP. (2015). *Atlas do desenvolvimento humano nas regiões metropolitanas brasileiras*. Retrieved November 20, 2015, from www.atlasbrasil.org.br/

ITDP Brasil. (2013). *Workshop de Planejamento Urbano no entorno da estação do BRT Transbrasil em Bonsucesso*. Rio de Janeiro: ITDP Brasil.

ITDP Brasil. (2014). *Análise do Fluxo de Pedestres nas Estações do BRT Transbrasil*. Rio de Janeiro: ITDP Brasil. Retrieved from http://itdpbrasil.org.br/wp-content/uploads/2014/11/Pedestrian-Flow-Analysis-Transbrasil_FINAL.pdf

ITDP Brasil. (2015). *Análise de Impacto do BRT TransCarioca na Mobilidade Urbana do Rio de Janeiro*. Rio de Janeiro: ITDP Brasil. Retrieved from www.itdp.org/wp-content/uploads/2015/04/ITDP-Brasil_An%C3%A1lise-Impacto-BRT-TransCarioca_em-PT_vers%C3%A3o-WEB-para-site.pdf

Jones, C. (2001). A Level Playing Field? Sports Stadium Infrastructure and Urban Development in the United Kingdom. *Environment and Planning A*, *33*(5), 845–861. doi:10.1068/a33158

Kaplan, S., Popoks, D., Prato, C. G., & Ceder, A. (2014). Using Connectivity for Measuring Equity in Transit Provision. *Journal of Transport Geography*, *37*, 82–92. doi:10.1016/j.jtrangeo.2014.04.016

Kasimati, E. (2003). Economic Aspects and the Summer Olympics: A Review of Related Research. *International Journal of Tourism Research*, *5*(6), 433–444. doi:10.1002/jtr.449

Kassens-Noor, E. (2010). Sustaining the Momentum. *Transportation Research Record: Journal of the Transportation Research Board*, *2187*, 106–113. doi:10.3141/2187-14

Kassens-Noor, E. (2013). Transport Legacy of the Olympic Games, 1992–2012. *Journal of Urban Affairs*, *35*(4), 393–416. doi:10.1111/j.1467-9906.2012.00626.x

Kassens-Noor, E., Gaffney, C., Messina, J., & Phillips, E. (2016). Olympic Transport Legacies: Rio de Janeiro's Bus Rapid Transit System. *Journal of Planning Education and Research*, 0739456X16683228. doi:10.1177/0739456X16683228

Kassens-Noor, E., & Kayal, P. (2016). India's New Globalization Strategy and Its Consequences for Urban Development: The Impact of the 2010 Commonwealth Games on Delhi's Transport System. *International Planning Studies*, *21*(1), 34–49. doi:10.1080/13563475.2015.1114448

Kommenda, N. (2016, August 2). How Evictions Have Laid Bare Rio's Real Olympic Legacy. *The Guardian*. Retrieved from www.theguardian.com/sport/ng-interactive/2016/aug/02/how-evictions-have-laid-bare-rios-real-olympic-legacy

Kwan, M.-P. (1998). Space-Time and Integral Measures of Individual Accessibility: A Comparative Analysis Using a Point-Based Framework. *Geographical Analysis*, *30*(3), 191–216. doi:10.1111/j.1538-4632.1998.tb00396.x

Lago, L. C. do. (2000). *Desigualdades e segregação na metrópole: o Rio de Janeiro em tempo de crise*. Observatório IPPUR/UFRJ-FASE. Retrieved from http://web.observatoriodasmetropoles.net/new/images/abook_file/desigualdade_metropolerj_lucianalago.pdf

Langmyhr, T. (1997). Managing Equity: The Case of Road Pricing. *Transport Policy*, *4*(1), 25–39. doi:10.1016/S0967-070X(96)00031-5

Leopkey, B., & Parent, M. M. (2012). Olympic Games Legacy: From General Benefits to Sustainable Long-Term Legacy. *The International Journal of the History of Sport*, *29*(6), 924–943. doi:10.1080/09523367.2011.623006

Liu, M., Mao, B., Huang, Y., . . . Chen, S. (2008). Comparison of Pre- & Post-Olympic Traffic: A Case Study of Several Roads in Beijing. *Journal of Transportation Systems Engineering and Information Technology*, *8*(6), 67–72. doi:10.1016/S1570-6672(09)60006-4

Magalhães, L. E., & Rodrigues, R. (2017, June 6). Sistema BRT completa 5 anos sem motivos para comemorar. *O Globo*. Retrieved from https://oglobo.globo.com/rio/sistema-brt-completa-5-anos-sem-motivos-para-comemorar-21439782

Manaugh, K., Badami, M. G., & El-Geneidy, A. M. (2015). Integrating Social Equity into Urban Transportation Planning: A Critical Evaluation of Equity Objectives and Measures in Transportation Plans in North America. *Transport Policy*, *37*, 167–176. doi:10.1016/j.tranpol.2014.09.013

Mao, B. (2008). Analysis on Transport Policies of Post-Olympic Times of Beijing. *Journal of Transportation Systems Engineering and Information Technology*, *8*(6), 138–145. doi:10.1016/S1570-6672(09)60011-8

Matela, I. P. (2017). Transport Management: The Renovation of the Road Pact. In L. C. D. Q. Ribeiro (Ed.), *Urban Transformations in Rio de Janeiro* (pp. 287–302). Cham: Springer. doi:10.1007/978-3-319-51899-2_16

McKay, S., Murray, M., & Macintyre, S. (2012). Justice as Fairness in Planning Policy-Making. *International Planning Studies*, *17*(2), 147–162. doi:10.1080/13563475.2012.672798

Melo, E. S. O. (2017). *Exerting State Power in Core and Semi-Peripheral Countries: Land Clearance and Domination Strategies in London, Rio de Janeiro and Johannesburg* (PhD). Oxford Brookes University, Oxford, UK.

Minis, I., & Tsamboulas, D. A. (2008). Contingency Planning and War Gaming for the Transport Operations of the Athens 2004 Olympic Games. *Transport Reviews*, *28*(2), 259–280. doi:10.1080/01441640701628685

Minnaert, L. (2012). An Olympic Legacy for All? The Non-Infrastructural Outcomes of the Olympic Games for Socially Excluded Groups (Atlanta 1996-Beijing 2008). *Tourism Management*, *33*(2), 361–370. doi:10.1016/j.tourman.2011.04.005

Motte-Baumvol, B., & Nassi, C. D. (2012). Immobility in Rio de Janeiro, Beyond Poverty. *Journal of Transport Geography*, *24*, 67–76. doi:10.1016/j.jtrangeo.2012.06.012

Müller, M. (2015). The Mega-Event Syndrome: Why So Much Goes Wrong in Mega-Event Planning and What to Do about It. *Journal of the American Planning Association*, *81*(1), 6–17. doi:10.1080/01944363.2015.1038292

Neutens, T., Schwanen, T., Witlox, F., & Maeyer, P. D. (2010). Equity of Urban Service Delivery: A Comparison of Different Accessibility Measures. *Environment and Planning A*, *42*(7), 1613–1635. doi:10.1068/a4230

O Globo. (2016). Falhas na racionalização das linhas de ônibus. Editorial – 20/02/2016. *O Globo*. Retrieved from http://oglobo.globo.com/opiniao/falhas-na-racionalizacao-das-linhas-de-onibus-18712277

Paddison, R. (1993). City Marketing, Image Reconstruction and Urban Regeneration. *Urban Studies*, *30*(2), 339–349. doi:10.1080/00420989320080331

Pereira, R. H. M. (2018a). *Distributive Justice and Transportation Equity: Inequality in Accessibility in Rio de Janeiro* (PhD Thesis). University of Oxford, Oxford, UK. Retrieved from https://ora.ox.ac.uk/objects/uuid:3552ca9f-25c0-4d2f-acdd-0649de911afc

Pereira, R. H. M. (2018b). Transport Legacy of Mega-Events and the Redistribution of Accessibility to Urban Destinations. *Cities*, *81*, 45–60. doi:10.1016/j.cities.2018.03.013

Pereira, R. H. M., Banister, D., Schwanen, T., & Wessel, N. (2017). Distributional Effects of Transport Policies on Inequalities in Access to Opportunities in Rio de Janeiro. *SocArXiv*. doi:10.31235/osf.io/cghx2

Pereira, R. H. M., & Schwanen, T. (2013). *Commute Time in Brazil (1992–2009): Differences between Metropolitan Areas, by Income Levels and Gender* (Texto para Discussão No. 1813a). Brasília: Institute for Applied Economic Research-Ipea. Retrieved from http://repositorio.ipea.gov.br/handle/11058/964

Pereira, R. H. M., Schwanen, T., & Banister, D. (2017). Distributive Justice and Equity in Transportation. *Transport Reviews*, *37*(2), 170–191. doi:10.1080/01441647.2016.1257660

Pillay, U., & Bass, O. (2008). Mega-Events as a Response to Poverty Reduction: The 2010 FIFA World Cup and Its Urban Development Implications. *Urban Forum*, *19*(3), 329–346. doi:10.1007/s12132-008-9034-9

PNUD, Ipea, & FJP. (2013). *Índice de Desenvolvimento Humano Municipal Brasileiro*. Brasília: PNUD, Ipea, FJP. Retrieved from http://atlasbrasil.org.br/2013/pt/home/

Porter, L., Jaconelli, M., Cheyne, J., . . . Wagenaar, H. (2009). Planning Displacement: The Real Legacy of Major Sporting Events. *Planning Theory & Practice*, *10*(3), 395–418. doi:10.1080/14649350903229828

Préteceille, E., & Cardoso, A. (2008). Río de Janeiro y Sao Paulo: ¿ciudades duales? comparación con Paris. *Ciudad y Territorio: Estudios Territoriales*, (158), 617–640.

Preuss, H. (2007). The Conceptualisation and Measurement of Mega Sport Event Legacies. *Journal of Sport & Tourism*, *12*(3–4), 207–228. doi:10.1080/14775080701736957

Rawls, J. (1999). *A Theory of Justice* (revised ed.). Cambridge, MA: Belknap Press of Harvard University Press.

Rawls, J. (2001). *Justice as Fairness: A Restatement*. Cambridge, MA and London: Harvard University Press.

Ribeiro, L. C. de Q. (Ed.). (2014). *The Metropolis of Rio de Janeiro: A Space in Transition* (1st ed.). Rio de Janeiro: Letra Capital.

Ribeiro, L. C. de Q. (2017). *Urban Transformations in Rio de Janeiro: Development, Segregation, and Governance*. Heidelberg, Germany: Springer International Publishing. Retrieved from http://dx.doi.org/10.1007/978-3-319-51899-2

Ribeiro, L. C. de Q., Rodrigues, J. M., & Corrêa, F. S. (2010). Segregação residencial e emprego nos grandes espaços urbanos brasileiros. *Cadernos Metrópole. ISSN (impresso) 1517–2422; (eletrônico) 2236–9996*, *12*(23). Retrieved from http://revistas.pucsp.br/index.php/metropole/article/view/5921

Rio de Janeiro. (1996). *Strategic Plan for the City of Rio de Janeiro-Rio Forever Rio*. Rio de Janeiro: City Hall of Rio de Janeiro.

Rio de Janeiro. (2008). *Plano de Legado Urbano e Ambiental: Olimpíadas Rio 2016*. Rio de Janeiro: Comitê Especial de Legado Urbano – Secretaria Municipal de Urbanismo. Retrieved from www.rio.rj.gov.br/web/smu/exibeconteudo?article-id=138922

Rio de Janeiro. (2014). Atualização do Plano Diretor de Regionalização – 2012 / 2013. *Secretaria Estadual de Saúde do Estado do Rio de Janeiro*. Retrieved from www.saude.rj.gov.br/component/docman/?task=doc_download&gid=9794&Itemid=1214

Rio de Janeiro. (2015). *Explaining Rio de Janeiro Habitational Policy*. Rio de Janeiro: City Hall of Rio de Janeiro. Retrieved from https://drive.google.com/file/d/0B1x0_cNhKxbDb094M1hraGVNekU/view

Robbins, D., Dickinson, J., & Calver, S. (2007). Planning Transport for Special Events: A Conceptual Framework and Future Agenda for Research. *International Journal of Tourism Research*, *9*(5), 303–314. doi:10.1002/jtr.639

Rodrigues, J. M. (2013). Transformações urbanas e crise da mobilidade urbana no Brasil: hipóteses sobre o caso do Rio de Janeiro no contexto dos megaeventos. *E-Metropolis: Revista Eletrônica de Estudos Urbanos e Regionais*, *4*(14), 38–51.

Rodrigues, J. M., & Legroux, J. (2015). A questão da mobilidade urbana na Região Metropolitana do Rio de Janeiro: reflexões a partir dos projetos de infraestrutura para megaeventos esportivos. In D. G. Castro et al. (Ed.), *Rio de Janeiro. Os impactos da copa do mundo 2014 e das Olimpíadas 2016* (1st ed.). Rio de Janeiro: Letra Capital.

Rodrigues, M. (2016). Após 5 meses, usuários reprovam racionalização de ônibus no Rio – 03/03/2016. *G1 Rio Globo.Com*. Retrieved from http://g1.globo.com/rio-de-janeiro/noticia/2016/03/apos-5-meses-usuarios-reprovam-racionalizacao-de-onibus-no-rio.html

Rodrigues, R. (2017, June 28). *Metrô faz oferta promocional após queda de 14,5% nas viagens – Jornal O Globo*. Retrieved from https://oglobo.globo.com/rio/metro-faz-oferta-promocional-apos-queda-de-145-nas-viagens-21527565

Rubalcaba-Bermejo, L., & Cuadrado-Roura, J. R. (1995). Urban Hierarchies and Territorial Competition in Europe: Exploring the Role of Fairs and Exhibitions. *Urban Studies*, *32*(2), 379–400. doi:10.1080/00420989550013149

Sánchez, F., & Broudehoux, A.-M. (2013). Mega-Events and Urban Regeneration in Rio de Janeiro: Planning in a State of Emergency. *International Journal of Urban Sustainable Development*, *5*(2), 132–153. doi:10.1080/19463138.2013.839450

Sandy, M. (2016, March 24). The Rio Olympics Could Be the Next Victim of Brazil's Corruption Scandal. *Time*. Retrieved from http://time.com/4271376/brazil-corruption-scandal-olympics/

Santos, R. R. de O. (2013, September 30). *O planejamento da cidade é o planejamento dos jogos? O megaevento olímpico como instrumento de (re)ordenação do território carioca* (text). São Paulo: Universidade de São Paulo. Retrieved from www.teses.usp.br/teses/disponiveis/16/16139/tde-06012014-160038/

Short, J. R. (2008). Globalization, Cities and the Summer Olympics. *City*, *12*(3), 321–340. doi:10.1080/13604810802478888

Silva, M. A. V. da, & Portugal, L. da S. (2016). Location Factors Affecting Trip Generation during Mega-Events. *Proceedings of the Institution of Civil Engineers: Municipal Engineer*, 1–14. doi:10.1680/jmuen.16.00014

Silvestre, G. (2012). *An Olympic City in the Making: Rio de Janeiro Mega-Event Strategy 1993–2016*. IOC Olympic Studies Centre. Retrieved from http://doc.rero.ch/record/32218

Silvestre, G., & de Oliveira, N. G. (2012). The Revanchist Logic of Mega-Events: Community Displacement in Rio de Janeiro's West End. *Visual Studies*, *27*(2), 204–210. doi:10.1080/1472586X.2012.677506

Smith, A. (2009). Theorising the Relationship between Major Sport Events and Social Sustainability. *Journal of Sport & Tourism*, *14*(2–3), 109–120. doi:10.1080/14775080902965033

Stewart, A., & Rayner, S. (2016). Planning Mega-Event Legacies: Uncomfortable Knowledge for Host Cities. *Planning Perspectives*, *31*(2), 157–179. doi:10.1080/02665433.2015.1043933

Tomlinson, A. (2014). Olympic Legacies: Recurrent Rhetoric and Harsh Realities. *Contemporary Social Science*, *9*(2), 137–158. doi:10.1080/21582041.2014.912792

UN-HABITAT. (2010). *State of the World's Cities 2010/2011: Cities for All: Bridging the Urban Divide* (p. 244). UN-HABITAT. Retrieved from http://unhabitat.org/books/state-of-the-worlds-cities-20102011-cities-for-all-bridging-the-urban-divide/

UN HABITAT. (2013). *Planning and Design for Sustainable Urban Mobility: Global Report on Human Settlements 2013*. London: Routledge and UN HABITAT. Retrieved from www.unhabitat.org/pmss/listItemDetails.aspx?publicationID=3503

van Wee, B. (2012). How Suitable Is CBA for the Ex-Ante Evaluation of Transport Projects and Policies? A Discussion from the Perspective of Ethics. *Transport Policy*, *19*(1), 1–7. doi:10.1016/j.tranpol.2011.07.001

van Wee, B., & Geurs, K. (2011). Discussing Equity and Social Exclusion in Accessibility Evaluations. *European Journal of Transport and Infrastructure Research*, *11*(4). Retrieved from www.ejtir.tbm.tudelft.nl/issues/2011_04/abstracts/2011_04_01.asp

Viegas, J. M. (2001). Making Urban Road Pricing Acceptable and Effective: Searching for Quality and Equity in Urban Mobility. *Transport Policy*, *8*(4), 289–294. doi:10.1016/S0967-070X(01)00024-5

Whitson, D., & Horne, J. (2006). Part 2 the Glocal Politics of Sports Mega-Events: Underestimated Costs and Overestimated Benefits? Comparing the Outcomes of Sports Mega-Events in Canada and Japan. *The Sociological Review*, *54*, 71–89. doi:10.1111/j.1467-954X.2006.00654.x

Xu, Y., & Gonzalez, M. C. (2016). Collective Benefits in Traffic during Mega Events via the Use of Information Technologies. *ArXiv:1607.08203 [Physics]*. Retrieved from http://arxiv.org/abs/1607.08203

Zarur, C. (2017). *Empresa de ônibus do Rio fecha por causa da crise*. Retrieved October 5, 2017, from https://extra.globo.com/noticias/rio/empresa-de-onibus-do-rio-fecha-por-causa-da-crise-21258317.html

Zhang, L., & Zhao, S. X. (2009). City Branding and the Olympic Effect: A Case Study of Beijing. *Cities*, *26*(5), 245–254. doi:10.1016/j.cities.2009.05.002

Zuazo, P., Goulart, G., & Rodrigues, R. (2017, December 29). Sistema de transporte no Rio anda para trás. In *Extra Online*. Rio de Janeiro, Brasil. Retrieved from https://extra.globo.com/noticias/rio/sistema-de-transporte-no-rio-anda-para-tras-22237449.html