
Subsidies for public passenger transport in Brazil – a sustainable mobility issue

Fernanda Camila Martinez Delgado*

Department of Production Engineering,
Faculty of Engineering,
Paulista State University (UNESP),
Bauru, Brazil
Email: Fernanda.delgado@unesp.br
*Corresponding author

Barbara Stolte Bezerra

Department of Civil Engineering and Production,
Faculty of Engineering,
Paulista State University (UNESP),
Bauru, Brazil
Email: Barbara.bezerra@unesp.br

Abstract: The present paper analyses how the public transport fare is calculated in Brazil. The choice of the research theme is related to the impact that tariff price has on the access to urban public transportation, especially since the people who most use this mode of transportation are the least favoured ones, and therefore, those most in need of public policies that help establish fair tariff prices. The first part of the article contains an analysis on the tariff calculation in the Brazilian public transport system. From this definition, it was concluded that extra-tariff funds in Brazil are very small, so it was necessary to research different forms of subsidies used in other countries, as well as legal innovations found in Brazil, to suggest new ways of operation, which can increase the demand for the system, and consequently, increase the injection of funds in the sector. With the increase in revenue, public transport can gain in technological innovations for the sake of sustainability, contributing to lower carbon emissions to the atmosphere.

Keywords: ‘public transport’ and ‘subsidy’; ‘public transport’ and ‘incentive’; ‘public transport’ and ‘financing’; ‘climate justice’ and ‘carbon emission’; Brazil.

Reference to this paper should be made as follows: Delgado, F.C.M. and Bezerra, B.S. (2021) ‘Subsidies for public passenger transport in Brazil – a sustainable mobility issue’, *Latin American J. Management for Sustainable Development*, Vol. 5, No. 2, pp.95–109.

Biographical notes: Fernanda Camila Martinez Delgado graduated in Law – Toledo Institution of Bauru Education (2005) with specialisation in didactics and methodology in higher education by Anhanguera Educacional. She specialises in labour law and processes labour law by Damásio de Jesus. She obtained her Master in Production Engineering in Progress from the State University of São Paulo – Julio de Mesquita Filho in Bauru. She has taught at the Getúlio Vargas Foundation – São Paulo between 2012–2017.

Barbara Stolte Bezerra graduated in Civil Engineering at the University of São Paulo (1995). She obtained her Master in Architecture and Urbanism at the Federal University of Bahia (2001), PhD in Transport Engineering at the University of São Paulo (2007) and post-doctorate at the Department of Transportation at EESC/USP 2011. She was an Assistant Professor I at the Law School of São Carlos. She is currently an Associate Professor MS 5.1 at the Department of Civil Engineering at FEB/UNESP and at the Graduate Program in Production Engineering (PPGEP) at FE-Bauru.

This paper is a revised and expanded version of a paper entitled ‘How to facilitate price modicity in brazilian public transport’ presented at Symposium Production Engineering (SIMPEP), Bauru, 7 November 2018.

1 Introduction

Currently, the sustainability theme permeates several sectors of society, mainly due to the United Nations’ Sustainable Development Goals (SDG) agenda. In this agenda, there are 17 goals to be achieved by 2030, which are:

- 1 eradication of poverty
- 2 zero hunger
- 3 good health and well-being
- 4 quality education
- 5 gender equality
- 6 clean water and sanitation
- 7 accessible and clean energy
- 8 decent employment and economic growth
- 9 industry, innovation and infrastructure
- 10 reduced inequalities
- 11 sustainable cities and communities
- 12 responsible consumption and production
- 13 climate action
- 14 life below water
- 15 life on land
- 16 peace, justice and strong institutions
- 17 partnership for the goals (Organização das Nações Unidas, 2017).

The achievement of these goals will require the interconnection of and focus on several other themes, such as urban mobility.

Urban mobility is presented as a theme that touches all SDG, since the emission of gases by motor vehicles has an impact on the environment, the deaths and sequels caused by traffic accidents have an effect on society and human health, and the lack of access to rights and opportunities affects the population economically and socially (Costas, 2019).

For this reason, a well-structured urban public transport sector can have a positive impact on the achievement of the SDG targets. Thus, in 2012, Brazil launched the National Urban Mobility Plan to promote sustainable development by reducing the environmental and socio-economic costs of the movement of people and cargo in cities, with public transportation being one of the main pillars. However, public transport, which caters mainly to the needy, has been losing users in recent decades. One of the factors that contribute to this is the increase in tariff cost, which is generally higher than inflation. One way to reduce this is through subsidies to the public transport system. In addition to the National Urban Mobility Plan, the Brazilian Government introduced another innovation in 2015, transforming public transportation into a social right, through Constitutional Amendment No. 90, dated September 15, 2015, which included transportation in the list of the 6th Article of the Federal Constitution. The legal breakthroughs are extraordinary, but in practice, they will require more innovation. Currently, the Law of Urban Mobility, Law 12.587, of January 3, 2012, defined that the provider's remuneration tariff (not to be confused with the tariff paid by the user) should be constituted of the public price charged to users for the services, as well as revenues from other sources of funding, in order to cover the costs of the services provided to the user by a public or private operator. However, in order to achieve the goal of transport as social right, legal changes are required so that the right to transport can be put into actual practice, as already happens with the right to health and education (Araújo and Nunes, 2018).

Despite the legal forecast, public transport in Brazil is still financed by the tariffs paid in full by its users. Currently, the fares paid by paying users finance the public transport of those who are exempted from paying. For this reason, fares are far from complying with the precept of reasonable fare price.

The calculation of the fare should be composed of other forms of financing and other sources of subsidy to the transportation sector should be considered. De Carvalho et al. (2013) points out that in Brazil, there are insufficient extra-tariff resources to finance public transport when the Brazilian situation is compared with that of countries from Europe, North America, Latin America and the BRICS.

In view of this, it becomes necessary to think about alternative forms of funding, since public transport users are generally less favoured people, regardless of the country, as has been pointed out, Montañez (2014) in Spain, Osula (1998) in Nigeria, Ljungberg (2016) in Sweden, Tscharaktschiew and Hirte (2012) in Finland, Norway, Austria, Belgium, France and Germany, and Taylor and Morris (2015) in the USA. Consequently, in order to reduce fare costs, laws will be needed to establish the guidelines and forms of financing for the transport sector, determining the sources of funding for this purpose. In this way, a literature review is the most adequate way of listing, acknowledging and understanding other forms of subsidies practiced in other countries.

This comparison of subsidies is intended to foster a discussion about the dissemination of ideas concerning new sources of funding that will help achieve the objectives of the Urban Mobility Law towards economic, social and environmental sustainability in the sector.

1.1 Article structure

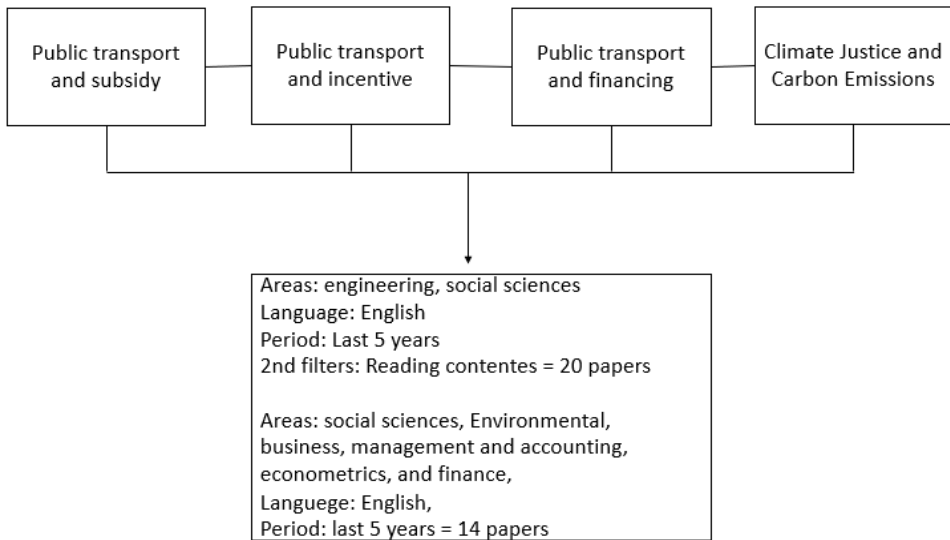
In view of the outlined goal, the article was divided as follows: Section 2 presents the forms of transport financing in Brazil and the form of fare calculation. In Section 3, a range of subsidies practiced in several countries, which can bring a beneficial discussion to the sector in Brazil, are presented. Section 4 presents funding sources for subsidies in Brazil and the possibility of implementing new sources. This section clarifies the forms of subsidies that are practiced in Brazil. In Section 5, it is presented how new sources of funding can stimulate the use of public transport and contribute to environmental sustainability. In Section 6, the discussion about sources of subsidy revenues in Brazil and the environmental requirements for reducing the level of carbon emission are presented. This section contains a discussion of how the subsidies found in the literature could be introduced into the Brazilian legal system, as well as the importance of these revenues for the implementation of technological innovations in favour of reducing carbon emission rates. Section 7 presents the conclusions about the subsidy of public transport, emphasising its importance to promote sustainable development with the mitigation of the environmental and socio-economic costs of daily displacements in urban areas.

1.2 Methodology

The research method used in this work was inspired by the literature reviews by Seuring and Müller (2008), Lage and Godinho Filho (2010), Seuring and Gold (2012), Jabbour (2013), Mariano et al. (2015) and Gaur and Kumar (2018).

Similarly to these works, the first step was the search of the following keywords: ‘public transport’ and ‘subsidy’ or ‘public transport’ and ‘incentive’ or ‘public transport’ and ‘financing’ in the Scopus database and then in the Web of Science database.

Figure 1 Research framework



Source: Prepared by the authors

The research at the Scopus database with the keywords: ‘public transport’ and ‘subsidy’ or ‘public transport’ and ‘incentive’ or ‘public transport’ and ‘financing’, in the fields of engineering and social sciences, in English, in the last five years, returned 136 articles on the subject.

In addition, in the Web of Science database, with the same keywords, the return was 46 articles. When the articles were located, it was necessary to apply a filter to reduce the base and find the articles that had more connection with the desired content, through careful reading of the title and abstract.

This screening resulted in a total of 50 articles and for the present study the most relevant 20 were mentioned, according to their contents. To complete the sustainability triple bottom line analysis, another search was made with the following keywords: ‘climate justice’ AND ‘carbon emissions’ at the Scopus database in the last five years in areas of social sciences, environment, business, management and accounting, econometrics and finance. This last search resulted in 14 articles. Figure 1 illustrates and summarises the research framework.

2 Conceptual review

2.1 Financing forms of the road transport sector in Brazil

In Brazil, the 1988 Constitution abolished the National Road Fund (FRN). This fund reserved all tax-related investments to be applied in the transport sector. Since the Constitution prohibited the binding of tax revenues to the FRN (Lee, 2005), this caused financing problems for the sector.

Thus, the government created new ways of financing road infrastructure, such as the Constitutional Amendment 33 of December 11th 2001, and Law 10.336, of December 19th 2001, which established the Contribution for Intervention in the Economic Domain (CIDE), levied on the import and commercialisation of petrol and its derivatives, natural gas and its derivatives and ethyl alcohol as a subsidy. The government also encouraged the road concessions initiated at the end of the 1990s (Emenda Constitucional no. 33 de 11 de dezembro de 2001).

Nowadays, the CIDE on fuels continues to be the only contribution directly linked to the financing of transport infrastructure in Brazil. This is because taxes and contributions are linked to some specific expense. Taxes, in the current constitutional view, cannot directly finance a specific sector or public service (Rocha, 2017).

Taking these aspects into consideration, it becomes necessary to understand the operation of the fare calculation and in what way the sector can receive subsidy resources, in order to create fair prices as foreseen in the Law of Urban Mobility.

2.2 Fare calculation

The fares paid by public transport users in Brazil finance a large part of the system’s costs. The calculation is made by the kilometre cost of the system divided by the number of passengers per kilometre. In this way, the costs of production of the transport are paid and distributed by the paying users (De Carvalho et al., 2013). The situation was aggravated by the loss of users in the transport system due to the reduction of IPI (taxes over industrialised products) for private cars, causing the systematic increase of the fare

paid by users. In 2013, there was a protest caused by the public transport users through riots and popular demonstrations against the increase in fares (De Carvalho et al., 2013).

Another consideration about the fare calculation was the use of the GEIPOT method that had an outdated calculation. In an attempt to solve the problem, National Association of Public Transport (ANTT) presented in August 21st, 2017, a proposal for a new method for calculating the costs of bus services, dismantling the old GEIPOT method. The new ANTT method was attended by the National Front of Mayors (FNP), the National Forum of Secretaries and Public Leaders of Urban Mobility and the National Association of Urban Transport Companies (NTU). The meeting raised the types of fixed and variable costs of urban public transport service. The new spreadsheet brought innovations to the calculation, specifying the value of the operating company remuneration and the implementation risk remuneration. This last one encompasses: change in environmental norms, decrease in demand for external factors, increase in existing free-of-charge passengers, lack of readjustments, default of public subsidy or of the chamber, and operational and labour risks (Asquini, 2017).

This spreadsheet also brought more clarity to the costs of public transport, making it possible to understand the dynamics of these costs. This can help to direct future decisions by the government with the goal of reducing fare costs and choosing effective public policies, especially in the area of subsidy, now foreseen in the fare calculation. Equations (1) and (2) present the fare calculation by the GEIPOT method and by the ANTT proposal, respectively.

$$\text{FARE}_{\text{GEIPOT}} = \frac{\text{variable cost} + \text{fixed cost} + \text{tributes} + \text{subsidies}}{\text{equivalent passenger}} \quad (1)$$

$$\text{FARE}_{\text{ANTT}} = \frac{\text{variable cost} + \text{fixed cost} + \text{RPS} + \text{tributes} - \text{subsidies}}{\text{equivalent passenger}} \quad (2)$$

Also, the new spreadsheet includes the increase in already existing free-of-charge riders, such as what is practiced in the State of São Paulo, such as: aid to unemployed people (who have been in this condition for at least one month and a maximum of six months); the free charge for students, provided for in State Law No. 12,615 of February 19th, 2015 and by State Act 61,134 of February 25th, 2015, as well as the Municipal Law 16,097 of December 29th, 2014; the free charge for the elderly, granted by Article 39 of the Statute of the Elderly, Law 10,741 of October 1st, 2003; and the exemption for people with special needs. And in some places, the exemption extends to some pathologies while the patient is undergoing treatment (Biblioteca Virtual, 2018).

In this way, understanding the composition of the costs that integrate the fare in the Brazilian case is essential to identify new forms of subsidies in other countries, which can be applied in Brazil, in accordance with Brazilian legislation.

3 Subsidies found in the literature

The exchange of information, especially nowadays, where globalisation is so present, brings interesting discussions about the ways in which different governments operate around the world.

In this sense, observing how the transport sector works in other countries can bring benefits to the Brazilian case, especially if Brazilian legislation allows the application of other forms of subsidies applied in other countries. This compilation of data indicates that there are several forms of subsidies in several countries, which may be of viable use in Brazil. Table 1 summarises the subsidies found.

Table 1 Summary of the list of subsidies found in the literature

<i>Country</i>	<i>Subsidy used</i>
France	Presence of specific legislation to finance public transport (Montañez, 2014).
Germany	
Italy	
Netherlands	
USA	Focus on optimising expenses on transportation operations is used as an aid to optimise the distribution of the subsidy.
USA	Tax on gasoline reverted directly to the public transport sector, about 50%
Germany	(Ljungberg, 2016).
Sweden	
USA	Use of usage fees, licensing fees and charges directly reverted to the public transport sector.
Germany	
Sweden	
Germany	Deduction of transport expenses in the income tax of the public transport user.
Nigeria	Direct subsidy on workers' wages.
Argentina	Direct subsidy through the use of SUBE card by low-income people.
Santiago, Chile	Public contract bidding for small businesses.
South Africa	Reallocation of the exemptions given for the fossil fuel sector to the transportation sector.
China	Sending of funds directly from the union to the cities that lack in public transport.
India	Subsidy directed to new investments in transport and not only to cover operating costs of companies.

Source: Adapted from Montañez (2014), Ljungberg (2016), Osula (1998), Nur et al. (2018), de Grange et al. (2018), Hensele and Maisonnave (2018), Deng et al. (2016) and Sadhukhan et al. (2017)

In view of this, France, Germany, Italy and the Netherlands have a specific law to finance public transport, which is lacking in many countries, including Brazil (Montañez, 2014). In the USA, the focus is on reducing expenses on public transport operations by optimising all operational resources.

On the other hand, in the USA, Germany and Sweden, for example, gasoline taxes and licensing fees are used as subsidies. They also use rates on traffic jam, parking and fuel fees as ways of subsidising public transport.

In Sweden, empirical researches have already identified that vehicular traffic in urban areas does not cover the externalities they cause, including: infrastructure expenses, road accidents, and expenses on techniques to ease the environmental impacts of pollution generated by emissions by private vehicles. The solution suggested by Ljungberg (2016)

in the case of Sweden would be the creation of means to internalise the costs of transport sector externalities, through the implementation of traffic jam charges and parking restriction rates. These forms of fees can be used not only for the infrastructure area, but also for the costing area.

In Germany, users can deduct transport costs in their income tax.

In Nigeria, a developing country, under similar conditions as Brazil, the government provides subsidies directly to workers as part of wages by using an average ratio between transport expenses and the worker's income, the missing part being subsidised by the government to benefit the worker. It seems fair and targets low-income working-age people, but it does not extend to other types of users (Osula, 1998).

In Argentina, low-income users use a card called 'SUBE' that guarantees lower fares.

In Santiago, Chile, a research analysed the aggregate cost structures of urban bus transport industries and concluded that smaller companies are more efficient than large ones, suggesting that public contract bidding opt to receive proposals and accept small companies in order to increase efficiency and competition in the sector (de Grange et al., 2018).

In South Africa, Hensele and Maisonnave (2018) presented a study suggesting the reallocation of subsidies granted to companies responsible for the production and refinement of fossil fuels for the transport sector, through the transfer of exemptions from one sector to the other.

In China in 2012, the central government emphasised the social role of public transport by including it in the national basic public service system in the 12th five-year plan. This put public transport as an essential service, and the government had to ensure the minimum level in the provision of service.

The study made in China also highlighted the urgency of generating a social needs index for public transport, representing the quantitative approximation of several socially disadvantaged variables in combination with the spatial dispersion of public services in the transport sector. This calculation served to measure financial resources to the small cities that had more resources in the transport sector, and the researchers also considered the possibility of applying direct resources from the central government in small towns (Deng et al., 2016).

In India, it has been observed throughout time that public transport is generally subsidised and the fare is kept low to make the service 'accessible' to all social classes. However, the subsidy is often restricted and therefore the focus of the government has been to maintain or continue the current service without proper attention to its quality and development of related facilities. While on one hand, most governments are finding it difficult to sustain the burden of the current subsidy on public transport, on the other hand, several governments hesitate to increase the fare due to socio-political reason. Thus, improving transportation facilities or systems in such a condition is a major challenge faced by transport professionals and policy makers in emerging countries such as India. Therefore, the results of the study suggest that the rationalisation of the fare increment is an important means for the government not to feel overwhelmed and unable to apply fare increases (Sadhukhan et al., 2017). The subsidy in India is directed to new investments in transportation and not only to cover operating costs of companies.

As it can be seen, there are several forms of subsidies in several countries, both in developed and under-developed countries, which can contribute to the elaboration of domestic legislation to increase the Brazilian transport sector, but it is not an easy solution.

4 Extra-tariff funding sources in Brazil and the possibility of implementing new sources

In Brazil, the Urban Mobility Law foresees the practice of reasonable fare price, but for this to take place, new sources of funding need to be included in the fare calculation.

However, implementing new forms of funding depends on constitutional rules, which in turn prohibit the link of taxes for the financing of the specific public service.

Tax is one of the types of tribute. Tributes can be divided into: linked tributes, that is, those in which the payment generating fact is related to some consideration of the state, such as rates, improvement contributions and other contributions in general; and non-linked tributes, those in which the payment generating fact is not related to any specific consideration of the state, and which are called taxes (Rocha, 2017). Taking this into consideration, it is possible for Brazil to establish, between the related tributes, a form of subsidy to public transport.

An example of direct link with the existing public transport system is the CIDE, whose resources directly finance transport infrastructure programs, as foreseen in the Federal Constitution, Article 174, §4º, II, c (Constituição, 1988).

Moreover, Ferreira (2017) reported on the Chamber of Commerce's website that a special commission approved, on March 15th, 2017, an amendment to the Constitution that proposes to the cities and to the Federal District to institute a contribution to pay for public transport.

Cities should create a contribution through a complementary law. And this contribution will focus on the retail sale of gasoline, ethanol fuel and vehicular natural gas. That is, the contribution will be charged on the pump price at gas stations.

In Brazil, there is also the Transport Ticket, instituted by Law 7418 of December 16th, 1985; however, the private initiative is responsible for this subsidy and not the public authority.

These are the forms of funding and the present possibilities in the Brazilian legislative system. This paper highlights that the sources of financing are small in Brazil and need to be increased, so investigating the format of the transport sector in other countries can be a beneficial search for new ideas.

For example, rates and improvement contributions are sources of subsidies that can be implemented in our regulatory system. Another way to help create a reasonable fare price practice is to optimise expenses within transport operations, which has a positive viability of deployment in Brazil.

Also, despite the fact that taxes cannot be linked to any expenses, the federal agencies may grant exemptions that are reflected on operations and transport companies, so that the company can operate at the same fare for a longer time.

So many possibilities exist for implementing subsidies, but the challenges imposed by the legislative system and the government may delay more beneficial measures.

5 Discussion of extra-tariff revenue sources in Brazil and the possibility of new revenue sources to implement less-polluting technologies

The viability of implementing the examples of subsidies found in other countries should be considered with parsimony, due to the particularities of the Brazilian legal system.

In cases where there is the legal viability of implementing the subsidy by means of an ordinary or complementary law, as shown in Table 1, there is a need for the law to be proposed by any member of the Congress, the Federal Supreme Court, the Superior Courts, General Attorney of the Republic, the President of the Republic or the citizens. After the proposal, the bill passes in two houses, the House of Representatives and the Senate. For the approval, the ordinary law requires simple majority, and the supplementary law requires absolute majority (Articles 61–69 of the Federal Constitution). So, for the implementation of specific financing legislation for the transport sector as it happens in France, Germany, Italy and the Netherlands, the path would be by ordinary law, and we already have a bill in this sense in process (Law 310 of 2009). This project would also make it possible to use a single card or ticket as it happens in Argentina.

An ordinary law would be required to establish usage and licensing charges, similar to what occurs in the USA, Germany and Sweden, and the workers' wage subsidy, as it is done in Nigeria.

The cases of deductions in income tax, as it happens in Germany, would be a little more complicated, as it would require approval of a supplementary law with quorum of absolute majority of the members of Congress, and a regulation issued by the Federal Revenue Service of Brazil.

Another interesting form of subsidies occurs in Santiago, Chile, with the opening of bids encouraging the participation of micro and small businesses. This can be accomplished with a well-written bidding notice, since the bidding law itself allows micro and small businesses to participate.

In South Africa, the exemptions given to the fossil fuel sector have been reallocated to the public transport sector. In Brazil, the exemptions must be directed but cannot be reallocated (Article 176 of the National Tax Code).

The examples of exemptions granted in India to the public transport sector would work well in Brazil, since the transport companies in Brazil would have to prove to the public authorities the fulfilment of the necessary requirements to receive such benefit (Article 179 of the National Tax Code).

As for the direct allocation of funds from the union to the cities, as it is done in China, it could be made effective in Brazil through agreements established between the two entities.

In light of these comparisons, it is noted that the possibilities to increase subsidies are possible and may become real in Brazil but depend on bureaucratic legislative procedures that may take some time to be concluded.

It also emerges from the study that the more developed nations are able to equate the subsidy in the form of financial dispatch and the least developed in the form of exemptions.

The presence of the subsidy in Brazil, whether in the form of financial dispatch or in the form of exemptions, can guarantee the implementation of less polluting technologies in public transport, such as the use of electric buses.

The Law of Urban Mobility No. 12.587 of January, 2012 had as a principle the sustainable development of cities, in the socio-economic and environmental dimensions. Law 12.187, of December, 2009, instituted the national policy on climate change, focusing on mitigation and adaptation to climate change in order to consolidate a low-carbon economy policy in several areas, including public transportation (Lei ordinária 12.587 de 3 de janeiro de 2012, 2012; Brasil, 2009).

As can be seen, the subsidy is a dense policy that will not only help increase the demand, through the practice of cheap tariffs, but also extensively propel the technological innovation in favour of the environment.

The law that instituted the national climate change policy is federal, so states must draft their laws at the state level. The State of São Paulo did this in 2018 with the enactment of Law 16.802 of January, 2018, providing for the use of sources of energy that are less polluting and have reduced greenhouse gas emissions in the collective urban transport fleet of the municipality of São Paulo (São Paulo, 2018).

Public transport vehicles that use cleaner energy will contribute to the carbon economy in Brazil.

In 2016, according to the ITDP survey, the state capitals in Brazil emitted an average of 900 kilograms of CO₂ per person.

Given the alarming numbers, both the national urban mobility policy and the national climate change policy must be considered so that the subsidy on public transport goes beyond the aspect of tariff price to achieve climate change mitigation objectives.

6 Discussion of sources of extra-tax revenues in Brazil and the environmental requirements for reducing the level of carbon emissions

According to information from the Ministry of the Environment, Brazil is a signatory to the Paris Agreement on climate change and has committed to reduce greenhouse gas emissions by 37% below 2005 levels by 2025, with a subsequent indicative commitment of reducing greenhouse gas emissions by 43% below 2005 levels by 2030. To this end, the country committed itself to increasing the share of sustainable bioenergy in its energy matrix to approximately 18% by 2030, to restore and reforest 12 million hectares of forests, and to achieve an estimated 45% share of renewable energy in the composition of the energy matrix in 2030 (Ministério do Meio Ambiente, 2019).

Based on the numbers in Table 2, which shows the emission levels per person in kilograms for the 27 Brazilian capitals, the task to achieve the objectives of the Paris Agreement will not be easy, especially in the public transport sector.

Extraterritorial revenues set out in the Urban Mobility Act have become not only a means of increasing demand and helping the needy population, but also of serving as an incentive for companies to invest in their fleet.

In addition to the Urban Mobility Law, enacted in the federal scope, the state of São Paulo has already advanced and promulgated a specific standard for adapting the public transport fleets in 2018.

The concern is recent and extra-tariff revenues are still small to encompass the triad of sustainability in its economic, social and environmental aspects.

Table 2 Quantity of CO₂ in kilograms per inhabitant

<i>FU</i>	<i>City</i>	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
SE	Aracaju	780	783	685	741	821	899	816	829	725	697
PA	Belem	533	500	469	507	532	590	572	577	553	523
MG	Belo Horizonte	701	702	713	853	919	948	917	895	751	778
RR	Boa Vista	690	819	871	1,420	856	970	1,185	1,393	1,289	1,192
DF	Brasilia	922	905	880	1,007	1,066	1,154	1,109	1,116	1,040	1,016
MS	Campo Grande	1,447	1,623	1,487	1,552	1,712	1,800	1,789	1,788	1,689	1,741
MT	Cuiaba	1,236	1,331	1,304	1,336	1,455	1,723	1,815	1,685	1,437	1,413
PR	Curitiba	1,001	987	963	1152	1,280	1,342	1,259	1,229	1,090	1,157
SC	Florianopolis	990	837	821	990	1,012	1,057	1,028	1,056	995	1,013
CE	Fortaleza	392	493	506	575	628	697	690	696	625	600
GO	Goiania	1,000	1,008	932	990	1,026	1,149	1,205	1,201	1,004	887
PB	Joao Pessoa	520	529	562	657	720	783	752	756	718	728
AP	Macapa	666	678	588	569	608	701	660	713	672	627
AL	Maceio	450	424	428	512	572	627	620	649	590	589
AM	Manaus	899	1,194	1,475	1,698	1,569	1,626	1,471	1,340	1,046	873
RN	Natal	596	629	563	632	669	717	727	720	713	661
TO	Palmas	733	887	861	741	930	1,086	1,088	1,124	1,000	1,012
RS	Porto Alegre	813	790	768	877	924	987	945	947	883	819
RO	Porto Velho	1,832	1,896	2,039	2,074	2,160	2,007	1,637	1,779	1,475	1,577
PE	Recife	484	494	507	605	686	772	758	739	615	644
AC	Rio Branco	673	709	677	774	863	1,338	870	915	824	760
RJ	Rio de Janeiro	537	522	516	576	667	703	675	652	632	588
BA	Salvador	412	423	405	499	564	599	524	548	496	505
MA	Sao Luis	921	1,118	998	842	1,375	1,528	1,436	1,419	1,464	1,448
SP	Sao Paulo	732	751	715	751	821	877	832	840	747	764
PI	Teresina	654	724	717	825	842	975	1,007	1,045	997	943
ES	Vitoria	774	733	753	687	775	1,050	928	902	770	746

Source: Institute of Transportation and Development Policies (ITDP), Brazil

7 Conclusions

The research reveals that the comparative analysis between different countries, on different forms of financing of the public transport sector, can bring beneficial ideas to the internal procedures in Brazil and to the achievement of the goals of the National Plan of Urban Mobility for the sustainability of the transportation system and the reasonable price of the fare, helping to reach the SDG agenda.

It is clear that Brazil must undergo legislative changes to adapt the domestic legal system to other models. However, the gains for the transport sector can be very important

and extremely necessary, especially after the popular demonstrations in 2013, where public transport users claimed for more affordable fares.

Despite the decrease in the transport financing sector, through the promulgation of the 1988 Federal Constitution, which prohibited the link of taxes to a specific expense, the government and the legislature have been concerned with the small sources of transport funding that nowadays are summed up only to the CIDE on fuels.

The transport sector has suffered, in a way, a drain of funds and ended up being scrapped over the years.

Thus, in order to recover public transport services and the entire transport field, the government has been issuing a series of bills that will assist in the transfer of funds directly, as in Project 310 of 2009, which will guarantee specific legislation for the public transport if it is approved. There is also a suggested proposal of implementing a CIDE on fuels at the municipal scope, which will direct all its financial results to the transport sector (Projeto de Lei da Câmara no. 310 de 2009, 2009).

But these measures alone are still insufficient for the sector. Therefore, analysing how other countries finance their public transport sector can benefit and bring new ideas to the Brazilian public transport system, mainly because this need has gained more power with the promulgation of the National Plan of Urban Mobility, followed by the inclusion of public transport as a social right.

As a social right, transport has the same importance as health and education, so the more ideas are brainstormed, the more open the range of public power options for the implementation of public subsidy policies for public transport fares will be.

Moreover, in addition to ideas for ways of financing the fares, other issues are in great need of change, such as management style and standardisation of public transport services, since states and cities in Brazil function in different ways generating discrepancies in the form and quality of public transport services.

Perhaps, the National Mobility Plan can help unify guidelines for all federal agencies, but this question can only be answered in a future research.

The research also demonstrated Brazil's recent concern with environmental issues related to public transport, more specifically the emission of greenhouse gases into the atmosphere, and how extra-tariff revenues could encourage public transport companies to invest in innovating their fleets.

Future research can be carried out to identify the effective influence of extra-tariff revenues on the cost of the public transport operation and its impact on the evolution of business fleets.

References

- Araújo, L.A.D. and Nunes Jr., V.S. (2018) *Curso de Direito Constitucional*, 22nd ed. rev., Editora Verbatim, São Paulo.
- Asquini, A. (2017) *Uma nova metodologia para apurar custos do transporte por ônibus e definir tarifas* [online] <http://antp.org.br/noticias/destaques/uma-nova-metodologia-para-apurar-custos-do-transporte-por-onibus-e-definir-tarifas.html> (accessed 25 June 2018).
- Biblioteca Virtual (2018) Governo do Estado de São Paulo [online] <http://www.bibliotecavirtual.sp.gov.br/temas/transportes/gratuidades-no-transporte-publico.php> (accessed 2 July 2018).

- Constituição (1988) *Constituição da República Federativa do Brasil: promulgada em 5 de outubro de 1988*, Brazil [online] http://www.planalto.gov.br/ccivil_03/constituicao/constituicaoocompilado.htm (accessed 27 May 2018).
- Costas, L.C. (2019) *Mobilidade urbana e os objetivos de desenvolvimento sustentável* [online] <https://www.cnm.org.br/cms/biblioteca/Mobilidade%20Urbana%20e%20os%20Objetivos%20de%20Desenvolvimento%20Sustent%3%A1vel.pdf> (accessed 3 July 2019).
- De Carvalho, C.H.R., Gomide, A., Pereira, R.H.M., Mation, L.F., Balbim, R., Neto, V.C.L., Galindo, E.P., Krause, C. and Guedes, E.P. (2013) *Tarifação e financiamento do transporte público urbano*, Nota técnica, Instituto de pesquisa Econômica Aplicada, Brasília.
- de Grange, L., Troncoso, R. and Briones, I. (2018) ‘Cost, production and efficiency in local bus industry: an empirical analysis for the bus system of Santiago’, *Transportation Part A: Policy and Practice*, Vol. 108, No. 1, pp.1–11.
- Deng, H., Li, Y., Li, W. and Yu, Y. (2016) ‘Urban transport social needs in China: quantification with central government transit grant’, *Transport Policy*, Vol. 51, No. 1, pp.126–139.
- Emenda Constitucional no. 33 de 11 de dezembro de 2001 (2001) *Altera os arts. 149, 155 e 177 da Constituição Federal*, Brazil [online] http://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc33.htm (accessed 4 June 2018).
- Emenda Constitucional no. 90 de 15 de setembro de 2015 (2015) *Dá nova redação ao art. 6º da Constituição Federal, para introduzir o transporte como direito social*, Brazil [online] http://www.planalto.gov.br/ccivil_03/constituicao/emendas/emc/emc90.htm (accessed 4 June 2018).
- Ferreira, A. (2017) *Comissão aprova permissão para município criar tributo para financiar transporte coletivo* [online] <http://www2.camara.leg.br/camaranoticias/noticias/TRANSPORTE-E-TRANSITO/524350-COMISSAO-APROVA-PERMISSAO-PARA-MUNICIPIO-CRIAR-TRIBUTO-PARA-FINANCIAR-TRANSPORTE-COLETIVO.html> (accessed 3 June 2018).
- Gaur, A. and Kumar, A. (2018) ‘A systematic approach to conducting review studies: an assessment of content analysis in 25years of IB research’, *Journal of World Business*, Vol. 53, No. 2, pp.280–289.
- Henseler, M. and Maisonnave, H. (2018) ‘Low world oil prices: a chance to reform fuel subsidies and promote public transport? A case study for South Africa’, *Transportation Research Part A: Policy and Practice*, Vol. 108, No.1, pp.45–62.
- Jabbour, C.J.C. (2013) ‘Environmental training in organisations: from a literature review to a framework for future research’, *Resources, Conservation, and Recycling*, Vol. 74, No. 1, pp.144–155.
- Lage Jr., M. and Godinho Filho, M. (2010) ‘Variations of the kanban system: literature review and classification’, *International Journal of Production Economics*, Vol. 125, No. 1, pp.13–21.
- Lee, S.H. (2005) *Introdução ao projeto geométrico de rodovias*, 2nd ed., pp.24–32, Editora da UFSC Florianópolis, SC-Brazil.
- Lei ordinária 12.587 de 3 de janeiro de 2012 (2012) *Institui as diretrizes da Política Nacional de Mobilidade Urbana; revoga dispositivos dos Decretos-Leis nos 3.326, de 3 de junho de 1941, e 5.405, de 13 de abril de 1943, da Consolidação das Leis do Trabalho (CLT), aprovada pelo Decreto-Lei no 5.452, de 10 de maio de 1943, e das Leis nos 5.917, de 10 de setembro de 1973, e 6.261, de 14 de novembro de 1975; e dá outras providências*, Brazil [online] http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2012/lei/112587.htm (accessed 4 July 2018).
- Lei ordinária no. 10.336 de 19 de dezembro de 2001 (2001) *Institui Contribuição de Intervenção no Domínio Econômico incidente sobre a importação e a comercialização de petróleo e seus derivados, gás natural e seus derivados, e álcool etílico combustível (Cide), e dá outras providências*, Brazil [online] http://www.planalto.gov.br/ccivil_03/Leis/LEIS_2001/L10336.htm (accessed 4 June 2018).

- Lei ordinária no. 7418 de 16 de dezembro de 1985 (1985) *Institui o Vale-Transporte e dá outras providências*, Brazil [online] http://www.planalto.gov.br/ccivil_03/Leis/L7418.htm (accessed 2 July 2018).
- Ljungberg, A. (2016) 'Marginal cost-pricing in the Swedish transport sector – an efficient and sustainable way of funding local and regional public transport in the future?', *Research in Transportation Economics*, Vol. 59, No. 1, pp.159–166.
- Mariano, E.B., Sobreiro, V.A. and Rebelatto, D.A.D.N. (2015) 'Human development and data envelopment analysis: a structured literature review', *Omega*, Vol. 54, No. 1, pp.33–49.
- Ministério do Meio Ambiente (2019) *Acordo de Paris* [online] <http://www.mma.gov.br/clima/convencao-das-nacoes-unidas/acordo-de-paris> (accessed 4 June 2019).
- Montañez, M.R. (2014) 'La financiación del transporte urbano: um reto para las ciudades Españolas del siglo XXI', *Investigaciones Europeas de Dirección y Economía de la Empresa*, Vol. 20, No. 1, pp.1–4, Madrid.
- Nur, S.A.S., Nur, K.B. and Ari, K.M.T. (2018) 'The role of incentives towards adolescents' commitment to use public transport in Malaysia', *Transportation Planning and Technology*, Vol. 41, No. 3, pp.301–318.
- Organização das Nações Unidas (ONU) (2017) *17 objetivos para transformar nosso mundo. Agenda 2030* [online] <https://nacoesunidas.org/pos2015/agenda2030/> (accessed 3 July 2019).
- Osula, D.O.A. (1998) 'A procedure for estimating transit subsidization requirements for developing countries', *Transportation Research Part A – Policy and Practice*, Vol. 32, No. 8, pp.599–606.
- Projeto de Lei da Câmara no. 310 de 2009 (2009) *Institui o Regime Especial de Incentivos para o Transporte Coletivo Urbano e Metropolitano de Passageiros – REITUP, condicionado à implantação do bilhete único temporal ou rede integrada de transportes*, Brazil [online] <https://www25.senado.leg.br/web/atividade/materias/-/materia/94361> (accessed 4 June 2018).
- Rocha, R. (2017) *Direito Tributário. Coleção Sinopses para Concursos*, Editora Jus Podivm, Salvador.
- Sadhukhan, S., Banerjee, U.K. and Maitra, B. (2017) 'Rationality of fare increment for improvement of transfer facilities at metro stations: an experience in Kolkata', *Transport Policy*, Vol. 58, No. 1, pp.31–38.
- Seuring, S. and Gold, S. (2012) 'Conducting content-analysis based literature reviews in supply chain management', *Supply Chain Management an International Journal*, Vol. 17, No. 5, pp.544–555.
- Seuring, S. and Müller, M. (2008) 'From a literature review to a conceptual framework for sustainable supply chain management', *Journal of Cleaner Production*, Vol. 16, No. 15, pp.1699–1710.
- Taylor, B.D. and Morris, E.A. (2015) 'Public transportation objectives and rider demographics: are transit's priorities poor public policy?', *Transportation*, Vol. 42, No. 2, pp.347–367.
- Tscharaktschiew, S. and Hirte, G. (2012) 'Should subsidies to urban passenger transport be increased? A spatial CGE analysis for a German metropolitan area', *Transportation Research Part A – Policy and Practice*, Vol. 46, No. 2, pp.285–309.