Education in the Transit: Analysis of Economic-Driving Program Implemented in a Public Transport Bus Company

Cristina Keiko Yamaguchi, CKY
University Alto Vale do Rio do Peixe (UNIARP)
Brazil

Carlos Roberto da Silva, CRS
Transul Bus Company
Brazil

Stéfano Frizzo Stefenon
Uniplac
Brazil

Abstract

The growing number of motor vehicles in urban areas has generated negative impacts on costs for users and bus operators due to congestion and the increase in travel time. Furthermore, transport sector is a significant user of energy, especially fuel, and a great responsible for greenhouse emissions. In order to mitigate these externalities, transport companies try to incorporate into their processes innovative tools and best practices in management, like the so-called economic-driving. The economic-driving seeks to reduce fuel consumption, greenhouse emissions and operational costs. This paper aims to present the results of an economic-driving program implemented in a public transport bus company in Brazil, in the period of 2010-2016. The methodologies used were exploratory, descriptive and case study. The results showed a reduction of fuel consumption by 786.336 liters. The analysis of the consumption of brake linings in eleven buses, running the same itineraries by the same drivers, decreased 47.46%. Based on the Embrapa's methodology for the calculation of greenhouse emissions the company stopped emitting 86,757.36 kilo grams of CO_2 in the atmosphere. In conclusion, the case study confirmed the feasibility of applying economic-driving strategies and the economic and social advantages with the program for the company.

Keywords: Public transport; Economic driving; Environmental impacts; Costs reduction

1. Introduction

The growing number of motor vehicles in urban areas has generated negative impacts on costs for users and bus operators due to congestion and the increase in travel time. Furthermore, transport sector is a significant user of energy, especially fossil fuels, and a great responsible for greenhouse emissions. In order

to address these concerns, a vast number of researchers, public and private institutions, of various continents, are involved in the debate seeking to find out what actions need to be undertaken to meet solutions (Rezvani et al., 2015; Matas et al., 2017; Wang and He, 2017).

The studies of Urban Land Institute and Cambridge Systematics, Inc. (2009, p.1) affirms that transport greenhouse gas (GHG) emissions "are the result of the interaction of four factors: vehicle fuel efficiency, the carbon content of the fuel burned, the number of miles that vehicles travel, and the operational efficiency experienced during travel." Based on that statements, the studies indicated four basic approaches for the development of strategies for the reduction in GHG emissions. Are they:

- Vehicle Technology - Improving the energy efficiency of the vehicle fleet by implementing more advanced technologies.
- Fuel Technology - Reducing the carbon content of fuels through the use of alternative fuels (for instance, natural gas, bio fuels, and hydrogen).
- Travel Activity - Reducing the number of miles travelled by transportation vehicles, or shifting those miles to more efficient modes of transportation.
- Vehicle and System Operations - Improving the efficiency of the transportation network so that a larger share of vehicle operations occur in favourable conditions, with respect to speed and smoothness of traffic flow, resulting in more fuel efficient vehicle operations.

The economic-driving program concentrated on the approach vehicle and system operations, having advantage of new vehicle and fuel technology available, vehicle maintenance and personal training. The objective of the program is to decrease GHG emissions, fuel consumption and operational costs. Moreover, the strategies used sought to avoid accidents, stress to the drivers and, as a consequence, to improve work environment and the level of service to the users (Ma et al., 2012). The program works on three main topics: the driver skills and training, the vehicle technology and maintenance, the fuel quality and the routes.

Economic-driving can be applied to all kinds of transport means, particularly those who depend on fossil fuel as energy source. Pollution is one of the main aspects that are in focus, legislation and the general concern about the economy of fossil fuels. The petroleum products, when burned, emit particulates and gases that negatively impact the planet's ecosystem and human health (IMTT, 2014). Moreover, Governments and transport companies, moved by the market and competitiveness or seeking for social efficiency and financial stability, are constantly searching for alternatives to reduce costs and improve the organizational processes (De Borger and Proost, 2012; Anas, 2012).

This paper aims to present the results of an economic driving program implemented in a public transport bus company in Brazil, in the period of 2010-2016. It highlighted the way the economic-driving can reduce costs for a bus company, emphasizing a practical application using experimented techniques of economic driving program (Kim, 2016; Allis and Fraga, 2017). The study can be justified based on its strategic and environmental value. The rationalization of fossil fuels is relevant as they are non-renewable fuel sources and in addition, directly influences the environment and pollution, by burning it (Brand et al., 2013). Furthermore, it becomes an item of great impact on the results of the companies because diesel oil consumption takes large share of the total costs.

The studied theme is of high concern to managers, considering that the consumption of less fuel,

maintaining the same mileage, means raising productivity, what present positive outcome for the business. For administration the relevance is to contribute to the sharing of knowledge through the organization, making them more sustainable on the economic and environmental point of view. It is also important to disseminate the commitment to environmental issues to the employees, either through sustainable practices in the production process or encouraging other projects linked to sustainability, the so-called environmental responsibility. These values will cross the gates of the company and reach society (Holden et al., 2013).

The methodology used for the study was: exploratory, descriptive, documentary and a case study. The study was conducted in an urban transport company, founded in 1969 in the city of Lages, Brazil. It has 240 employees, 57 buses operating on urban transport, traveling on average 260,000 kilometers and carrying an average of 550,000 passengers per month. The company is positioned in the urban transport market as a public concessionaire, got through bidding of Municipal Public Power. The study was performed in the traffic division. The data were collected from documents and management reports. Eighty drivers participated in the fieldwork. The fuel used in the engines of the bus fleet is the diesel S-1800, which has been improved over the years, since the Brazilian Federal Government started to invest to use cleaner energy sources.

It was developed parameters to calculate the volume of spared fuel based on the numbers of thirty-eight vehicles, operating at a fixed line, by averaging the consume of each bus during the year 2008-2009. To calculate the amount of CO_2 that the company no longer pumped into the atmosphere it was used the parameters provided by Brazilian Company for Environment and Agriculture Research (EMBRAPA - *Empresa Brasileira de Pesquisa Agropecuaria*). It was calculated the volume of brake linings consumption using Excel spreadsheet to compare the expense volume before and after the implementation of the economic driving program.

2. Passenger Urban Transport in Brazil

The urban public transport by bus is an essential service to the Brazilian population. In the last decade it has required improvements to the quality of its services in order to meet the needs of users. This happens especially given the increasing use of private individual transport, which can be considered unfeasible both in socioeconomic and in environmental conditions for cities that want to develop in a fair and sustainable manner (Cooper et al., 2014).

The bus is probably the most widespread collective mode of transport worldwide. This is related to its flexibility, its ability to adapt to different demands, its simple technology and its ease of changing or creating new routes. In addition to the low cost of manufacture, implementation and operation when compared to other high capacity transport modes (Börjesson el al., 2017). The urban transport systems of Brazilian cities have a number of different types of vehicle operating passengers transport services. There are several manufacturers in the bus market and, consequently, competition becomes increasingly fierce. Every year there are new standards for vehicles being sold in the market due to the technological innovations proposed by the constructors (Corazza et al., 2016).

According to Gonçalves (2014) Brazilian cities face numerous problems related to urban transport what affects the standard of living for its citizens, such as: loss of mobility and accessibility, traffic congestion,

increasing environmental impacts of transport, greater travel times. Urban public transport systems, despite some major investments in specific cities or areas, it remains insufficient to meet the growing demand and has experienced cyclical crises mainly to the mismatch between costs, rates and revenues, as well as the shortcomings in the management and operation.

To reverse this situation it is necessary a revision of the current model of urban transport in the Brazilian cities, providing better mobility options, along with higher overall system efficiency. In order to achieve such results, public policies should be adopted to ensure: (1) better standard of living for all sections of the population, translated into decent transport, traffic safety and accessibility for carrying out the essential activities of modern life (Nævestad, Elvebakk, Phillips, 2017); (2) availability of an integrated transport network, working with social and operational efficiency, with effective priority to collective means; (3) high standard of environmental management, controlling the level of air pollution and noise (Schein, 2003).

2.1 Sustainability in Transport Operation

The transport sector has attracted the attention of the international community for being pointed as one of the biggest responsible for the intensification of global warming and its adverse effects on the earth's environment (Santos et al., 2010). Carbon dioxide (CO_2) is one of the most significant pollutants harming the earth's ecosystem. The emission of these gases cause the so-called "greenhouse effect ", what influences the rise of the average earth's atmosphere temperature. Diesel oil is a non-renewable source of energy. The process of burning fuel in a combustion engine, produces gases, vapours and particulate, and they are launched directly into atmosphere. The diesel emissions have the gas carbon monoxide, nitrogen oxides, hydrocarbons, sulfur oxides and particulate (black smoke), which contributes to increase greenhouse gases (Lee and Madanat, 2017; Kishimoto et al., 2017).

When 1 liter of gasoline gets to the gas station and even before combustion, it has already issued to the atmosphere 507 grams of CO_2. Similarly, 1 liter of diesel oil before being completely converted into energy in the engines already issued 510.4 grams of CO_2. Adding the CO_2 equivalent emitted from the burning of these fuels, 1 liter of gasoline emits a total of 3.65 pounds CO_2 equivalent and 1 liter of diesel 4.01 pounds CO_2 equivalent (EMBRAPA, 2009).

According to EMBRAPA (2009), data calculated on the basis of information provided by a bus manufacturer, in a 100 kilometres journey the diesel vehicle releases 29.69 pounds of CO_2 equivalent into the atmosphere. These values corresponds to the greenhouse gases emitted by industry in the extraction, refining, processing and transportation associated with the fuel, in addition to all the carbon dioxide produced in burning the fuel. A flex vehicle (engine technology able to use gasoline or ethanol fuels) that used pure gasoline emits, on the same distance, 35.10 pounds of CO_2.

Government institutions together with transport sector conducted studies in urban public transport in the major cities of Brazil searching for alternatives in order to change the energy sources for more sustainable solutions (Lanzoni et al., 2011). The studies concentrated on three main focus: the emission of local pollutants, including heat; the contribution of emission to the greenhouse effect, especially CO_2; and the alternative fuels in public transport by bus seeking to encourage experiments with bio diesel, mixture of bio diesel and ethanol, CNG and hybrid electric technologies (Burke and Zhu, 2015).

A first evidence of the studies was the confirmation that the set of renewable and non-polluting energy sources are not enough and are not even adapted to the automotive market for use on a large scale, despite the steps already taken towards hybrid and electric vehicles, what are more efficient on energy consumption and non-polluting (Goodwin, Dargay , Hanly, 2004). Therefore, it is required more investment in research and development to grow in technologies solutions (Monzon et al., 2017). However, the problems about energy use are already on the table of managers. The immediate solution is to seek sustainable alternatives whether through adoption of available technological or management and processes innovations, or better, the combination of both.

Furthermore, due to the fierce competitiveness, one of the great challenges of government and transport companies is, on one hand to generate revenue and, on the other hand to reduce operational costs in order to guarantee the financial stability and to offer lower costs to the users (Gonçalves and Novaes, 1996). Studies and practical experiences show that the correct way to operate a vehicle reduces fuel consumption, providing financial savings for the companies and safety to the drivers and users, what may increase their sustainability (Verband Region Stuttgart, 2006). The environmental responsibility of organizations is based on sustainable growth that respects the environment (Araghi, Van Wee, Kroesen, 2017). According to Trennepohl (2009), environmental liability is the set of attitudes, individual or organizational, focused on the sustainable development of the planet. That is, these attitudes should take into account the adjusted economic growth to environmental protection today towards to guaranteeing sustainable life to future generations (Li et al., 2017).

2.1 Economic Driving

The economic driving tools includes a set of techniques that provides reduced fuel consumption, increases life for the vehicle component's, and seeks greater safety for the drivers and for the traffic (Luijt et al., 2017).

Fuel consumption in Brazil in 2012 increased 6.1% over the previous year, totaling 129.6 billion liters. There was an increase of 7 % in the consumption of diesel oil in the same period: from 52.2 billion liters to 55.9 billion liters (ANP, 2013). According to Silva (2001), the transport sector is responsible for 76% of the total consumption and, from this number, road transport takes 97%. The challenge of reducing this level of diesel oil use is justified considering the environmental impacts of greenhouse gases, and also due the trend of world oil reserves depletion.

Besides the environmental claims, managers of different organizations faces day by day great difficulties to reduce their production costs and to increase profitability, what is not different for transport companies that have on the top of their costs the diesel oil. Considering there are no longer fast perspectives in the horizon for large-scale replacement of fossil fuels, the rationalization is of great value for the economic balance in transport companies. The cost management works to provide information on opportunities to improve the economic results performance for the companies (Ito and Managi, 2015).

An important technological innovation alternative for transport companies to improve financial performance is to find a way to raise the average mileage with the same amount of fuel consumption. The economic driving aims to decrease the average fuel consumption and to increase the life for the vehicle

component's, based on technical tools and instructions for driving the vehicles (Miles and Potter, 2014). For economic operation the vehicle must be conducted avoiding accelerations and frequent and unnecessary braking. The vehicle speed must be compatible with the traffic conditions and the gear should be selected judiciously to ensure the best functioning of the engine, whenever possible, in the most economic engine rotation (Mercedes Benz, 2007).

The driving skills of the driver, according to obtained guidance and instructions, personal habits acquired during his work experience, determine in great way the fuel consumption of the vehicle. Points out some techniques for economic driving: (1) take advantage of the inertia of the vehicle; (2) using the tachometer to drive; (3) always travel with the vehicle in gear; (4) changing gears with ideal speed; (5) using the vehicle power only when necessary; (6) driving with traffic forecast; (7) using the brakes correctly; (8) do not use intermediate accelerations; (9) using the least number of possible gear changes; (10) maintain constant speed.

According to IMTT (2014), energy efficiency reference values for each vehicle and outside factors affecting the vehicle, the practice of an economic and eco driving, require the adherence to certain important principles. It is considered an economic-driving, the practice of driving a vehicle using the least amount of energy, with the lowest mechanical wear and the lowest environmental impact. The economic-driving depends on some key factors: (1) driving skills and manner; (2) choice of the route; (3) time savings; (4) the vehicle specifications; (5) vehicle maintenance and best practices (Bogoni, 2009).

The reduction of fuel costs can only come into practice when the professional driver applies the knowledge of economic-driving techniques. Therefore, training the drivers is essential. For acquiring the knowledge it is necessary to take specialised theoretical and practical lectures, applying a methodology easily understood by the drivers. According to Bogoni (2009, p. 29), in Brazil from the mid 1980s the training of professional drivers has been considered as necessary and strategic by transport companies. In the past the characterization of a good driver was only related to those who were not involved in traffic accidents. This situation changed as time passed because of the need to involve the drivers on the responsibility to reduce the operational costs.

For Spitzer (1997, p.175), nothing can distinguish better the exceptional companies from the mediocre than the commitment to training the staff. The most successful companies in the world are those that invest more in training their employees. Successful companies described by the author differ from others, when identifying new technologies, investing in searching for competitive advantages on several fronts, including that of his intellectual capacity and its dynamics. This environment dynamic is related to how the space where, considering knowledge and information became basic value for any organization.

The drivers have the power to decide to apply the knowledge acquired according to their motivation to perform their tasks, considering the human motivation refers to why people behave in a certain way. According to Chiavenato (1993) individual motivation for carrying out certain task is evidenced by acts and practices and the behavior is also a result of the work environment. The behavior depends not only on past or the future, but the current environment a person is works and his psychological perception of it. The force mentioned by the author is confirmed when the bus driver shows commitment to the company where he works, and also receives a good working environment, even challenged by the targets, he seeks to fulfill

them.

In their studies Oliveira e Orrico Filho (2004) affirms that the diesel fuel has a significant share of transport fare for the users. Therefore, the authors recommend more attention both in the measurement of fuel consumption, regulating the engines, improving technology, and implementing the national guidelines to improve the productivity and quality of transport program.

In order to conduct a performance analysis to measure whether the objectives are being achieved or not the company needs to take the historic series of individual average fuel consumption of each vehicle associated with the average fleet before the starting of the drivers training in order to compare them with fuel consumption after the completion of the program. In this way it can be established an indicator for the monitoring of the application of economic-driving techniques. This analysis can also be used for planning and for assisting decision making (Luijt et al., 2017).

3. The Case Study Analysis

The findings pointed out that each of the eighty drivers involved in the fieldwork drive the vehicle in a different way, resulting in different level of fuel consumption. Moreover, it was observed that the second highest operational cost is related to fuel consumption. According to the company managers, it was used a special fuel to avoid releases of greenhouse gases, that´s way fuel prices raised. The company implemented the economic-driving program in mid-June 2009 and gradually introduced all drivers till the month of December 2009. The experience that its success depends on some key factors: (1) driving technique; (2) choice of the route; (3) time savings; (4) vehicle standard and technology; (5) vehicle maintenance and best practices (Bogoni, 2009).

Based on the economic-driving features of Bogoni (2009), the company gave the following instructions to the drivers:

- The vehicle with electronic engine increases the average km/l when using the inertia in favor, with gear and no acceleration, because it enters fuel consumption zero regime in this condition.
- Using the tachometer to drive: it is a device on the dashboard to provide information to the driver about the engine rotation - in flat topography the driver should use higher gear and lower rotation.
- Always travel with the vehicle in gear, because the braking system will be required within a normal operating condition, with normal slit.
- Making changes gears with ideal rotation, guided by the tachometer: the driver must make changes gears according to the ground, using in flat topography and slopes the lowest possible rotations, and when going up hills use higher rotations and taking advantage of the full power of the vehicle.
- Using vehicle power only when really required: the vehicle's power should be used as little as possible because this operating condition greatly increases fuel consumption; the torch is the ideal track to achieve the lowest fuel consumption.
- Using traffic prediction guidance: the urban roads present several situations that require the vehicle to be long stopped including traffic lights, preferred roads, roundabouts, traffic congestion; the driver must use good traffic forecast to remain the shortest time possible under those conditions, avoiding slow gear for the vehicle what raises fuel consumption.

- Using the brakes correctly: the service brake must be used only to the vehicle stops or emergency situations; for speed corrections should be used other resources such as deceleration; it is also important the use of the brake motor right way, because the engine brake has maximum effect in high regime of rotation;
- Not using intermediate accelerations: intermediate rotations or raises are unnecessary because the vehicle is not in gear, so it does not contribute to power and speed.
- Using the lowest possible number of gear changes because when changing gear the engine stops the power between the gearbox, increasing the fuel consumption: using appropriate traffic forecast the driver identifies the real need to make the gear changes;
- Maintaining constant speed whenever possible, avoiding speed oscillations that forces higher engine rotations.

Table 1 shows a significant reduction of fuel consumption in the period of 2008 to 2016, and the amount of litres of fuel saved per year, resulting of the applied program in the company.

Table 1: Results of economic driving program in the period of 2008 to 2013

Year	Km run by the fleet	Fuel consumption (liters)	Average fuel consumption km/l	Saved fuel (litres)	Saved money (R$)
2008	3,126,395	1,305,766	2.39		
2009	3,082,860	1,258,885	2.45		
2010	3,134,396	1,174,390	2.67	102.454	183,653.02
2011	3,076,084	1,155,216	2.66	103.627	184,526.65
2012	3,028,129	1,122,401	2.70	113.537	208,777.65
2013	3,148,558	1,175,829	2.68	109.446	232,125.35
2014	3,164,540	1,173,580	2.70	118.546	268,399.99
2015	3,242,316	1,191,735	2.72	121.484	317,984.37
2016	3,096,478	1,145,075	2.70	117.242	328,441.74
TOTAL	**28,099,756**	**10,702,877**	**2.63**	**786.336**	**1,723,908.77**

Source: The studied company.

The data in Table 1 shows that in 2009, when the economic-driving program started, the vehicle began to run higher mileage per liter of fuel. In 2010 when all trained drivers were working, the average km/l rose further, stabilizing in the third year and going up even more in the fourth year. In this case study the saved fuel was calculated using the established parameters based on the consumption of thirty eight vehicles running in the same itinerary, calculated by averaging the bus of each fixed itinerary, during the year 2008-2009.

Table 2 shows the volume of CO_2 that have ceased to be emitted into the atmosphere after the introduction of the economic driving program. According to EMBRAPA (2009) and the data provided by the bus manufacturer, every trip of 100 km made by a diesel vehicle releases 29.69 kg of CO_2 to the atmosphere.

Therefore, the volume of diesel fuel saved could cover additional 292,210.71 km, what means that the studied company avoided the emission of a volume of 86,757.36 kg of CO_2 into the atmosphere in the period of 2010 to 2016.

Table 2: Volume of CO_2 that have not been released to atmosphere with the introduction of the economic driving program

Year	Average fuel consumption km/l	Saved fuel (liters)	Km that could be run using the saved fuel (Km)	CO_2 volume not released to atmosphere (Kg)
2010	2.67	102,454	38,372.28	11,392.73
2011	2.66	103,627	38,957.52	11,566.49
2012	2.70	113,537	42,050.74	12,484.86
2013	2.68	109,446	40,838.06	12,124.82
2014	2,70	118,546	43,905.92	13,035.67
2015	2,72	121,484	44,663.23	13,260.51
2016	2,70	117,242	43,422.96	12,892.28
TOTAL			**292,210.71**	**86,757.36**

Source: from the authors

Moreover, it is worth noting the economic aspect: the organization saved in the studied period R$1,734,971.75 (R$2.2064/l X 786,336 liters) values calculated using the price for a liter of diesel in February/2014. Likewise, it was observed there was a reduction in the consumption of replacement components and brake lining for the fleet.

Table 3: Brake lining consumption in the period of 2010

Bus number	Km year before starting the program	Brake lining consumption	Km year after starting the program	Brake lining consumption after starting the program
24	56,992	24	43,843	8
34	20,371	8	26,191	4
37	37,003	16	22,829	0
45	61,691	24	61,099	16
46	45,406	16	45,936	4
47	63,441	24	59,638	8
48	72,469	36	57,561	12
51	49,775	12	48,492	8
52	50,342	36	50,401	24
64	66,274	24	63,132	20
65	50,456	16	65,514	8
Total	**574,220**	**236**	**544,636**	**112**

Source: from the authors

It was found that the brake lining consumption in eleven buses compared to the previous year and after the economic-driving program, operating in the same itineraries and with the same drivers, reduced 47.46%. Furthermore, considering there were no replacement pads for the buses, it was also reduced time working for the maintenance. The tire consumption also receives less effects of friction of the brake lining components.

The results showed that the introduction of adequate training and efficient techniques of economic management it can reduce fuel consumption, replacement components and maintenance. Together to these advantages, the company consequently reduced the amount of CO_2 released to the environment, contributing to environmental responsibility and to avoid the harmful effects of fossil fuels.

In terms of economic results, the theory confirms the findings of the case study in the urban transport company. A significant reduction of fuel was found when the driver applied the economic driving techniques. The professional driver decides the way he would drive the vehicle but it is the companies' responsibility to motivate and monitor the operation in order to get the sustainable outcomes. Based on what Chiavenato (1993) wrote, it is evident that human behavior depends on the subjectivity of each person, and there is a direct relationship with everyday reality, which can directly influence the person considering his psychological state, since the human being reacts differently to the own present moment. However, the organization should take the responsibility and be concern that the environment and its own staff should not significantly affect the desired result. In this cases training is essential. At the beginning of training the company had the natural resistance of the human being to change. Therefore, along with the economic driving program were established criteria for awards and bonuses for attained goals by the drivers. Then, gradually the drivers started to adhere to the program. Today on average 91% of the drivers received awards and existing bonus.

The overall average fuel consumption presented by the fleet in 2008 was 2.39 km/l. That meant the vehicle had underperformed in operation in relation to the performance reported by the bus manufacturer. In the following year, in 2009, when started the training for the drivers, it was observed a small increase to 2.45 km/l. In 2010, the average fuel rose to 2.67 km/l and remained with the average through the year 2011. In the year 2012 was the peak performance of 2.70 km/l, which had the best performance, recorded to this day, reinforced also because the introduction of new buses to the fleet. In 2013 the average consumption returned to keep in 2.68 km/l, meeting with this result the company's goal, keeping the average diesel consumption reduction of 100,000 liters/year.

3. Conclusions

This study confirms that investments made in training and monitoring contribute to the positive outcome of the organization. It was seen reduction in operating costs that directly impact on the financial balance. Furthermore, economic-driving program brings tangible benefits in the economic and environmental aspects for urban passenger transport companies, when enable the control of fuel consumption, the reduction of brake lining consumption and the monitoring of emissions CO_2 released into the atmosphere. Moreover, qualified professionals can deliver better services for the population.

Professional drivers face in their daily work the challenge of safely carrying passengers with comfort and

courtesy in the heavy traffic of urban centers, requiring careful attention. In order to improve the working environmental conditions, seeking to reduce their operating costs, the transport companies need to incorporate in their processes innovative ways and best practices in management. The case study proved that economic-driving program, when applied by skilled drivers, increases the average fuel consumption per kilometer per vehicle, thus consuming less fossil fuels, increasing company profitability and preserving the environment.

Finally, it is well known that motor vehicle impacts negatively on air degradation in urban centres since it launches every day huge amounts of pollutants into the atmosphere (Ma, Xie, Han, 2012). In spite of several meetings being held worldwide trying to meet agreements to reduce the emission of air pollutants, seeking the preservation of the environment and the reduction of greenhouse gases effects, transport sector still remain as one of the greatest contributor to these effects. Therefore, this discussion should be among the priorities of transport managers, as the degradation of the environment does not meet the needs of sustainable organizations. We all have direct responsibilities to the preservation of the environment, and we all are committed with the future of the planet we want to leave our children and grandchildren.

4. References

Allis T., Fraga C., 2017. Tourism, public transport and sustainable mobility. Transport Reviews. 1-3.

Anas A., 2012. The optimal pricing, finance and supply of urban transportation in general equilibrium: A theoretical exposition. Economics of Transportation. 1, 64-76.

ANP (National Oil Agency), 2013. Fuel consumption increased by 6.1% in 2012.

Araghi, Y., Van Wee, B., Kroesen, M., 2017. Historic vehicles: an overview from a transport policy perspective. Transport Reviews, 1-19.

Bogoni T. N., 2009. Development of a simulator for the monitoring of economic steering techniques in trucks with the use of virtual environments. Dissertation. Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil.

Börjesson M., Fung C. M., Proost S., 2017. Optimal prices and frequencies for buses in Stockholm. Economics of Transportation. 9, 20-36.

Brand C., Anable J., Tran M., 2013. Accelerating the transformation to a low carbon passenger transport system: The role of car purchase taxes, feebates, road taxes and scrappage incentives in the UK. Transportation Research Part A: Policy and Practice. 49, 132-148.

Chiavenato I., 1993. Teoria geral da administração. São Paulo: Makron Books.

Burke A., Zhu L., 2015. The economics of the transition to fuel cell vehicles with natural gas, hybrid-electric vehicles as the bridge. Research in Transportation Economics. 52, 65-71.

Cooper E., Arioli M., Carrigan A., Lindau L. A., 2014. Exhaust emissions of transit buses: Brazil and India case studies. Research in Transportation Economics. 48, 323-329.

Corazza M. V., Guida U., Musso A., Tozzi M., 2016. A new generation of buses to support more sustainable urban transport policies: A path towards "greener" awareness among bus stakeholders in Europe. Research in Transportation Economics. 55, 20-29.

De Borger B., Proost S., 2012. Transport policy competition between governments: A selective survey of the literature. Economics of Transportation. 1, 35-48.

EMBRAPA, 2009. Mitigation of gas emissions in the replacement of diesel or conventional gasoline by bioethanol from sugarcane.

Gonçalves N. M., 2014. Integrated urban transport planning: accessible cities towards individual and collective development. Universität Tübingen, Germany.

Gonçalves N. M., Novaes A. G, 1996. Returns to scale and user's benefits in urban bus operation. CODATU. 7, 192-29.

Goodwin P., Dargay J., Hanly M., 2004. Elasticities of Road Traffic and Fuel Consumption with Respect to Price and Income: A Review. Transport Reviews. 24(3), 275-292.

Holden E., Linnerud K., Banister D., 2013. Sustainable passenger transport: Back to Brundtland. Transportation Research Part A: Policy and Practice. 54, 67-77.

IMTT (Institute of Mobility and Land Transport), 2014. Driving instruction manual. Economic and ecological driving.

Ito Y., Managi S., 2015. The potential of alternative fuel vehicles: A cost-benefit analysis. Research in Transportation Economics. 50, 39-50.

Kim J., 2016. Vehicle fuel-efficiency choices, emission externalities, and urban sprawl. Economics of Transportation. 5, 24-36.

Kishimoto P. N., Karplus V. J., Zhong M., Saikawa E., Zhang X., Zhang X., 2017. The impact of coordinated policies on air pollution emissions from road transportation in China. Transportation

Research Part D: Transport and Environment. 54, 30-49.

Lanzoni C. O., Scariot C. A., Spinillo C. G., 2011. Public transport information system in Brazil: some considerations about users' information demand at bus stops. InfoDesign. 8(1), 54-63.

Lee J., Madanat S., 2017. Optimal policies for greenhouse gas emission minimization under multiple agency budget constraints in pavement management. Transportation Research Part D: Transport and Environment. 55, 39-50.

Li et al., 2017. Logistics as a driving force for development under the Belt and Road Initiative – the Chinese model for developing countries. Transport Reviews. 1-22.

Luijt R. S., Berge M. P. F. V. D., Willeboordse H. Y., Hoogenraad J. H., 2017. 5 years of Dutch eco-driving: Managing behavioural change. Transportation Research Part A: Policy and Practice. 98, 46-63.

Matas A., Raymond J. L., Dominguez A., 2017. Changes in fuel economy: An analysis of the Spanish car market. Transportation Research Part D: Transport and Environment. 55, 175-201.

Ma W., Xie H., Han B., 2012. Development and evaluation of an economic-driving assistance program for transit vehicles. Energies. 5(2), 371-385.

Mercedes Benz, 2007. Operation Manual. Campinas: Daimler Chrysler of Brazil.

Miles J., Potter S., 2014. Developing a viable electric bus service: The Milton Keynes demonstration project. Research in Transportation Economics. 48, 357-363.

Monzon A., Castro A. G., Valdes C., 2017. Methodology to Assess the Effects of ICT-measures on Emissions. The Case Study of Madrid. Procedia Engineering. 178, 13-23.

Nævestad, T. O., Elvebakk, B., Phillips, R. O., 2017. The safety ladder: developing an evidence-based safety management strategy for small road transport companies. Transport Reviews, 1-22.

Oliveira G. S., Orrico Filho R. D., 2004. Analysis of urban bus fuel consumption. ANPET. 13, 1479-1491.

Rezvani Z., Jansson J., Bodin J., 2015. Advances in consumer electric vehicle adoption research: A review and research agenda. Transportation Research Part D: Transport and Environment. 34, 122-136.

Santos G., Behrendt H., Teytelboym A., 2010. Part II: Policy instruments for sustainable road transport. Research in Transportation Economics. 28, 46-91.

Schein A. L., 2003. User information system as a loyalty and attraction strategy. Dissertation. Federal University of Rio Grande Do Sul, Porto Alegre, Brasil.

Silva O. C., 2001. Biodiesel: an alternative to reduce consumption of diesel oil. Cenbio Notícias. 12, 3.

Spitzer D. R., 1997. Supermotivation: a strategy to dynamize all levels of the organization. São Paulo: Futura.

Trennepohl N., 2009. Environmental responsibility: a matter of business sustainability. Neomondo.

Urban Land Institute and Cambridge Systematics Inc., 2009. Moving Cooler: Analysis of Transportation Strategies for Reducing Greenhouse Gas Emissions. Washington, USA.

Verband Region Stuttgart, 2006. Bus driver training. EuropeAid. Stuttgart, Germany.

Wang Z., He W., 2017. CO emissions efficiency and marginal abatement costs of the regional transportation sectors in China. Transportation Research Part D: Transport and Environment. 50, 83-97.