

Public policies and sustainable urban mobility: a comparative analysis between Groningen and Campinas

Políticas públicas e mobilidade urbana sustentável:
análise comparativa entre Groningen e Campinas

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Abstract

The National Urban Mobility Policy encourages Brazilian cities to develop a series of actions in favor of public and non-motorized transport, but successful cases of promotion of sustainable urban transport are still scarce in Brazil. This article analyzes the experience of Campinas concerning promotion of bicycle transportation, comparing it with a successful international case, namely, the city of Groningen (the Netherlands). The analyses are based on interviews with public managers and specialists in the two assessed cities. The results show fundamental institutional factors for the success or failure of the cycling policy. It is particularly noteworthy that actions to discourage the use of private vehicles are as important as those to promote the use of bicycles.

Keywords: urban mobility, sustainability, bicycles, transport policies, comparative analysis.

Resumo

A Política Nacional de Mobilidade Urbana motiva os municípios brasileiros a desenvolver uma série de ações a favor dos transportes públicos coletivos e não motorizados, mas ainda são escassos os casos bem-sucedidos de promoção de transporte urbano sustentável no Brasil. Este artigo analisa a experiência de Campinas na promoção do transporte ciclovitário, que é comparada com um caso de sucesso no mundo, Groningen (Holanda). As análises baseiam-se em entrevistas realizadas com gestores públicos e especialistas nas duas cidades em estudo. Os resultados mostram fatores institucionais essenciais para o sucesso ou fracasso da política de mobilidade ciclovitária. Destaca-se, particularmente, que ações de desestímulo ao uso do veículo privado são tão importantes quanto as de promoção do uso de bicicletas.

Palavras-chave: mobilidade urbana; sustentabilidade; bicicletas; políticas de transporte; análise comparativa.



Introduction

Transport and mobility are fundamental to the economy and society. They ensure the well-functioning of the market, economic growth, free mobility of citizens, and job creation (EC, 2011). Mobility policies based on conventional cars have developed a “crisis of (im)mobility” (Silva, 2015), being put in check by the new challenges proposed by sustainability (BNDES, 2009; UNFCCC, 2014).

A study by Ipea/ANTP (1998), conducted in ten Brazilian cities,¹ indicated that the continuity of this model of urban mobility leads to three main types of diseconomies (IRIB, 2004): 1) Time: time lost in traffic jams corresponds to high losses in terms of Gross Domestic Product (GDP) and working hours (ibid.); 2) Excessive consumption of energy and resources: traffic jams increase the consumption of fuels and resources needed to improve urban mobility (EC, 2011; IRIB, 2004). Environmental resources are also affected (Alexandro, 2013); 3) Pollution: automobiles are responsible for excessive greenhouse gas emissions² (EC, 2011; IRIB, 2004; Ministério das Cidades, 2004; Ministério da Ciência e Tecnologia, 1998), in addition to noise and visual pollution. Such externality has a negative impact on the quality of life of the population (Bhat, Guo and Sardesai, 2005; Fernández-Heredia, Monzón and Jara-Díaz, 2014; Ministério das Cidades, 2004; Van Steen and Pellenbarg, 2008), intensifying the diseconomies of time and energy consumption, with an increase in inactive days and deaths in traffic accidents (Irib, 2004; Vias Seguras, 2015).

Actions have been taken to reverse the situation, from municipal to national government levels. One of them, the adoption of non-motorized transport, is supported by its various positive impacts on the individuals, the society, the environment, and the economy (Belotto, 2009; Bhat, Guo and Sardesai, 2005; Grous, 2011; Pucher, Dill and Handy, 2010; Sælensminde, 2004).

This study analyzes the effectiveness of public policies for cycling transport in Campinas, seeking to answer the following question: why, despite numerous initiatives in favor of bicycle mobility, its adoption in this city is so small? Our ultimate goal is to point out public policies to improve bicycle mobility and solve traffic problems in the municipality.

While there is no single method for determining the success of the non-motorized transport system, it is essential to analyze different cities that have adopted this model or are seeking to adopt it (Mercier et al., 2016). Thus, the analysis of sustainable transport policies in Campinas is compared with a successful international reference, namely, Groningen (The Netherlands). According to the report of Fietsberaad (2009), 37% of all trips are made on bicycles in Groningen, the highest percentage compared to other European “cycling cities.” Despite their geographical, morphological, institutional, social, and economic differences, the comparative analysis provides important information to assess the low adherence of users to the non-motorized transport in Campinas, which is especially explained by management and institutional aspects.

The analyses of this article are based on a literature review and qualitative interviews applied with managers and important players in the adoption of non-motorized transport. Carvalho's³ (2016) form has open-ended questions (23 questions for Campinas and 15 for Groningen) and multiple-choice questions (5 questions with several items for evaluation). The questions have been adapted and translated into English for application in the Netherlands. The first part refers to questions about non-motorized transport, the Master Plan, the Urban Mobility Plan, and the interviewee's perception of the functioning of this mode of transport. The multiple-choice questions address the city's infrastructure, municipal government actions, and changes for the sake of active transport.

The interviewees' participation was confidential. Therefore, none of the information can identify them. In Campinas, an employee of the transport policy area was interviewed (interview A). In Groningen, two professors from the University of Groningen (interviews B and C); an employee of the cycle planning sector in the province of Groningen (interview D); and an employee of the "Groningen energizez" campaign (interview E) were interviewed.

This article consists of four more sections, in addition to the introduction. The second section analyzes the determining factors for the use of bicycles. The third section presents the historical context of cycling transport policies in the case studies: Groningen and Campinas, highlighting the failures of policy conduct aimed at stimulating sustainable transport in Brazil. The fourth section brings together policy suggestions

found in the literature review that could serve as a guide to improving the use of bicycles as a means of transportation, especially for the city of Campinas. Finally, the fifth section presents the final considerations.

Determining factors of bicycle use

This section analyzes the determining factors for cycling as a means of transport. From a broad review of the literature, the main structural factors that explain the adoption of bicycle transport are: a) adequate infrastructure and facilities; b) spatial distribution; c) topographic characteristics; d) climatic characteristics; e) demographic and socioeconomic characteristics; f) safety.

Studies by Nelson and Allen (1997) in the United States concluded that the number of cyclists grows proportionally with the availability of cycling infrastructure. Dill and Carr (2003), analyzing data from 2000 for cities with more than 250,000 inhabitants in the United States, indicate that every mile created of cycle paths leads to an increase of one percent in the number of cyclists. These results suggest that workers will use bicycles if the infrastructure is adequate (Bhat, Guo, and Sardesai, 2005).

But bike paths, bike lanes, sidewalks, and public transport are not enough. According to Bhat, Guo and Sardesai (2005), adequate lighting, landscaping, parks, drinking fountains, commercial opportunities, and recreational places are elements that stimulate the use of the bicycle. The existence of playgrounds

and other attractions for children increases their physical activity and reduces the need for parents to drive in search of recreational opportunities. In addition, there is a need for personal hygiene and bike racks at the place of destination and home (Fernández-Heredia, Monzón and Jara-Díaz, 2014).

If the infrastructure is adequate, but the distance is too big, transportation by bicycle is no longer feasible (Fernández-Heredia, Monzón and Jara-Díaz, 2014). Despite being objective, this factor is affected by individual aspects, such as physical conditions, attitudes, perception of distance, and reason for displacement (Bhat, Guo and Sardesai, 2005). Besides, urban expansion has a negative effect on the adoption of non-motorized transport, as it increases the distances between places of interest. At the same time, a higher density can result in higher traffic volume, which would make streets unsafe for cyclists and pedestrians. That is why compact land use must be accompanied by appropriate facilities for cyclists and pedestrians (*ibid.*).

Additionally, with large variations in the route hilliness (total change in the vertical distance of the trip – whether of ascent and/or descent, compared to the horizontal distance), cycling becomes more complicated (Fernández-Heredia, Monzón and Jara-Díaz, 2014). Lack of connectivity between bike paths (lack of ramps, for example) inhibits the adoption of bicycles as a means of transport (Bhat, Guo and Sardesai, 2005) and also impairs the locomotion of people with physical disabilities in the city.

Weather conditions, such as rain, wind, and very high or very low temperatures, are also relevant. Hanson and Hanson (1977)

evaluated that the percentage of daily bicycle trips is correlated with temperature and the number of clouds. In addition, such a study outlined that “discretionary” travels are more sensitive to temperature changes and less sensitive to the number of clouds than commuting by bicycle to work (Bhat, Guo and Sardesai, 2005).

Karner, Hondula and Vanos (2015) conducted a study that combined urban meteorological simulation and non-motorized transport activity levels. The study showed that, although physical activity outdoors has an unambiguous social gain, it is also associated with damage to health due to extreme exposure to heat. Such periods also coincide with periods of increased concentration of air pollution. Given this, in addition to the appropriate infrastructure, the environment around should also be considered.

Regarding individual characteristics, analyses point out that, if a person has sedentary habits, using a bicycle becomes much more complicated (Fernández-Heredia, Monzón and Jara-Díaz, 2014). Younger people are more likely to ride a bike, while older people are more prone to walk. Usually, the number of male cyclists is higher than that of women (Bhat, Guo and Sardesai, 2005).

Concerning household income, having access to a private car decreases the probability of adopting the bicycle as a means of transport (*ibid.*).

Although the study by Pooley et al. (2013) in cities of England concluded that, regarding potential attacks, some women felt safer on bicycles than walking or in public transport. That said, the risk of accidents and fear of the bicycle being

stolen can hinder the adoption of this means of transport (Fernández-Heredia, Monzón and Jara-Díaz, 2014) and inhibit new people from experiencing it. Stinson and Bhat (2004) add the lack of sunlight to ride safely and the existence of dangerous neighborhoods.

History of cycling transport policies

This section analyzes policies to stimulate cycling transport in the cities of Groningen and Campinas. Table 1 shows a comparison between the two cities.

Despite their differences evidenced in the table above, the comparative analysis provides important information to understand the failure in the case of Campinas, guide public agents on successful experiences, and adjust them to local realities.

The case of Groningen

The Netherlands is commonly known as a cycling country (Pucher and Buehler, 2007). Historical, cultural, topographical, and climatic features influence this position (Ministry of Transport, Public Works and Water Management, 1999). But, like many other sources, this section shows that policies play an important role in implementing this means of transport. According to Scubelek (2008), a comprehensive traffic policy can describe almost 73% of the difference in bicycle use between cities.

According to Fietsberaad (2009), 37% of all trips are made on bicycles in Groningen, the highest percentage compared to other European “cycling cities.” Three factors explain such a reality: policy, coherence, and continuity (ibid.).

From the 1970s onwards, the excessive proliferation of automobiles led some European cities to reinvest in bicycles. On

Table 1 – Characteristics of Campinas and Groningen

Characteristic	Groningen	Campinas
Area	83.7 km ² *	794.6 km ² *
Population	201,000 hab.*	1,173,370 hab.*
Demographic density	2,401.4 hab./km ² *	1,476.7 hab./km ² *
Bike paths	200 km***	36.7 km*
Travels by bicycle ^a	37%***	2.2%**
Travels by vehicles ^a	–	38.5%**

Notes: *values for 2016; **values for 2011; ***values for 2009; ^aCompared to total travel.

Source: Fietsberaad (2009); STM (2011).

other continents, cars continued to be the priority, and this reality only changed in 1990 (Belotto, 2009). With the oil crisis (1973), the Dutch government encouraged cycling. Some houses that were demolished for the construction of new roads were rebuilt as the original model, revitalizing the space with priority for pedestrians and cyclists (Alexandro, 2013; Ministry of Transport, Public Works and Water Management, 1999). Several bicycle facilities and an extensive cycling network began to be built (Pucher and Buehler, 2007; Scubelek, 2008; C.R.O.W., 1993). In addition, policies to discourage the use of cars (with less available and more expensive parking, especially in central regions of the cities) were adopted to increase the mobility of cycling (Pucher and Buehler, 2007; Pucher, Dill and Handy, 2010; Scubelek, 2008).

In the 1970s and 1980s, cities with growth prospects were regulated to restrict urban sprawl, and new neighborhoods were built in the vicinity of cities (De Vos, 2015; Ministry of Transport, Public Works and Water Management and Fietsberaad, 2009; Ministry of Transport, Public Works and Water Management, 1999; Pucher and Buehler, 2007). It was also demanded that all companies and organizations with more than 50 employees should have a company transportation plan, focusing on bicycle mobility. Local governments have to make specific plans, build and finance bicycle facilities, besides create programs for cycling training, safety, and promotion (Ministry of Transport, Public Works and Water Management, 1999; Scubelek, 2008).

Additionally, Dutch traffic laws protect cyclists and convict drivers in an accident, except when proved that the cyclist was

disobeying the law. Children have classes on traffic and bicycle use inside the classroom and “on the road.” In some cities, the government lends bicycles to children who do not have them. Drivers also receive specific training on how to drive with cyclists on the road (Pucher and Buehler, 2007; Scubelek, 2008).

The city has more than doubled the length of bike paths and bike lanes in recent decades, reaching 220 km in 2006 (interview D). It is important to emphasize that it is unnecessary to have bike paths or bike lanes on all streets. Still, it is essential to have connectivity to provide a network for cyclists, as explained in interview B.

According to the cycle transport planner in the province of Groningen (interview D), many shortcuts for cyclists have been developed to ensure the direct connection and speed of this means of transport. Road signs were reduced as much as possible by building priority roundabouts for bicycles. When this is not possible, cyclists have separate traffic lights, and sometimes they are given two phases of green light during each cycle. Besides, some regions allow cyclists to turn right even if the traffic light is red. There are green four-way traffic lights for cyclists at some intersections, which allows a faster and safer crossing for bicycles, especially when the cyclist needs to turn left. Various “bicycle boxes” (stop lanes at the traffic light in front of cars for cyclists) are also allocated in the city.

All these improvements make bicycles more accessible and more convenient than cars. In addition to the entire network, bicycle facilities are growing in all locations, which contributes to keeping bicycle use high and growing, as fear of theft and vandalism

discourages bicycle use (interviews B and D; Fietsberaad, 2009; Pucher and Buehler, 2007; Scubelek, 2008).

In 1975, the Circulation Plan (in Dutch, *Verkeerscirculatieplan Groningen 1968-1969 – VCP*) divided the urban center into four traffic sectors. The plan makes it impossible to pass through the city center from one end to the other in the four sections, and one must take roads outside the city center. In doing so, the problems of traffic jams, noise, air pollution, and traffic hazard were removed from the center. Traffic deceleration areas have also been implemented. Parking spaces were reduced in the city center and built close to the ring road, encouraging drivers to walk, ride a bike, or take a bus to the center (Fietsberaad, 2009; Hellemeier and Soltaniehha, 2010; Pucher and Buehler, 2007; Scubelek, 2008).

In addition to these factors, over the years, land use plans have sought to encourage the continued increase of this mode of transport by keeping the city compact, that is, limiting the type of low-density urban sprawl, which would have increased travel distances and required more use of cars; and promoting many activities within not very large distances to citizens (Fietsberaad, 2009). Since 1980, there has been little further expansion, and the city has developed at a distance of up to 7 kilometers from the center (Pucher and Buehler, 2007): 78% of all residents live and 90% of all jobs are within a distance of 3 kilometers from the center. The city has five radial routes linking the city center with the periphery and a ring road linking these routes (*ibid.*).

Despite the good infrastructure in many cities, especially in Groningen, the problems of jams on bike paths, long waiting times at traffic lights, lack of parking for bicycles, and theft of bicycles still represent aspects that need improvement (interviews B and D). Some cities have developed an official free registration of bicycles with the police. The police regularly check the possession of the bike, and, based on codes attached to it, can return it to the owner and detect the stolen ones (Pucher and Buehler, 2007). Another problem faced today, according to interview D, is the increase in the number of scooters, which widens speed differences and generates safety problems for pedestrians and cyclists. It is important to find solutions to these problems, considering the central issue of lack of space in the city, highlights the planner.

According to the coordinator of the program “Groningen energizes” (interview E), the city is seeking to enhance the already existing structure first, improving the conditions for the inhabitants who already use bicycles as a means of transport. Later, the city seeks to expand the number of cyclists. Over the next nine years, Groningen will pursue this goal by following five strategies: 1) priority for bicycles; 2) coherent bicycle network, focusing on door-to-door travel; 3) more space for more bicycles; 4) better parking for bicycles; 5) continuity and enhancement of the promotion of Groningen as a cycling city (Municipality of Groningen, 2015). This proves that the three words for Groningen's success – policy, coherence and continuity – still dominate and also serve as an example for other cities.

The case of Campinas

Campinas is one of the most populous and developed cities in Brazil. In 2010, the city presented the second largest GDP among the non-capitals of the country and occupied the eleventh position, including the GDP of the Brazilian Capitals (Ipeadata). In addition, it is a center of production and diffusion of cutting-edge technology, with the presence of prominent universities and research centers.

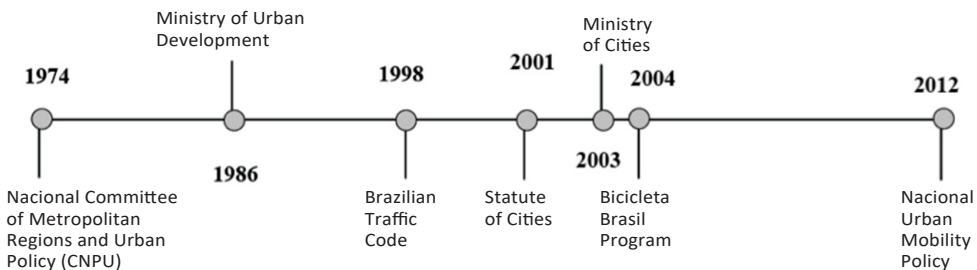
As well as large urban centers, Campinas presents numerous difficulties in transportation. With an increasing number of cars, Campinas is not immune to the problems generated by the adoption of automobiles as the main means of transport. After unsuccessful initiatives to stimulate

cycling transport, with the implementation of a bicycle rental system, the city hall plans to implement a cycling plan for the coming years, as will be detailed below.

Before moving on specifically to the case of Campinas, some laws and projects that have emerged in recent decades in Brazil will be detailed, seeking to encourage transportation by bicycle, as shown in Figure 1.

The Bicicleta Brasil Program was created in 2004 by the National Secretariat of Transport and Mobility (Semob), seeking to stimulate the development of cycling infrastructure. The program financed 57 projects related to sustainable mobility, but the number of transfers from federal government resources to municipalities is still small (only 8% of the R\$10 million available) (César, 2014).

Figure 1 – Historical line of urban mobility in Brazil



Source: Carvalho (2016).

In 2012, the National Urban Mobility Policy was regulated, which aims to

[...] contribute to universal access to the city, the promotion, and concretization of conditions that contribute to the implementation of the principles, objectives, and guidelines of the urban development policy, by the democratic planning and management of the National Urban Mobility System, art. 2nd of law n. 12,587. (Brasil, 2012)

The federal government demanded that all municipalities, up to 20 thousand inhabitants, should have an Urban Mobility Plan by 2015. It is a macro project made in small stages, and its main stage is to use public transport and non-motorized vehicles instead of cars. The law differentiates principles, guidelines, and objectives, which should guide urban mobility policies. Before the law, it was optional to follow such principles and guidelines. In 2012, it became mandatory to apply them in the Urban Mobility Policy. Thus, municipalities can be opposed if they do not follow them and start to have legal certainty when prioritizing collective or non-motorized means of transport (Brasil, 2012; Ministério das Cidades, 2013). Despite this, the principles and guidelines are very generic, and little has been done to advance sustainable urban mobility in Brazil.

Regardless of these attempts to stimulate transport by bicycle at the national level, Brazilian cities have a history of growth

without control and planning, creating large and disorganized cities without bicycle infrastructure. This difference is significant compared to Groningen, which sought to maintain a small growth radius (with a cyclable distance). Still, it is possible to think of policies and practices that use bicycles for short distances and use mass public transport for long distances. The authors recognize that the models of occupation and urban planning followed by both cities under study are very different, but, in any case, the Groningen experience serves as motivation and learning for other municipalities in the world.

Another factor of concern for Brazilian cities is the tropical climate. Karner, Hondula and Vanos (2015) showed that, although physical activity outdoors brings social gains, it is also associated with health losses, due to extreme exposure to heat and air pollution. Given this, in addition to the appropriate infrastructure, the environment around should also be considered.

The lack of success in the adoption of sustainable urban mobility policies in Brazil can also be explained by the policies adopted in recent years to facilitate access to private vehicles, such as the reduction of taxes for the acquisition of vehicles, gasoline subsidies, or free parking (Silva, 2015). In Groningen, the Circulation Plan of 1975 restricts direct car access through the city center, encouraging the use of bicycles, public transport, or walking to get around this part of the city.

The last factor that must be considered is the lack of safety in Brazil – which carries a greater weight in the adoption of bicycles as a means of transport –, despite the dangers of bicycle theft in the Netherlands, as pointed out by interviewee B.

More specifically about Campinas, according to the “Origem Destino” (Origin-Destination) survey, conducted in the Metropolitan Region of Campinas (RMC) in 2011, composed of 19 municipalities, 4.7 million trips are made daily, which represents an increase of 32% compared to the levels of 2003. Of this total, only 2.2% are carried out by bicycles (STM, 2011).

A cycling plan was prepared for the period from 2014 to 2016, corresponding to the implementation of more than 181.9 km of bicycle lanes (Emdec, 2015). It is important to highlight that many of the existing bike paths lack maintenance, being risky to cyclists. Many also do not offer negotiability at intersections, as Gondim (2006) proposes, nor an environmental comfort, with shadows and possibilities of hydration. Another important point is the lack of connection between bike paths; this creates a set of bike paths in each city corner, not a network. Many of them end on highways with heavy traffic and large speed differences, compared to bicycles, bringing risks.

Despite these attempts to improve the bike path network (far below what is necessary), there are no plans to expand other infrastructures, such as adequate lighting, drinking fountains, recreational places, spots for personal hygiene, bicycle racks, among others, highlighted in Section “Determining factors of bicycle use”.

Moreover, interview A has shown that the municipality of Campinas still has much to advance. No educational actions on the use of bicycles nor campaigns to increase the number of cyclists were released. Such measures would cause the adoption of the bicycle as a means of transport to increase, encouraging the expansion of the cycling system.

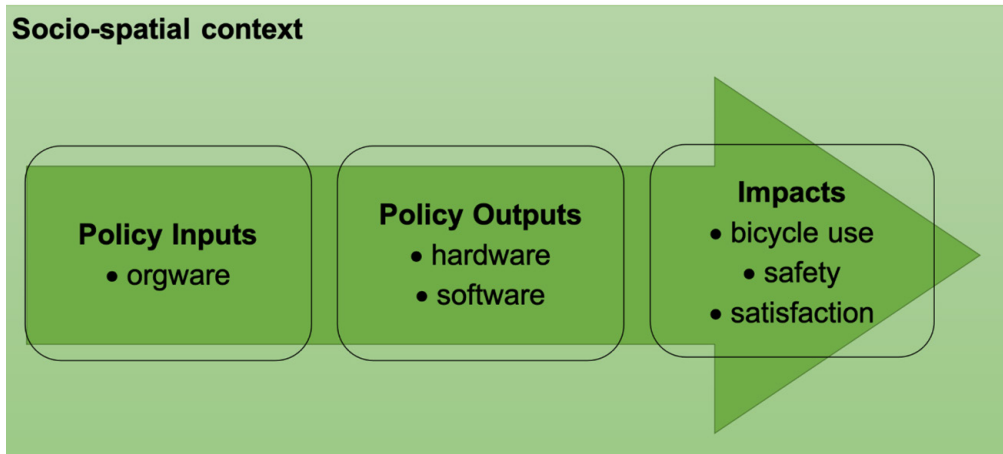
Proposals and policies

A literature review of policies was carried out to evaluate the potential for the city of Campinas, aiming to improve mobility by bicycle and solve traffic problems. The policies were divided following the study by Harms, Bertolini and Brömmelstroet (2016), with the definition being given by such authors (Figure 2) and the suggestions added by other authors, as indicated.

The “policy inputs” define the conditions and institutional framework in which a pro-bike policy was created. It is composed of the “orgware,” which can be defined as the application of policies and action from different actors, that is, the involvement of citizens, strong leadership, groups, means of financing, and organizational structure of policies for bicycles.

Tsay and Herrmann (2013) suggest national policy coordination and promotion of cooperation among federal entities to establish a long-term plan for sustainable urban mobility and expand the capacity of local governments to implement projects involving sustainable transport. It is also necessary to establish financing systems for transport, prioritizing

Figure 2 – Policies definitions



Source: adapted from Harms, Bertolini and Brömmelstroet (2016).

collective or non-motorized transport. In the Netherlands, transport policies are established by the municipality, but the other spheres of government also have this concern, as pointed out by the bicycle transport planner in the province of Groningen and one of the university professors.

In Brazil, this relationship between the three levels is still weak, and there are not many resources available for this purpose. Ang and Marchal (2013) suggest: 1) public-private partnerships; 2) revenues from indirect and close benefits generated by transport infrastructure, such as increased real estate value; 3) banks or infrastructure funds, to in the future disburse loans and guarantees to support private sector participation in sustainable transport projects; 4) green bonds,

such as carbon credits; 5) tax exemptions and temporary subsidies, as transitional support for sustainable transport options and other green technologies. The scheme proposed in Figure 2 highlights that this system is essential to ensure that the “outputs” will present concrete results. Thus, for Brazilian cities to succeed in promoting sustainable transport, it is of paramount importance that the federal government sustain the bases, providing financial and human resources.

The “policy output” is segmented into the provision of material infrastructure (“hardware”) and immaterial elements, such as education, communication, and information (“software”). The first one (“hardware”) deals with the provision of infrastructure, which must expand the attractiveness and

opportunities for adopting bicycles as a means of transport. It is important to point out that these policies, if not accompanied by others, are not enough to improve safety in bicycle mobility (Harms, Bertolini, and Brömmelstroet, 2016). Such a program can be divided into two types:

1) "Pull" factors: they make cycling more attractive, such as bike lanes, bike paths, cycle routes, improved intersections, and better bike parking. The Campinas Cycling Plan (in Portuguese, Plano Cicloviário de Campinas) focuses on expanding these factors. Nevertheless, several authors discuss the need for "discouraging" factors, as discussed in the analysis of the Groningen case.

2) "Push" factors: they make transport alternatives less attractive, such as traffic restrictions in the city center or other regions, like streets' narrowing, increased curves, application of "obstacles" to slow down the speed, increased travel costs, and decreased availability of parking lots.

The main action for the government in cities without infrastructure (such as Campinas) would be to reformulate the road system of the cities, giving priority to pedestrians and bicycles. The itineraries for the latter should be direct, with signaling and security. Transport planning should eliminate external constraints, such as danger and vandalism. The bicycle space must be fully segregated from motorized and walking transport, and wide enough to allow many bicycles, at different speeds, to be in it. In spaces where a fully segregated bike path is not possible, policies that decrease the average speed of motor vehicles or restrict their access

can be used (Fernández-Heredia, Monzón and Jara-Díaz, 2014; Pooley et al., 2013).

Gondim (2006) adds the importance of cycling planning with access to different regions of the city, negotiability at intersections or shared routes with other means of transport, and route efficiency. Silva (2015) explains that the possibility of accessing, with or without mobility restriction, any place, activity, or service should be guaranteed. Equal circulation between different means of transport should also be ensured.

Pooley et al. (2013) state that interventions for behavior change should make car use more difficult and less acceptable rather than being restricted to making walking and cycling easier and more attractive. Elvik and Ramjerdi (2014) suggest some economic policies, such as fuel price change, traffic jam charges, and tolls, driver award schemes that reduce car use. Elvik and Ramjerdi conclude that such policies help decrease traffic volume, reduce traffic jams, and minimize driving at speeds associated with a high level of emission of polluting gases.

The sustainability of non-motorized transport is associated with environmental comfort, avoiding bad weather conditions, and promoting a pleasant environmental experience (Gondim, 2006). To ensure this, Karner, Hondula and Vanos (2015) suggest providing opportunities for hydration, shade, and parks, as well as adopting opportunities to decrease urban heat, such as advanced paving technologies (such as permeable pavement), white or green roofs, forced evaporative cooling, and urban agriculture. Another less

important action, but positively evaluated by cyclists, would be to expand auxiliary facilities (cabinets, bathrooms with showers, covered bike racks, space, and tools for maintenance) (Fernández-Heredia, Monzón and Jara-Díaz, 2014; Pooley et al., 2013).

Additionally, to increase the number of users, it is of great benefit to allow people to experience the use of bicycles in real situations. Policies should provide public bicycle schemes and assist in training, especially for children (Fernández-Heredia, Monzón and Jara-Díaz, 2014; Pooley et al., 2013). Campinas tried such a policy, from an agreement with Banco Itaú, but, with the precarious infrastructure and other difficulties pointed out in this article, the system did not prosper.

In addition to normative regulation, democratic-participatory mobilization is decisive: the population needs to accept, defend, and demand changes in urban infrastructure (Chapadeiro, 2011). For this, many policies can also be used. “Software” policies aim to alter perceptions, beliefs, and attitudes, motivating voluntary exchange in transport choices.

Many studies argue that early childhood education about traffic is necessary for establishing cycling habits and skills that will be maintained in adulthood (Harms, Bertolini and Brömmelstroet, 2016). Traffic education is a mandatory subject in Dutch elementary schools and could be adopted in Brazil as well.

Policies should show that bicycles are a competitive means of transport for various types of travel, reinforcing pro-bike elements

(economy, fun, health, ecology) and thus the convenience of this mode of transport. Public authorities should invest in advertisements that highlight this aspect of the bicycle to encourage its use (Fernández-Heredia, Monzón and Jara-Díaz, 2014).

Besides, the study *Rethinking urban mobility* (Tsay and Herrmann, 2013) suggests the development of training and improvement of the research system to evaluate the policies adopted in this area, including the assessment of safety and environmental impacts, as well as the generation of cost-benefit analyses for projects proposed at the local level.

As previously pointed out, the “socio-spatial context” can influence policy outcomes. These factors include sociodemographic composition, the spatial structure of cities and neighborhoods, density and diversity of urban functions, topography, and meteorology. The use of bicycles is directly proportional to the density of built allotments, to the diversity of urban functions, and inversely proportional to the distance between destinations (Harms, Bertolini, and Brömmelstroet, 2016). The government should be concerned about regulating these factors as well, with projections of city expansion aimed at maintaining cycling distances. This difference is very noticeable between Campinas and Groningen. As explained, the city of Groningen was planned to grow within a radius of 5 to 7 km from the center. Campinas never had this policy, making it difficult to cycle in the city. Still, it is possible to think of policies and practices that use bicycles for short distances and use mass public transport for long distances.

There is a difficulty in generalizing the effectiveness of different policies. Culture, customs, and habits tend to encourage cycling in cities with already high levels of cycling, while discouraging cycling in cities with low levels of adoption. Research has shown that non-cyclists tend to be more bicycle-friendly if surrounded by other cyclists (Pucher, Dill, and Handy, 2010). In the case study, a policy that encourages cycling will be better accepted by non-cyclists in Groningen than in Campinas. The results of a pro-bike policy are difficult to measure. An increase in bicycle indices, a decrease in car ownership, and an improved safety indices are expected. Results in health, local economy, and living standards are much more complicated to assess. Such results should be made explicit, giving credibility to pro-bike policies to expand this type of mobility.

Final considerations

Faced with all the problems from using cars as the main means of transport, initiatives that seek to reverse this situation have been arising. Several developed countries have sought to reduce the use of cars, investing in public transport and encouraging the use of bicycles. However, the problem of urban mobility is far from its full solution. Brazil is trying to move forward, but several policies still favor the use of private vehicles. The National Urban Mobility Policy of 2012 had

a great influence on the change of focus in creating and implementing municipal mobility initiatives in Campinas, proving the need for laws that regulate the implementation of cycling infrastructure.

Despite the historical, demographic, and structural differences between Campinas and Groningen, comparative analysis can guide future policies and plans to reduce the distance between the two cities, adapting some experiences to the situation of this Brazilian city.

This study pointed out different policies adopted in Groningen, which could be considered for the context of Campinas. In general, the results highlight the low commitment of municipal administrations in Campinas. Groningen, in turn, develops consistent and continuous policies to stimulate sustainable transport. Several studies suggest actions to the local government to stimulate transport by bicycle, which go far beyond building cycle paths and bike lanes. Nevertheless, due to the complexity and scope of policies, such actions are long-term and must be adopted continuously and coherently to achieve the objective.

In addition, the political inertia that many Brazilian cities experience occurs due to the dissatisfaction that the population presents. The vast majority of the time, policies to stimulate cycling transport generate negative externalities to motorized transport. As the fleet of vehicles has grown year after year, this is a move contrary to

the paradigms that govern the current locomotion standard, which requires much more effort. Therefore, actions in favor of bicycles must be accompanied by educational events seeking to change citizens' perceptions

and policies that discourage the use of private transport. More specifically for Campinas, intermodal policies should be considered, with synchronicity between public transport and non-motorized transport.

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Notes

- (1) Belo Horizonte, Brasília, Campinas, Curitiba, João Pessoa, Juiz de Fora, Porto Alegre, Recife, Rio de Janeiro and São Paulo.
- (2) According to the Kyoto Protocol, in Appendix A, the greenhouse gases are: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), the hydrofluorocarbons family (HFCs), the perfluorocarbons family (PFCs), and sulfur hexafluoride (SF₆).
- (3) The form developed by Cristiane Carvalho (2016) was used to identify and analyze the critical points of the inclusion of non-motorized transport in the urban planning of the municipalities of the Metropolitan Region of Vale do Paraíba and Litoral Norte. The same form was used for the interview held in Campinas and was adapted to the context of Groningen.

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