

Brasilia's Urban Mobility Plan: review and speculations – an environmental approach

Introduction

Brasilia, the capital of Brazil, is a naturally born high carbon city. From its original road centered design to its expansion and occupation of land policies, everything has strengthened the premise that the car - and not the pedestrian - is a measure of both the public policies on urban planning and the smallest government actions which are taken. A journalist, telling in her daily column that her car had gone to the shop, and therefore she had been "car orphan" for "27 long and disorienting hours", wrote the following: "It may sound disrespectful and snobbish towards the one and a half million people who are carless in Brasilia to say so, but the fact is: who has no car in this city lives as a castaway" (Freitas, 2009).

Although the city itself favors the use of the car and has a fleet that in May of 2009 was composed of 1,086,015 vehicles – out of which 75% are cars –, over 63% of the population still gets around by public transport and non-motorized transportation (i.e. bicycle or on foot). However, this pattern of more sustainable mobility is not laid out by either governmental or population choice. It is rather the lack of options that drives the low income population to choose these means (Silva & Bowns, 2008). Public transport is in fact inefficient, inadequate, uncomfortable and dangerous (a report from April 2009 registered one case of robbery every five hours in the Federal District. PMDF, 2009). In addition, networks of sidewalks and bike paths are poor or nonexistent, which discourages the use of non-motorized transport and puts its users in situations of risk and discomfort (46.5% of the 456 traffic casualties in 2008 were pedestrians or cyclists. DETRAN, 2008). Thus, public or non-motorized transportation in Brasilia is, regrettably, "a poor people thing".

Not surprisingly, car is one of the most desired consumer good: the population grew 20% from 2000 to 2007, while the fleet of vehicles grew 65% over the same period. Due to the urban sprawl through suburbs, typical of the expansion of the city, a middle-class family of 5 who lives 20 kilometers from the city center spends 450 liters of petrol and emits 7.3 tons of CO₂ per month with their two cars. There are 60 kilometers traffic jam daily in the Federal District (one of the main reasons for such is the fact that 60% of the cars carry only the driver). Adding to this, there is a deficit of approximately 30 thousand parking spaces in the city center, therefore, cars invade green and public areas in search of space. Dissatisfaction is generalized and the socio-environmental damages arising from this situation are enormous.

In face of this situation, the Government of the Federal District – GDF – adopted in 2007 an urban mobility plan, in order to improve public transportation in the capital. The initiative, also known as Urban Transport Program: Integrated Brasilia can be considered a major breakthrough in this field, especially for having as general objective: "Promote mobility in the Federal District in order to increase the integration of urban areas and improve the equity and quality of life of the population". However, it focuses only on the public transport and it does not encompass all possible forms of displacement around the city, as well as the possible interactions between them. Also, there isn't an association between these possibilities of mobility and the land use and occupation strategies. Another worrying aspect is that the plan does not specify the option to change the model of mobility in the city, discouraging the use of the private car. This option is the only one that, with all its ramifications and implications, can make Brasilia become, gradually, a low carbon city.

This paper, after briefly describing the urban structure of the city, analyzes the objectives and interventions proposed by the Urban Transport Program of the Federal District. At the same time, comments are made regarding the findings of the Report on Strategic Environmental

Evaluation (a relevant supplementary document, aimed at obtaining funds from the Inter-American Development Bank – IDB) and its implications are discussed. Finally, the present study speculates about possible solutions that are complementary or alternative to the program and can contribute to urban mobility with low CO₂ emissions in the Federal District.

Brasilia

Brasilia is a peculiar city regarding its territory occupation. It is one of the most dispersed cities in the world and its population density, unlike other cities, increases as we move away from the center. This center is where 82% of formal jobs and 44% of total jobs in the city are concentrated; however, it is located 11Km away from the morphological center of the capital (Holanda, 2002). In addition, only around 15% of the population lives in a radius of less than 10Km away from it, which results in great commuting distances. The implications for mobility are evident. The map below (Figure 1) illustrates the reality of Brasilia, which is considered here not only as the Pilot Plan - the section that encompasses the design by Lucio Costa and is the core of the World Heritage area of the city - but the entire Federal District – FD: 2,455,903 inhabitants, which rises to 3,263,535 people, when considering the dormitory towns immediately surrounding it in the state of Goiás (IBGE). The Federal District's fleet is of 964.534 vehicles, which means an average of 2.5 persons per vehicle. The data are from 2007.

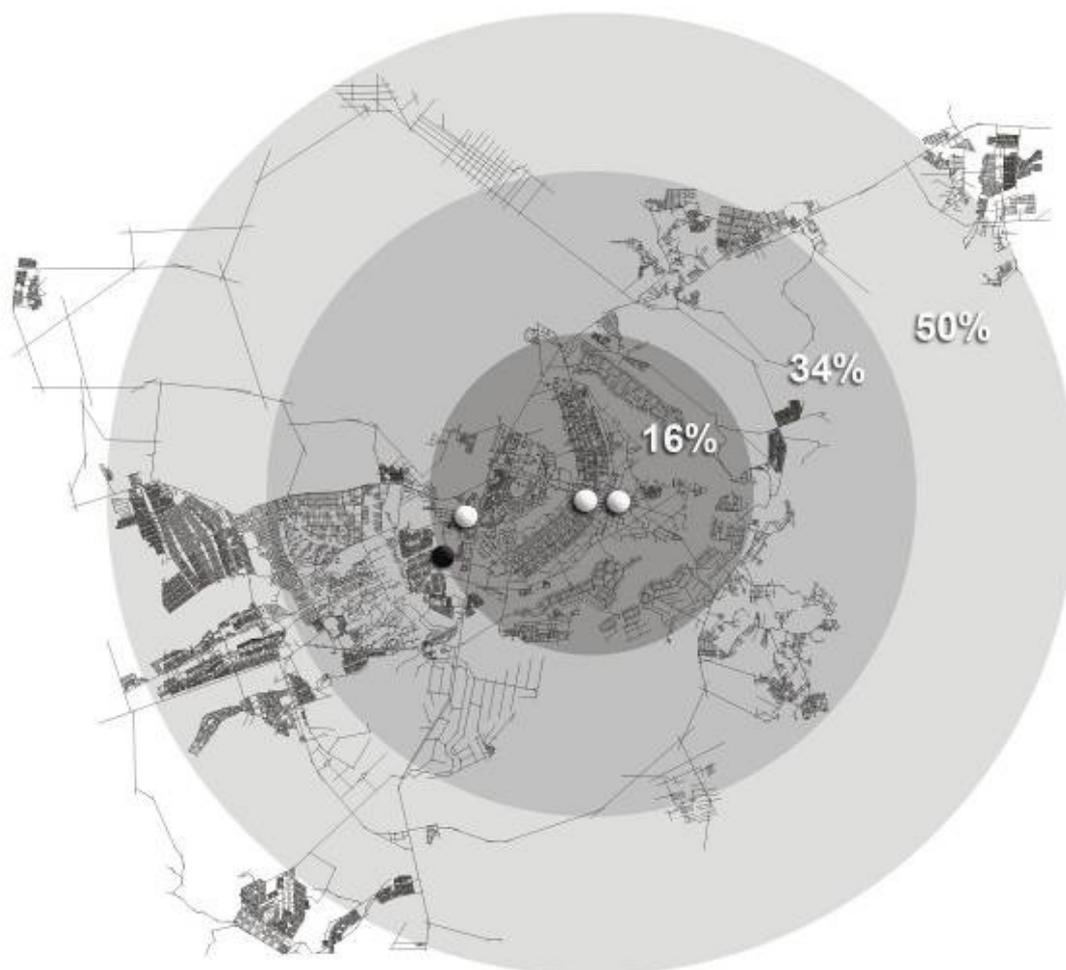


Figure 1 – Brazilian Federal District. The circles represent the 10, 20 and 30Km distance from the employment center. In percentage there is the proportion of the registered population who lives in each area. This percentage calculation was done based on the information from the population census of 2000 (IBGE), in which the information was separated by Administrative Region – RA. At the time, the Federal District had 19 RA's and today it has 29. The white dots represent the areas which concentrate the most jobs in the city and the black dot marks the geometrical center of the metropolis.

The expansion policies adopted since the city's construction were that of creating settlements based on single family housing, distant from the Pilot Plan, many of which were created from the displacement of invasions or slums. They were the homes of low income communities who depended on the employment opportunities of the Pilot Plan and who had as the only means of transportation the public road transport. These places grew in density but their employment opportunities are still irrelevant and its inhabitants, many of which have cars nowadays, continue to depend on the daily displacement to the city center.

Brasília is a city with various nuclei, and the neighborhoods destined to the low income communities are still being built away from the city center. The middle class began to illegally occupy areas around the city, many of which are public or environmental protection areas, a practice which is still alive. Also, the middle class has been the target of many real state projects, such as Águas Claras – the most vertical neighborhood of the Federal District – which was devised to justify the metro line between the Pilot Plan and the city of Taguatinga. The construction of the metro was a great step to articulate the nuclei, and today it extends from Ceilândia to Samambaia.

Not only the commuting movement, but also the lack of connection between the parts of the metropolis, the existence of urban voids and low density areas in places fully provided with infrastructure – including that of transport – are responsible for Brasília having today an expensive, inefficient and unattractive public transport model. The bicycle has always been associated to leisure activities, and the pedestrian has always seemed to have fewer rights than the automobile.

The Integrated Brasília Program: a Review

The Integrated Brasília establishes the Integrated Transport System of the Federal District and the Automatic Billing System, in accordance with the District Law 4011-2007, and provides other modifications in order to reach its mobility goals.

These measures basically seek to:

- improve the service of public transport - combat the illegal transport; fleet renewal; increase in the number of buses and metro trains; deployment of trams; expansion of the metro system; integration of transport means; introduction of automatic billing, creation of exclusive bus lanes; deployment of bus terminals, transfer points, and shelters;
- vent traffic - expansion of roads, construction of marginal roads; construction of new roads, widening of bridges and overpasses and construction of new ones.



Figure 2. Brasília Integrada – general interventions. Based on: GDF, 2007.

The progress that the program represents to the Federal District is undeniable. The current expansion of the subway lines; the linking of the airport with the city (an initiative which has to do with the fact that Brasília is one of the host cities of the World Cup of 2014) and the concern with a decrease in commuting time as well as increased comfort and safety for the users of public transport are all necessary and appropriate actions.

Nevertheless, the Program stumbles in some flaws within its approach. According to the Report on Strategic Environmental Evaluation, the program's aim is to implement an integrated transport system directed "to the lower income users, who are already its habitués", instead of being directed to all inhabitants of the city, especially including those who *do not* use. The main reason would be that these "habitués", in their vast majority, take bus or metro, and travel great distances on foot or by bicycle, for lack of choice. Even if the buses are newer and faster, as soon as they can afford to acquire and maintain a car, they will. "There is a comfortable way of living in each city. In Brasília, the only way is with a car", a resident of Brasília stated.

And why is that? Because, in spite of the improvements in public transportation, the city is still concerned with the comfort of the car and its users. There is no explicit policy discouraging the use of the car in the program, although it states clearly that the car should be rejected in favor of public and/or non-motorized transport. When an action in favor of the public transport is taken, without penalizing the private transport, the car remains as an even more tempting option.

Take it as an example the creation of exclusive bus lanes. When the bus goes faster, this is a positive factor to promote fairness and make public transport an attractive thing. However, the exclusive bus lanes will be made only on roads that will have their capacities increased, even though many of them already have three lanes. That is, the bus will have its exclusive lane, but the cars will have the whole road for themselves. A citizen summarized the issue in an Internet discussion group about the Integrated Brasília: "Everybody is rooting for the new system to be successful so that they can drive around freely in less congested roads! I don't see anyone with plans to use only public transport and leave their 4 or 5 cars in the garage!"

The intention of mitigating congestion is, undoubtedly, beneficial, and should be pursued. Nevertheless, the motivation for such should not arise from the desire to provide sufficient space for all the cars that circulate in the city today and that will inevitably become part of the current 5th largest fleet of cars in Brazil. It should rather be the commitment to a more sustainable and environmentally desirable pattern of mobility, in a scenario with fewer cars on the streets, even if the fleet grows. As it has been done successfully in many cities of the world, instead of increasing the number of lanes, building new marginal roads and overpasses, what should be done is the reduction of the road capacity destined to cars alone, in favor of other means of mobility.

There is another action which encourages the use of private transport, although it is not entailed in the Program, nor is listed among its supplementary action: the government's attempt to solve the problem of parking in the center, with the creation of 15 to 20 thousand new vacancies. These would be created by means of underground garages, built in a public-private partnership. However, the initial estimate was that the price for parking would be around 3 BRL (almost 1 Euro) per hour, which created controversy and resulted in the government stating it was still studying the proposal.

In parallel to the program, but not directly integrated in it, there are the projects and initiatives aimed at the non-motorized transport. Concerning the use of the bicycle, there is the "Pedala – DF", an ambitious project which intends to build 600Km of bike lanes around the city (42 of which have already been built). A local law also allows people to carry their bikes inside the subway train, but due to their over crowdedness, a lot of people have complained. Another supplementary action is the "rent a bike" service to be installed in the integration terminals. The price would also be approximately 3 BRL per hour, after the first 30 minutes, which are supposed to be free (in this case, the price did not create any controversy).

There is still another initiative aimed at recovering and extending the sidewalks, but this is not tied to a specific project to create a network of safe and comfortable footpaths, which would deserve some planning and a number of additional equipments. The pedestrian, according to a member of the GDF, "has been remembered. After all, Brasilia is not only a city for cars. We all turn into pedestrians, when we get out of the car!"

Thus, reversing the logic of the car requires not only a positioning about the desirable model of urban mobility for the present and future city, but also a change of culture. Fortunately, this is happening little by little, as the negative impact of certain choices begin to compromise the quality of the whole urban environment.

Adding to this, there is one of the biggest challenges to be overcome by people from Brasilia: raising the awareness of the need for adopting a pattern of land use and occupation which fosters a more democratic and sustainable city, with a better use of its infrastructure. In other words, the need to create a more compact and more dense city, with better distribution of activities in its territory. Brasilia needs to immediately stop growing beyond its current urban boundaries, and start growing into it. This brings about, of course, the patrimonial issue which, although worthy of the utmost seriousness and attention, should not lose sight of the fine line between *preservation* and *segregation*.

The Master Plan for Land Use of the Federal District (PDOT, from its abbreviation in Portuguese) – defines the structural network of public transport as an element that articulates the urban areas and leads the development of economic activities. Among the strategies mentioned by the Plan, the ones seeking to build new centralities in Federal District, in order to "reduce the socio-spatial segregation and establish relationships with neighboring counties" can be highlighted. The means for such would be: the increment of urban spaces (along the large production and flow expressways) and the deployment of multifunctional nodes (located within a radius of 600 meters of the terminals of integration).

The Integrated Brasilia does not mention the PDOT. Although they have some common actions – such as the creation of the Interbairros road, and important articulation of the urban nuclei – in general, it does not encompass the strategies and trends for territorial occupation. For instance, no action includes the nuclei of the north exit, or provides alternatives for a circular route. The Integrated Transport System, the way it was released so far, seems designed to facilitate the movement of users in their commuting, rather than to allow the wide access to the city by offering different alternatives of displacement. A public transport which does not allow us to get where we want, is not attractive. And that is another point in favor of the automobile.

The environmental issue

The issue of environmental gains that can be obtained from the execution of the Program is discussed very timidly in its documentation. In the list of expected results, for example, it says that "the improvements in road traffic and the reduction in congestion will contribute to the reduction of toxic gases emission to the atmosphere, with positive environmental effects such as improving air quality," since "constant speed vehicles tend to emit less combustion gases." The "positive environmental effects" are seen not as a *target* to be met, but as a *side effect* of actions such as renewal of the fleet, technological modernization and increase in the flow of traffic.

The Report on Strategic Environmental Evaluation, required by the IDB, is concerned with the monitoring of pollutants, but does not establish anything about the effect of greenhouse gases. Nothing is mentioned in the Program about the CO₂ emissions; therefore, there are no figures about either the current volume of CO₂ dispersed in the atmosphere, or the perspectives for its reduction, which is of the utmost importance to the world scenario. Still, even without figures and statistics, it is possible to infer that, by maintaining the logic of the car – which is apparent in the Integrated Brasilia program, by either naïvety or omission – the environmental damages will be incalculable.

The Report focuses on the environmental impacts that the construction works and implementation of the Program will generate in the neighboring areas, such as removal of vegetation or the increase of the rainwater runoff. The environmental vision of the Program is, therefore, of a localized character, not linked to the perception that the pattern of mobility of the Federal District has global implications. Nevertheless, these impacts for the local environment could be minimized if public transport was effectively prioritized.

It's worth mentioning specifically the deployment of trams in W3 Street, which is located in the World Heritage area and has got, in its 13.2Km length, a 10m wide central island full of trees, as well as trees on both sides of the road. The image that the city inhabitants have of the W3 is strongly influenced by landscape factors. The deployment of the tram in central island will necessarily remove all existing vegetation (this suggestion actually came after the Program had been released, once at first the solution was only an exclusive bus lane). The negative impacts of this decision will be both symbolic and environmental.

Speculations

The Integrated Brasilia offers the following interventions related to exclusive tracks for public transport and the metro line (Figure 3). It is interesting to compare this picture with the critical points of the city (Figure 4). In the latter, the places where the traffic virtually stops in peak hours are represented. It is possible to notice that there is no intervention devised to some roads, including the ones in the World Heritage area, especially the Monumental Axis, where there are large concentrations of jobs. More serious than that, the roads to be expanded correspond to the critical areas; however, this expansion does not follow the whole length of the road in question. Only 15, from the 30Km of jammed roads will receive an exclusive lane for public transport.

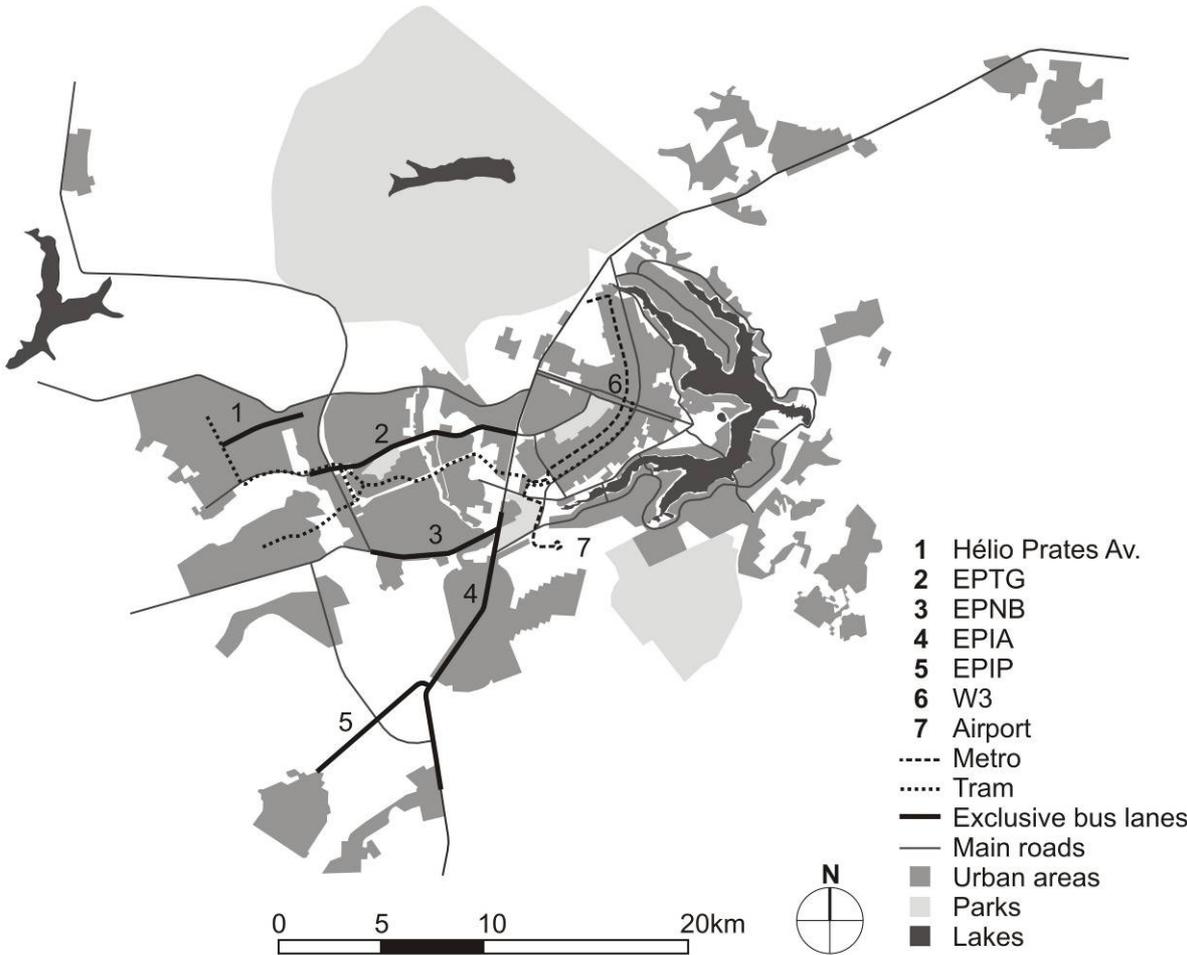


Figure 3. Brasília Integrada – exclusive lanes for public transport and metro lines.

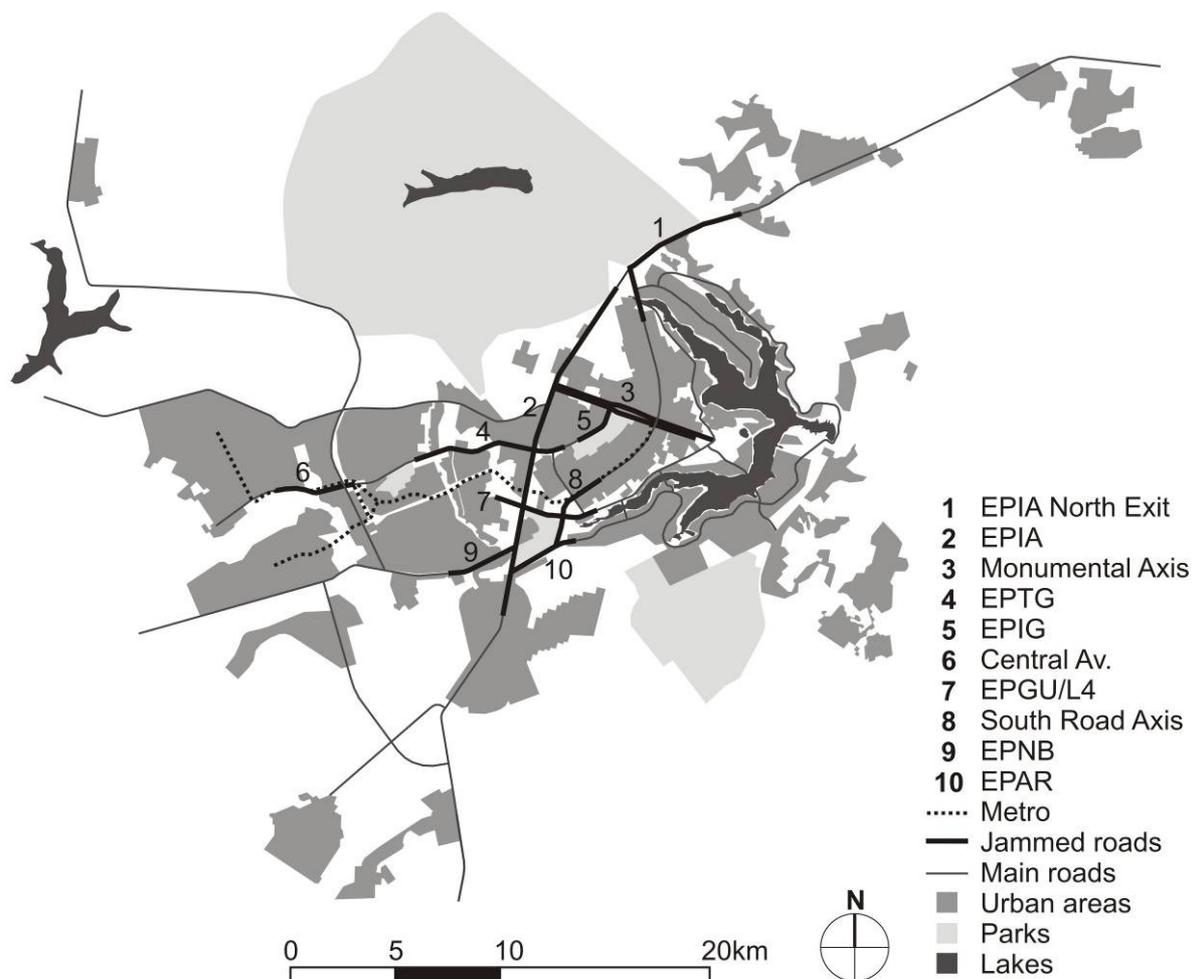


Figure 4 – Critical Points on the Federal District. Based on: *Correio Braziliense*, 16.03.2009

The other interventions are listed in Table 1.

Interventions	Roads
Implementing the exclusive lanes for public transport	Av. Hélio Prates, EPTG, EPNB, EPIG and part of the EPIA
Road adaptation – buses traveling with priority on the left lane	Av. Comercial, Av. Central, Via W3
Implementation of bypasses – to increase the road capacity	EPTG, EPNB, EPCL, EPGU
Implementation of an additional lane for traffic – to increase the road capacity	EPNB, EPGU, EPCL, EPDB, EPAR
Implementation of an additional lane for traffic and treatment for public transport	Av. Samdu, Av. Comercial, Av. Estádio, EPIG
Construction of special overpasses – to increase the road capacity	EPCL, EPTG, Águas Claras, EPVP, Guará, SIA, SOF/Sul, EPGU, EPNB
Implementation of reversible traffic lane, to increase the road capacity	EPCL
Construction works already encompassed (bypasses and connections)	EPCL, EPTG, Ceilândia/Taguatinga
Implementation of access to terminals in Asa Sul (South Wing) and Asa Norte (North Wing)	Plano Piloto

Table 1. Brasília Integrada - interventions on roads. Source: GDF, 2007

The proposals which follow are based on the issues raised along the paper and are aimed at encouraging the public transport and discouraging the individual transport, in order to reduce CO₂ emissions in the city.

Initially, this is done by considering a context of land use and occupation that, respecting the characteristics that make Brasília World Heritage, prioritizes the elimination of empty spaces and the growth within the limits of the current consolidated urban areas, in order to obtain a more compact city. It also prioritizes increased density and the mix of uses, while rejects the model of urban sprawl based on monofunctional neighborhoods, illegal occupations and interventions that cause great environmental impact.

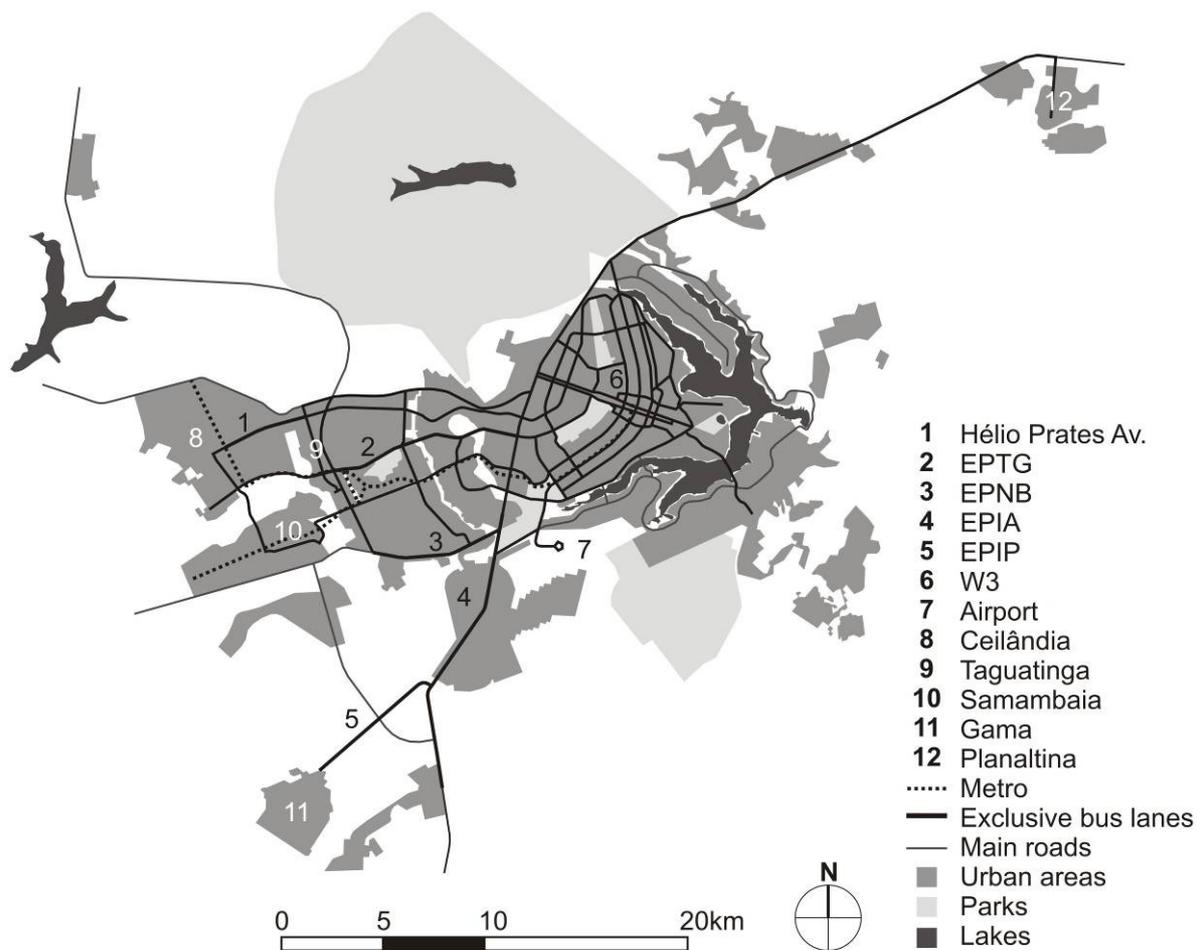


Figure 5 – Proposal

Using the interventions devised in the Integrated Brasília and the deployment of the integrated systems and automatic billing, this proposal increases by over 700% the number of Km of roads with exclusive lanes or corridors for public transport. In order to achieve that, in most cases, the solution was simply to reserve one or two tracks already on the road to the use of public transport, rather than expanding it. Among the guidelines that led to it are:

- reduce the circulation area of private transport;
- avoid that the roads become barriers in the urban fabric (this way, the transport by foot is stimulated, because the pedestrian is not forced to the discomfort or insecurity of using the underground passages or bridges to perform something as simple as crossing the street);

- transform the image of the roads into that of a street, so that the traffic may become more friendly, which brings more security to all involved, especially to pedestrians and cyclists;
- waterproof the soil as little as possible;
- maintain the maximum vegetation cover and
- save millions in financial, energy and environmental resources by not proposing to build additional lanes, bypasses or overpasses in the city (which will end up becoming more barriers for pedestrians), except in few cases where the current width of the track in relation to their role in the city so requires. This economy must be fully reversed in favor of public and non-motorized transport.

The solution was spread throughout the whole territory of the city, not only focusing on its southern and southwestern parts, and brings the following provisions:

- Ensure that the corridors of Helio Prates Av., EPTG, EPNB and EPIP came to the city center with exclusive lanes. Additional interventions in ways that are complementary to these main express roads, such as EPIG, prolonging EPTG, in which a little over 3Km of exclusive track for public transport should be built. For the sake of continuity of the corridor, it was necessary to create new routes.
- Do not carry out the interventions devised to EPTG and EPNB (marginal roads, widening of roads and construction of overpasses): only reserving a lane for the bus corridor.
- Contemplate the north-south axis (From Gama until Planaltina), which covers the most integrated and most central structural road in the city: the EPIA (Holanda, 2002). This provision seeks to fill a gap in the program, which is to ignore the north exit as part of the road. In it, the investment for the construction of exclusive lanes will be greater, because of its size and the fact that only 1/ 3 of it has three tracks.
- Resume the original proposal of opting for the bus on W3 Street, but now in corridor, a much more economical solution that preserves both the vegetation of the central island and the image of the street;
- Reserve exclusive lanes for buses in EPAR, the Monumental Axis and Road Axis. These three routes have not received any intervention in the program, but are extremely important for connecting the already described corridors with the employment center, the distribution of people in the city and the airport link.
- Establish a circular route, called Pilot Plan Ring, to structure the new occupations in the northwest area of the city, interconnecting the other corridors to the central area, and creating exclusive lanes to facilitate transportation in the World Heritage area of the city.
- Reserve, even on roads without great demand today, and on roads in places that cannot receive great densities due to Heritage restrictions (as in the case of L4 Av., which is located in a city area that has bucolic characteristics), exclusive tracks for public transport. The goal is to take the infrastructure that is already available, set up the culture of the use of the bus and rid the city of its expressway look.
- Reserve, on existing or proposed major avenues where today there isn't great demand, but where there is potential for such, exclusive lanes for public transport. The goal is to prepare them to absorb the activities arising from the implementation of multifunctional centers provided by PDOT.
- Articulate corridors and routes with exclusive lanes to cover the entire city, providing alternatives for promoting route alternatives and granting access to the Brasilia as a whole.

Table 2 shows a summary of the proposals and its calculation by Km, in each kind of intervention which will be needed.

Type	Name	Intervention (Km)				
		One lane reserved in each way exclusively for public transport	Two Lanes reserved in each way exclusively for public transport	Construction of an exclusive lane for public transport	Construction of an exclusive lane in each way for public transport and one for general traffic	Construction of roads with 3 lanes each way: two for general traffic and one for public transport.
Corridor	EPTG	21,7		3,6		
Corridor	EPNB	8				
Corridor	South-North Axis	26,5		50,4		
Corridor	W3	13,2				
Corridor	EPAR	4,8				
Corridor	Road Axis	17,2				
Corridor	Monumental Axis		9,8			
Corridor	Pilot Plan Ring			9	2	3
Exclusive Lane	L2	14				
Exclusive Lane	L3	4,1				
Exclusive Lane	L4	20				
Exclusive Lane	N3	2		3,5		2
Exclusive Lane	S3	2				2
Exclusive Lane	N4	1,4				
Exclusive Lane	EPAA	1,6		3,4		
Exclusive Lane	ESPM	4,4				
Exclusive Lane	Ponte JK	6,8				
Exclusive Lane	EPCL	14,3				
Exclusive Lane	EPGU	8,7				
Exclusive Lane	Ceilândia Centro	11,3		3,8	4,8	10
Exclusive Lane	Taguat. Norte					
Exclusive Lane	Comercial Taguatinga	5,7				
Exclusive Lane	EPCT	6,4		3,5		
Exclusive Lane	EPVP			2,4	5,6	
Exclusive Lane	Interbairros					16
Exclusive Lane	Taguat. Ceil. Samamb Ring.	3,5		8,8		
Total		197,6	9,8	88,4	12,4	33
				Total Corridors		169,2
				Total Exclusive Lanes		172
				Total interventions		341,2

Table 2 – Proposal and its calculation (in Km)

The proposal requires: the absolute priority to pedestrians in all actions; the use of vehicles for public transport that are safe, non-pollutant and suitable for physically challenged people; the implementation of all the signage and equipment related to the initiatives; the establishment of an easy and efficient information service for the citizen; the adequacy of bus lanes to facilitate the flow of public transport; the not building new parking spaces in the center; the charge of parking in public places; the creation of networks for bicycles and sidewalks throughout the city; establishing a plan to simplify the geometry of the roads in the Federal District to eliminate design solutions that support the traffic of cars at high speed.

Conclusion

Brasília will only start to become a low carbon city when public and non-motorized transport triumph. That means only one thing: they need to be an option. The people who freely opt for them based on their environmental awareness today are very rare, and one cannot expect that this awareness spreads to everybody or become actions immediately. It is, rather, the role of government and every citizen that is concerned with mobility in the city, to get involved in the debate, to listen and offer solutions. In regard to public transport, these solutions must necessarily make it more efficient, faster, more comfortable, more practical and more secure than the car. And, most of all, environmentally friendly.

The Integrated Brasília has come in a very appropriate time and has very good points, but its interventions are often diverting it from the solution of the problems, instead of reaching its goals. These speculations briefly tried to show that much can be done with the current generous road structure of the Federal District, without the need to make large expenditures. Also, one cannot separate mobility policies from the land use and occupation. Last, investing less, one can do much more for the sustainable mobility.

It is expected that, soon, the quest for environmental improvement can be a goal, not a side effect or consequence, of our policies in transport, and that, in Brasília, everybody can become car orphan ... by choice.

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