

## 639: Cities for Pedestrians – Urban Mobility fosters Sustainability

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### Abstract

This article discusses ways to implement sustainable transport, following the guidelines of the Sustainable Urban Mobility Bill to be approved by the Brazilian government. It refers to how the Mobility Bill guidelines could be implemented in tropical climate cities, in order to assist in developing the Master Plan of cities with less than 100,000 inhabitants. The strategies for implementation presented herein are based on several case studies, one of which, the small city of Quissamã, close to Rio de Janeiro, is presented in more detail. Quissamã is undergoing fast growth and thus is a fertile ground for new ideas and feedback about concrete possibilities of such strategies.

Keywords: sustainable urban design, urban mobility, alternative to cars

### 1. Introduction

Based on authors who perceive cities as urban ecosystems, this study considers the redesign of the urban plan by re-establishing the road system as a mobility policy that supports safety and higher standards of living, in possible detriment of automobile traffic. In considering traditional environmental standards, some of them could be considered sustainable principles that can apply to urban design, such as: ecological protection, urban refurbishing, sustainable transportation, inexpensive housing, communities with a sense of belonging, alternative sewage, natural drainage, integrated management of waters, alternative energies, etc. The article discusses ways to implement sustainable transport, following the guidelines of the Sustainable Urban Mobility Bill to be approved by the Brazilian government, also incorporating city climate and energy conservation measures.

The traditional zoning system in urban planning gives priority to vehicles and does not consider that barely 6% of the Brazilian population own vehicles. On the other hand, 40 million people have public transportation problems and 170 million people are pedestrians. The Brazilian mobility profile shows that more than 50% of trips within cities with less than 250 thousand inhabitants occur without the support of motor vehicles.

The road and street distribution, and in many cases of parks as well, is designed to meet the needs of automobiles and not that of pedestrians. Nowadays, automobiles have taken over roads that once were used for social exchanges and encounters. Valuing and fostering collective or alternative transportation, such as the use of bicycles or going to work on foot, are essential for sustainable urban planning, and could change this situation. A sustainable urban design may bring about better

mobility, since it generates mixed uses of the city, where housing, work and recreational activities interact. The mixed-use design diminishes the need for public transportation and, consequently, contributes to lowering both environmental and noise pollution.

Thus, this article refers to how the Mobility Bill guidelines could be implemented in tropical climate cities, in order to assist in developing the Master Plan of cities with less than 100,000 inhabitants<sup>1</sup>. The strategies for implementation presented herein are based on several case studies, one of which is presented in more detail.

### 2. Methodology

The methodology used analyses the criteria of the PlanMob<sup>2</sup> and the directives of the National Mobility Policy in relation to its applicability to small cities, through implementation of their Master Plans.

In this study, the city of Quissamã<sup>3</sup>, whose population is growing fast due to people migrating in search for jobs, is used as reference. This growth may lead to disorder and a loss of control in the city, in the near future.

After analyzing the criteria and their applicability in the case studies, this study presents a listing of proposals regarding items and sustainable

<sup>1</sup> There are (IBGE, 2000) 5.071 municipalities with up to 60 thousand inhabitants, where about 40% of the total Brazilian population lives.

<sup>2</sup> The PlanMob is a Law proposal about urban mobility, created by the Ministry of Cities of the Federal Government of Brazil (2007).

<sup>3</sup> The city is part of a region which is the beneficiary of royalties of the oil industry. Despite the fact that the source of the wealth of the city is a fossil fuel which is one of the main causes of atmospheric pollution, the city has taken measures which seek a sustainable development.

strategies to be considered in small cities, as suggestions for inclusion by the Sustainable Master Plans and implementation by urban planning practices.

### 3. Criticisms of the current mobility system

The concept of individual autonomy in contemporary culture permeates the discussion about mobility, because that autonomy, or the desire of each one to control their own time and space in the city, demands large surfaces for transportation, generating huge costs and collective regulation problems. In modern societies the automobile is seen as a symbol. The individual vehicle conveys the idea of liberty of movement by its owner, but, beyond being a means of transportation, the automobile is like an item of attire, meeting the demands of status seeking and narcissism of the modern and post-modern age. It has a profound repercussion in the lives of people, including a redefinition of society and space. The pragmatic aspects of the discussion about mobility – origin-destination, speed, and concepts about sustainability – are thus confronted by symbolic questions. Santos (1996) suggests that: “Symbolic action conditions rational action, so that feelings of power or self-esteem determine cultural forms of appropriation and utilization of technology, and the models of significance and representation are overpowering. The automobile culture is a limiting factor for the renovation of the concepts which underlie mobility projects”.

In the traditional zoning system, the automobile became the most important factor in urban planning. In the distribution of public spaces every street and avenue, and often even parks, are thought so as to meet the needs of automobiles and not of pedestrians. Streets, which used to be a place for social exchanges and encounters, are today taken by automobiles. Current urban designs, and even Master Plans, reaffirm and consolidate this vision of the city.

### 4. Urban Master Plans

With Brazil's constitution of 1988, a new urban policy was conceived. Law 10.257, of July 10, 2001, known as the Statute of Cities, created by the Ministry of Cities, offers a new instrument of power for the control and adjustment of solutions to establish quality and equity in Brazilian urban land use. The Statute mandates the institution of Master Plans for cities with over 20 thousand inhabitants, and for those which are part of metropolitan regions.

Master Plans seek to provide for the planning and organization of cities. They are an instrument of development and urban planning, with the participation of the community, and seek to identify and discuss problems, potentialities and solutions for the municipality, with the objective of building a better and more just city for present and future generations. Their function

is to orient the actions of public authorities and the private sector in the construction of urban and rural spaces in a certain region.

Every Master Plan must identify and analyze the physical characteristics, the problems and the potentialities of the city, the main economic activities, and its vocations. The Plan is formulated by local government authorities and representatives of the society, and seeks to direct urban growth. Its guiding principles are the improvement of the quality of life and the preservation of natural resources.

### 5. Sustainable Master Plans

A few Brazilian cities created Master Plans for Sustainable Development, which shows the beginning of a concern with the interaction between constructed spaces, urban management and the natural environment. These plans are recent and more common in smaller cities. Some examples can be cited, such as Quissamã, in the state of Rio de Janeiro, with about 20 thousand inhabitants, Rio dos Cedros, in Santa Catarina state, with about 10 thousand inhabitants, Gurupi, in Tocantins state, with 65 thousand inhabitants, and Palmas, in the same state, with 230 thousand inhabitants. These cities have shown a great desire to devote special attention to actions involving the urban environment. Still, many of the sustainable proposals are not implemented, or are applied incorrectly<sup>4</sup>.

In general, Sustainable Master Plans deal with questions such as housing, public health, sanitation and transportation, just as normal Master Plans do, but they focus on questions and proposals with an ecological viewpoint, such as incentives for public transportation and bicycles, segregation of garbage, social and technological inclusion, and others. But many of those initiatives are ineffective or inefficient, especially regarding urban mobility. Despite the well known importance of locomotion in urban structuring, many of these Plans treat mobility superficially and are not very conclusive in relation to specific actions.

The difficulty in incorporating the idea of urban mobility in urban and regional planning is a major reason for the crisis in quality of current Brazilian cities, strongly contributing to the current scenarios, where cities are unsustainable from an economic and environmental point of view.

### 6. Brazilian Policy of Urban Mobility

The Brazilian Ministry of Cities instituted the National Policy on Sustainable Urban Mobility (PNMUS-2004), and from there the PlanMob – Master Plan of Transport and Mobility (see footnote nr. 2, page 2).

<sup>4</sup> Often times, the interest of legislators in presenting such proposals have only political motivations, without really having a sustainable application.

### 6.1. PNMUS

Considering that urban mobility is an important factor for sustainability, the Brazilian Ministry of Cities adopted the PNMUS, National Policy on Sustainable Urban Mobility<sup>5</sup> (2004). In its view, mobility is considered a fundamental factor for urban planning and deserves special attention from Master Plans, especially those which call themselves sustainable.

Among the points which the PNMUS demands in the structuring of local policies for transportation and municipal urban legislation, the authors analyzed, summarized and selected the following:

- Reduction in the number of motorized trips;
- Revision of the urban design so as to promote non-motorized circulation;
- Revision of the patterns of circulation of vehicles;
- Incentives for the use of non-motorized means of transportation;
- Recognition of the importance of pedestrian locomotion;
- Furnishing mobility to handicapped people and those with restrictions on mobility;
- Prioritize public mass transit;
- Investments in sidewalks, urban greening, and public infrastructure with access to all citizens;
- Construction of more accessible spaces (without architectural barriers).

The discussion of questions relating to Urban Mobility in the city seeks to reach these objectives:

- Emphasize the use of public transportation and not individual transportation;
- Reduce congestion in the city;
- Reduce environmental pollution caused by various transportation means;
- Reduce the number of traffic accidents;
- Orient public investments in the transportation sector;
- Orient the equipment, the distribution of transportation infrastructure, and the circulation and distribution of goods and people in the city;
- Guarantee the appropriation of the use of urban space for the most numerous and vulnerable portion of the population (pedestrians, cyclists, etc.).

Summarized, these concepts are well expressed, but they are difficult to implement, due to the lack of citizen involvement in their elaboration. This leads to a lack of information and difficulty in

<sup>5</sup> Sustainable Urban Mobility is defined by ANTP (2003) as “the result of a set of transportation and circulation policies which seek to provide ample and democratic access to the urban space, through prioritization of mass transit and non-motorized means of transportation, in an effective, socially inclusive and environmentally sustainable fashion”.

modifying a transportation policy which is very entrenched in Brazil.

### 6.2. PlanMob

Recently, the Statute of Cities established the obligation of applying, in cities with over 500 thousand inhabitants, the PlanMob. In this study a theoretical application was made in a small city with fast growth, since acting in a city with under 100 thousand inhabitants may contribute to preventing it from becoming an unsustainable mega-city.

The PlanMob is a guide to planning and management which entails an innovative concept. It follows the principles established in the PNMUS, especially in the reorientation of the model of urbanization and circulation within cities.

The PlanMob highlights four basic understandings for transportation:

- Transportation must be part of a wider context, that of urban mobility, which considers quality of life, social inclusion and access to the opportunities of the cities;
- The mobility policy must be ever more associated with urban policies, and subjected to the directives of urban planning as expressed in the Master Plans;
- Mobility planning, treated in a wider fashion and in particular considering the sustainability of cities, must dedicate special attention to motorized and non-motorized models of mass transit, and offer universal accessibility;
- Mobility planning must be carried out with maximum participation of the society in the elaboration of its plans and projects, so as to guarantee support and political legitimacy in its implementation and continuity. This new concept of mobility planning, with a wider scope, needs to be incorporated by municipalities;

Starting from these concepts, the PlanMob establishes principles and directives to be followed in cities:

- Guarantee the diversity of transportation means while respecting characteristics of the cities and prioritizing mass transit, which is structuring, over individual and non-motorized means of transportation, valuing pedestrians;
- Guarantee that Urban Mobility occurs in an integrated fashion within the Municipal Master Plan;
- Respect local and regional special conditions;
- Guarantee the control of urban expansion, universal access to the city, improvement in environmental quality, and control of the impacts generated by land use on the mobility system.

These directives are relevant and adequate, but the authors think that it is a mistake to try to apply the PlanMob in cities with over 500

thousand inhabitants, which already possess a very consolidated urban structure, which makes it difficult or impossible to convert to a sustainable situation. Another question not contemplated by the PlanMob is the tropical climate and its implications for pedestrians and cyclists.

### 7. Quissamã as a Reference

In seeking to exemplify a real situation of a small Brazilian city with the political will to become sustainable, an analysis is presented of the mobility question, as contained in the Master Plan for Sustainable Development of Quissamã - PDDSQ (2006), in light of the directives and principles of the PlanMob.

The small city<sup>6</sup> of Quissamã, near the city of Rio de Janeiro, is currently undergoing fast growth, and is thus a fertile ground for developing ideas and obtaining feedback about concrete possibilities for the application of mobility policies (Fig. 1 and Fig. 2). The city was also chosen because it has a high level of human development<sup>7</sup> (Fig. 3, Fig.4 and Fig. 5).



Fig.1 - Map of Brazil showing Rio de Janeiro state.

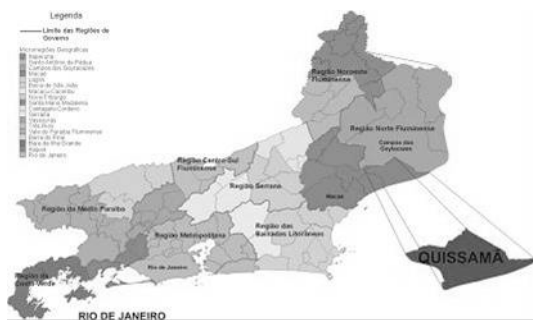


Fig.2 – Map of Rio de Janeiro state showing Quissamã.

<sup>6</sup> The city has about 18.000 inhabitants.

<sup>7</sup> The city has a sanitation system for most of its population; it has a high literacy index (all school age children are matriculated in basic free education schools – 12 years of study); it offers university scholarships to about 700 youngsters; there is a digital inclusion program through free wideband internet access for the population; and it carries out programs to promote public health, with the lowest infant mortality rate of the state of Rio de Janeiro.



Fig. 3 e Fig 4 - Cultural Patrimony of Quissamã - Central Square and Quissamã Museum.



Fig. 5 - Ambient Patrimony of Quissamã - Lagoons.

While Quissamã has a small population and only a small portion has an automobile, its original urban design and all its planning were thought out with the circulation of automobiles in mind.

The PDDSQ identified some demands to be implemented in the restructuring of the transportation network:

1. Create a new North-South urban traffic backbone, as a strategy to induce occupation of large empty spaces and ordering of the urban territory;
2. Revert the tendency of urban linear expansion along main traffic lanes, and promote a more compact and economical urban growth;
3. Improve the conditions of urban mobility and public transport through the development of a system for detouring heavy traffic, including intercity traffic through the historical center of town;
4. Promote consolidation of the use of bicycles as an important means of municipal transportation;
5. Give preference to pedestrian circulation, especially in downtown areas;
6. Improve local accessibility and thoroughfare conditions in neighborhoods, and establish traffic hierarchy according to road dimensions.

According to the suggestions of the PlanMob, these propositions present some contradictory points.

In proposals 1 and 2, despite seeking a new urban territorial ordering, in practice the main roads are laid out so as to reinforce the existing linear growth.

In proposal 4, despite the fact that the PDDSQ presents a project for increasing the number of bicycle paths, the number of kilometers exclusively destined for bicycles is still too small.

In addition, the proposal for bicycle paths does not meet the demand of the real commuting flow of bicycles in Quissamã, since it only proposes a circuit around the city and another crossing it. Also, despite a significant bicycle flow between urban centers, no thought was given to travel between them (Fig. 6 e Fig.7).



Fig. 6 - Main way with bicycle paths, but without no protection against the direct solar radiation.



Fig. 7 – The secondary ways do not possess bicycle paths.

As to proposal 5, despite being in a tropical zone, it does not propose protection for the pedestrian in relation to direct solar radiation. It must be mentioned that pedestrians and cyclists are not given priority when they must share space with cars, due to the lack of bicycle paths and the narrow sidewalks.

These questions present themselves with little variation, in the case of other cities with Sustainable Master Plans which were studied. From this observation, general proposals are described, which can complement the studies of Sustainable Urban Mobility in cities with a tropical climate.

### 8. Cities for Pedestrians

As a general proposal, it is reaffirmed that in tropical cities of up to 100.000 inhabitants alternative transportation means should be valued and promoted, such as bicycles or walking to work and/or public mass transit, which are essential policies for sustainable urban planning.

From there, specific proposals are made to permit a sustainable urban design in a small city. These proposals can be part of Sustainable Master Plans through their action strategies, making possible better mobility between rural

and urban areas, with the use of efficient public mass transit, and bicycle paths between urban centers close to each other. Some suggestions are described below:

- Limit the tendency of cities to expand linearly, which leads to increased distance of motorized trips, and the consequent increase in fuel use;
- Promote the integration between nearby cities through public transportation, building micro-terminals at the main entrances to the cities, with integration using minibuses circulating within city limits (Fig. 8). This way, the internal flow of buses is reduced, and quick accessibility between nearby cities is improved. The city can develop through the growth of various centers of mixed activities, all connected by public transportation of good quality.



Fig. 8 – Example of exclusive tracks for bus with micron-terminals in Brazil.

- In relation to intrastate travel, the connections between various urban centers or nearby cities must be improved in order to sustain fast and safe traffic<sup>8</sup>.
- Build separate “channels” for buses in existing highways and roads, or, if necessary, build new roads with dedicated traffic.
- Minibuses, with reduced speeds and low power, should be electric<sup>9</sup> or use alternative fuels, with low emissions.
- Restrict the use of cars in specific areas of cities, placing physical limits to their penetration.
- Tricycles can be used to transport small loads of goods and merchandise (as is already done in the distribution of purchases in supermarkets), which implies greater promotion of small shops throughout the city<sup>10</sup>.
- Build bicycle paths along main roads and some secondary roads, improving bicycle travel in the interior of cities and separating the cyclist from automobiles.
- In flat cities the bicycle can also be an alternative for medium distances. In cities with rough topography, detailed studies

<sup>8</sup> Brazil has 5,5% of all traffic accidents in the world (PlanMob, 2007).

<sup>9</sup> Brazilian electricity is mostly from hydroelectric generation, without polluting emissions.

<sup>10</sup> This question would demand a more profound analysis of the structuring of the city.

must be made in order to consider modifications of streets to reduce hill slopes, alternative roads, or the use of vertical transport means, such as elevators and skylifts with room for bicycles (or bicycle terminals).

- Study the peak use periods of bicycle paths so as to provide shading.
- Provide incentives for a project of public bicycles, which would be ceded to registered residents at “bicycle posts” in the interior of neighborhoods, following the example of what is done in Paris with the “Velo Lib” (Fig. 9). The resident could walk to the post closest to home, get a bicycle, and pedal to a bus terminal, which would have a place for returning the bicycle. This way there would also be integration between motorized and non-motorized transport.



Fig. 9– Example of “Velo Lib” in Paris.

- In tropical cities, pedestrian and cyclist paths should have protection from direct solar radiation, that is, they should have shading provided by trees or urban elements, which do not block the wind. They should also offer protection from possible “car attacks”.

## 9. Final Considerations

The transport network is a significant installation and an important part of the urban infrastructure. In any city, mobility is relevant to sustainability. In view of this fact, the actions taken with regard to the transportation network should be thought out giving preference to the pedestrian, the cyclist and public mass transit, not the automobile, as in the current urban design. As the Brazilian government itself opines, “the mobility model adopted in major Brazilian urban centers, which have almost naturally been reproduced in medium sized cities, has as its basic premise the imperative need for utilization of private vehicles. In this way, all the city or region is structured and develops so as to accommodate, receive and harbor the private vehicle and assure it the best possible conditions for locomotion in urban areas.” (PNMUS, 2004).

In order to achieve urban sustainability it is necessary to effect a paradigm change, considering pedestrians as the principal factor.

A city for pedestrians must possess appropriate dimensions, which cannot exceed certain limits, according to its topography. For a tropical climate, a city must be sparse.

Thus, in cities for pedestrians the discussion between authors who defend that sustainability can only exist in compact cities and that sparse cities are unsustainable, and those that defend sparse cities, loses reality in the case of small cities. Cities with few inhabitants allow a greater spatial extension than compact ones. This extension is necessary in tropical regions, whereas compact cities are more appropriate for colder climates. The discussion then becomes one pitting small, possibly sustainable cities, against large cities, clearly unsustainable.

Future steps of the research are related with the study of the distances to be roamed about with bicycles, or with tricycles, in agreement with the local topography. For rough places – not plane – there will be searched complementary mechanical elements, as bicycle lifting, or elevators, or integration with microbuses, etc. The possible limitation on the area of the city raised from the anterior considerations must be related also to other restrictions emerged from sustainable constrains. The limits will be affected as well by the local climate; as an example, the correlated legislation of the PlaMob will be very different for places with strong climatic differences as the North and Northeast and the South and Southeast regions of Brazil.

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