

# The urban transportation in time of crisis. The case of Havana.

## Le transport urbain en temps de crise. Le cas de La Havane

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**ABSTRACT :** the evolution of urban transportation in Havana, capital of the Republic of Cuba ( 2,2 millions inhabitants in 2000, a million in the fifties) went through ups and downs for more that one century. The last crisis happened in the early nineties of the XXth century. The lessons learned in this experience rich past will supply the basis for the design in the new century of an integrated and sustainable urban transport system for all in Havana, conceived as a contribution to the quality of life, with four prevailing objectives: equity, efficiency, economy of resources and ecological values.

**RESUME :** le transport urbain de La Havane, capitale de la République de Cuba ( 2,2 millions habitants en 2000, un million dans les années cinquante) , a connu, depuis plus d'un siècle, des hauts et des bas. La dernière crise s'est produite au début des années quatre-vingt-dix. Les leçons qu'on a pu tirer d'un passé riche d'expérience serviront de base, dans le siècle qui commence, à la conception d'un système intégré et durable de transport urbain pour tous à La Havane. Conçu comme une contribution à la qualité de vie, c'est un système où pourront prédominer quatre objectifs: équité, efficacité, économie de ressources et valeurs écologiques.

### 1 INTRODUCTION

#### 1.1 *The city of Havana, past, present and future*

La Habana, indigenous name, was settled as an Spanish town in 1519. Due to the excellent port and to the strategic position, it became the main Spanish naval station in the New World, where the ships of the fleet of the India loaded with gold, concentrated, before beginning the turn voyage to Spain. In 1861 the city reached 200.000 inhabitants, becoming the third bigger city of Spain.

Havana population in 2000 (according to estimates) is 2 186 632 inhabitants. Their rate of current growth is almost null. In the last four years it has only grown some dozens of inhabitants, general tendency for the whole country. In the last 50 years the population has been duplicated.

A commercial city till the XIX century has developed an important industrial capability, and in the last decade, foreign tourism has increased, been now her first hard currency income. In the future, isn't expected an increase in her population, remaining in the 2,2 million figure.

#### 1.2 *Urban public transport in Havana: flourishing and collapse*

In the first decades of the XX century, Havana can be considered in the selected group of world cities with a comprehensive public transport system. Trams and electric railways facilitated the population mobility, in a radial structured city with easy pedestrian accessibility to urban, suburban and neighbour settlements.

The world economic crisis of the XX century thirties, strongly shocked the sugar-dependent Cuban economy, motivating an abnormal growth in the Havana population, linked with land speculation, poor equipped new neighbourhoods, and bus lines increase whose opportunity apparent low cost was utilised by the foreign owners of the tramways and electric regional trains companies (linked with trans-national electric consortia) to close services till the total elimination in 1952.

Some short periods of economical blooming, consequence of sugar prices increase, and a boom of Havana as a gambling and leisure paradise for foreigners, motivates a fast motorisation increase. In 1958, Havana motorisation rate was similar to some developed countries big cities, in a country where

only 70 % of the labour force had total or seasonally occupation (during the 3-4 months sugar crowd).

From 1959 to 1990, the radical transformations in Cuban society due to the revolution has as important significance in the population mobility: full employment, full and cost free access to education, medical assistance, and cultural, sports and recreational activities. An average family spent only a huge 5 % of his income for urban transportation. A fleet of two thousands of standardised eleven meters, three doors buses, covers all the city, 24 hours per day, with rational walking distances to bus stops for an 80 % of the population.

From 1991 to 1993, the Cuban economy collapsed, due to the European socialist countries debacle. Shortage of fuel, spare parts, and replacement capability shortly paralysed the fleet, and only a few buses can survive.

Bicycles were the salvation. More than one million bikes were distributed at nominal prices to workers and students, assembled in technical schools. An existing factory produced the *camellos*, giant trailer buses hauled by military hauling trucks, and the city life can continue.

## 2 MOBILITY

### 2.1 *Colonial Havana and the early XX century mobility*

In colonial era, ended with the XIX century, Havana population mobility was intense. Passenger's railways (three lines transporting more than six million passengers en 1897), public horse hauled buses or "volantas", (more than 12 lines in 1891).

Trams were introduced from 1901 to 1920. In 1905, the system carried more than 29 million passengers. Ten years later, the figure was doubled. In 1925, passengers carried were 125 millions. Electric trains were introduced in the same period, connecting down town railway stations with new development urban areas and neighbor towns on existing railway lines. There are not separated statistics of those urban and suburban electric trains, but most be relevant, considering that they serve five lines, with headways from 15 to 30 minutes in rush hours.

### 2.2 *Middle XX century mobility*

There are not comprehensive data of such period. But public transport company's statistics were compiled by researchers (see reference XX), giving an

acceptable outlook of the motorized mobility. Pedestrian movements were huge, due to the very low bus or tramway ticket cost 0,06 Cuban pesos, (a Cuban peso equal to one US dollar). Employee's salary was between 40 and 80 pesos in such times. Only some employees could afford the four daily trips.

The Havana Electric Railway Company, tramways lines (186 km) operator, had sets a transportation record in 1945, reaching 145,5 million passengers (due to shortage of fuel, tires and spare parts for bus fleet operators as a consequence of the economic restrictions in Second World War years). Three years later, only 100 millions were carried. In 1952, the company was sold, and trams substituted by second hand buses.

There are not bus passengers carried information, but in 1955 were registered 1583 public services buses, mainly adapted trucks, locally manufactured.

A 1961 a transport survey reports 1,1 million as passengers carried in a labor day by buses. Havana population was estimated in 1,3 millions in 1961.

### 2.3 *Mobility in the eighties*

In 1981 the city of Havana had 1 929,4 thousands inhabitants. 3,1 million in a labour day motorised trips were calculated in the Havana Transport Study done by IIT, now Cetra.

The mobility in motorised transport in 1981 was 547 trips per inhabitant-year, from which 185 were for work purposes and 362 for socio-cultural reasons. The average trip time for work purposes was 41,5 minutes and the average distance of these trips was 5,7 kilometres, for all transport means. 59,57% of the work trips were carried out at 40 minutes or less.

In that year 84,5% of all the transportations in the city were assumed by the urban buses public service. Cars significance was only 6 %.

Concluding 1981 in the city were 1 997 eleven meters three doors buses that operated in 189 routes and the longitude of the route network was 747,4 kilometres, compared with an urbanised territory of 280 square km, and a total territory of 760 km<sup>2</sup>

The bus level occupation in several routes reached 13 standing passengers by square meter of saloon surface.

Biking was only a recreational mode for some, and full access to bus use by all at very low prices (0,05 Cuban pesos, flat fare), determines that pedestrian trips represent only a 6 % of the daily mobility.

In the eighties the individual motorization level was 32 automobiles per thousand inhabitants, including taxis, which was inferior to which existed in the late fifties.

#### 2.4 *The present mobility in the city if Havana. 1998 data.*

In 1998, was realised the last all-the-city mobility study. Were reported 3 920 139 daily trips more than 500 m long. From them, 961 699 trips were reported as “home to work”.

Purpose of the trip	Quantity of trips	%
Return home	1 734 224	44.2
<b>Going to work</b>	<b>961 699</b>	<b>24.5</b>
<b>Going to study</b>	<b>129 856</b>	<b>3.3</b>
Recreation	96 991	2.5
Personal matters	958 292	24.5
Others	39 077	1.0
<b>Total</b>	<b>3 920 139</b>	<b>100.0</b>

The modal split was striking. The predominance of the pedestrian trips (1 686 730) is significant. Also relevant are the small amount of car trips (217 656) and the notorious bicycle trips (373 641). Only 640 893 trips were done by public transport.

Compared with the 1981 mobility, the recent study shows that for a similar population, and only few differences in the number of trips, substantial changes has been noted in the modal split. Motorised trips decrease from a 94 % in 1981 to only 43 % in 1998, differential volume assumed by pedestrian and bikes. This can be valued by ecologists as a success, but a significant number of walking and biking trips are done at abnormal distances.

### 3 THE CITY OF HAVANA URBAN DEVELOPMENT IN THE XX CENTURY.

#### 3.1 *The city core. The radial city.*

Havana, as a coastal city, has his core around his port. Secular urban growth has been in close relations with roads construction, for carriages only till 1837 (construction of the first railway to the sugar rich area of Guines, in the south east), but railways based in other four directions in the first quarter of the XX century.

Electric tramways and electric trains development also had a remarkable influence in the city structure. The most populated areas of the city, even now, were covered with tramway lines or electric railways (the center, historical and new; the four intermediate municipalities and five of the seven external neighborhoods).

#### 3.2 *Existing railways right of ways.*

Electric trains disappear in the forties, trams in the fifties. Five of the six former urban and suburban railways lines already exist; only one was abandoned and occupied by neighbors and some streets. Even the former tramways lines have her presence in some broad avenues, mainly to the west.

#### 3.3 *Traffic intensity.*

Low motorisation rate (25 cars per thousand inhabitants) has a relevant influence in the high LOS of the main avenues in Havana, with only some traffic conflicts in the morning rush hour due mainly to a high level of trucks, pedestrians and bicycles and lack of ordaining measures.

Per example, in the Havana Bay tunnel, LOS is A even in rush hours. That’s why trucks traffic is prohibited, also motorcycles and bikes.



Fig. 1. Independence Avenue. Direction to Airport. Non rush hour

## 4 ACTIONS TO REMEDIATE THE LAST URBAN TRANSPORT CRISIS

### 4.1 *Corridor analysis and priority*

Once the urban bus fleet was affected by cash scarcity, some studies about relevant urban corridors done in the eighties serve to organise a few (only seven) directions that interconnect the core of the city with the main industrial, educational and housing areas. Implementing high capacity bus services in those lines permit at least that with a reasonable pedestrian complementary trip anyone can reach his working place, his educational center or his home.

#### The Metrobus concept

Metrobus is a transitional system between normal bus routes and a high capacity bus line in separated lanes. The possibility to run extra long buses in mixed traffic in some directions in Havana is possible because car traffic is low. The Metrobus system is partially installed, with only few facilities regarding to priorities, traffic signal coordination, etc. Substituting the present *camellos* by articulated buses is a goal, now deleted on behalf of hard money scarcity. The seven Metrobus lines, six radial, one semi-circular, carry near 300 000 passengers daily.

### 4.2 *Bicycles as a transport mode*

A program for the insertion of bicycles in the city was conceived and implemented in only one year. More than a million of bikes delivered to workers and students substitutes more than 1000 buses. The bikes program includes training, shop facilities, bike lanes and bike paths. The program was financed by the national budget, with a very small payment by the beneficiary.

### 4.3 *Pedestrians and walking facilities.*

Bus stops were diminished and bus lines coverage was reduced to a third. In the Metrobus system, stops separation goes to more than 1000 m, and in complementary lines stops separation was extended.

### 4.4 *Social scope*

Collapse of urban transport has a consequence: employees that try to found a new post near home. But if they do so, a loose of some benefits may happen. The government supports this relocation through subsidies to the new employer.

### 4.5 *Ordaining of the present bus system*

With the cooperation of RATP, the DPT (Transport Agency of the city of Havana) initiated en 2001 an improvement of the actual bus service, capable to increase services in main directions with the available equipment.

Main corridors will be served with Metrobus type lines, with linkage in interchange areas (already in an investment process) with the secondary lines, fed by the complementary system.

### 4.6 *Fares*

As part of the full concept of equity present in the Cuban social program, urban transport fares must be plain. The citizens that had to travel long distances to reach his work site or study center spend a relevant time, not covered by his wage. That's why the charge to his economy related to urban transport, a need for all, must be covered with a minimal budget, through a season ticket as much as possible, which cost may be shared with the employer.

## 5 LESSONS LEARNED

### 5.1 *Corridor schemes*

The Metrobus with the *camellos* system was not only a remedial solution. Is a corridor scheme, which improvement and extension, with separated lanes as much as possible, using low emission buses, electric buses or modern tramways will constitute a Rapid Transit System for the future city.

### 5.2 *Bikes*

Bikes can be part of a comprehensive transport system, if the government supports a comprehensive program.

### 5.3 *Pedestrian movements*

Pedestrian movements may have a substantial role in the city, not only motivated by unavoidability to pay the fare. But walking facilities and pedestrian safety must be a principal priority. In the case of Havana, this problem remains.

### 5.4 *Sustainability*

Any improvement of transport urban facilities must be sustainable. The question is not only to invest. Expenses are as relevant as investment. In the Ha-

vana case, increased oil prices were a constraint for diesel bus operation.

### 5.5 *Traffic calming*

Traffic calming is a need. As bicycling and pedestrians grows, speed is the main cause of casualties in traffic accidents. This problem has not been enhanced till now.

### 5.6 *Urban structure*

Urban transport is in close relation with the urban structure of the city. In the case of Havana, the master plan of the city has been adapted in order to facilitate a comprehensive transport system based on public transport.

## 6 PREMISES FOR THE FUTURE

### 6.1 *Sustainable Energy*

Urban transport in Cuba, with Havana as main system, relies in diesel buses. Growing prices and the question that the national crude, whose extraction is growing, can't be refined introduce a new approach. The cost of electricity production is diminishing, as national oil and natural gas are the source of electricity production. Urban electric transport systems, as in the past, can be developed in the long term.

### 6.2 *Compressed Natural Gas*

Use of CNG in transport begins in 1999. The city of Havana is improving the use of Natural Gas for domestic use. The use of CNG for buses is a sustainable possibility, and highly convenient for economic and ecological reasons

### 6.3 *Alcohol*

Cuban economy is partially sugar production dependant. Alcohol produced from the sugar cane (ethanol) can be a substitute for diesel in buses. Actually, gasoline – alcohol mix is used in some sugar mills complementary activities.

### 6.4 *National bus industry*

Developed in the fifties, bus bodies manufacturing was improved in the seventies and at present a modern bus bodies factory exists in Havana province. If electric buses or gas powered buses were an option, this factory is able to cope with some hundreds of buses assembling yearly.

## 7 THE GOAL FOR THE FUTURE

The Integral System of Mass Transport of the city of Havana in its evolution stage by stage must achieve that:

A well structured city facilitates walking, and great part of the short trips may be done on foot and in bicycle.

A comprehensive system of urban transport covering the whole city, physically linked, coordinated in fares and institutionally driven, oriented to desestimule car use.

Access to work or study may be done in no more than 40 minutes for at least an 80% of the inhabitants.

Mass transport vehicles intervals must be as needed to avoid saturation.

Light rail transit system (LRT), based mainly in existing railway lines, with few short tunnels, must serve to longest rides in main corridors.

The corridors of highest demand not covered by the LRT must be served by the Metrobus, equipped with electric, gas or alcohol powered articulated buses.

A mesh of small and medium sized buses using gas or alcohol may assure that the whole housing and working places areas would be served by the system, avoiding access trips longest than 400 m

A wide fleet of gas or alcohol taxis, with regulated and affordable fares, facilitate eventual services.

At least one of each five public service vehicles must be equipped with facilities for disabled people.

## 8 CONCLUSIONS

Havana has in process an urban transport improvement program, very limited for the lack of financial resources that characterizes the Cuban economy. Nevertheless it is necessary to think about a comprehensive system development as a master plan. Is not possible to conceive it, neither in the short term, neither in a single stage.

In the short term, it should continue bus routes net ordaining and improvement, according to the recommendations of the French technical assistance, adjusted to the possibilities of the country, followed by new articulated buses introduction in existing lines of the Metrobus. Some of this lines may be provided with electric buses.

In the medium term, secondary and complementary bus lines must be improved, introducing gas and alcohol buses. Electric buses system may be extended in Metrobus lines. Some existing urban railways can be reconstructed and electrified. In the mean time, the LRT system can be projected serving the main corridors of the metropolitan area.

In the long term, the reconstruction of the urban railways would be completed in the metropolitan area. Some lines will go on existing avenues, with short tunnels serving the city new and historical centers, and the Habana del Este new towns. The Integral Mass Transport system would be completed.

Transport system in the city of Havana must be conceived using existing facilities (non congested streets in the short and medium term, urban railways), and local resources (gas and alcohol as fuel for buses and taxis, less-cost electricity generated by national oil and gas for electrified sytems)

Doing so, the urban transportation system in Havana in the new century will be a huge contribution to the quality of life, a system where can prevail 4E objectives: equity, efficiency, economy of resources and ecological values.

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