

# Co-ordination of traffic management with investment challenges

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**ABSTRACT:** Population mobility in cities of one to 2 million inhabitants is provided and secured at strategic and intermediate transport levels. Most dynamic by modes and routes are the intermediate levels, which include various bus and non-motorised transport modes for low to medium income people at distances 25 km and more. In management these levels are adaptable to functional and investment challenges due to changes in demand, but need to be co-ordinated with strategic frameworks, as illustrated with the example of Harare.

**RESUME :** La mobilité de la population dans les villes de un à deux millions d'habitants est assurée à des niveaux de transport stratégiques et intermédiaires. Les plus dynamiques, tant en ce qui concerne les modes de transport que les dessertes, sont les niveaux intermédiaires, qui comprennent diverses sortes d'autobus ainsi que des transports non motorisés ( bicyclettes) pour des personnes à revenu bas ou moyen, sur des distances de 25 km ou plus. L'organisation de ces différents niveaux de transport peut répondre aux défis posés par des changements de la demande, en matière de fonctionnalités et d'investissements, mais ces réponses doivent être coordonnées avec la stratégie générale des transports, comme l'illustre l'exemple d'Harare

## 1 INTRODUCTION

Studies on urbanisation in Africa (Oucho J. O. 2001, Williams B. & Barter P. 2001, UNCHS 2001) show that by the year 2001 about 38% of the population were living in urban centres. Africa will experience high and rapid urbanisation to about 53% urban inhabitants by the year 2030. Big cities in developing countries, including in Africa those of one to 2 million inhabitants with a tendency of further rapid growth have some common characteristics linked to this process, as follows:

- Large poor populations live in peripheral formal or informal settlements at inaccessible locations;
- Both housing and transport policies do not assist access to employment, education, health and other services for all groups of population;
- There are low development levels of ineffective and unaffordable modes of public transport and low space-efficient designations of networks.

The urbanisation process is accompanied by deterioration of existing roads and lack of practical

programmes for effective actions to secure the mobility of the population. Mobility is further jeopardised heavily due to poverty problems.

This common situation has led to recommendations by some professionals to the World Bank to adopt a Code of Practice for Urban Liveability in order to influence future lending practices for infrastructure and urban development in developing countries.

Sustainable urban livelihood and urban liveability are inseparable from population mobility. Mobility concerns must entail relevant policies and patterns of land use, housing and services, which are integrated with urban transport systems.

Some contradictory predictions related to the Information Technology boom have affected the understanding of the urban development process and it was expected that the mobility of urban population groups would change dimensions. Such expectations do not assist in solving mobility problems. It seems that daily and weekly people's journeys will define urban mobility for many years to come.

Providing sustainable and diversified urban transport systems is a corner stone to liveable cities. The trends toward creating and pursuing a strategy for mobility for all urban population must be treated as one of the realistic successful means in the fight against poverty, as shown in the example of Harare.

## 2 OBJECTIVES AND METHODS

### 2.1 General objectives

During the last decade the local authority of Harare, the capital city of Zimbabwe with population above 1,2 million, has implemented some practical programmes/projects in housing and transport. Some studies were carried out in this regard. The general objective here is to analyse collectively the results of issues contributing to mobility at strategic and intermediate levels. In more detail the objectives in this paper are as follows:

- To appraise the level of mobility strategy and whether the development of the city is guided by a concept of “accessibility planning”.
- To assess the approaches to providing for sustainable and seamless in future transport network, which shall meet the population mobility needs.
- To derive lessons and recommendations for integrated spatial and transportation strategic planning, which can induce short to medium term affordable and beneficial projects.

Transport issues, linked to the above objectives and regarded as interconnected outcomes from the considered studies, concern the following:

- Railway and minibus transport
- Walking and bicycling as transport modes
- Transportation planning
- Investment challenges

### 2.2 Methodology

The general methodology used combines analytical and comparative approaches in order to achieve such characteristics out of all considered studies, which are consistent with problems of urban population’s mobility. Thereafter, an explorative approach assists in synthesising a holistic assessment and aimed recommendations.

However, relevant measuring, analytical and statistical methods were used for each and all particular carried out studies, as for example the

moving observer method for determining the speeds of minibus flows.

In this way, the final recommendations offered have an acceptable backing by reliable research findings, achieved by using relatively limited resources.

## 3 STUDY RESULTS AND DISCUSSION

### 3.1 Minibus transport

In mid-1990’s urban and peri-urban transport in Zimbabwe experienced positive changes with the introduction of minibus transport run by private operators (Maunder D.A.C. & Mbara T. C. 1995). This transport mode started playing very significant role for the mobility of a high percentage of urban population. Mostly captive passengers without other transport means use minibuses for work, school, social and other trips.

In order to collect and analyse data of minibus operations in mixed flows in particular traffic and road conditions and investigate some behavioural aspects, a study was carried out along a section of a major arterial road in Harare. Analyses of recorded data of 18-seater minibus operations in morning peak periods for 51 days have lead to some valuable conclusions (Vassileva L. D. 2001).

In summary, the results show that in morning peak periods of typical weekdays average minibus flows of 21bus/h travelled along a 2,7 km road section at average speeds of 24 to 30 km/h. Considering morning mixed traffic flows, it was found that the journey time delays, measured relative to the section, are from 25 to 80 % due to unsuitable road conditions. Section length of 1,75 km has only one lane per direction and the unsuitable road conditions together with the mixed traffic flows put pressure on minibus drivers. They brake the regulations and confuse the remaining drivers in the flows.

Minibuses/midibuses will continue to provide mobility in short and medium terms for a large share of population (Moving South Africa 1998, Vassileva L. D. 2001) despite of increasing fares. In long-term visions minibuses/midibuses are considered mostly as major feeder and shuttle modes integrated into seamless urban transport systems. In this regard, dedicated road network of at least two directional lanes is needed, which may provide for suitable average speeds, journey times and capacities with reasonable operational costs and fares.

### 3.2 *Walking and bicycling*

Walking as a legitimate mode of moving from one to another place was almost forgotten in transportation planning of the near past. In transportation planning of the 1980's and even 1990's walking distances of about 1 km were considered acceptable for work trips. While in the past 5-minute walk was the standard distance to transport stops and stations, today 10-minute walking distance and more is accepted as effective in a safe environment.

The actual practice in the cities of developing countries is different. With increasing bus fares in a context of economic hardship more and more people are seen to walk longer distances in Harare. This is particularly valid for men of a wide group between 18 to 50 years of age, who live in residential areas attached to the Central Business District (CBD) and even in some farther medium to high density neighbourhoods. A study to this effect is carried out currently, but no conclusive results are obtained yet.

The bicycle is a legitimate transport mode for some urban population groups in safe and bicycle friendly conditions (Hanlon J. 2001, Wachtel A. & Leviston D. 1994, Howe J. & Dennis R. 1993). In large cities like Harare bicycling may be treated as a potential mode, but it would require additional studies and consequently - conditional applications. The related issues are economic (affordability), social (age, sex, culture) and spatial (geography and climate, urban planning patterns).

Harare is known to be bicycle friendly with quite extensive path network in many residential areas and some links to the CBD. Due to lack of proper maintenance and safety improvements at some major intersections, the bicycle path network is under-utilised and deteriorating, or alternatively in some areas used by pedestrians only.

Lately bicycling becomes more popular even with some age groups of women and mostly for economic reasons. Distances of 25 km and more are observed to be commuted daily by men and relatively young women of up to 45 years of age. The journeys take part in mixed traffic conditions along major distributor and arterial roads like for example S. Machel Avenue, which leads to Msasa employment area at high speeds and no segregated bicycle paths.

In the last few years a functional change in land use in some areas has occurred. It stimulates walking and bicycling as modes for work trips. In areas

adjacent to and those not far from the CBD originally developed as residential areas in Harare more and more individual houses are converted into business premises and headquarters of some organisations. Maintenance of bicycle paths and sidewalks is non-existing. Traffic calming projects in these areas may become necessary in view of the current mixed land use.

Accident statistics of the period 1988-1993 for three major intersections on routes to the industrial areas and CBD show annual percentages from 1,1% to 14,3% of all recorded accidents caused by bicyclists and from 1,7 to 14,2% of all accidents involving bicyclists. Higher percentages appeared with higher traffic flows. It should be noted that these intersections have not been changed since 1993 and no significant changes in vehicular flows have occurred, but the number of bicyclists has increased.

Clearly, bicycling as non-motorised transport mode needs additional studies in order to determine the true requirements of the mode for commuting purposes and recommend particular improvements.

### 3.3 *Discouraging use of private cars*

Discouraging the use of private cars for daily trips to the CBD and other employment areas is an effective concept, when accompanied by concerted efforts to provide public transport and stimulate walking and bicycling.

As the Harare experience confirms, discouraging use of cars is also best achieved with introduction of a forceful programme. The City Council introduced a feasible system of pre-paid parking discs with effect from September 2000 over a CBD area of 5,5 sq.km with specific boundaries. Management motives were traffic congestion, parking shortage and giving priority to pedestrians arriving by bus transport.

Study to evaluate the operation of the disc parking system was carried out after eight months of its introduction (Mudoti P. & Vassileva L. D. In press). Through interviews of motorists and pedestrians, questionnaires to shop owners and office managers, observations, measurements and a sample street study it was revealed that the system is well efficient in discouraging use of private cars in the CBD. Accumulated vehicles in all categories of parking facilities and during different periods of the day are compatible with the available capacities of parking

facilities. The impact on street functions is lessened due to avoiding double and other illegal parking.

Negative aspects, such as rampant illegal parking of up to 15 minutes, fraudulent activities related to marking of discs and some problems with delivery vans, do not undermine the positive results.

The system does not require capital investment and maintenance as previously employed systems and is considerably easy in enforcement. The generated revenue is substantially larger than previously due to an increased turnover in parking and its collection is easier. Under relevant legislation part of the revenue may be used for other traffic management projects.

### 3.4 *Urban sprawl and patterns of development*

In theory both planners and local authorities agree that urban sprawl of housing and lack of hierarchy in patterns of road networks jeopardise provisions of mobility. Practice may differ under the pressure of demand and in the context of land availability.

Whereas creating hierarchical road patterns in order to stimulate walking and bicycling is a question of physical planning and design, the urban sprawl may entail costly provisions for population's mobility. High capital cost is needed for public transport systems of large capacity.

High density suburbs in Harare, i.e. Dzivaresekwa, Mufakose and Mabvuku, were developed along main railway lines. The National Railways of Zimbabwe (NRZ) used this strategic advantage and introduced in September 2001 commuter trains to the central city railway station at distances of up to about 25 km. The service is conducted jointly with the Zimbabwe United Passenger Company (Zupco), which is providing feeder bus transport at distances of 5-7 km. Passengers acclaimed the service as convenient and affordable, but according to the press the NRZ is losing around Z\$6 million a month, thus contributing to its debt and budget deficit.

The NRZ started a restructuring exercise and an improved effectiveness is expected, including of commuter trains in Harare and the second large city Bulawayo. At this point in time these strategic opportunities must be adapted to demands through proper management, based on studies of system operations and associated facilities in order to provide efficient and affordable transport for all with a possible commercial soundness.

The example confirms worldwide observations of 40 years that commuter railway systems of this scale can not be successful to basic standards, sufficiently reliable and affordable without public subsidies. Experience in some developed European countries shows that privatisation does not fully guarantee high standards of performance and safety.

## 4 LESSONS AND RECOMMENDATIONS

### 4.1 *Integration of urban and transport development*

Mobility needs of urban dwellers in rapidly growing large cities in developing countries can realistically be met at two principal levels, which are a strategic and intermediate levels. In general, these levels may be associated with major socio-economic groups of population and existing urban land use patterns.

The strategic level is best handled as a long term fixed right-of-way system, which can be refined in technical standards, renewed and/or doubled and improved in performance management. First and foremost condition for successful strategic level is to sustain an integral connection of land use and urban development with transport development by limiting urban sprawl and densification of inner urban areas.

Mass transit systems of improving capacities of 6 to 18 thousand commuters/h, depending on whether a system is fully independent or mixed and for trip distances of 10-30 km can prove to be sustainable and well adjustable to demand with proper planning.

For example, the railway tracks in Harare can be used more successfully with properly selected and experimented operational standards and safety regimes. The system is not independent and standards of 30 km/h effective platform speed, 3-7 km spacing between stations, dwell time of about 4 minutes, 3 to 4 cars in one train, headway linked to frequencies etc will correspond well to a near future demand and can be adjusted from time to time.

This strategic corridor has a potential to be upgraded and developed further with a dedicated fund, which must be created now. New land development must be co-ordinated with the corridor's capacity, based on performance appraisal and disaggregated trip generation models.

Road transport as integral part of the strategic level should be organised as express service on designated arterial roads of at least two continuous lanes per direction and signalised intersections. Some major roads in Harare were converted into one way traffic.

Together with increased capacities these roads are more convenient now for bus transport modes.

The most dynamic transport level is the intermediate level, at which the challenges of changing social needs of housing, healthcare, education and other services must be met.

This level may have many management “layers” according to city size, urban patterns and traditions. It is flexible in operational forms and relevant technical standards and challenging for innovative approaches. Because of its dynamism and flexibility there is a need to co-ordinate traffic management programmes in short to medium term and investment opportunities at stages and in continuity.

The intermediate level may include a variety of modes from walking to non-motorised and motorised road modes at travel distances from 5 to 25 km. Its modal diversity is an advantage with direct positive impact on accessibility for all people.

Pedicabs and rikshas are used in some countries, but these modes are acceptable for short distances. For Harare a recommendable non-motorised mode is bicycling. It is affordable, culturally acceptable and climatically suitable for relatively long annual periods. There is also some existing infrastructure.

It may be logical to expect that the information technology changes mobility and the numbers of trips of high-income groups are decreasing, but for low-income groups the numbers of trips will still increase. Currently employed people travel 5 days per week and unemployed people travel 2,5 times per week (Moving South Africa 1998). In Harare surveys on work trips were carried out in 1987. Some fresh data would be available from the latest sample study on mobility in 2001.

A modal variety of bus services are providing for the mobility of a large share of the population with increasing fares. From microenterprise point of view a study (SSATP Working paper No 54 2001) showed that 30-seater midibuses are more profitable than 18-seater minibuses. But the minibus mode is more flexible, adaptable and effective for daily operations on round trips at off-peak frequencies and can be more attractive for small operators on a franchise basis.

#### 4.2 *Planning and managing transport*

Needed and desired trips to employment, education, healthcare, entertainment, other services define the true goal of transport planning as planning for access and for proximity (Williams B. & Barter P. 2001).

The planned provisions must be equitable and address issues of availability, convenience, safety and affordability through continuous management. Traffic and transport management is a process and involves four formal activities, which are planning, organising, directing how to do, as well as co-ordinating and controlling. Without planning there is no management. The relationships between planning and management in transport vary depending on the levels of activities.

Transport plans have upper-most role to outline the framework for both strategic and intermediate levels. Leading planning concepts are integrating transport planning with land use and physical development, reducing demand for transport and diversifying transport. Ideally most trips to schools, shops, clinics and other services should become by walking and by non-motorised environment friendly modes, which may be achieved to a certain extent by densification of the land use.

Large and growing cities in developing countries, including Harare, must have transportation plans in co-ordination with their master plans as conceptual frameworks of strategic development. This must be the immediate task of the city authorities in order to unite the challenges of changes and guide the efforts in transport management and investment.

Preparation of spatial transportation plan with a programme for infrastructure investment and related transportation schemes, as for example a scheme of major bicycling routes by trip types and distances is a necessary first step for action planning approach.

Circles of “equal times” radii (isochronos) may define suitable standardised distances of access by various modes. Strategic spatial planning based on touching or overlapping access circles can warranty a seamless passenger transport system in sustainable terms. The strategic system of fixed-right-of-way is to be carried forward in long term and be refined and improved in future practical developments.

The intermediate sub-systems may vary by mode, access and standards. Traffic and transport survey and interactive participatory approach to potential players (e. g. investors, operators) in the respective socio-economic context shall provide assistance and

backing. An action planning approach of the city authority must ensure that applications of practical management programmes shall be co-ordinated with investment challenges.

A spatial transportation plan serves for programming of infrastructure investment, prioritisation of road maintenance and public-private action planning.

#### 4.3 Investment challenges

At strategic levels capital investments predominate over management activities. At intermediate levels management activities focus on co-ordination of programmes for public-private partnership actions with investment challenges.

In order to ensure mobility for meeting livelihood needs of all urban population within the Harare city context and respective development strategy, as well as in other cities of similar size and character, the investment challenges are formulated as follows:

- Budgeting for traffic and transportation survey and strategic spatial planning
- Designating major arterial and distributor streets/roads for strategic and intermediate road transport alternative modes
- Creating a dedicated urban fund for strategic development and current management of fixed route transport corridors
- Prioritising and programming for widening of road sections and improving of road conditions in order to reduce operating costs and the fares of road transport modes
- Action planning and management programming for appropriate choices of alternative bus modes as intermediate mobility solutions based on the principle of diversification
- Defining suitable planning, environmental and technical/operational standards of bus transport modes, whichever are applicable in current or coming actions (by vehicle and operation type: mini-, midi-, conventional, express, shuttle bus)
- Strategic planning for improvement of bicycling conditions and management programming based on bicycling scheme with associated facilities
- Defining areas within specific boundaries for traffic calming and formulating the principles of calming application in a particular urban context for achieving mobility goals

In conclusion, it should be emphasised that the city authority has a leading role in co-ordinating traffic and transport management with investment

challenges in view of achieving steadily improving and sustained mobility for all inhabitants.

It must be recognised as well that this is a collective process, which requires fruitful relationships of the city authority with the national government, a partnership with the private sector and pro-active participation of urban communities through existing structures and elected organs.

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