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ENVIRONMENT FRIENDLY AND SUSTAINABLE TRANSPORTATION IN HARARE: IS A FUNCTIONAL TRANSPORTATION TOOL BOX MODEL THE ANSWER?

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HIGHLIGHTS

- Transport enables access to employment, business, education, health services and social interaction.
- The tool box approach is premised on a fair and efficient choice of transport.
- Urban transportation should be created through ecological civilisation in which people and environment co-exist.
- Strategies to manage transport systems are management of the transportation system, reduced travel demand and increasing transportation system capacity.
- Good governance of a transport authority could reduce Harare's transport challenges.

ABSTRACT

Transport is an essential part of everyday life and is central to sustainable development. It enables access to employment, business, education, health services, and social interaction. The world's prosperity and well-being are inextricably linked to transport and the choices made available to them. This paper reviews current thinking about sustainable transportation as part of a broader strategy of transportation and land use planning for sustainability in Harare. Strategies for increasing transportation sustainability include demand management, operations management, pricing policies, vehicle technology improvements, clean fuels, and integrated land use and transportation planning. The transportation toolbox presents a range of sustainable strategies that can potentially address transportation issues within a corridor to provide a systematic approach to develop projects to address corridor transportation needs. As Harare grows, traffic generation is anticipated to increase with significant impact on the transportation system. A lack of sustainable transport infrastructure and affordable services remains a major obstacle to the development of the transport sector in Harare.

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1. INTRODUCTION

Transport is an essential part of everyday life and is central to sustainable development (Mbara, 2015). It enables access to employment, business, education, health services, and social interaction. The European Union Council of Ministers of Transport defined a sustainable transportation system as one that allows the basic access and development needs of individuals, companies and society to be met safely and in a manner consistent with human and ecosystem health, and promotes equity within and between successive generations e.g. walking and car-sharing. Sustainable transport is affordable, operates fairly and efficiently, offers a choice of transport mode and supports a competitive economy. Transport sustainability tenets include economic, social, cultural, political environmental and financial dimensions (WHO, 2011). The transportation toolbox presents rational planning of a number of sustainable transportation strategies that can potentially address transportation issues for a systematic approach to develop projects to address corridor transportation needs. Harare, a colonial city, officially called Salisbury until 1982 is located at coordinates: 17°51'50"S31°1'47"E. Harare was founded in 1890. Harare was proclaimed a municipality in 1897 and a city in 1935. Harare is Zimbabwe's capital and primate city. Harare is the administrative, commercial, communications, industrial and political, capital and primate city of Zimbabwe. Greater Harare Metropolitan Area consists of five urban local authorities vis-à-vis Harare City, Chitungwiza Municipality, Norton Town Council, Ruwa Town Council and Epworth Local Board and a significant rural grouping living in the Chitungwiza corridor and the Borrowdale -Domboshawa Corridor. Greater Harare is 1800km² in area and an estimated population of 4 million with an annual growth rate of 2% per annum (ZIMSTATS, 2012). Harare is a rapidly expanding metropolis with a floating population of one million people coming to Harare City to trade or work.

2. THE TOOLBOX APPROACH TO SUSTAINABLE TRANSPORTATION

In everyday usage, a toolbox is a box that contains various pieces used to organise, carry, and protect the owner's tools. With regards to transport

planning, a toolbox is a set of activities that can be used to organise and plan the transportation sector within a given area to make it efficient and sustainable.

In coming up with a toolbox, the following steps are important:

- classification of the preferred outcomes most relevant to an area, corridor or point by planning authorities;
- understanding Toolbox strategies, that is, Management of the Transportation System, Reduced Travel Demand and Increasing Transportation System as shown in Table 1 below;
- identification of strategies that best respond to each outcome for each transportation corridor;
- evaluation of the selected strategies using the travel demand model, highway capacity model, simulation model or manual techniques as appropriate;
- reviewing the effectiveness of the strategies in meeting the toolbox criteria after the implementation.

2.1 *Desirable Environmentally Friendly and Sustainable Transport System*

Ecologically, sustainable transportation is that kind of transportation that does not cause harm to the environment e.g. cycling and walking have health benefits as well. Issues in transport policy investment are grappled with location of transport and related infrastructure impact on land use patterns, overcrowding of transportation systems. Transportation is a complex phenomenon because it touches various facets of life, such as the link between transportation and economic growth as well as its impact on residential areas, industrial areas and commercial areas (Black, 2002). An efficient transport system goes beyond just the carrying of goods, people and services but overall development of a country e.g. the need for one to acquire a driver's licence and the need to register and insure a vehicle.

For the transportation system to be sustainable, it should be socially equitable, support civil rights by allowing all people to gain access to jobs, education, training, and needed services (Black & Nijkamp, 2002). Expenses in transportation should be minimal so as to support capital creation and augment integrated land use planning. Transportation should also improve the quality, livability and character of communities and participation



Figure 1: Harare’s skyline. Source: retrieved from pixbay [CC0 Creative Commons]

by all, including distressed communities. Essentially, a socially equitable transport system should meet the needs of the marginalised (African Development Fund, 2013). Efficient transportation system analyses the comparative mode of transport versus another. Trucks are generally faster though breakdowns and accidents may occur.

2.2 Steps in Transport Planning Process

Transportation planning defines future policies, goals, investments and designs to prepare for future needs to move people, goods and services to destinations (Beatley, 1995). Planning is a collaborative process that incorporates the inputs of many stakeholders such as government agencies, the public and private businesses (Litman, 2014). It is concerned with the design, location, evaluation, analysis and assessment of transport routes, infrastructure and facilities. Planning involves, observing current conditions, in the case of Harare the last time the roads were repaired is important; projecting future population and employment growth i.e., evaluating anticipated land uses in the region and identifying major growth corridors; detecting current and projected future transportation problems and needs; analysis is done through comprehensive planning studies, various transportation improvement strategies to address those future needs; developing long-range plans and short-range programmes of alternative modes of transport; injection of capital and operational tactics for moving people and goods within



Figure 2: Desirable System of Sustainable Transport

a reasonable time; appraising the impact of recommended future improvements to the transportation system on the environment; and developing a financial plan for securing adequate revenues to cover the costs of effecting strategies. Transportation requires huge capital in terms of investment. A transportation strategy is a careful plan for

achieving a particular goal usually over a long period of time (African Development Fund, 2013). Commonly, there are three main strategies to manage transport systems; management of the transportation system, reduced travel demand and increasing transportation system capacity. These three are shown and explained in Table 1 below.

Table 1: Transport Toolbox Strategies.
Source: adapted and modified by author from Beatley,1995

Category / Strategy	Definition
1. Management of the Transportation System	This set of strategies emphasizes the management and operation of existing transportation facilities.
Traffic Signal Timing/Optimization	Upgrading traffic signal equipment and timings
Freeway& Arterial Bottleneck Removal	Minor roadway geometric or traffic control improvements
Ramp Metering	Traffic signals on ramps control vehicles entering freeways
Access Management	Careful planning of access points along roadways
Variable Speed Limits	Speed limits are changed based upon traffic conditions
Congestion Pricing	Variable toll pricing based upon peak or off-peak periods
ITS Technology	ITS applications that address travel mobility
Traffic Incident Management	Planned process to detect and respond to traffic incidents
Travel Information	Provides information to drivers regarding traffic conditions
Parking Management	Providing information regarding parking
2. Reduced Travel Demand	This set of strategies address transportation needs by reducing the number of trips during peak periods.
Ride-sharing	Includes both car-pooling and van-pooling
Public Transportation	Includes fixed route bus service and para-transit service
Bicycle and Pedestrian Travel	Bicycle and pedestrian facilities
Alternate Work Hours	Varying work schedules to avoid peak travel times
Tele-work	Promoting Tele-work to reduce the number of commuters
Land Use Management	Guide development to lessen traffic impacts
3. Increasing Transportation System Capacity	This set of strategies refers to traditional capacity. Improvements such as adding lanes or new roadways.
Add Travel Lanes	Widening existing roadways to add travel lanes
Modify or Add Interchange	Adding capacity to existing interchanges or adding new interchanges
Construct New Highways	Constructing new roadways on new alignments
Intersection Capacity Improvements	Includes adding turn lanes, and roundabouts
Transit Capacity	Includes added transit service and facilities such as, park & ride lots
HOV and Managed Lanes	A set of lanes where operational strategies respond to changing conditions
Bicycle and Pedestrian Facilities	Construct bicycle and pedestrian facilities
Freight Rail Track Improvements	Track related projects or grade separations

3. METHODS AND MATERIALS

This study used a qualitative research design. Key informants who were interviewed included local government officials in transportation services, City of Harare (CoH), Vehicle Inspection Department (VID), Zimbabwe Republic Police (ZRP) Traffic Section, Traffic Safety Council of Zimbabwe (TSCZ). Survey questions were assessed for their suitability; alterations were factored in to provide a more thorough exploration of Harare. The questionnaire was prepared for pilot testing followed by on testing and post-pilot testing. Preliminary answers to the survey resulted in a range of new questions being conceived of.

Key informant interviews were used to enable an understanding of Harare's transportation system context. Participant observation was used to ingratiate oneself within Harare. Observation focused on socio-economic and the physical processes of the transportation system. In general, structured observation was more appropriate for this short fieldwork since it is usually undertaken through the creation of a pre-determined checklist of physical characteristics that require examination. A number of secondary data sources were collected throughout the period of the research to appreciate the social, historical and geographical context.

4. RESULTS AND DISCUSSION

4.1 *Legal and Policy Framework of the Transportation Sector in Zimbabwe*

In 1996, Zimbabwe signed the Southern African Development Community (SADC) Protocol on Transport, Communications, and Meteorology in direct response to failure by traditional approaches, whereby road management was carried out by government departments using general budget allocations, were not effective.

Main Features of the SADC Protocol:

- establishing an independent Road Authority made up of both the public and private sectors to drive strategic management, planning, development, maintenance and rehabilitation of the network. It is this feature that led to the creation of Zimbabwe National Road Administration (ZINARA) in Zimbabwe in 2001,

though its wholly owned by government;

- accommodating financial management practices to increase institutional, economic, and technical efficiency. In addition, introducing competition in road activities by incorporating all types of contracts of road construction and maintenance activities;
- introducing requisite financing principles and practices for sufficient and sustainable funding sources through incremental growth of road user charges;
- dedicating revenues from roads to their provision, operation, and maintenance;
- taking economic consideration when defining the scope, design, and timing of the road programme;
- harmonious technical standards for road and bridge building in the SADC.

4.2 *How a 'Toolbox' Model can be used in Harare*

Role of Travel Demand Management (TDM)

Demand Management is a practice that uses various strategies to increase transportation system efficiency (Victoria Transport Policy Institute, 2011). In essence; TDM measures are concerned with the alteration of travel behaviour in order to enhance the efficient use of the existing road infrastructure and facilities. Traffic flow can be improved by shifting the trip in terms of the use of alternative times through measures such as staggered working hours. A reduction on car dependence trips is necessary in order to minimise congestion in urban areas. People can be encouraged to share their cars. A significant shift to public transport would also reduce trips but this has to be concomitantly undertaken with the improvement of public transport in terms of adequacy, efficiency and reliability. Transport land use integration is another TDM tool that can be implemented to achieve urban transport sustainability. In Harare, it is trendy to move with one's own vehicle as opposed to use public transport because public transport is not reliable. The local authority needs to implement land use planning policies that integrate residential and employment areas. Effective transport land use integration minimises travel costs and reduces congestion as the number of vehicles travelling to the Central Business District (CBD) is reduced (Mbara, 2015).

Another TDM measure that the City of Harare can implement with minimal financial injection is

parking supply restrictions. This can be achieved either by limiting the physical supply of parking space in the central area or charging parking space to discourage private vehicles entering the CBD, a role currently done by Easipark which charges USD1 per hour. Again, this measure should be balanced by the provision of a good quality public transport which currently is non-existent. In order to decongest the CBD and rein in on the traffic lawlessness propagated by minibuses and touts, the CoH constructed a huge minibus holding bay on the outskirts of the CBD along Coventry Road. Minibuses are required to drop passengers in the CBD and then proceed to park at the holding bay. Radio systems would be used to control the movement of kombis (minibuses) between the holding bay and the rank in the CBD. This innovative scheme falls within the realm of TDM. Its success is depended on the level of compliance by minibus drivers as well as enforcement by CoH. Minibuses that are not legally registered shun the holding bay and continue to use undesignated ranks. Council's traffic enforcers and ZRP are on numerous occasions involved in cat and mouse chases with non-compliant kombis that use undesignated ranks resulting in accidents / death in some cases. The minibus holding bay project was a litmus test for the CoH to demonstrate its commitment to decongest the CBD. However, compliance is the major issue and most minibuses continue to use undesignated ranks thus, contributing to congestion.

Transport Management Governance

Governance is the exercise of economic, political, and administrative authority to manage a country's affairs at all levels (Birner, 2007). Projects such as mass transit and improvement of infrastructure that are required to reach the sustainable transport milestone cannot attract funding both locally and internationally without proper governance. The Government can create an enabling environment for investment. Government Ministries (Local Government and Transport), Local Authority, Zimbabwe National Roads Administration (ZINARA), Zimbabwe Republic Police (ZRP) are multiple actors that breed corruption and through their lack of working together. ZINARA is responsible for collecting vehicle fees and CoH laments the meagre amounts it receives, ZRP mounts endless roadblocks thus, reducing traffic flow (Mbara, 2015). The roles of the Ministries of Transport and Local Government are not clearly defined hence an Urban Transport Authority as a way of resolving the current institutional dysfunctional challenges is needed, provided it does not

add to the existing bureaucracy. CoH does not have the funds to finance critical transport projects let alone maintaining existing infrastructure. Roads are not labelled and where they are labelled the paint becomes too faint just after a few days after the job has been done. However, in line with SADC requirements, there are some traffic signs that were erected in 2016 although these have been subjected to vandalism. Ironically, Harare's revenue base was further reduced when the Minister of Local Government unilaterally ordered all Local Authorities to write off debts owed by residents from February 2009 to the end of June 2013 (The Herald, 22 July 2013).

City of Harare (CoH) Traffic Enforcement section falls under City Treasury Department. Its mission is to clear roads, encourage free flow of traffic in the Central Business District (CBD) and controlling illegal parking of heavy vehicles in the suburban areas. This is done through, application of Harare Traffic By-laws to make the roads passable. Controlling illegal parking of heavy vehicles in the suburban areas and the movement of heavy vehicles from entering the CBD during business hours, clamping vehicles, towing, spiking and impounding vehicles that have violated traffic by-laws are some of the main duties of the traffic enforcement department. Additionally, there is the City Traffic and Transportation Planning under the Works department whose duty is to process permits for taxis operations, outdoor advertising and regulating traffic movements and parking of minibus-taxis. Overall, the division is responsible for public transport provision within CoH. The mandate of the division includes guaranteeing public safety, convenience and amenity through the development and implementation of effective traffic monitoring and control infrastructure, planning and regulating the public transport system in the CoH and the management of outdoor advertising within the city's influence. However, this department is generally understaffed to carry its mandate and of the manpower that is available is not appropriately qualified.

Vehicle Inspectorate Department (VID) is a government department under the Ministry of Transport & Infrastructural Development. Its operations are governed by the Public Service Commission (PSC). VID's main duties include: vehicle inspection and accident evaluation, testing of aspiring drivers for learner's licence, testing of learner drivers for certificate of competency, preservation of infrastructure and road network through weighing all loaded heavy vehicles and provision of expert evidence in court cases involving disputes on vehicles inspected. This department has caused a lot of

problems in Harare because it is difficult to get a driver's licence and corruption is the order. Some daring unlicensed drivers continue to operate small taxis in Harare, thus endangering the lives of the public because it is estimated that there are more than 1000 such taxis in Harare.

The Traffic Safety Council of Zimbabwe's (TSCZ) core mandate is education through campaigns, publicity, training and information dissemination, e.g., research on incidence of road traffic accidents, developing training programmes, e.g., defensive driving courses and standards control, e.g., registration and deregistration of driving schools. These core activities can be summarised to say the main function is to promote safety on the roads as well as related aspects thereto. However, TSCZ is understaffed to properly carry out its mandate and defensive driver certificate they issue cannot be produced to law enforcement agents without a driver's licence.

The Zimbabwe National Road Administration's

(ZINARA) role is to fix, collect, disbursing road user charges and mobilisation of revenue for roads development and maintenance including the monitoring of such funds disbursed for road maintenance to road authorities. ZINARA took over collection of these fees in 2009, Fuel Levy, initially collected by National Oil Infrastructure Company of Zimbabwe (NOIC) and transit fees, overload and abnormal load fees originally collected by Vehicle Inspectorate Department (VID). At ZINARA major constraints exist, corruption, nepotism, high staff turnover, low remuneration levels, and the organisation is not well placed to attract the required skills. The major constraint is few disbursements of financial resources to local authorities, especially to the CoH since more than 80% of Zimbabwe's vehicles are found within the greater Harare urban environs. ZINARA's work is not visible in the CoH. The Zimbabwe Republic Police (ZRP) maintains law and order. Its National Traffic Branch provides a road policing service which entails enforcement



Figure 3: First Street, Harare. Source: by Gary Bembridge, retrieved from flickr [CC BY 2.0]

and education. The main duties of the traffic section are response, attendance at road traffic accidents, enforcement where every police officer shall enforce traffic laws and regulations and not just those assigned to traffic duties including general policing duties, investigation of traffic offences, reassurance and advice for people involved in road traffic accidents, through provision of clear information. Until November 2017, ZRP has been accused of corruption by fining drivers even for petty offences, as well as mounting many road blocks. What is further disturbing being that the revenue raised through fines does not go towards education of people on the road usage but is used for some unrelated activities.

Infrastructure Improvements

Harare’s roads are characterised by potholes, malfunctioning traffic signals and dilapidated transport termini. The four main bus termini built in colonial times, i.e., Fourth Street, Copacabana, Rezende, Charge Office and Market Square have not been revamped to cater for the increasing population. These five have a total holding capacity of less than 1500 people when they were created. Pot holes and malfunctioning traffic signals are external factors that also contribute to higher levels of congestion and pollution. Harare has, however, been installing solar lights for traffic lights and lighting, although in recent years these have been subjected to severe vandalism, especially the

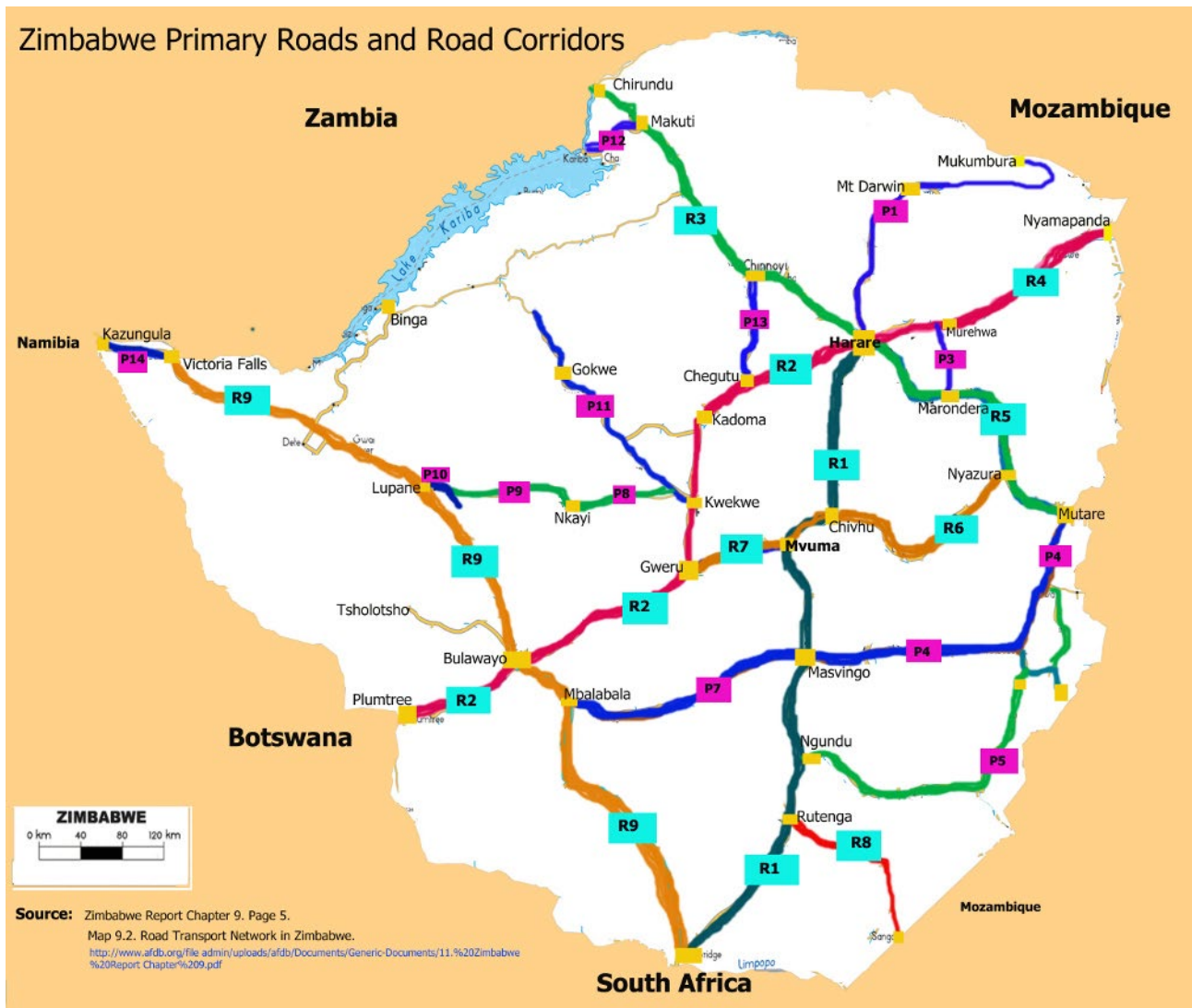


Figure 4: Zimbabwe primary roads network. Source: By Jaisondlovu [CC BY-SA 4.0], from Wikimedia Commons

theft of solar panels and batteries. The Chitungwiza-Harare railway meant to decongest roads has not materialised due to funding challenges. Road network has declined significantly since the mid-1990s due to lack of funding for routine and periodic maintenance and government declared them a state of disaster in 2017.

Institutional Capacity Building

There is a serious lack of technical skills to address urban transport challenges by the CoH. CoH has no employee with relevant qualifications and experience in transport for planning and implementing appropriate transport strategies. No university in Zimbabwe offers either a taught undergraduate or post graduate degree programme in transport for planning and implementation. The substantial "brain drain" of qualified road sector professionals from Zimbabwe over the past decades has affected all road sector institutions and the private sector. CoH had to engage less qualified personnel and some staff in key posts in "acting" capacities for extensive periods.

Public Transportation

Harare has an unsustainable public transport system. Operators should be empowered to acquire and operate bigger buses. A group of minibus operators who have responded to the policy direction of mass transit have formed an association with the intention of importing conventional buses. Franchising of routes is another option that the CoH can use to introduce bigger buses on high demand corridors (Mbara, 2015). Minibuses must not be allowed to operate on these routes and strict enforcement is required. Informal networks such as family, friends and church as well as neighbours may offer transport to disadvantaged people to go to town, social capital contributes to transport solution since it is the least complicated,

cheapest and the most appropriate as this entail carpooling.

5. CONCLUSION

Urban transport in Harare is in need of transformation. Congestion has reached gridlock levels. Harare is far from fully embracing the components of sustainable transportation. The toolbox approach offers affordable commuting by operating fairly and efficiently based on choice of transport rooted in a competitive and vibrant economy connected to the outside world and thus has densification and integration features. Harare is still lagging behind in all these aspects although it is slowly embracing requirements set out by SADC.

6. RECOMMENDATIONS

Sustainable urban transport in Harare can be achieved through:

- financing mass transit systems which are efficient users of road space due to their high carrying capacities, as well as urgent transport infrastructure improvements and enhancing capacity and retaining skills;
- good governance and the establishment of a transport authority could go a long way in addressing some of Harare's transport challenges although such an entity could turn up to be another bureaucracy without corporate governance;
- creation of Harare Metropolitan Transport Planning Authority (HMTPA) whose mandate should be all transport related business.

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