Quest Journals
Journal of Architecture and Civil Engineering
Volume 2 ~ Issue 1 (2014) pp: 01-09
ISSN(Online) : 2321-8193
www.questjournals.org

Research Paper

Critical assessment of Port Elizabeth Bus Rapid Transit system

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Received 28 November, 2013; **A**ccepted 18 January, 2014 © The author(s) 2013. Published with open access at **www.questjournals.org**

ABSTRACT:- Due to increasing pressure on public transport, it has become necessary to seek for a more efficient means of moving passengers, reduce travel time, delay time and numbers of stop. Bus Rapid Transit (BRT) has been adopted as an improvement on regular bus services through the combination of features like infrastructure changes that resulted in better operation speeds and service reliability. The main aim of this study is to check the performance and operationof Libhongolethu BRT system in Port Elizabeth (PE) from inception. Physical assessment and critical review of the operating BRT system was employed in this study. The BRT system in which mixed flow traffic lane is practiced with dedicated lanes and no full weather protection is said to be less effective, even to build more buy-in customers to use the system, especially the private car users.It is cost effective over a long distance when compared to other public transport because it operates at a flat rate. A full weather protection streamlined station should be implemented adopting bicycle and car parking lots, phone booth, CCTV, AVL, comfortable seating and information map/s at each station. Mixed flow traffic lanes should be totally discouraged. Other modes of BRT system, especially segregated mode should be employed in case of future BRT intensification.

Keywords:- Vehicle manoeuvre, commuters, traffic congestion, dedicated lane

I. INTRODUCTION

Today, the public and private transports are facing problems due to increase in vehicle ownership and the suburbanization of both firms and residences in the world. In the past, public transport focused mainly on the central areas of the cities where high population and employment densities enabled frequent services, high occupancy rates and many routes. As growth is reaching suburban from the metropolitan area, imperative challenge crops up in the public transport to increase its service in order to serve the commuters better, and also to integrate suburban service with the metropolitan service(Pucker and Hurth 1996). The main aim of this study is to check the performance and operation of the Port Elizabeth (PE)Bus Rapid Transit (BRT) system from inception. Hence, public transport has to be made more attractive and user friendly in order to have improved service, travel information, reliability, safety and upgrading of infrastructure like waiting stations. Cost is also an imperative element that influences the demand for public transport in relation to the time spent waiting, boarding and alighting from vehicles coupled with the risks and inconveniences involved in those actions. The report (Conquest Research, 1997) also suggested that commuters and business users board the fastest and most direct routes.

What is BRT?

Bus Rapid Transit can simply be defined as a rapid mode of transportation that can coalesce the quality of rail transit and flexibility of a bus(Thomas, 2001). Transport Research Board (2001 cited in (Levinson et al. 2002) defined Bus Rapid Transit in a more simplified and understandable way as a flexible and rubber-tired rapid transit mode that combines running way, intelligent transportation system (ITS) elements, stations, vehicles and services into an integrated system with a strong positive image and identity. Bus Rapid Transit is a project embarked in phases as fund and opportunity permit because of the service flexibility. Bus Rapid Transit application is planned to be appropriate to the place/destination it serves and its physical surrounding. Provided its performance in the implemented areas is successful, the service would be extended to other environments. Effective and cheap public transport provision will aid the growth of the nation in terms of the economy, social and environmental wellbeing leading to the urbanization of cities.

II. HISTORICAL DEVELOPMENT OF BRT SYSTEM

The significant development of the BRTs started in Curitiba (Brazil) in 1974, and before then, there were several smaller-scale projects earlier in its development. After the success of an effective BRT in Curitiba, its experience inspired other cities to develop similar systems (Matsumoto, 2004). In the 1970s, development of BRT systems was limited to the North and South American continent. In the late 1990s, the replication of the BRT concept gained momentum and BRT systems were opened in Quito, Equador (1996), Los Angeles, USA (1999) and Bogotá, Columbia in the year 2000 (Ernst, 2005). However, the TransMilenio project in Bogotá started operation in 2000 and its success drew attention from the world community as an example of the state-of- the-art BRT systems. As of 2005, there may be up to 70 systems around the world, depending on one's definition of BRT (Levinson et al. 2003; Wright, 2005).

National operating subsidies

Developing a business plan for a public transport is somehow difficult for any transport authority unless they know the rate of operating subsidy that will be made available to them. At each metro or functional area, the existing level of subsidy must continue at the level currently being allocated for bus subsidy. A judgment call will be made by the transport authority to decide which proportion of the subsidy will be allocated to catalytic initiative. In other words, it means that they have to plan for zero operating subsidies for the catalytic initiatives since they have no control over the subsidy streams(DoT, 2007).

White paper on transport for sustainable development

This is a government guide or an authoritative report on transport issues of the Eastern Cape (EC) province for a sustainable development and it was published in the provincial gazette on July 24, 2001. Lapses have been noticed in the inefficient running of the public transport system, which prompted the act of a white paper on transport for sustainable development. It takes into proper consideration the role and responsibility of the transport department in establishing a plan for sustainable development. Consult all stake holders, correct the imbalances of the past, promote safe and accessible transport, promote social and economic development, equal opportunities for all and integrated land use and transport are the objectives listed by the white paper in order for EC department of transport mission to be accomplished. The mission is to"provide, facilitate, develop, regulate, and enhance safe, affordable and reliable multi- modal transport systems which are integrated with land uses to ensure optimal mobility of people and goods in support of socio- economic growth and development in the province of the Eastern Cape" (SSI Engineers and environmental Environments, 2011).

III. STAKEHOLDER CONSULTATION

Before taking a decision of implementing BRT system in the province, the transport needs of the residents in various communities around Nelson Mendela Bay Municipality (NMBM) area were observed through a public consultation process in the years 2010 and 2011. This initiative provided vital information about the challenges and needs faced by the communities with regards to transportation which is of great input for the NMBN Integrated Development Plan (IDP). Furthermore, various authorities and industries around NMBM area were consulted to pinpoint their transport related problems, alongside with a survey, in order to get individual view with respect to public transport (SSI Engineers and environmental Environments, 2011).

Public transport

The major public transport services in NMBM are buses and minibus. There isa rail service of 31km that link PE to Uitenhage and it is only being accessed by a very small number of people that live at a walking distance from the station. The reason is that the rail was previously used as a freight track that is why it was constructed far away from the residential areas. Eleven train stations are situated along the line. The commuter rail operates on weekdays during morning peak (departure times from 05h30 – 07h50) and afternoon peak (departure times from 14h25 – 18h15). Twelve train trips are operated on weekdays and no train service on Sunday and public holiday. A survey was carried out by Passenger Rail Agency of South Africa (PRASA) between the years 2003 – 2010 to know the total number of passengers boarding and alighting at all train stations at Port Elizabeth to Uitenhage as shown in table 1. The survey shows that the average number of passenger trips was 7 344 per day in 2010, which depicts 26.3% patronage increase in relation to 5 817 per day in 2003. The minibus taxi operation is categorised as follows: operation between places of residence and work opportunities, minibus and sedan taxis providing feeder services in residential areas and sedan taxis providing link service between Motherwell and Zwide/Kwazakhele. Survey conducted in 2001 by Current Public Transport Record (CPTR) at 49 taxi ranks shows that 119 000 passengers board taxi on a daily basis, fares are determined by taxi association and passengers are not consulted. Algoa bus company served 298 bus routes with a total route length of 7 147km. The main routes are 19 in number and various permutation and variations to these routes, making up the remaining 279 routes. The major bus routes span between 10km to 30km long with

very few routes exceeding 40km in length.A total number of 65 385 passengers makes use of it daily during 1 410 daily trips (SSI Engineers and environmental Environments, 2011).

Metered taxis

This is another form of transport that focus majorly on tourism market and it remains a system that can not totally fit in as a public transport. This mode is still in the process of setting a strategy of encouraging its use in NMBM. Its operation is mainly around Port Elizabeth airport where there is the opportunity of serving businessmen and tourists. It is not like any other public transport that has a fixed rank station; it operates through a radio cell or cell phone system. These operators rely solely on the contact from advertising brochures at hotels, guesthouses and airport. The operating licensing board and NMBM have little understand of the need for metered taxis, the extent of vehicle fleet and its operation because they are faced with the challenge of transforming other mode of public transport which are more boarded by the commuters, hence, metered taxi is in low profile in NMBM (SSI Engineers and environmental Environments, 2011).

IV. CURRENT SITUATION OF PUBLIC TRANSPORT IN PE

There are roughly 400 standard Algoa buses and 3,200 minibus taxis providing the commuters with transport services on daily basis in NMBM area. Their operations are usually on the same routes; it gives room for competition as their fares are similar. NMBM procured 24 new low-floor articulated buses(Length: 18.5m, number of doors: 2-5, seating capacity including the driver: more than 70) with doors on both sides which were used for 2010 FIFA world Cup in PE. These are now used by the Integrated Public Transport System (IPTS) as BRT buses. These buses are operated by the taxi co-operatives and replaced the existing taxis operating at the median lanes. This is imposed by the operational needs of the new system, which demands the articulated bus with wheel chair accessibility to be operated at these lanes during the peak and off peak times. Hence, the taxi owners were compensated according to their current profits in this regards. Table 2 shows the cost of the proposed transport projects required for further implementation of the Integrated Public Transport System (IPTS) for the next five years. Table 3 shows that a proposal was submitted to the Department of Transport (DoT) for the funding (cost updated to current) of the IPTS project in 2011/2012 financial year. The project in table 3 has been included in Comprehensive Integrated Transport Plan (CITP). The fund shown in table 3 is part of an ongoing funding programme for the implementation of an IPTS in NMBM area. The problem that ravages the current public transport situation is the increasing traffic congestion on the roads leading to city centre, resulting into delay, some drivers become extensively aggressive and drive recklessly which might lead to head-on collisions, injuries and mortalities (SSI Engineers and environmental Environments, 2011).

Port Elizabeth BRT operation

The NMBM area has a population of about 1.1 million with total area of 1950km^2, 289 000 households are located in the formal areas coupled with 35, 257 informal households and 49 009 backyard shacks also exist with the area. 112 306 out of 289 000 households are classified as indigent and 44% of all households depends on, at least, one social grant. In table 4, it indicates that 66% of the residents receive low income and the remaining residents fall within the low to medium income brackets. This statistic also depicts that a large percentage of the NMBM residents depend solely on public transport (SSI Engineers and environmental Environments, 2011).

Libhongolethu is the name given to the BRT system in Port Elizabeth, which means “our pride”, that is, an integrated public transport system that is safe, convenient and reliable. This system brings Nelson Mandela Bay closer to becoming a world-class city and started with seven routes running through Port Elizabeth, Uitenhage and Despatch(Nelson Mandela Bay Tourism, 2012). Within Port Elizabeth city, only four corridors are operated as stated below. Port Elizabeth BRT system was a disaster. The reason is that it was constructed for World Cup 2010 with the initial budget of R 1 billion used to create extra lanes and 2 years later the initial lanes were destroyed because it was not properly planned. There were 20 buses lying idle because they did not fit into the original lanes created for them, so an extra R30 million was used to make changes (Calls made for inquiry into PE's BRT system, 2012). Due to this, the BRT system in PE was put on hold until it commenced operation in February 2013. There are functioning operation of BRT systems in other South African cities like Johannesburg, Cape Town, Pretoria and on-going implementation of such a system in Durban (Thomas, 2010).

The functioning routes within PE (IPTS zone 1, see figure 1) are listed as follow:

1. **Route 300: PE Central Business District (CBD) -Triangle**

Start point: Lilian Diedricks building, Govan Mbeki Avenue

Bus stops: Mostly median stops in dedicated lanes

Direction of service: Triangle will be operated in both the clockwise and anti-clockwise direction

Service: It is operated between 06h00-20h00 and 08h00-20h00 with 10 minutes interval in peak hour during the weekdays and weekend respectively.

2. Route 302: PE CBD-NMMU

Start point: Lilian Diedricks building, Govan Mbeki Avenue
End point: NMMU south campus
Bus stops: existing kerb-side stops
Service: It is operated between 06h30 -20h00 and 07h00-20h00 with 10 minutes interval in peak hour during the weekdays and weekend respectively.

3. Route 303: PE CBD-AIRPORT

Start point: Lilian Diedricks building, Govan Mbeki Avenue
End point: Port Elizabeth International Airport
Bus stops: existing kerb-side stops
Service: It is operated between 05h30 -20h00 and 08h00-20h00 with 20 minutes interval in peak hour during the weekdays and weekend respectively.

4. Route 304: PE CBD-Greenacres

Start point: Lilian Diedricks building, Govan Mbeki Avenue
End point: Port Elizabeth International Airport
Bus stops: Median stops on IPTS lanes, existing kerb-side stops on loop around Greenacres
Direction of service: Greenacres loop will be operated anti-clockwise
Service: It is operated between 06h30 -20h00 and 08h00-20h00 during the weekdays and weekend respectively. There are three buses operating at 20 minutes interval during the weekdays.

On-site assessment

The method employed was an on-site assessment using a checklist system(see annexure 1) to assess the performance and operation of the system and suggest the possible pros and cons of the system. Libhongolethu BRT system makes use of median BRT lane configuration, that is, the lane is located at the middle of the roadway in a two-way direction as an exclusive right-of-way with pavement/lane marking, intersection road marking and stud separator (10cm). The stud separator serves as a separator to the other traffic to avoid vehicle manoeuvre. It has only four functioning corridors, two corridors (Central Business District – Triangle and Greenacres) operate in median dedicated lanes and the two other corridors (CBD – NMMU and Airport) operate in mixed flow traffic lanes. It has a distinctive branding/marked identity of vehicle and colour that differentiates it from other public transport. A low-emission vehicle technology articulated standard bus with bi-fold doors at both sides. Multiple entrances for boarding and alighting alongside a distinctive identity and image are used throughout the corridors in Port Elizabeth.

As the lane is located at the middle, the station is also constructed at the median of the roadway without a proper shelter: the commuters and staff stand under the sun. The acclaimed station has a map, security, staff, routine schedule and ramp for disabled/ wheelchair accessibility. The existing kerbside station for other public transport is adopted in a mixed traffic and makes use of CCTV installed on the street to monitor the buses. It makes use of off board payment in which the transport fare is paid in cash inside the bus and fare verification is also done inside the bus. The fare is also charged at a flat rate. The pedestrian crossings are controlled by traffic lights in most of the places and at very few places, you would see that the pedestrian crossway is not controlled by traffic lights. Adoption of existing transit signal infrastructure is in place where it is necessary. The system is said to be safe, clean, accessible and able to meet service demand. A security guard is assigned to each bus during the course of movement.Passengers within this IPTS (Integrated Public Transport System) zone 1 may be transferred between these routes/corridors at no extra cost within 30 minutes of buying a ticket.

Problems/challenges/cons

The ability to build more buy-in customers to use the system especially the private car users is important. To develop a robust business and financial model for continual maintenance of the existing system is a challenge. Continuous skills training are required for the owners and operators to maintain the success of the system. The intermodal coordination/network is poor. There is no Automatic Vehicle Location (AVL) which is connected to the control room that helps with updated schedules both inside the bus and station which is essential. Its operation in mixed flow traffic lane is a major problem. No provision is made for commuter to seat, bicycle and private car lots/parking at each station. Absence of a streamlined shelter is noticeable. Collection of fare within the bus makes it more like other "standard" public transport.

V. CONCLUSION

Use of a dedicated bus lane should be encouraged throughout the routes because there is great improvement in travel time, reliability, safety and fastness with a dedicated BRT system when compared to other road public transport travelling in mixed flow traffic lanes. It makes use of articulated standard buses to accommodate more passengers. The system is far below standard because it has no AVL, information kiosk, phone booth or a full weather-proof shelter

Conclusively, it is cost effective over a long distance when compared to other public transport because it operates at a flat rate and also commuters can be transferred within 30 minutes of purchasing the ticket within the IPTS zone 1. In the system, pedestrian safety, convenient and secure access to the facility for the physically challenged and abled commuters are fully guaranteed, which makes commuters not to be discouraged about the system.

Recommendation

High/future maintenance should be the watchword to keep what is in place at the moment. If there is the need for BRT system diversification in Port Elizabeth,other lane configurations should be implemented especially the segregated type of BRT system. A full weather protection streamlined station should be implemented adopting bicycle and car parking lots or park and ride lots, phone booth, CCTV, AVL, comfortable seating and information map at each station. Mixed flow traffic lanes should be totally discouraged. If there is population intensification, bi-articulated standard buses should be adopted. The use of smart card should be solely adhered to, which will help the commuters to load more than a day fare, depending on their financial capacity, hence, making it more user friendly.

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Table 1: Passenger rail survey for the period 2003 - 2010

YEAR	2003	2004	2006	2007	2008	2010
IN	5801	4949	6079	5393	6958	6961
OUT	5832	5078	5847	5533	7585	7726
TOTAL	11633	10027	11926	10926	14543	14687
AVERAGE	5817	5014	5963	5463	7272	7344

Table 2: Summary of public transport project

Number	Project description	Project cost for 5years (Rand)
1	IPTS bus lanes	860, 530, 000
2	IPTS shelters	312, 400, 000
3	IPTS modal interchanges	231, 000, 000
4	IPTS operational cost	2, 083, 400, 000
5	IPTS planning and design	89, 100, 000
IPTS work packages (Total)		3, 576, 430,000

Table 3: DoT – 2011/2012 Public Transport Infrastructure and System Fund (PTISF) funding application

Number	Project description	State subsidy
1	PT work package: IPTS shelters	136, 400, 000
2	PT work package: IPTS modal interchanges	110, 000, 000
3	PT work package: IPTS operational cost	679, 400, 000
4	PT work package: IPTS planning and design	23, 100, 000
Total allocation (R)		948, 900,000

Table 4: Individual monthly income by NMBM population

Income bracket (R)	Percentage of population(%)
No income	66.0
1 - 400	3.3
401 - 800	10.7
801 - 1600	6.1
1601 - 3200	5.7
3201 - 6400	4.7
6401 – 12 800	2.4
12 801 – 25 600	0.8
25 601 – 51 200	0.2
51 201 – 102 400	0.1
102 401 – 204 800	0.1
204 800 or more	0.02
Total	100.0

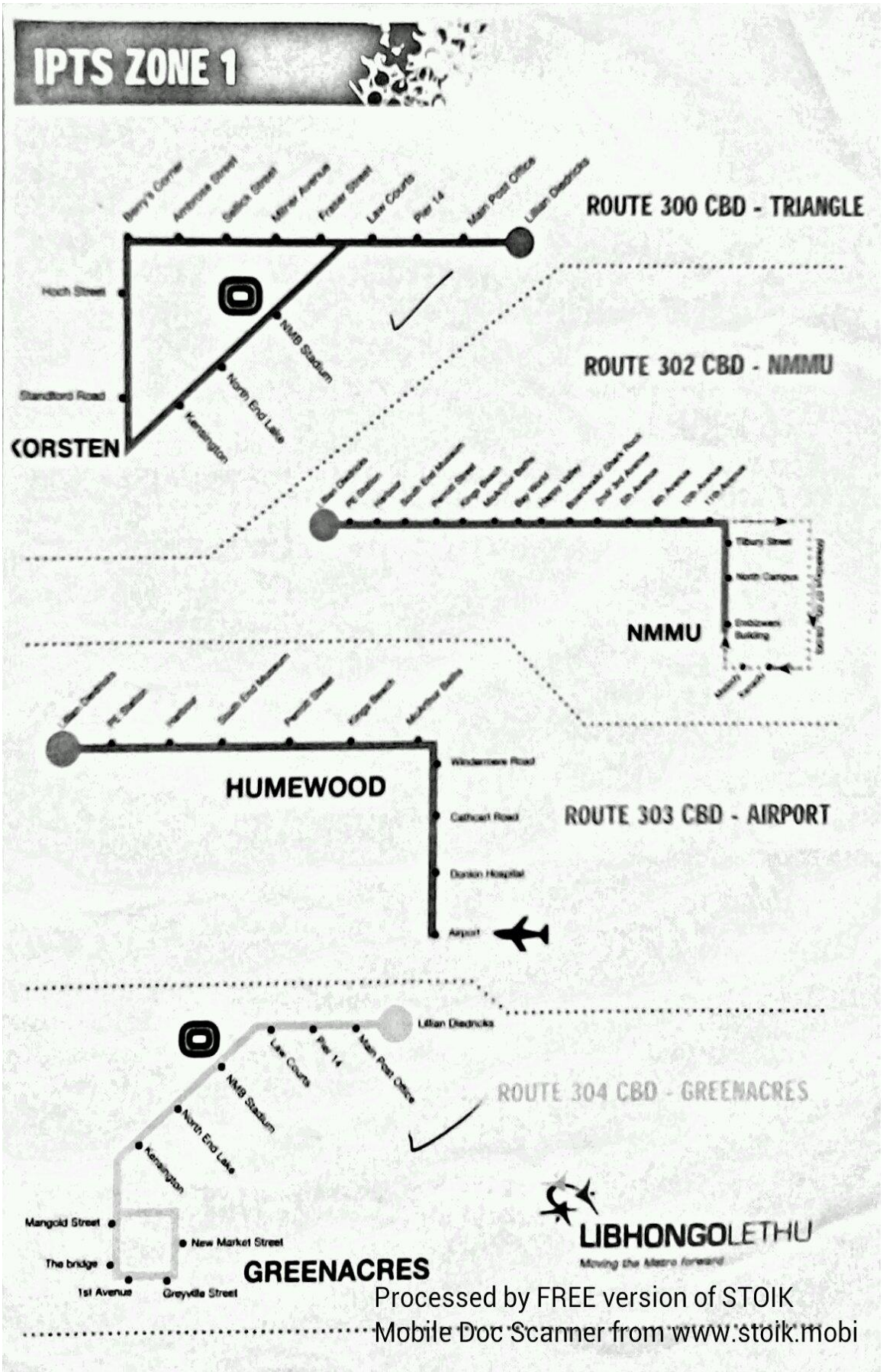

Figure1 Route map

ANNEXURE 1

Location: Port Elizabeth (Libhongolethu BRT system) Checklist for BRT system

	Met√
Lane configuration	
Basic separator cones	
Pavement marking	√
10 cm separator blocks/studs	√
50 cm separator blocks/studs	
Kerbside lane configuration	
Segregated lane configuration	
Median lane configuration	√
Bus colouration/ road markings	
Intersection roadmarking	√
Lane marking	√
Bus way with fully coloured way	
Distinctive BRT identity and image	√
Distinctive marketing identity for the system	√
Landscaping	
Cycle paths/footpaths	
Tree planting and grassing-	
Additional park or civic improvement	
Integration with other modes at stations/terminals	
Bicycle parking at stations/terminals	
Formal taxi stands at stations/terminals	
Car parking at stations/terminals	
Intelligent Transportation System (ITS)	
Real-time information display	
Connection to the control station/room	
Audio announcements on BRT buses	
Incorporate schedule data into station electronic information systems	
Place updated schedules and maps at stops	
Adapting existing transit signal infrastructure	
Maps and information	
Maps at station	√
Information kiosk/ staff standing without shelter	√
Station amenities	
Air conditioning	
Elevator for disabled/ramp	√
Automatic doors	
CCTV/security	√
Enhanced station environment	√
Wheelchair accessible station	√
Full weather protection on all station platforms	
Telephones	√
Security provision	
Consistent pattern of station location, configuration, and design	√
Separate BRT, local buses, automobiles, and pedestrian movements in station design.	
Fare collection system	
Smart card	√
On-board fare collection	
Pre-board fare collection	√
Fare verification	√
Flat fare type	√
Zonal fare type	
Distance based type	
Other	
Convenient pedestrian and bicycle access to transit facilities	

Are the bus stops accessible to persons with disabilities?	√
Is there a wheelchair ramp to access the street at crosswalks or mid-blocks?	√
Are these stops accessible by sidewalk or pedestrian paths?	√
Has space been provided for bus stop shelters and/or benches?	√
Is there sufficient lighting?	√
Bus type	
Low –emission vehicle technology	√
One side doorway	
Both sides doorway	√
Standard bus type	√
Articulated bus type	
Bi-articulated bus type	
Double-decker bus type	
Boarding/alighting	
Multiple-door boarding/ alighting	√
Single-door boarding/alighting	
Door with ramp	√
Door type	
Swing door	
Bi-fold door	√
Plug	
Pivot door	
Sliding door	
Problems	
Safety	
Cleanliness	
Accessibility	
Reliability	
Lack of intermodal coordination	√
Urban traffic congestion	
Inability to meet service demand	
Pedestrian crossing controlled by traffic light	
Excessive bus-to-platform gaps at BRT stations	