AN INVESTIGATION INTO THE APPLICATION OF LOCAL AREA TRAFFIC MANAGEMENT PLANS (LATMPS) IN EKURHULENI METROPOLITAN MUNICIPALITY (EMM) AND IN THE GENERAL SOUTH AFRICAN CONTEXT

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ABSTRACT

Traffic management can be defined as the act, or manner of managing, or handling, controlling, directing, etc. the movement of motorised and non-motorised vehicles and pedestrians on roads. Can the implementation of Local Area Traffic Management Plans (LATMPs) have a significant positive impact on energy usage, health, safety and convenience of transportation in communities in EMM and the current South African environment?

Planning and implementing a local area traffic management plan (LATMP) must take into account or consider all planning, geometric design and traffic operations of roads, streets, and highways, their networks, terminals, adjacent lands and relationships with other modes of transportation for the achievement of safe, efficient, and convenient movement of persons and goods.

This paper will investigate the application of LATMPs in EMM and in the general South African context by taking into account international best practice sources and case studies to improve traffic management. The four focus areas in this paper are:

- Comparison of energy usage within the transport system,
- Strategic link of LATMPs with national, provincial and local policies and guidelines,
- Planning and identification of LATMPs,
- Development of LATMPs,
- Prioritisation of LATMPs.

1. INTRODUCTION - WHAT ARE THE MAIN ENERGY USERS?

The main energy users nationally, in Gauteng and in within EMM are industry and transport which is shown in Figure 1. The energy demand of transport varies between 28% nationally to 41% in EMM.

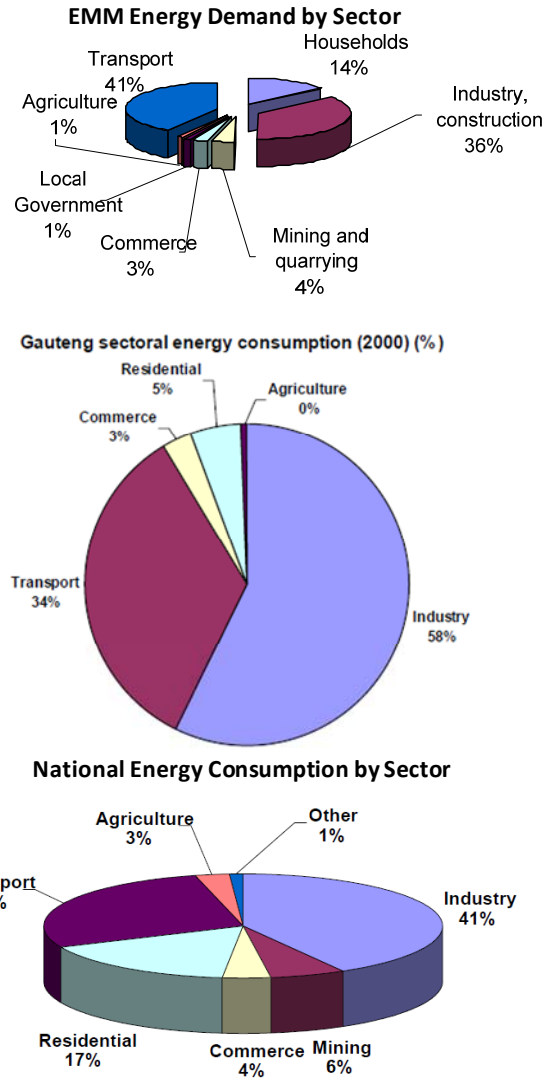


Figure 1: Energy Demand by Sector

Promotion of modal shift from private vehicle to public transport as a mechanism to promote energy efficiency can be illustrated by means of the following example. A private car and taxi consume approximately the same litres of fuel per kilometre to travel from point A to B. However, the taxi is carrying 15 people and thus accounts for hypothetically 10 less private cars in the transport system – this is assuming vehicle occupancy of 1.5 persons per car. The use of a taxi or high occupancy vehicle decreases the fuel consumption within the total transport system.

In **Figure 2-a,** a qualitative comparison between energy (fuel/man power) consumption of different modes within a transport system is shown based on the above simplified comparison. To minimise energy consumption within a transport system the ideal utilisation per mode in a transport system is show in the **Figure 2-b**.

Qualitatively comparing the current energy use between transport modes within the EMM's transport system shown in **Figure 2-b,** the private vehicle use is currently the highest resulting in high and inefficient energy use.

Figure 2-c shows the ideal situation of energy use within the EMM transport system. It is however impossible to discard private vehicles from a transport system but to use this mode more effectively can lead to a more energy efficient transport system.

Figure 2-d shows a realistic aim that can be achieved taking into consideration the opportunities and practicality of mode shift within any transport system to ensure the optimum energy use. This appropriate apportionment of mode will lead to effective use of energy within the transport system without hampering freedom of choice of selection of mode within the system.

The aim of the investigation of LATMP regarding energy efficiency is to establish a process and measurement criteria to promote the effective use of all modes with the promotion of modes that are more energy efficient within a local area to the support of the main targets set in the national Energy Efficient Strategy (2005), the Gauteng provincial Development Strategy (2008) and the local Energy and Climate Strategy (2003) of EMM.

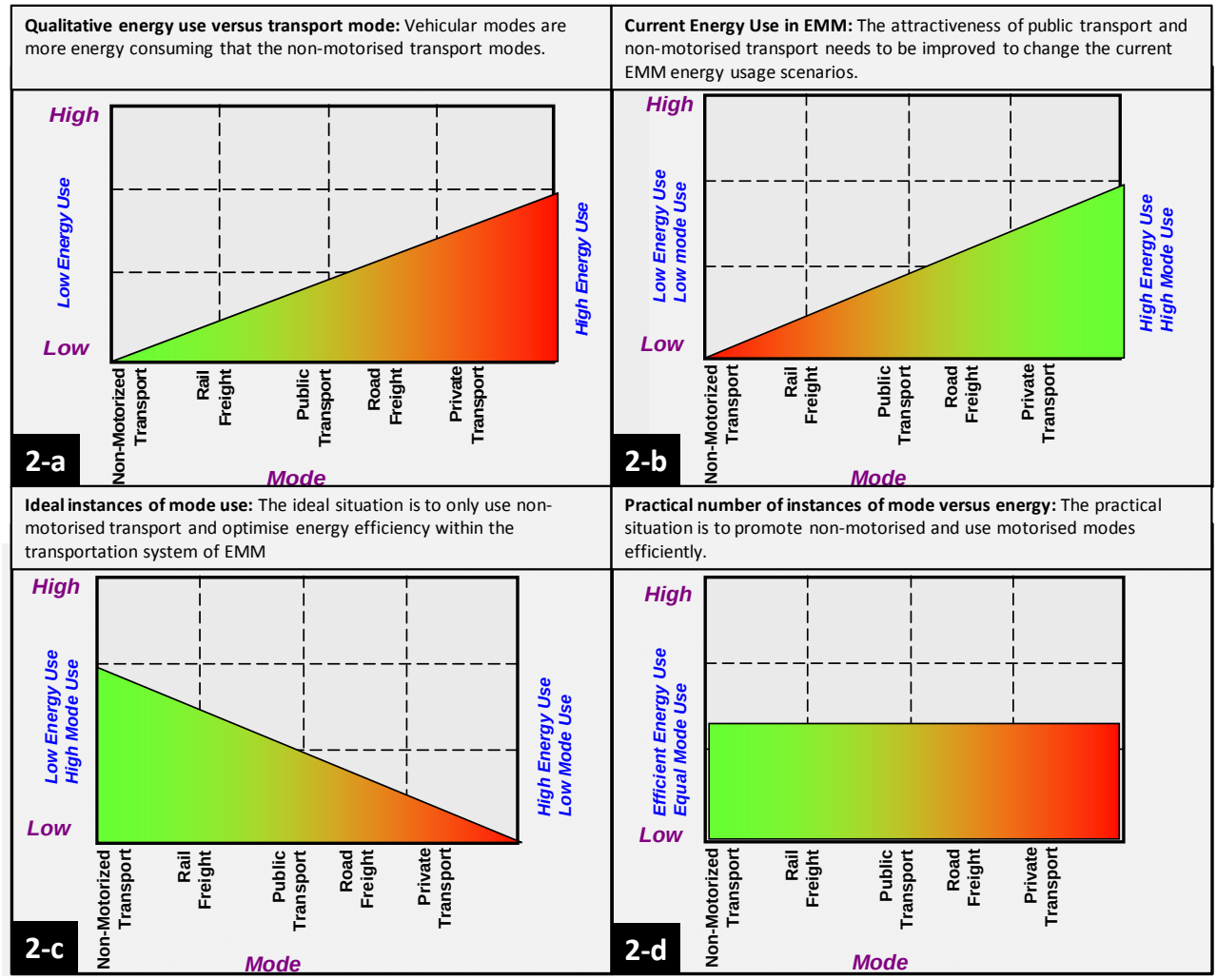


Figure 2: Energy Usage Compared

2. STRATEGIC LINK OF LATMPs WITH NATIONAL AND PROVINCIAL POLICIES AND GUIDELINES

It is essential to take into account the transportation priorities of national and provincial government as reflected in policy and strategic documents as well as other applicable guideline documents on the subject. This forms the foundation for establishing LATMPs and assists in defending, motivating and justifying the methods and criteria for establishing and prioritising of the LATMP areas as well as the proposed traffic management measures within these areas. Five sources were taken into account, namely

- The Road to Safety, National Department of Transport, 2001 – 2005,
- National Road Safety Strategy (2006 onwards),
- National Road Access Guidelines – Land Use and Urban Design Aspects Draft Working Paper, City of Cape Town, July 2001,
- The Gautrans National Road Access Management Guidelines (Land Use and Urban Design Aspects) draft working paper (dated July 2001).

It is important that EMM takes cognisance of the integration between development strategies/ frameworks and the effect on the environment and sustainable transportation. LATMPs will serve to assist with the establishment of these concepts within EMM.

3. POSITIONING LATMP WITHIN THE STRATEGIC PLANNING CONTEXT OF EMM

The planning environment within EMM consists of three main spheres macroscopic, messoscopic and microscopic.

The detail captured in each planning sphere varies according to the scale of the planning. In Figure 3, the current planning structure in EMM is shown with the related documents in each sphere currently available. The three spheres are:

- Macroscopic planning is city or metropolitan wide planning and metropolitan or citywide strategies regarding freight, private vehicles and public transport. Typical outcomes of this sphere of planning are the Strategic Public Transport Network with its associated intermodal facilities. This form of planning gives the strategic vision for the metro and aligns with the Metropolitan Spatial Development Framework.
- Messoscopic planning has taken place on an ad-hoc basis until recently. The first initiative to roll out messoscopic planning throughout EMM, was the development of Local Spatial Development Frameworks (LSDF). LSDF's boundaries are defined by ward boundaries and consist of three to four wards. EMM is divided into 103 LSDF's, which gives an indication of the extent of a LSDF. The focus of a LSDF is on an implementation level and assists the day-to-day approval of rezoning applications and new township establishment applications. ***LATMP's are typically on the same level of planning detail as the LSDFs and will tie in with the proposed medium- and long-term land use planning of the LSDFs.***
- Microscopic planning entails the detail planning for a development in the form of the Site Development Plan (SDP) and Traffic Impact Study (TIS). The detail captured in these planning documents pertains to the specific development and take into account developments adjacent to the proposed development. The planning effort is on site level and to the nearest intersection depending the size of the development.

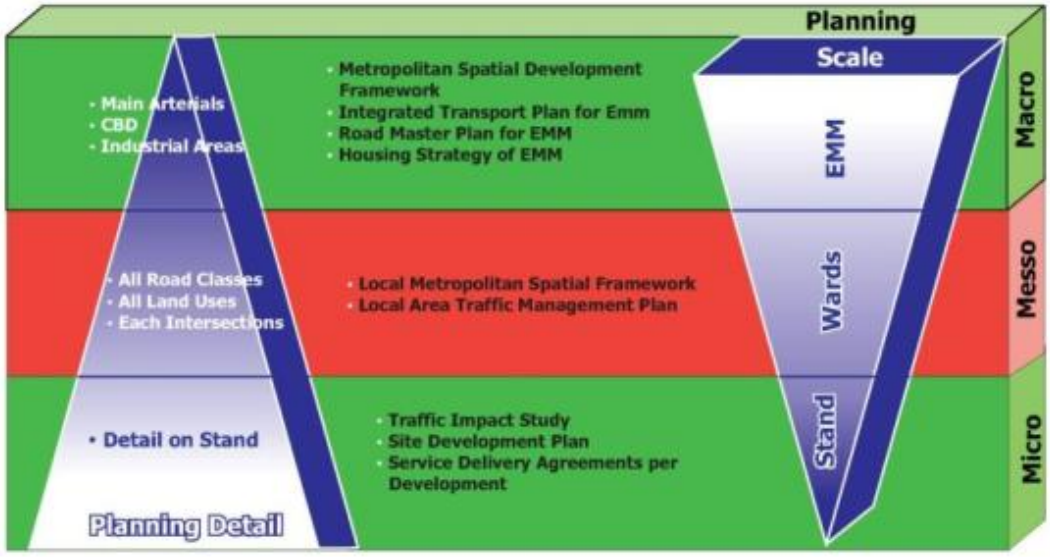


Figure 3: LATMP Position in Planning Environment

Source: Ekurhuleni Planning Unit

4. LATMP FOCUS AREAS

The EMM LATMPs focus on the implementation of the strategies identified in the:

- Energy and Climate Change Strategy (ECCS 2003),
- Integrated Transport Plan (ITP 2006) and
- Metropolitan Spatial Development Framework (MSDF 2005).

These strategies guide the focus areas of the LATMP for the implementation of projects and strategies that will mobilise the above-mentioned plans.

The vision set in the ECCS 2003 guides the development of LATMPs given that the vision identified for the transport sector is: ***"to improve local urban environmental management".***

The detail measurable targets forthcoming from the ECCS 2003 vision to ensure energy efficiency within EMM:

- Reduce the travel times and the travel distances of commuters by 10-15% by 2025 (EGDS), based upon the 2004 baseline information (ITP).
- Reduce, within the financial means of the Metro, the kilometers of the road network experiencing saturation levels higher than 90%, with 10% by 2025 (EGDS), based upon the 2004 baseline information.
- Initiate a 10% modal shift: 10% of private vehicles shift to rail/road based public transport by 2020, based on the 2004 baseline information (ITP/ CPTR).
- Include dedicated bicycle lanes on at least 20% of the roads identified for possible bicycle lanes by 2020.
- Enforced bus lanes and/or HOV or appropriate Public Transport lanes on suitable roads by 2020.
- Adopt the National Department of Mineral and Energy's Energy Efficiency target: Energy demand in transport sector reduced by 9% by 2014.

These targets are incorporated in the Integrated Transport Plan process, transport modelling as well as public transport and intermodal operational plans. The outcome of the modelling and operational plans is for example the Strategic Public Transport Network and infrastructure improvement on major roads to alleviate congestion and thus lower emissions.

The focus area of the LATMP is based on the strategic transport vision with the emphasis on the development of a local transport system that integrates the needs of the local community with the strategic planning of the city. With this integration, the targets set for an energy efficient transport system in the ECCS feeds into the LATMP.

For example, the need for an intermodal facility is identified based on the volumes of commuters utilising the facility and the modes operating from the facility as well as predicted future demands estimated from the proposed and pending nearby developments. The integration of the commuters from the facility into the local area requires detailed planning to ensure that all modes are treated equally. The ITP does not address / gather detail data to ensure this level of integration. The aim of the Local Area Traffic Management Plan is to assess the existing situation in the vicinity of the facility, identify the gaps in the integration process, and propose mitigating measures to enhance the experience of the commuters in and around the facility.

Based on this example the other aspects pertaining to private vehicles and freight movements can also be incorporated to ensure an effective transport system in the local area that reflects the strategic vision and planning of the city.

5. WHAT IS THE SCOPE AND PROCESS TO DEVELOP A LATMP AND THE CONTENT OF A LATMP TO IMPROVE ENERGY EFFICIENCY?

In terms of domestic and international experience based on literature studies in South Africa and Internationally the development of a LATMP can be divided in four stages with a revision of Stage 3 and 4 in instances where the implemented traffic management interventions or remedial measures were not successful (i.e. targets were not reached), alternative interventions or recommendations should be considered. The stages are summarised in Figure 4.

5.1 STAGE 1:

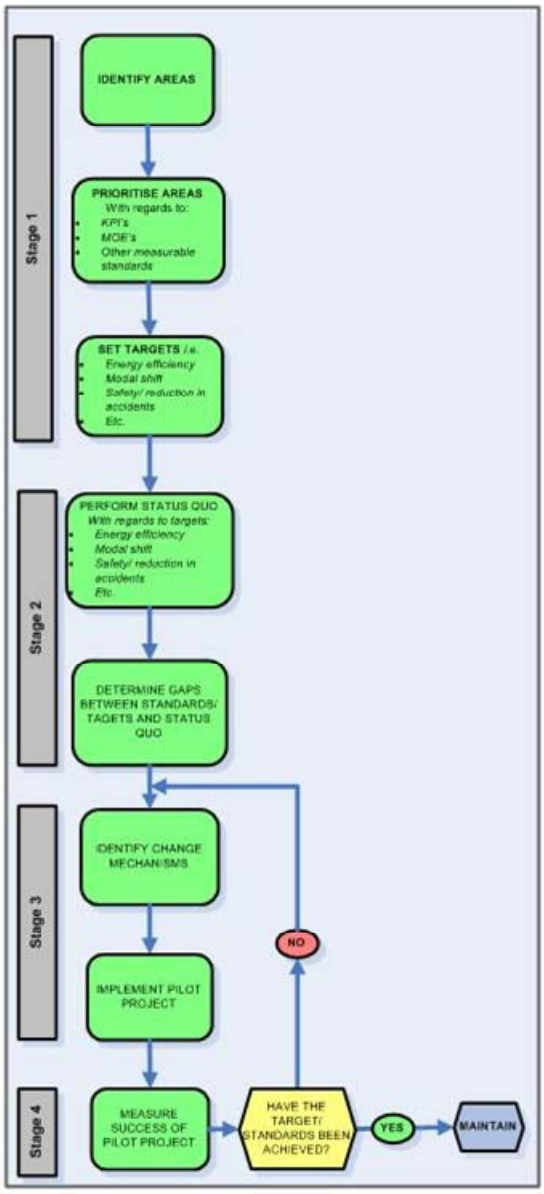


Figure 4: LATMP Development Process

- Determine local traffic area boundaries:
  - Typically the boundaries for the LATMP relates to other planning demarcations such as regional boundaries, transport model zones, wards, local spatial development framework boundaries etc.
  - It is recommended that the boundaries of the LATMPs align with the Local Spatial Development Frameworks boundaries to ensure integration between land use development and transportation planning. The detail of each LATMP is determined based on the land use within the boundaries of the LATMP ~ hence the link between LATMPs and LSDFs.
- Determine the order or priority of each local traffic area based on pre determined Key Performance Indicators (KPIs) or Measures of Effectiveness (MOEs) such as delay (congestion), volume-capacity ratios, travel time, passenger waiting time, public transport passenger walking distances, energy usage etc.
  - Depending on the land-use composition of the area, the extent of the investigation is determined. In other words, a rural area would typically cover a greater area than an urban local traffic area, given that the road hierarchy, access strategies and planning complexity will be less complicated.

- Set targets in relation to KPIs and MOEs used in prioritising the LATMPs, based on planning and strategic documents of the city relating to all the modes operating within the city. Typical targets would relate to the following:
    - Public transport service frequency – The Public Transport Operational Plan for the city established the frequency of public transport services through the specific Local Traffic Area (LTA). The LATMP should implement strategies or interventions to achieve these targets.
    - Modal split targets for the city's transport system are primarily based on Integrated Transport Planning strategies. The LATMPs should implement strategies and interventions to achieve sustainable modal split within the city's transport system.
    - CO_2 emissions targets for the city or on an area-wide basis could be used to measure the relative decrease or increase in congestion levels.
    - Walking distance standards applied in strategic public transport planning for the city could be used to determine the location / spacing of inter-modal transfer facilities or public transport stops within the LTA.
    - Determine whether HOV lanes and strategic public transport networks are located in the LTA and the implications of these proposals,
    - Energy use targets could be used to measure the impact of technology changes in intersection control technologies (i.e. Fluorescent versus LED technology).

5.2 <u>STAGE 2:</u>

- A status quo assessment should be undertaken for each of the LATMPs in relation to the targets set above, i.e. congestion, modal split, walking distances, energy usage etc. This status quo assessment will form the basis of comparison between the desired future end state (i.e. having achieved the targets) and the current scenario. Typical elements to be included in the status quo assessment may relate to:
    - Determining the existing location of public transport routes and facilities and the condition thereof
    - Modal split in the local area based on traffic counts, traffic models or relevant National Studies (e.g. National Household Travel Survey)
    - Accident statistics based on the visual observation of damage to lamppost at intersections or debris left after an accident. These observations are qualitative but give an indication of the problem, as detailed accident records and reliable accident statistics are difficult to obtain.
    - CO_2 emissions in the local area, sourced from existing or commissioned emission studies.
- A ***gap analysis*** should be undertaken to compare the ideal situation (targets) in Stage 1 and the current situation (status quo) in the local traffic area. This phase would typically involve public participation to ensure that all user needs within the specific area are incorporated as part of the desired end state or targets.
- The difference between the target and the status quo should be calculated for each of the KPIs or MOEs in order to establish the gap between the desired state and the status quo. Some of the analyses are qualitative but give an indication of the state of affairs and the areas that need detail investigation.

5.3 STAGE 3:

- Based on the outcome of the gap analysis of Stage 2, a set of traffic management interventions or remedial measures must be designed (and implemented) in the local traffic management area across all modes - motorised and non-motorised. The traffic management interventions may include:
    - Detail planning studies aimed at quantifying and addressing specific transportation issues within the local traffic management area.
    - Reducing vehicle delay through optimisation of intersection control thereby reducing vehicle emissions
    - Implementing pedestrian crossings, pedestrian walkways or conveniently located public transport stops, thereby improving public transport utilisation through improving convenience of the public transport system.
    - Implement a pedestrian walkway system between main uses such as schools and clinics or business nodes, thereby improving convenience and safety of non-motorised transport users.

A preliminary cost estimate and priority should be associated with each identified measure based on the effect it will have towards achieving the targets set during Stage 1.

5.4 STAGE 4:

Review of the implemented traffic management interventions or remedial measures to evaluate their effectiveness. The section entails a public participation process to ensure that the measures or devices were successful. In instances where the implementation was not successful (i.e. targets were not reached), alternative interventions or recommendations should be considered. Alternatively, investigating whether the initial targets set were achievable could result in revision of targets.

6. LATMP PILOT STUDY IN EMM

Based on the above the Local Area Spatial Development Frameworks for Ekurhuleni was used to select an area to develop one LATMP as a pilot study. The prioritisation of these areas was done based on a consultation process with the regional managers of the EMM to identify three critical areas within each region which resulted in the following potential project list:

- Oakmoor Station
- Tembisa Civic Centre
- Kempton Park Station
- Germiston Station
- Daveyton CBD
- Springs Station
- Natalspruit Hospitaal

Three criteria points (land use, public transport and income level) were defined based on the objectives of the Energy and Climate Change Strategy of EMM to prioritise the potential projects. In the end Kempton Park Station came out as the pilot study.

Six targets were identified in the Energy and Climate Change Strategy of EMM that is directly linked to the transport environment. These targets will form the basis of the development of the Kempton Park Local Area Traffic Management Plan to optimise the energy use within the local area. These targets are roughly defined and need to be linked to Levers and associated Measures of Effectiveness (MOE).

The targets identified in the Energy and Climate Change Strategy are:

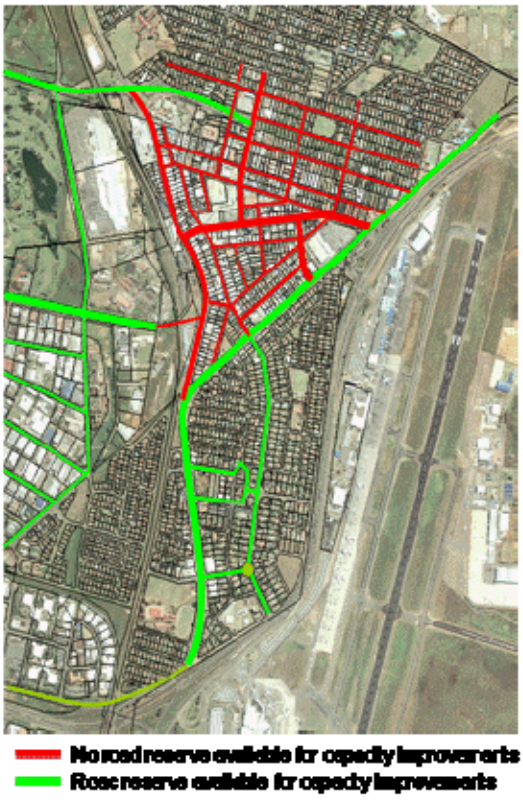
- **Target 1** - Reduce, saturation levels higher than 90% (Volume-Capacity Ratios of 0.9), with 10% by 2025 (EGDS), based upon the 2004 baseline information.
- **Target 2** - Reduce the travel times and the travel distances of commuters by 10-15% by 2025 (EGDS), based upon the 2004 baseline information (ITP).
- **Target 3** - Transport modal shift: 10% of private vehicles shift to rail/public transport by 2020, based on the 2004 baseline information (CPTR / ITP).
- **Target 4** - Establish bus lanes and/or HOV or appropriate Public Transport lanes on priority public transport corridors by 2020.
- **Target 5** - Establish a NMT network, aligned to the public transport network, with the necessary infrastructure and facilities for the Kemptonpark LATMP area and implement at least 20% of the network by 2020.
- **Target 6** - Adopt the National DME Energy Efficiency target: Energy demand in transport sector reduced by 9% by 2014 (Traffic Signals).

To ensure that each of these targets can be realised, Levers and Measures of Effectiveness (MOE's) were defined. The current affairs within the Local Traffic Area (LTA) are measured against these Levers and MOE's. Mitigation measures are recommended to rectify/ improve the physical infrastructure to ensure that the MOE are achieved. To illustrate the principle, Lever 2 of Target 1 is illustrated in the Table 1 below:

Table 1: Lever 1 Target 2

Lever 2: Current Link Capacity

Road Reserve Widths	Available Road Reserve Widths



Comparison:

Comparing the current road reserve widths *(Figure 7)* with the number of lanes provided, road reserves are available for lane additions within the road reserve *(Figure 8)* for the following roads:

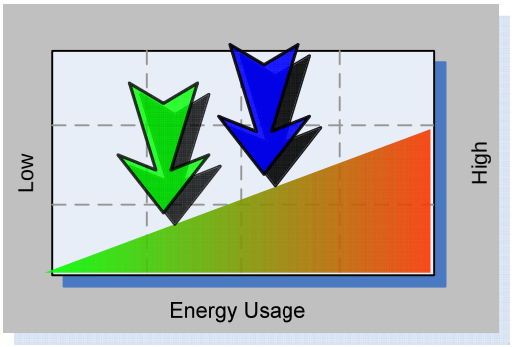
1. *Pretoria Rd* between Anslie Greyling St and Albatros St.
2. *Gladiator St*, south of Albatros St.
3. *Albatros Rd*.
4. *Plaas St*, west of Pretoria Road.
5. *CR Swart Drive* west of Monument St.

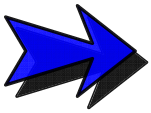
Conclusions:

The roads with a V/C >0.9 with road reserve available to provice additional lanes/ capacity are:

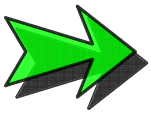
6. *Albatros St* between Voortrekker Street and Blockhouse Street.
7. *CR Swart Rd* to the west of Monument Road.

Based on the Levers and MOEs identified for the Kempton Park LATMP Area Pilot study, each of the targets were evaluated based on the current status and the foreseen impact of the implementation of identified projects which is illustrated below.**Target 1 - Volume Capacity Ratio**





Current Energy Usage



Anticipated Energy Efficiency After Implementation Of Listed Projects

Short Term Projects:

- Detailed model for the area updated with the latest traffic volumes, new development proposals and road projects.
- Detail investigation/study of the intersection following priority controlled intersections to determine if traffic signals are warranted:
  - *Intersections along Park Street and*
  - *Intersections along Cypress Street.*
- ♦ Detail investigation/study of traffic signal controlled intersections to determine the best remedial measure to improve intersection capacity. The remedial measures can include updating of the timing plans or capacity improvements of the intersections. The intersections identified for detailed investigations are:
  - *a. Central Street and Park Street,*
  - *b. Central and Monument Street,*
  - *c. Pretoria Street and Central Street,*
  - *d. Long Street and Greyilla Street.*
- Main movement corridors identified within the LTA that can benefit form traffic synchronisation to improve the V/C ratio are listed below. These corridors need detailed analysis to determine the signal settings for synchronisation. These corridors are:
  - e. *Central Street*
  - *f. Pretoria Avenue*
- The roads with a V/C >0.9 with road reserve available to provide additional lane (capacity) are:
  - g. *Albatros St* between Voortrekker Street and Blockhouse Street,
  - h. *CR Swart Rd* to the west of Monument Road.

Long Term Projects:

- Alternative to Pretoria Avenue as a Class 3 road (north – south link)
- Additional links between LTA and OR Tambo airport
- ♦ New access onto R21 – Pamona Rd.

7. CONCLUSION

It can be concluded that the development of LATMPs will assist in capacity building in the local government sphere (LGS) to empower the EMM achieve a more energy efficient transport system according to the targets and strategies identified in the macro-planning sphere of EMM, the Gauteng province as well as the national government.

LATMP is the implementation of the strategies and targets identified on a city- or metropolitan wide scale and assist in the day-to-day planning to ensure the integration of the local transport system with the strategic transport system of the city.

A LATMP is the implementation plan and localised building blocks for the ITP and thus ensures that the energy efficiency strategies identified in the ITP is implemented on a local scale. LATMPs furthermore can have a significant positive impact on energy usage, health, safety and convenience of transportation in communities in EMM and in the South African context.

With the implementation of these plans and following the Four Stage LATMP approach the community has a sense of ownership of the LATMP, ITP and other strategic plans for the city.

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