The Gauteng Spatial Development Framework 2030 (GSDF) identifies the following spatial development principles in relation to mobility and connectivity:

- Ensuring **connectivity between nodes** and connectivity from surrounding areas (for example lower-density neighbourhoods, major industrial zones or the rural hinterland) to areas of concentration, which implies a hierarchy of movement routes
- Including **investment in public transport** along the key connectors to link various nodes
- Incorporating **connectivity to and through a green open system** throughout the built environment
- **Addressing the spatial marginalisation of townships** (and the overwhelming tendency to locate most government-funded housing projects on the periphery) through spatial integration and development of housing on well-located land parcels
- **Preventing further spatial fragmentation**
- Recognising secondary towns as part of the overall settlement and economic network of the province, with **functional linkages between the urban conurbation and the hinterland**

At the municipal level, the City of Tshwane is informed by the Comprehensive Integrated Transport Plan (CITP) 2015–2020. While the plan is due for review, the strategic directives remain valid.

The CITP aims to ensure **equitable access and reduced travel times and costs**, and it also promotes integrated land use by means of transit-oriented development (TOD) and “green” transport initiatives.

Tshwane is well served with regional access through high-order roads which serve as linkages to the municipalities in Gauteng such as Johannesburg (via the N1), Ekurhuleni and OR Tambo International Airport (via the R21), Mogale City (via the N14), the greater Gauteng City-Region (GCR) and the neighbouring provinces of North West (via the N4/PWV 2), Mpumalanga (via the N4) and Limpopo (N1).

While Tshwane is well served by first-order roads, the reality is that a vast majority of commuters and freight transporters experience considerable delays and traffic bottlenecks. This phenomenon is attributed to the fact that highways are under pressure to function as both national, regional and local distributors. This has a negative **impact on economic activity** that relies on the efficient movement of people and goods. As such, the metropolitan road network system is in need of upgrade or alternative means of reducing the load on highways in Tshwane in order to provide the necessary relief in many parts of the city.

Spatial inefficiencies in Tshwane continue to define the sparse pattern of development in some parts of the city. The northern and far eastern parts (Regions 1, 2, and 7 to the largest extent) have limited employment opportunities relative to the population size, skill sets and land mass of those regions. Most employment opportunities are in Regions 3, 4 and 6. These latter regions are also better provided for in relation to social facilities and amenities relative to the former regions. As a consequence, many communities are forced to traverse the length and breadth of Tshwane in order to access employment opportunities and certain social services and amenities.

According to the National Development Plan (NDP), an average of 65% of Tshwane residents are dependent on public transport. Thus, the **NDP identifies transport as a core element of a decent standard of living**.

The majority of Tshwane residents, therefore, spend an enormous amount of time and earnings on public transportation in order to commute between their homes and their places of employment. These spatial inefficiencies contribute to spatial inequalities in Tshwane. Inefficient land use patterns and low-density sprawl further exacerbate the issue. These
contribute to undesirable travel demand patterns. Better alignment of land use and transport will reduce the need for long-distance commuting, which is a key response to ensure spatial efficiency and justice.

Gauteng remains the economic hub of South Africa, and it remains the responsibility of each sector in Tshwane to transform the spatial economy to integrate economic opportunities, transport, and human settlements and infrastructure to achieve spatial transformation. Improved productivity and market access can be achieved by providing strategic access to key economic nodes. Roads for growth (nodal and economic) have been identified in the Municipal Spatial Development Framework (MSDF) specifically to address the spatial economy. This is critical for spatial sustainability.

As part of spatial transformation, mobility and connectivity planning should contribute to efficient access to employment, ensure social and economic inclusion, and reduce travel distances by providing for the efficient, effective, safe and sustainable movement of people and goods in all of Tshwane.

Even though the majority of commuters rely on public transport, the number of private vehicles on the road, coupled with traffic congestion, contributes to increased carbon emissions. Greener, smarter transport should become a priority. Dense, compact, walkable, transit-oriented cities and precincts that put people before vehicles contribute positively towards a reduced carbon footprint and healthier, happier societies. Transport planning should therefore be in response to growth management.

Understanding that the current needs far outweigh the resources, it is important that the City focuses on the opportunities that exist for exponential growth and investment in the long term. These opportunities have been identified within nodal areas, as discussed in Chapter 2.

4.1 EXISTING AND PROPOSED NETWORK

The movement system in Tshwane comprises three of the four forms of transportation (rail, road and air), and it excludes maritime transport. The manner in which all three of these transport means are developed, managed, maintained and integrated will largely determine the success of the nodal concept. The sustainability of the nodal concept is dependent on connectivity and ease of access from one node to the other. The success of all focused spatial interventions relies on the adequacy of that spatial form to meet the needs of all users. As efficient as a node may be within itself, the node will not be sustainable if the target users cannot access it. The regional profiles presented in Chapter 1 indicate clearly that Tshwane accommodates quite a number of nodes, some performing very different functions, while others are quite similar. The synergies that exist between the various nodes are what enable many of them to be sustainable. But those synergies cannot exist without efficient linkages between the nodes. Connectivity via the movement system effectively strings the city together,
making it “smaller” and providing equal access for all residents to all nodes, integrating labour markets and providing flexibility around options for residential location versus one’s place of work.

The movement system in an urban environment is literally the arteries of the city – without these linkages there can be no economy, no interrelatedness and no “life”. Movement systems can be used to create access, structure settlements, and promote integration, diversity and mixed land use. Movement (flows of people, finance or goods) defines the energy networks of settlements. Accordingly, more continuous lines of movement represent planes of greater accessibility and, therefore, become the more desirable planes of connection for intensive use. Significantly, the energy potential contained in lines of movement is released through stopping, not through movement. Different movement modes have different patterns of stopping.

While Tshwane has a comprehensive system of higher-order mobility routes and development corridors, there are still several localities that are not adequately catered for. Integrated transport planning in Tshwane includes not only the planning side of things, but also intergovernmental relations. Some of the localities referred to above fall under provincial or national control and not under the local authority. Cooperative planning will therefore remain pertinent to the process required to address such areas.

4.1.1 ROAD

Tshwane contains all classes of road, from the highest to the lowest order. The regional (Southern African Development Community (SADC)), national and regional connectors support robust economy. Each class or category of road performs a unique function.

The hierarchy of roads categorises roads according to their functions and capacities. The basic hierarchy comprises freeways, arterials, collectors and local roads. The related concept of access management aims to provide access to land development, while also ensuring that traffic flows freely and safely on surrounding roads.

![Hierarchy of roads](image)

- Freeways or highways

At the top of the hierarchy are limited-access roads, freeways, highways or motorways, including most toll roads. These roads provide largely uninterrupted travel, often using partial or full access control, and they are designed for high speeds. Some freeways have collector or distributor lanes (also known as local lanes) which further reduce the number of access ramps that directly interface with the freeway. Rather, the freeway periodically interfaces with these parallel roadways, which themselves have multiple on- and off-ramps. These allow the freeway to operate with less friction at an even higher speed and with higher flow. Freeways are often included in the next category, arterials. No direct access is given to developments. Nonetheless, the high visibility and exposure given by these highways increase the potential for creating development corridors where
large-scale industrial, commercial and office developments can be located. Examples of these are the N1 and R21.

- **Major arterial roads or mobility spines**
  These are major through-roads that are expected to carry large volumes of traffic. In some places, there are large divided roads with few or no driveways that cannot be called freeways because they have occasional at-grade intersections with traffic lights that stop traffic, or otherwise they are just too short. Such roads are usually classified as arterials. These roads serve the purpose of interregional and metropolitan movement. As with highways, these roads often serve as good development corridors for large industrial, commercial and office developments due to the visual exposure offered to such developments. An example is the R101/Old Johannesburg Road in Region 4.

- **Minor arterials or mobility streets**
  These roads serve intra-metropolitan movement and are the most important linkages between nodes in Tshwane. Pockets of mixed-use developments where occasional access is given can be found. Where these roads cut through a node, TOD should be provided along these roads. Examples are Francis Baard Street and Nelson Mandela Drive in the inner city.

- **Collectors or activity spines**
  These roads collect traffic from local roads and distribute it to arterials. Traffic that uses a collector is usually going to or coming from somewhere nearby. These streets are characterised by slower-moving traffic due to the nature of the activity, which is often high-density mixed-use development along the street. Direct and high accessibility to land uses is provided. TOD should be provided for along these roads. Examples are Burnett Street and Park Street in Hatfield.

- **Local roads or activity streets**
  At the bottom of the hierarchy are local streets and roads. These roads have the lowest speed limit and carry low volumes of traffic. In some areas, they are mostly just adjacent to collectors and in residential areas. Examples are Pimento Avenue and Corobay Avenue in the Menlyn area.

Movement in terms of the road network relates to two metropolitan spheres of influence: Intercity and intracity movement.

**4.1.1.1 ROADS FOR GROWTH**

Development corridors can signal the development that occurs along a major transport route, for instance a freeway or a rail system, or development at either end of the corridor, that is, at the origin or the destination. Direct access to features that line the corridor is often restricted, with the number of stops for public transport being further apart from one another. There is a stronger correlation between the development and its surrounding environment than there is with the corridor itself. Points of concentration of higher-density development must occur around public transport stops and interchanges.

Higher-order development corridors (Class 1, 2 and 3) are focused more on the mobility and visibility of developments than on direct accessibility to developments. Lower-order development corridors allow for greater direct access and activity along the corridor itself.

Tshwane has a vast length of underused or incomplete metropolitan development corridors, and there still exists untapped potential to welcome iconic and economically stimulating developments along our major routes.

Tshwane forms part of a larger Gauteng urban region. Its economy is closely connected to the spatial economy of the neighbouring
municipalities and is also part of the economic engine of the country. From that perspective, the following routes (roads for growth) are the most important to connect the areas of opportunity in Tshwane to other areas of economic significance, at metropolitan and district (cross-boundary) scale:

- The PWV 2/N4 Platinum Highway links Tshwane in an east-west direction to port destinations (Maputo/Walvis Bay) and several significant regional centres of production.

- The N1 and R21 link Tshwane to economic growth areas in Gauteng, and they create amazing opportunities in terms of economies of scale, visibility, accessibility.

- The PWV 9 (also known as the R80 or Western Bypass (north)) is the missing link in the west and north of Tshwane. The road is disconnected in that a southern portion and a northern portion have been built. However, these portions are not connected and thus have a missing link. Without this link, large areas of Tshwane to the west remain marginalised in terms of access to areas of opportunities and lack support for the latent development potential in the west and north. The PWV 9 is long awaited and is significant to open up the western part of Tshwane and encourage development. Once the PWV 9 is realised, commuters from the northern parts of Tshwane (from as far as Soshanguve) can have direct access to the Centurion–Midrand–Sandton economic areas without having to interact with the congestion of the inner city. This linkage has further benefits for the northern industrial node of Rosslyn, which forms part of the Rosslyn/Wonderboom economic development priority quadrant as described in the Tshwane Built Environment Performance Plan (2020/21) as the economy can be reached “just in time”, which further strengthens Tshwane’s competitiveness and enhances development.

- The R25 provincial road serves the eastern part of Tshwane and the south-east between Bronkhorstspruit/Sokhulumi and Kanan/Bapsfontein. This route also links the area with OR Tambo International Airport.

- The R104 provincial road runs through from Region 3 to Region 7 in an east-west direction parallel to the north and forms part of the N4 to the east. This route links up with Emalahleni Local Municipality to the east.

- The R513/R42 road links the industrial area of Ekandustria with OR Tambo International Airport.

- The K101 is also known as the Old Johannesburg Road. The fact that the road has not been developed to its full potential while development has taken place all around the road creates serious bottlenecks during peak hours. This situation also stifles new development applications due to the shortage of transport capacity in the area. The road should be regarded as a strategic link which serves as an alternative route to the N1 freeway between Tshwane and Johannesburg.

- The K54 is the next planned ring road after the K69 (Solomon Mahlangu Drive) from Mamelodi and the N4 freeway. This road intersects the PWV 17 and links with the R21 freeway, and further intersects the N1 freeway up to Olievenhoutbosch and further. Development in the east as well as in the south is impeded due to this link not being developed. The road was supposed to be implemented as part of the second phase of the Gauteng Freeway Improvement Project. However, due to e-toll problems, the South African National Roads Agency (SANRAL) will not attend to it. The City should therefore prioritise this road to be implemented due to development pressure in these areas.
• The K97 is a link between Hammanskraal and the north of the city. This road intersects the N4 Bakwena freeway and links it with Lavender Road as well as the Rainbow Junction development. All public transport from the Hammanskraal area must use one lane per direction on this road, which causes unacceptable traffic congestion and road safety concerns, especially from Lintvelt Road and further north. The implementation of the K97 will relieve these conditions and have a positive effect on the demand for freight on the road.

• The K139 (Moloto Road upgrade) is a missing link that is supposed to carry north-south transport between the Waltloo industrial area and the Rosslyn Automotive Hub, as well as to link Waltloo and Mamelodi with the Moloto Road. Since the alignment of the K139 runs through a portion of Eersterust, which caused objections from the Eersterust community, it was decided to rather extend Derdepoort Road towards the north from Stormvoël Road and link it up with Baviaanspoort Road, which connects with the Moloto Road. This road will fulfill the same function as the K139. Currently, all heavy vehicles from Waltloo drive though the Jan Niemand Park residential area in Jan Coetzee Street. Fortunately, the Moloto Road was recently transferred from the Gauteng Provincial Government to SANRAL. SANRAL took over the link all the way to Stormvoël Road. This implies that SANRAL is supposed to implement the road from Stormvoël Road (the extension of Derdepoort Road) to link with the current Moloto Road. This is definitely a step in the right direction. Tshwane can benefit if SANRAL proceeds to implement this long-outstanding link road.

• Hornsnek Road (M17) is a key corridor for traversing Tshwane from the north to the south and is in need of maintenance.

The completion of the missing links of the PWV 2, PWV 9 and PWV 17 (all Class 2 roads) are especially important for commuter travel and for opening up the economy of Tshwane at strategic municipal level.

The major road proposals as per this narrative are reflected in the CITP (2015) as in the figure below.
Figure 4.3: Roads for growth
The following table compares the terminology from three selected sources as contained in the South African Road Classification and Access Management Manual:

**Table 4.1: South African road classifications**

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 1</td>
<td>Mobility</td>
<td>Principal arterial</td>
<td>Primary distributor</td>
<td>Principal arterial</td>
</tr>
<tr>
<td>Class 2</td>
<td>Major arterial</td>
<td>Regional distributor</td>
<td>Major arterial</td>
<td></td>
</tr>
<tr>
<td>Class 3</td>
<td>Minor arterial</td>
<td>District distributor</td>
<td>Minor arterial or activity arterial – spine</td>
<td></td>
</tr>
<tr>
<td>Class 4</td>
<td>Access or activity</td>
<td>Collector street (4a commercial, 4b residential)</td>
<td>District collector</td>
<td>Activity street</td>
</tr>
<tr>
<td>Class 5</td>
<td>Local street</td>
<td>Access road</td>
<td>Residential street</td>
<td></td>
</tr>
<tr>
<td>Class 6</td>
<td>Walkway</td>
<td>Non-motorised access ways</td>
<td>Non-motorised</td>
<td></td>
</tr>
</tbody>
</table>

*Source: South African Road Classification and Access Management Manual, 1989*
4.1.2 RAIL

While Tshwane has a comprehensive network of rail infrastructure, certain parts of it have been decommissioned. Other parts, including train stations, are in dire need of maintenance. The perceptions around rail in Tshwane are not positive. It is therefore critical that planning for trains and train stations is such that the standard of service offers a safe, attractive and efficient service that will even be used as an option by business commuters.

4.1.2.1 RING RAIL

The rail network in the Tshwane metropolitan area additionally comprises a circular system around the inner city which is linked via feeder lines to communities on the periphery of the municipal area (for example Ga-Rankuwa, Mabopane, Temba, Soshanguve, Atteridgeville and Mamelodi). The ring rail network itself links with a number of activity nodes, including a variety of education, health, sport and recreation facilities, as well as a number of residential areas of all income groups.

The importance of the capital core cannot be overemphasised. The inner city still remains one of the most important employers in Tshwane. Thus, access to the inner city is vitally important for the overall economic sustainability of Tshwane. Along the existing rail infrastructure tracks is the "ring rail".

The aim of the ring rail project is to optimally use the existing, centrally located rail infrastructure to enhance public transport in the metropolitan area through the integration of land uses and transport modes. The ring rail provides an ideal opportunity for densification and mixed-use development in the central part of the metropolitan area, and more specifically the roughly 1 km influence area around the network. The ring rail system will move a great number of people into the Pretoria CBD.

Through the rationalisation of the Integrated Rapid Public Transport Network (IRPTN) operational plan, other forms of public transport should support the feeder routes of the ring rail.

![Figure 4.4: Ring rail](image)

4.1.2.2 PASSENGER RAIL AGENCY OF SOUTH AFRICA

The main passenger commuter line in Tshwane is provided by the Passenger Rail Agency of South Africa (PRASA). A division of PRASA, PRASA Rail Operations, manages the urban metropolitan commuter service provided by Metrorail. Other services provided by PRASA in Tshwane are the Tshwane Business Express from Tshwane to Johannesburg and the Shosholoza Meyi, which provides long-distance public transport with the bus services of PRASA (Translux and City to City).

As part of the modernisation programme undertaken by PRASA, it has embarked on a major upgrade of its system that includes the following:
• New rolling stock
• Improvement of the signalling systems
• Station upgrades
• New upgraded train depots
• Upgraded operational plans
• Refocused timetables

In Gauteng, PRASA has identified a “super-corridor” that is subject to priority in the modernisation process described above. The corridor in Gauteng links Mabopane–Pretoria–Centurion–Kempton Park–Germiston–Johannesburg–Naledi.

Some of the benefits of modernisation and new rolling stock include the following:

• Addressing the capacity shortages on the line
• Alleviating the crush loads being experienced on the Mabopane–Pretoria rail corridor
• Decreasing the travel time on this corridor by approximately 20 minutes

The PRASA network, as illustrated in Figure 4.5, comprises the following lines:

• Mabopane–De Wildt–Belle Ombre–Pretoria

The Mabopane line to the north is one of the demonstration corridors in the PRASA rail modernisation initiative due to the high volume of passengers that it carries (up to 65 000 per day). PRASA’s plans for this demonstration corridor will prioritise the new rolling stock and new generation stations.

• Pienaarspoort–Hercules and Pretoria

PRASA has plans to use the Mamelodi to Pretoria CBD line as the “proof of concept” as part of the rail modernisation before the Mabopane demonstration corridor is rolled out. It is envisaged that this will be Phase 1A of the “proof of concept”.

• Saulsville–Pretoria

The link to the Pretoria CBD at Pretoria Station provides a continuous east-west link and this line will be Phase 1B of the “proof of concept”.

• Eerste Fabrieke–Mahube Valley (Pankop)

This line is presently a non-electrified Transnet Freight Rail line which is envisaged as a passenger line to serve Mahube Valley (Mamelodi). Two stations are planned on this line.
Figure 4.5: PRASA network
Figure 4.6: Railway upgrade projects
Figure 4.7: Railway new rolling stock
PRASA’s turnaround strategy

PRASA has adopted a turnaround strategy that employs the following objectives to reach its goal:

<table>
<thead>
<tr>
<th>Objective</th>
<th>Deliverables</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1: Improve the customer experience</strong></td>
<td>Customer centricity throughout operations</td>
</tr>
<tr>
<td><strong>Objective 2: Improve the rail performance</strong></td>
<td>Rail operations and rail engineering</td>
</tr>
<tr>
<td><strong>Objective 3: Realign support functions in order to achieve an efficient rail business</strong></td>
<td>Information and communication technology, supply chain management, human capital and financial efficiencies</td>
</tr>
<tr>
<td><strong>Objective 4: Modernise the rail system by means of the R173 billion investment programme</strong></td>
<td>Rolling stock fleet renewal programme, train manufacturing activities, local factory development, signalling programme, depot management and the 120 km per hour per way programme</td>
</tr>
<tr>
<td><strong>Objective 5: Expand rail networks and services through regional or provincial corridor expansions and the introduction of new services</strong></td>
<td>Hammanskraal–Pretoria rail corridor Moloto rail corridor</td>
</tr>
<tr>
<td><strong>Other planned service offerings</strong></td>
<td>Light rail solutions High-speed project</td>
</tr>
</tbody>
</table>

### 4.1.2.3 PROPOSED HAMMANSKRAAL–PRETORIA RAIL CORRIDOR

The Hammanskraal to Pretoria rail corridor was served by a limited passenger train service until 1987. Due to a long commute time, this service became unpopular with commuters. Based on the recommendations of a study done by the Department of Transport and the Council for Scientific and Industrial Research (CSIR) in 1986, the service was terminated towards the end of 1987. The vast majority of commuters travel by bus. Hammanskraal is situated approximately 40 km to the north of Tshwane, which renders it isolated from the rest of the city, especially since it is separated by a large expanse of agricultural land.

Pre-feasibility studies done in 2004 and 2010 found that the passenger train service can only be viable if the parallel competing bus service is terminated. The Regionalised Spatial Development Framework (RSDF) and GSDF have identified Hammanskraal as an activity node and it is pivotally in need of major road and rail networks to be constructed and/or upgraded as a top priority. The National Treasury has approved funding for the development of the Hammanskraal area as part of the Tsosoloso Programme, on the condition that PRASA commits itself to reintroduce the train passenger service.

Through the prioritisation of rail as the backbone of public transportation in the north of Tshwane, the spatial divisions in Tshwane that continue to define the sparse pattern of settlement will be minimised. The MSDF has elevated the prioritisation of rail as the backbone of public transport and this one of the key priorities in abolishing spatial discontinuities.
4.1.2.4 PROPOSED MOLOTO RAIL CORRIDOR

The Moloto rail corridor is an imperative project for Tshwane to elevate rail as the backbone of public transport. The Moloto rail corridor involves a new integrated multimodal transport system that is to serve as a spine and catalyst for economic development that connects Gauteng, Mpumalanga and Limpopo. The Minister of Transport gave a mandate for the project in 2006 and indicated that it must be treated as part of the priority corridor strategy of the National Passenger Rail Plan.

The project is a joint intergovernmental initiative by the Department of Transport, PRASA and the provincial governments of Gauteng, Limpopo and Mpumalanga. The district municipalities of Nkangala, Sekhukhune and the City of Tshwane also form a part of the initiative. The project was initiated due to various passenger public transport problems that have developed incrementally over time.

In addressing the transport challenges, the Department of Transport has introduced a three-pronged approach:

1. Optimise the current service design of the contracted bus services
2. Address the current road infrastructure and improve road safety
3. Implement a range of transportation solutions with rail transport forming the backbone of a transport-oriented development solution

In terms of the rail initiative, PRASA concluded a feasibility study in October 2014 that confirmed rapid rail as the preferred long-term transport solution for the corridor. PRASA established a project management and implementation office, and submitted a treasury application to the National Treasury for approval of project funding considerations.
Figure 4.8: Existing versus new railway services
4.1.2.5 GAUTRAIN

The Gautrain is a premium rapid rail system that provides a commuter service line from Johannesburg and Tshwane (north-south) and to OR Tambo International Airport (east-west). It is a strategic development initiative that is aimed at economic development and job creation, over and above its benefits from a public transport perspective and the reduction in traffic pressure on major roads, especially between Pretoria and Johannesburg. This commuter service links three important nodes in Tshwane at the following stations:

- Centurion Station
- Pretoria Station
- Hatfield Station

It is expected that the Gautrain will have a major impact on the demarcated destination Gautrain stations in Tshwane in terms of the future development of these areas. These nodes are also complemented by Gautrain feeder bus routes. To date, though, the Gautrain has only catalysed significant development at the Sandton and Rosebank stations, while areas around the Rhodesfield, Centurion and Midrand stations have not developed as much. There are many reasons why this disparity may exist. Nonetheless, this does not mean that every opportunity to leverage the value of Gautrain stations should not be used to catalyse the development of high-quality transit-oriented precincts and economic hubs. The City needs to ensure that development policies and incentives support the achievement of growth at the existing stations.

The Centurion property market has received investment since the development of the Gautrain station. In addition to this, the newly upgraded highways will make the Centurion area a more economically viable area to locate business enterprises, including increased accessibility to a potential workforce from areas south of Tshwane.

Current proposals for extending the Gautrain in Tshwane include linking Centurion to Mamelodi via Hazeldean. The City would want a station at Menlyn as well, as Menlyn serves as an important economic hub for the City. Further demand modelling is required to determine the optimal route to ensure that the service caters for the largest possible number of users, while also meeting the strategic intentions of the city with regard to prioritised areas for infrastructure investment and nodal development.

The Gautrain service is cost-prohibitive and therefore inaccessible to lower-income earners. However, it still remains a shining example of the standard that the rest of the public transport services need to attain in order to be safe, attractive, reliable and efficient.

4.1.3 AIR

Linking Tshwane to other localities in South Africa and the world is important for its competitiveness and global positioning. Being a “capital city of excellence” also implies being accessible by air from an international point of view, not only from an economic point of view but also from a political one.

Tshwane is home to two military air force bases (Waterkloof and Swartkop), which are located in the south-western part of the city, and one national airport (Wonderboom) located in the north-western part of Tshwane.

The airports in Tshwane fulfil the role of specialised activity areas, in accordance with the nodal structure of Tshwane.

Waterkloof Air Force Base plays a significant role in accommodating the movement of people, with a focus on VIP protection. This is very important for Tshwane’s functioning as a capital city. The main runway of Waterkloof Air Force Base has been upgraded to allow the current largest civilian and military aircraft to land safely. The airport also fulfils an important
diplomatic service and can therefore not be seen as a “public” airport. However, what has become important to Tshwane is the development of the Centurion Aerospace Village (CAV) as a high-technology defence and advanced manufacturing cluster located on the Waterkloof Air Force Base property and adjacent to it. This cluster forms part of the Department of Trade and Industry’s Aerospace Industrial Support Initiative (AISI). The purpose of this initiative is to retain existing technologies, skills and internationally recognised products and services, to build on these, and in the process to create international partnerships with leading aviation manufacturers and suppliers.

Wonderboom National Airport falls within the Rosslyn/ Wonderboom economic development priority quadrant. The quadrant is a strategic investment focus area that is intended to have a positive catalytic effect on development in the north-eastern areas of Tshwane.

The advantages of the quadrant include its proximity to the capital core, existing infrastructure (such as the N4) and the momentum of existing developments within the industrial area of Rosslyn.

The GSDF 2030 notes that in order to satisfy the long-term demand (beyond 2037) for aviation in Gauteng, a second international airport (other than OR Tambo) will be required at some stage. A feasibility study needs to be done to select and reserve a site for this airport. Such a study will need to consider airspace management, land availability, environmental impact and accessibility. Given the rate of expansion in Gauteng, once a site has been selected, the land needs to be protected. City airports (for example Lanseria in Johannesburg and Wonderboom in Tshwane) could also be developed further to alleviate the usage of OR Tambo International Airport by smaller aircraft.

However, further development and expansion of Wonderboom National Airport has been stifled by the fact that it lost its international status in 2000. The fact that the main runway is too short to handle a Boeing 737-800 or similar type of aircraft further limitS the potential of the airport. Added to this is the fact that the municipal government is not geared towards the effective and efficient running of airports, where important decisions often need to be taken quickly. Nonetheless, the City is still investigating various options for the expansion of Wonderboom National Airport.

Within the context of the economic development priority quadrant, the expansion and international status of Wonderboom National Airport would allow further nodal development and economic opportunity in the north of Tshwane, which is needed in view of the north/south population/job opportunity split that is presented by the Magaliesberg mountain range.

4.2 PUBLIC TRANSPORT

Public transport in South Africa is marred by general dissatisfaction from commuters. The public transport system is not sufficiently customer-centric, which results in poor service levels, delays and inaccessible service. It is also generally unsafe and does not reflect the world-class aspiration of the NDP 2030 of an integrated passenger transport system and access to opportunities for all.

With the introduction of the IRPTN, the hope was for a more integrated public transport system which would enable users to access and enjoy seamless movement through the various modes of transport, a shorter travel distance, and a safe and reliable service. This service would further bridge the spatial inequalities of the spatial form, but this goal has not been fully achieved as yet. However, the City continues to strive towards this goal.

Public transport services in Tshwane have been influenced by partisan spatial planning, characterised by long travel distances and travel times. While there are public transport services (rail- and road-based), they do
not always adequately meet the needs of customers. This gave rise to a taxi industry that responded to customer needs, and as urban migration continued, the taxi industry started to grow, largely in an unlicensed and uncontrolled manner. The road-based public transport facilities, especially bus terminuses, bus stops and taxi ranks are inadequate and do not subscribe to promoting integration between modes. More importantly, any new facilities or upgrades are based on addressing the basic needs of the captive customer and of the operator, rather than creating an integrated system of public transport which focuses on the needs of the existing and potential public transport commuter in both the first and last mile.

4.2.1 COMMUTER STATISTICS

This section deals with the regional patterns and trends in passenger transport, based on the Tshwane Household Travel Survey undertaken by the City in 2013. While the data captured may be six years old and may have changed slightly, the focus is on the broader impact of passenger transport on the movement of commuters.

The vast majority of commuters in Tshwane are economically marginalised and are predominantly lower-income earners who thus cannot afford a private car as a means of travel. The areas of Wallmannsthal, Mamelodi, Eersterust, Nellmapius, Hammanskraal, Ekagala, Soshanguve, Tshwane far east, Tshwane north-east, Tshwane far south-east, Bronkhorstspruit and Tshwane far south-west, which are spatially and economically marginalised, form the lower quantile of Tshwane’s economy.

Region 4 is characterised as Tshwane’s predominantly medium- to upper-income area. Together with Region 3 and Region 6, it is structured around transport connectivity links and residents are more inclined to have at least one private car available to them as a mode of transport. As such, the majority of those who own private vehicles are located in Regions 3, 4 and 6.

Some of the current practices in Tshwane promote and support private car use, which contributes to traffic congestion in Tshwane, but it may be justified by the lack of a quality public transport system and non-motorised transport (NMT) facilities. Currently the following are synonymous with high private motor vehicle usage:

- Developers are allowed to provide excessive parking, with no maximum limit.
- Travel demand management measures are not promoted.
- Until recently, NMT focused on captured users, with no active promotion of NMT as a viable and sustainable alternative mode.
- There is a lack of NMT facilities and networks in a safe and secure environment.
- There is poor funding of infrastructure maintenance and operational costs.
- The City of Tshwane has developed a road safety plan for disadvantaged areas.
- There is limited interaction and integration between the Tshwane Metro Police Department and traffic engineering with regard to road safety issues.

The majority of commuters travel for reasons of employment and education, and they frequently travel home.

Tshwane suffers from structural fragmentation caused by the Magaliesberg mountain range, and this creates significant polarisation and a poor north-south linkage in Tshwane. The bulk of the Tshwane population is located in the north, but the bulk of employment opportunities are in the south. The north-south traffic flows are putting a great deal of pressure on Tshwane’s roads. In view of the long distances that are currently being travelled in the north-south or south-north direction, rail transport needs to be prioritised. A mass investment in
mass transit would also assist Tshwane to achieve lower carbon emissions and to become more climate-responsive.

A third of all trips made in Tshwane are made by NMT. This is largely in the rural reaches and spatial outskirts of Regions 7, 5 and 2 where passengers do not have any choice in public transport and therefore have to walk. However, this is not limited to rural Tshwane. Other parts of the city, albeit to a lesser degree, also use NMT to access services in Tshwane.

Public transport is used widely in most of Tshwane, with the most use in Region 1 and the least in Region 6. A third of all trips in Tshwane are made by private transport, with the majority of those trips being allocated to Regions 4 and 3.
Figure 4.9: Commuter statistics, 2013

Source: Tshwane Household Travel Survey, 2013
Public transport in Tshwane, as in the rest of South Africa, is plagued by several challenges which include the following:

- Reliability, convenience and safety issues
- Overcrowded facilities
- Lack of coordinated and integrated modes
- Inadequate pedestrian and bicycle facilities to support mobility needs

4.2.2 MINIBUS TAXIS

At present, the minibus taxi industry plays a pivotal role in providing public transport services that cover most areas of Tshwane. The taxi industry currently responds much faster than other public transport modes due to its proactive response to demand. Apart from rail and the bus rapid transit (BRT) system, the minibus taxi industry has potential in the formulation of an integrated public transport system. However, this system has current challenges that must be resolved.

There is opportunity for the minibus taxi service to expand its offerings in various ways to provide a feeder service while using its current strength of connecting commuters with rail and/or BRT services. This has the potential to reduce operating costs for the minibus taxi industry, thereby providing much-needed economic relief to the end user. While many taxis are operating at capacity during peak hours, they are largely empty during off-peak times. Technology can be employed to optimise their offerings and to ensure that, similar to e-hailing services, commuters have “real-time” access to a minibus taxi, which will limit the need to drive around looking for commuters or to wait at the taxi holding areas for commuters.

By virtue of their reach, minibus taxis can form part of the solution to creating a compact city. A further opportunity for the industry is the development of TOD ecosystems which thrive on the highest possible densities along public transport routes. This creation of economic opportunities will strengthen the transport sector and foster integration into a complete IRPTN.

4.2.3 BUS SERVICES

The bus network in Tshwane is composed of several networks under the responsibility of various stakeholders, and consequently it is operated by several service providers. These networks can be summarised as follows:
Table 4.3: Transport authorities that operate in Tshwane

<table>
<thead>
<tr>
<th>Transport authority</th>
<th>Name of contract</th>
<th>Operator</th>
<th>Main origin and destination of services</th>
</tr>
</thead>
<tbody>
<tr>
<td>City of Tshwane</td>
<td></td>
<td>Tshwane Bus Services</td>
<td>Numerous services throughout Tshwane</td>
</tr>
<tr>
<td>Gauteng provincial government, Department of Roads and Transport</td>
<td>D23/96, D24/96 D25/96, D26/96</td>
<td>A Re Yeng</td>
<td>From Mamelodi to the Pretoria CBD and elsewhere in Tshwane</td>
</tr>
<tr>
<td></td>
<td>D28,96, D29/96, D30</td>
<td>Atteridgeville Bus Service</td>
<td>From Atteridgeville to the Pretoria CBD, Pretoria North and Centurion</td>
</tr>
<tr>
<td>IC51/97</td>
<td>PUTCO Soshanguve</td>
<td>Soshanguve to various destinations (Pretoria CBD, north, east and west)</td>
<td></td>
</tr>
<tr>
<td>IC52/97</td>
<td>PUTCO Mpumalanga</td>
<td>Various areas in Mpumalanga and most destinations in Tshwane areas</td>
<td></td>
</tr>
<tr>
<td>IC53/97</td>
<td>NWS Botlhaba Tswana Depot</td>
<td>Hammanskraal to the Pretoria CBD and various destinations in the north, east and west</td>
<td></td>
</tr>
<tr>
<td>IC54/97</td>
<td>NW Batsvana Gare Depot</td>
<td>Various origins in the north-west areas of Tshwane to various destinations in Tshwane</td>
<td></td>
</tr>
<tr>
<td>NW711.0</td>
<td>Thari Bus Service</td>
<td>Ga-Rankuwa to various destinations in Tshwane</td>
<td></td>
</tr>
<tr>
<td>Gautrain Management Agency</td>
<td>Part of the Gautrain concession</td>
<td>Bombela Concession Company</td>
<td>Feeder routes around the Gautrain stations (Hatfield, Pretoria and Centurion)</td>
</tr>
</tbody>
</table>
4.2.4 THE INTEGRATED RAPID TRANSPORT NETWORK AND BUS RAPID TRANSIT

The IRPTN represents public transport services that are “rapid” in that they have designated lanes or are built in such a way that they are faster than other forms of public transport. Thus, A Re Yeng, which is a BRT system that consists of five identified phases of IRPTN trunk routes and supported by feeder and distribution routes and the Bus Rapid Transit (BRT) forms one component of the IRPTN. This may, in some instances, include rail such as the Gautrain.

The Integrated Public Transport Network (IPTN) includes the IRPTN and all public transport-related routes and modes, including rail, bus, minibus taxi, metered taxi and NMT in Tshwane.

The BRT is currently the only component of the IRPTN that has been built by the City of Tshwane. For an effective and efficient transport system to support the entire extent of Tshwane, it is important that the entire IPTN is taken into consideration and that there is not undue focus on the BRT, as there are many areas of Tshwane that currently have no access to the BRT. The long-term planning of the BRT network also only covers parts of Tshwane and there are many communities that still rely on the other forms of public transport.

To this end, the many communities that are not adequately provided for are left without alternatives but to use the minibus taxi or standard bus services, which both continue to fulfil an important role that should otherwise be integrated into a complete IRPTN network. Key to the function of the IRPTN is the modal transfer facility, which selects the appropriate mode of service and eliminates competing or parallel services.
Figure 4.10: IRPTN Phase 1
Figure 4.11: IRPTN development schedule
Figure 4.12: IRPTN phasing
4.2.5 GAUTRAIN

Pretoria Station is situated in the capital core and is deemed to bring with it urban upliftment and revitalisation that encourage business and tourism trips. In particular, existing land uses must be improved and renovated, and pedestrian links created, thus ensuring safe passage for commuters.

The draft precinct plan for the Hatfield area aims to increase TODs around the Gautrain station. These developments will benefit from this fast and reliable public transport service, but will also contribute to increase the patronage of the Gautrain, particularly passengers that walk to the station. The other objective is residential densification. There is an international tendency of densification around public transport nodes, particularly metropolitan and intercity railway services such as the Gautrain. Increased densities of residents are a prerequisite for a viable and efficient public transport service. A policy of residential densification will support the feasibility of the Gautrain.

To ensure the viability of these stations, the areas around the stations will have to comprise a specific land use mix (with a strong emphasis on residential development) at a specific intensity and density, with a strong focus on pedestrians and intermodal transfer facilities. They will also have to comply with specific urban design requirements. Local spatial frameworks and precinct plans for and around these areas will guide the implementation of development here. The development of rapid rail (Gautrain) towards the south, thus linking with the economic centres of Johannesburg and the airport, is a major step in a strategic change in direction from a predominantly private vehicle transport system to creating an appropriate alternative in the form of a public transport system over the long term.

The Gautrain is a working example a mode of transport that employs an intelligent system through the use of its electronic ticketing system at the Gautrain stations and on the Gautrain buses. A detailed description of passenger rail services in Tshwane can be found in the Commuter Rail Strategy in Section 7.6.5 of the CITP 2015–2020.

The Gautrain project team is currently investigating the possibility of extending the Gautrain line in Tshwane to include a line from Irene to Mamelodi. From a strategic spatial planning perspective, and in view of the proposed extensions being close to the Menlyn area, which is a metropolitan node, the extension is supported.

The Gautrain service is cost-prohibitive and therefore inaccessible to lower-income earners. However, the Gautrain still remains a shining example of the standard that the rest of the public transport services need to attain in order to be safe, attractive, reliable and efficient.

4.3 TRANSIT-ORIENTED DEVELOPMENT

TOD is a tool that supports growth management, maximises the potential of existing infrastructure and creates a more competitive space economy within target areas.

To concentrate high-quality, mixed-use, pedestrian- and cyclist-friendly development, the intention is to build a spatially inclusive city that supports social and economic inclusion and opportunities for all its residents coupled with low carbon emissions, and to do this it is necessary to develop TOD. Spatial restructuring will require that future settlements or densification of existing settlements are focused along corridors and within nodes in order to redress the spatial distortion caused by past policies. These specific actions can be achieved through TODs. But those synergies cannot exist without efficient linkages between them.

TODs are necessary to optimise existing resources and infrastructure in order to ensure prioritised densification at the nodes and along corridors, intensification of mixed uses and a compaction of the urban form. Most importantly, TODs prioritise walking and cycling, and overall reduce...
dependence on private vehicles by creating an attractive environment that is geared towards the use of public transportation and a habitat based on social and economic inclusion. Concentrating development in targeted areas also assists to minimise the carbon footprint as Tshwane continues to develop.

The RSDFs (2018) have identified the following TOD opportunities in Tshwane:

Table 4.4: TOD opportunities in Tshwane

<table>
<thead>
<tr>
<th>Region</th>
<th>Area Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 1</td>
<td>Mabopane/Soshang uve urban core</td>
</tr>
<tr>
<td></td>
<td>Pretoria North/ Rainbow Junction metropolitan node</td>
</tr>
<tr>
<td></td>
<td>Kopanong Station</td>
</tr>
<tr>
<td>Region 2</td>
<td>Pretoria North/ Rainbow Junction metropolitan node</td>
</tr>
<tr>
<td>Region 3</td>
<td>Saulsville Station</td>
</tr>
<tr>
<td></td>
<td>Pretoria Station</td>
</tr>
<tr>
<td></td>
<td>Hatfield Station</td>
</tr>
<tr>
<td>Region 4</td>
<td>Centurion Gautrain Station</td>
</tr>
<tr>
<td>Region 6</td>
<td>Mamelodi urban core</td>
</tr>
<tr>
<td></td>
<td>Menlyn metropolitan node</td>
</tr>
</tbody>
</table>

The RSDFs (2018) serve as a critical input layer to the MSDF. One of the most critical layers is the densification strategy.

The strategy proposes four key density zones (see Chapter 3 for a detailed description of zones). Two of these zones are essential for density zones which are essential for TOD, namely:

- Concentration zones
- Linear zones

4.3.1 CONCENTRATION ZONES

(Less than 500-metre walking distance: Density of more than 200 units per hectare)

Concentration zones are the primary focus areas for high-density residential developments and are centred around nodes of metropolitan importance, such as metropolitan nodes and urban cores (high-density zones), transit promotion zones and other strategic locations. A density of more than 200 units per hectare will only be supported on properties adjacent to the trunk routes.

Transit promotion zones refer to those nodes that are centred on transportation nodes such as stations and large intermodal transfer sites, and where TOD should take place. TOD is defined as a unique mix of high-density and high-intensity land uses located within an 800-metre walking radius of a railway station or major public transport node.

The areas around the existing Gautrain and PRASA railway stations and around the existing and proposed BRT or IRPTN stations have been earmarked as higher-density transit promotion zones. Densification should take place within an 800-metre walking radius of a BRT or IRPTN station. Densities of more than 200 units per hectare in nodes and around rail stations will be applicable for the first 500-metre walking distance and up to 120 units per hectare for the distance between 500 metres and 800 metres. The guidelines have been determined by the National Treasury in terms of their Urban Hub Design Toolkit. Funding of BRT lines and stations are dependent on these guidelines.

The concentration zones and linear zones call for a drastic change in the built environment in terms of densities, typologies, built form and urban design, moving away from suburban typologies in these areas toward a more urban fabric. Heights of up to eight storeys will only be supported on
properties adjacent to and fronting the trunk routes. Downscaling of height will be applied relative to the distance away from the trunk route.

Densities in concentration zones should not be developed at less than 80 units per hectare or less than three storeys.

Existing and planned PRASA railway stations outside the metropolitan nodes and urban cores will be regarded as densification areas. Densification should take place within an 800-metre walking radius from a PRASA station. Densities of up to 200 units per hectare around rail stations will be applicable for the first 500-metre walking distance and up to 120 units per hectare for the area between 500 metre and 800 metre. Only two- to three-storey developments (walk-ups) are envisaged for these areas around rail stations.

4.3.2 LINEAR ZONES (CORRIDORS AND SPINES)

(Up to about 200-metre walking distance from public transport: Density up to 80 units per hectare)

For the purpose of densification, linear zones refer specifically to high-intensity activity areas that are located along major routes. The routes usually carry high volumes of traffic to areas such as zones of concentration and transit promotion zones, and thus encourage the feasibility of public transport on strategic routes. The linear zones also connect the urban core areas in Tshwane with one another.

Identifying these linear zones should follow a focused, selective and phased approach, where only the most important routes are identified in the short term. This is necessary in order to achieve a high level of concentration along each of these routes rather than dispersing development along too many routes, and then the critical mass for public transport viability is never achieved. In terms of the densification strategy, linear zones refer specifically to high-activity areas that are located along major routes. The main aim of the routes should be to encourage public transport. The average density supported around linear zones will be in the order of 80 units per hectare.

In view of the investment that the City has made in BRT infrastructure, over the next five years, high-density housing (private or public) and mixed-land-use investment should, as far as possible, be prioritised close to and alongside areas where the BRT has already been completed, such as the BRT Phase 1, Line 1A (Pretoria CBD to Rainbow Junction) and Line 2A (Pretoria CBD to Hatfield).

The following City of Tshwane documents provide detailed guidelines for development along these lines:


It is important to note that the City of Tshwane owns a number of land parcels along Line 1A. Unlike the completed BRT Line 2A, where developers have submitted a number of land use applications and building plans in line with the spatial plans for Tshwane, there has not been much take-up or interest along Line 1A. There may be numerous reasons for this, but one option for catalysing development along this line is to consider the City-owned land along the line, some of which includes open spaces. It may be necessary to reconsider the current land uses and lease limitations of the City-owned properties in order to encourage developers to invest along the line and support the City to achieve TOD and sustainable human settlement outcomes (see further elaboration under Land Banking, Chapter 3: Human Settlements and Growth Management).
When it is correctly done, densification need not be at the cost of greening the urban environment, nor do the various modes of movement and transport need to compete with one another. However, NMT should be given priority within and close to transit stations and within transit precincts.

Figure 4.13: Project Bonaventure, Montreal

Image credit: Canadian Society of Landscape Architects
Figure 4.14: A transit-oriented mixed-use precinct

Image credit: CLIMATEWORKS (adapted)
4.3.3 URBAN NETWORK STRATEGY AND THE INTEGRATED RAPID PUBLIC TRANSPORT NETWORK

Through the Urban Network Strategy (UNS), TODs may be employed as a means to link marginalised area to areas of opportunity. The UNS alignment is anchored by the IRPTN alignment to ensure that layering of interventions is achieved. The marginalised areas are connected to opportunity areas via an integration zone. The definition of an integration zone, in accordance with the Urban Network Structure of the National Treasury and as reflected in the Built Environment Performance Plan, is defined as follows:

The urban network consists of a number of integration zones. Each zone is a part of a city or city-region-wide TOD network. An integration zone is a spatial planning element that facilitates spatial targeting of investment aimed at spatial transformation. Each zone consists of a transit spine that connects two anchors via mass public transport (rail or bus), for example the CBD and an “urban hub” (township node with the best investment potential). It can also comprise the CBD and another primary metropolitan business node. Between the two integration zone anchors are a limited number of integration zone intermediate nodes that are strategically located at key intersections and connect to marginalised residential areas (townships and informal settlements) and economic nodes (commercial and industrial nodes) via feeder routes. The urban hub connects to secondary townships nodes in the marginalised peripheral township. The integration zone includes a hierarchy of TOD precincts located and prioritised within the structure of nodes described above.

From this definition, it is clear that an integration zone is the proverbial “string” in the “beads on a string” concept. The basic elements necessary to define an integration zone are therefore as follows:

- Transit spine
- Nodal anchors
- Intermediate nodes or precincts that intersect with feeder routes
Figure 4.15: Urban Network Strategy and integration zone
4.3.4 NON-MOTORISED TRANSPORT

The City’s policy instruments to drive transition of the transportation sector to low carbon emissions is encouraged through NMT, which is an important mode to prioritise, with many benefits that include creating an equitable liveable city for all. After minibus taxis, walking and cycling are the most important modes of transport, since Tshwane already has high walking mode share and high cycling potential. This will involve changing the spatial configuration of the city as well as supporting a cultural shift towards promoting walking and cycling as inclusive modes that are attractive to people from all walks of life. This must be supported by an efficient public transport service or IRPTN and a comprehensive safety plan. While NMT infrastructure is starting to be rolled out throughout Tshwane, there is a general lack of guidance and design guidelines to inform the current developments, which results in a lack of pedestrian-friendly developments.

It is critical that NMT planning be incorporated along all the existing IRPTN routes where all investment is being focused in the short to medium term, and along all IRPTN routes to be constructed in the medium to long term, as well as future developments. Pedestrian and cycle access must be independent from vehicle access, and bicycles shall be provided at all stations, as well as some other modes of transport, where appropriate.

The CITP for the City of Tshwane articulates a set of objectives, principles and standards to establish a broad framework for NMT development. NMT links have been proposed to serve at metropolitan and regional level.

The focus is on general movement across the regions. The NMT links serve the broad areas concerned and do not specifically target integration with other transport modes or serve specific attractors and generators. This is acceptable in serving the broader IPTN system for Tshwane, but those NMT links that will directly and specifically feed the IRPTN (designating BRT and rail) facilities need to be sought out, planned for and prioritised.

The IPTN operations plan targets connectivity from within a 2 km buffer zone to intermodal transport facilities, but restricts itself to only the major intermodal facilities usually associated with rail stations and/or bus terminals, and not all stations and facilities.

The vision for NMT in Tshwane has broad and far-reaching impacts. The current state of planning for NMT in the city has focused on the broader objectives and is inadequate to support the focus required in the Optimisation Strategy for the IPTN. In order to achieve this, a further planning and prioritisation process is necessary.

One of the key requirements for precinct plan developments is that where a TOD precinct is identified, NMT needs to be addressed.

In 2018, the Tshwane NMT Guidelines were finalised and these will further entrench the incorporation of NMT into the City’s development plans.
Figure 4.16: NMT network plan

Source: Tshwane Integrated Public Transport Plan, 2020
4.4 RAIL AS THE BACKBONE OF PUBLIC TRANSPORT

Tshwane suffers from structural fragmentation caused by the Magalies mountain range, which creates significant polarisation and a poor north-south linkage in Tshwane. The bulk of the population in Tshwane is located in the north, but the bulk of employment opportunities are in the south. The north-south traffic flows put a great deal of pressure on our roads. In view of the long distances that are currently being travelled in the north-south or south-north direction, rail needs to be prioritised.

The railway network should be the backbone of long-distance travel in Tshwane, providing connectivity to surrounding municipalities and provinces. Tshwane has extensive boundaries and a number of commuters who, due to unique circumstances and an undersupply of reliable public transport, traverse the length or breadth of Tshwane to commute from home to work and vice versa.

On the other hand, there are also a number of people who live in Tshwane but work outside Tshwane’s boundaries (and vice versa) who require a cost-effective means to commute in Tshwane.

As has already been alluded to, the existing rail system provides essential infrastructure for cost-effective long-distance public transportation. If it functions efficiently, it should be the backbone of public transportation due to its reach and inclusiveness of the marginalised areas in relation to the Pretoria CBD and other areas of economy. However, rail faces real challenges due to ageing infrastructure. This challenge has resulted in an ongoing investigation by PRASA into demand projections for the rail-based service versus integration of rail-based transport with BRT. The result will provide an indication for the future of public transport and land development in Tshwane.

Where people live and work matters a great deal to the function of a city. Living far from employment, with poor access to basic services and low levels of participation in the economy, and spending one’s entire earnings on public transport is a recipe for a dysfunctional society. Through the years and due to the degradation of rail infrastructure, road travel has enjoyed a larger share of the market than rail travel. This is not without consequences, because the unhealthy competition of the road transport mode has led to the minibus taxi industry monopolising the market over bus services, particularly for urban commutes, due to the versatility and reach of the minibus taxi. However, the taxi industry faces the challenge that it is an unregulated informal system that does not fit into the City’s current operational plans.

Passenger rail is managed by PRASA, formerly the South African Rail Commuter Corporation (SARCC).

It will be important that both the BRT and the rail system be supported by Tshwane Bus Services in the north-west of Tshwane, closing the gap between Hammanskraal and Mabopane, and offering stops in Dilopye, Stinkwater, Soshanguve and Mabopane. In the medium to long term, should funding be available, the commuter railway line should be extended to link Hammanskraal to Mabopane.

The rail network in the Tshwane metropolitan area additionally comprises a circular system around the inner city (the ring rail) which is linked via feeder lines to communities on the periphery of the municipal area (for example Ga-Rankuwa, Mabopane, Temba, Soshanguve, Atteridgeville and Mamelodi). The ring rail network itself links with a number of activity nodes, including a variety of education, health, sport and recreation facilities, as well as a number of residential areas of all income groups.

A complete reversal of the current situation in terms of service offering and ridership is required, with rail and BRT services intended to supersede ordinary road-based transport modes.
Until public transport across all modes is sufficiently customer-centric, addresses poor service levels, omits delays, is accessible to differently abled groups, and is safe and comfortable to use, we will likely not achieve the transition to a low-impact and sustainable transport system.

In addition to road safety, crime is another important issue. Using transport means being in public spaces, whether via road, rail or NMT. Commuters need to feel safe and need to know they will arrive at their destinations without being victims of crime.

An unsafe but beautiful city is not of much use to residents, for who – apart from those who have no choice – would venture out to engage with the city at risk of life or property? In Chapter 1, crime is listed as one of the key challenges facing Tshwane residents. **Safe and liveable** communities require more than just reliance on effective policing or a well-functioning criminal justice system. Crime is a complex social and economic phenomenon that is linked to a myriad of factors, such as social change, urbanisation, power differentials, poverty, difficulties in integration, lack of opportunities, gender differences, etc. The policy framework required to deal with “safety” should therefore be holistic and address issues of employment, urban planning and environment, education, transport, housing, etc. The safety of the community can only be achieved by an effort that includes providing remedial measures for the social and economic conditions that foster crime and victimisation.

The City of Tshwane’s targets should include the following:

- A safer city through environmental design
- Using technology for public security
- Visible policing
- Community capacity for safety through legitimate means
- An entrenched culture of respect for the law
- Integrated safety strategies through interdisciplinary engagements and partnering with the community and all relevant role players
- Efficient and effective response and recovery
4.6 SUPPORTING ECONOMIC ACTIVITY

Gauteng is the economic hub of South Africa. In ensuring that Gauteng continues to play a leading role in the transformation of the economy and society, in 2004 the government adopted the vision of building Gauteng into a city-region. The GCR is in the making, and Gauteng is fast becoming an urban conurbation of highly integrated cities and urban economic nodes.

The GCR comprises an “integrated cluster of cities, towns and urban nodes that together make up the economic heartland of South Africa” (GCRO, 2018a). In fact, according to a publication by the Gauteng provincial government, our developing GCR is one of the largest urban agglomerations, ranking 26th in the world. This picture places into perspective the potential that Gauteng has as a participant in the global economy and highlights its position as the possible gateway to Africa. Already flying the flag as the economic hub of South Africa, Gauteng is a growing province with a growing labour sector and investing in infrastructure is essential to realise this vision.

The City of Tshwane is a critical participant in realising the success of the GCR. Tshwane, the capital city of South Africa, is also the hub of the automotive industry’s manufacturing sector. In 2019, the president announced the launch of the Automotive Special Economic Zone (SEZ) in Silverton and supported investment into the sector as an opportunity to expand the workforce and uplift the manufacturing of automobiles in Tshwane. Another substantial contributor to the economy in Tshwane is the freight industry. As a subsector of the automotive industry, the freight industry has equal potential to grow with the investment potential of the automotive sector. The vehicles that will be produced by the Automotive SEZ and the Rosslyn Automotive Hub will contribute to the economy of Tshwane and increase its gross domestic product (GDP). The manufactured vehicles will be sent to the ports through the freight corridor and then to the SADC and global markets.

A competitive economy is a productive economy. The productivity level also determines the rates of return obtained by investments in an economy, which in turn are the fundamental drivers of its growth rates. Extensive and efficient infrastructure, specifically pertaining to transport and communication, determines where and to what extent specific sectors can develop. An efficient freight and logistics system influences the cost of doing business and is a catalyst for economic development.

To this end, the City of Tshwane’s freight and logistics plan is informed by the National Freight Logistics Strategy, Public Transport Strategy and the 25-year Gauteng Integrated Transport Master Plan.

Tshwane’s location gives it significant advantage in relation to freight and logistics potential due to the north-south sub-Saharan regional development corridor, the proximity to the platinum belt, including the east-west Walvis Bay–Maputo corridor, as well as the automotive manufacturing sector and Transnet’s Pyramid freight hub initiatives. Further, Tshwane plays an important role in freight and logistics due to its role on the Durban–Free State–Gauteng corridor (Strategic Infrastructure Project 2), as identified by the government and Transnet.

4.6.1 CONNECTING ECONOMIC NODES

There are a number of nodes that form major centres of economic development and job opportunities. The synergies that exist between these nodes are what enable many of them to be sustainable. However, those synergies cannot exist without efficient linkages between the nodes. Connectivity via the IRPTN system effectively strings the city together. This network comprises both rail and road-based rapid transit infrastructure. It includes all the major railway stations along the PRASA rail network as well as the current and planned BRT network (also known as A Re Yeng), the Gautrain and proposed extensions. The spatial strategy of the MSDF seeks to promote densification along the IRPTN corridors and around the nodal points.
It is important to understand the spatial layout of Tshwane and the characteristics of the transport system in Tshwane before various strategies to address these discontinuities are developed. The results indicate a spatial fragmentation that requires an effort to open Tshwane to more opportunities from a transportation perspective. This section will not analyse the household travel survey, which was a major data collection exercise commissioned for the CITP 2015–2020, but it will endeavour to summarise the data collected in 2013 and the results thereof in order to understand and deduce a clearer spatial reality.

The main employment economies in Tshwane include the following:

- Pretoria CBD or inner city
- Hatfield–Arcadia–Sunnyside
- Silverton–Waltloo, Pretoria West
- Rosslyn
- Centurion

Marginalised communities are clustered as follows:

- Mamelodi (east)
- Olievenhoutbosch (south-west)
- Atteridgeville (west)
- Ga-Rankuwa–Mabopane–Soshanguve–Winterveld (north-west)
- Temba–Hammanskraal (north)

The main retail and office node functions are mostly concentrated as follows:

- Pretoria CBD/inner city
- Centurion CBD strip
- Hatfield/Arcadia/Sunnyside
- Greater Menlyn

The main industrial complexes are located as follows:

- Rosslyn/Klerksoord (near Soshanguve)
- Waltloo (near Mamelodi)
- Centurion strip, Babelegi (near Temba)
- Pretoria West industrial (near Atteridgeville)

There is a distinct spatial relationship between these industrial areas and previously disadvantaged communities.

(Source: CITP 2015–2020)

### 4.6.2 FREIGHT AND LOGISTICS

Rail freight is managed by Transnet Freight Rail (TFR), the largest division of Transnet, which specialises in freight transportation.

South Africa’s rail network is the 11th largest in the world and consists of more than 30,000 km of track. The network provides good coverage of most of South Africa from a freight demand point of view and links all the major mining and primary production areas with the port system. The network also covers all the major commercial and consumer areas.

Transnet’s Long-term Development Plan alludes to mining remaining the backbone of freight transport in South Africa and is largely made up of coal and iron ore exports. Manufacturing is the second-largest sector, while agriculture is the smallest contributor to freight transport.

South Africa’s economy is relatively open to trade, with total imports and exports making up more than 60% of the country’s GDP. This is one of the reasons for South Africa’s well-developed rail system and is a key driver of freight traffic across South Africa’s main rail corridors. According to the 2019 TFR annual report, about 215 million tons of freight were moved via rail throughout South Africa (down from 226 million tons in 2018), through
primary and secondary commodities. Secondary commodities comprise steel, grain, timber, fuel, motor vehicle parts, containers and chemicals. This is particularly important for the freight landscape in Tshwane.

The freight landscape in Tshwane is impeded by the limited rail and terminal capacity to accommodate potential growth in the freight industry. This has a negative impact on the performance of the automotive manufacturing sector which is largely dependent on the distribution of the vehicles into the SADC region and for global distribution. The City of Tshwane is investigating a proposal for a freight terminal at Pyramid South. The roads for growth (PWV 2 or PWV 17) strategic freight and mobility road will breathe life into the automotive sector and SEZ to bolster their growth and opportunity.

The primary freight generators in Tshwane include heavy industrial areas (Mittal, PPC and Transnet workshops at Koedoespoort and Capital Park, Pretoria West), light industrial areas (small-scale manufacturing and warehousing), container terminal(s), fuel tanks (Waltloo), automotive manufactures and distribution centres (SAB, ABI Coca-Cola and the Tshwane Fresh Produce Market).

Currently, freight services operate on all roads and contribute to traffic congestion on internal roads, without there being preferred and planned routes for the movement of freight. The current situation regarding freight and logistics in Tshwane includes the following:

- SADC freight and minerals from the Rustenburg and Lephalale areas are transported by road through Tshwane to City Deep.
- Long and heavy vehicles run through the Pretoria CBD due to the lack of bypass facilities such as the proposed Tshwane Western Bypass (PWV 9).
- There is fragmented and limited overload control and law enforcement as well as limited control over the movement of oversize vehicles and hazardous material.
- Transnet’s Capital Park container facility (Precon) has limited capacity and is located in close proximity to the Pretoria CBD.
- Container facilities that support the automotive industry in Rosslyn and Samcor Park are limited and mainly focused on road-based vehicles.
- Limited rail capacity exists for the import and export of containerised freight and vehicles.
- Freight rail access to Rosslyn currently operates on the commuter rail network, not on a dedicated freight rail line, even though the freight line is in close proximity to the commuter line.

Within the context of the strategic initiatives that relate to Tshwane, provincial and national freight and logistics imperatives, the following opportunities were identified:

- Establishing freight corridors that link to the Durban–Free State–Gauteng, the north-south and the Maputo–Walvis Bay N4 corridor
- Developing a transport plan and identifying routes for the movement of hazardous material through Tshwane
- Conducting ongoing overload control and enforcement
- Aligning with the Transnet Market Demand Strategy, for example the Pyramid South development
- Establishing road connectivity, especially the development of the Tshwane Western Bypass (TBS/PWV 9) route to unlock the economic potential of the west of Tshwane
- Providing customs control for imports and exports at terminals (through the National Treasury)
- Providing light industrial development (warehousing, processing facilities and small-scale production facilities (spares))
- Developing the freight ring concept (road and rail) on the periphery of Gauteng’s urban core
- Developing infrastructure and support systems to enable the migration of freight from road to rail
• Establishing a freight intermodal (road, rail and airside) terminal at Pyramid South linked to Strategic Infrastructure Project 2 and in support of the automotive industry
• Providing adequate connectivity (road and rail) to the Pyramid terminal
• Providing public transport to the Pyramid terminal
• Developing law enforcement mechanisms and institutional processes to ensure the migration of freight from road to rail
• Developing overload control and proper law enforcement mechanisms
• Providing customs control to enable a one-stop service for importing or exporting products

The Tshwane Freight Strategy is anchored on the automotive industry and intermodal container handling. The current container terminal is in Pretcon in Capital Park. The facility’s major snag is that the available two rail lines are shared between passenger rail and the discharging and loading of containers. This has the effect that freight handling operations must stop during peak times, because transportation of passengers takes precedence over freight. The Freight Strategy forms a strategic link between the proposed Pyramid South freight hub intermodal inland freight terminal (that will have rail siding to link Pyramid South TFR, the main rail network, the container yard, warehouses and the freight village) and the road network. The hub will address the current capacity constraints at the existing terminals (Pretcon, etc) and industrial zones (special economic zones) in Silverton/Waltloo and the Tshwane Automotive Centre (Rosslyn Automotive Hub) by increasing container, automotive and pallet-handling capacity for SADC traffic beyond 2046 in the Tshwane region.
Figure 4.18: Freight and logistics zones and terminals
Through the Rosslyn Automotive Hub and the Pyramid South intermodal hub, Tshwane may critically influence the position of its intermodal freight offering as one of the fastest-growing commodities in South Africa. The freight terminal has the potential to generate two to three million heavy vehicle trips per year. The PWV 2/PWV 17 is a strategic freight and mobility road identified by the Gauteng 25-year ITMP. Its function is part of a strategic ring road for Gauteng. Tough discussions on the focus for the movement of freight are centred on the move from road to rail; the existing rail network does not have sufficient capacity or terminals to supply current and future demand. For this reason, the MSDF proposes that the Rosslyn Automotive Hub and the Pyramid South intermodal hub should be a strategic link to the OR Tambo logistics hub in order to entrench the GCR model through the prioritisation of the PWV 2/PWV 17 ring road and the ring rail proposed by the Gauteng 25-year Integrated Transport Master Plan (ITMP).

Other important road projects that have been identified to support the freight plan are located along the following roads:

- K99 (from the N4 West to provide access to the Pyramid terminal from the south)
- K6 (to provide connectivity between Rosslyn and Pyramid)
- K14 (to provide connectivity to Rainbow Junction and Pretoria North)
- PWV 17 (also provides access to the PWV 5 into Midrand and Johannesburg)
- PWV 9/R80 (as a critical corridor between the N14 and N4 West to divert traffic from the north around the Pretoria CBD)
Figure 4.19: Freight transport network and airports (GSDF)
Gauteng as a province is the second-highest contributor to logistic costs in South Africa. One of the biggest challenges in South Africa will be to provide sufficient road and rail capacity in the next 25 years, considering the fact that the capacity expansion programmes at the port of Durban mainly make provision for container terminals and an automotive terminal, which directly affects Tshwane. The historical shift from rail to road for moving freight resulted in greater congestion on roads and in increased maintenance and upgrading costs. Congestion in urban areas is aggravated by the location of freight or intermodal terminals within built-up urban areas, although plans for new terminals may alleviate this problem. However, crucially, the existing rail network does not have sufficient capacity or terminals to supply the current and future demand or to accommodate the required shift of freight back to rail.

A mass investment in mass transit and a shift from road to rail for moving freight will also assist Tshwane to achieve lower carbon emissions and to be more climate-responsive.

### 4.7 CLEANER, SMARTER TRANSPORT

The Tshwane Greenhouse Gas Emissions Inventory (2015) shows that transport is among the top sectors that contribute to greenhouse gas emissions.

**Source:** City of Tshwane Greenhouse Gas Emissions Inventory 2014/15
Table 4.6: Breakdown of the 2014/15 Tshwane Greenhouse Gas Emissions Inventory per sector

<table>
<thead>
<tr>
<th>Inventory</th>
<th>Sector</th>
<th>Activities</th>
<th>CHC source</th>
<th>tCO₂eq</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tshwane Community</td>
<td>Energy</td>
<td>Commercial</td>
<td>Electricity Consumption</td>
<td>2,490,700</td>
<td>14.5%</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Industrial</td>
<td>Electricity Consumption</td>
<td>4,375,613</td>
<td>26.3%</td>
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<tr>
<td></td>
<td></td>
<td>Residential</td>
<td>Electricity Consumption</td>
<td>5,831,395</td>
<td>33.9%</td>
</tr>
<tr>
<td></td>
<td>Transport</td>
<td>On-road and Off-road Vehicles</td>
<td>Mobile Fuel Combustion</td>
<td>4,363,277</td>
<td>25.9%</td>
</tr>
<tr>
<td></td>
<td>Waste</td>
<td>Solid Waste</td>
<td>Fugitive Emissions</td>
<td>567,381</td>
<td>1.9%</td>
</tr>
<tr>
<td>Total Tshwane Community</td>
<td></td>
<td></td>
<td></td>
<td>13,256,893</td>
<td>91.7%</td>
</tr>
</tbody>
</table>

| Tshwane Corporate | Energy   | Buildings & Other Facilities         | Purchased Electricity   | 1,764,447 | 1.1% |
|                  |          | Power Generation Facilities          | Stationary Fuel Combustion | 23       | 0.00% |
|                  |          | Streetlights & Traffic Signals       | Stationary Fuel Combustion | 2,262   | 0.02% |
|                  | Transport| Vehicle Plant                        | Mobile Fuel Combustion   | 11,251  | 0.07% |
|                  | Waste    | Solid Waste Facilities               | Fugitive emissions       | 1,022,656 | 6.2% |
|                  |          | Purchased electricity                |                          | 241     | 0.00% |
|                  |          | Wastewater Facilities                | Purchased electricity    | 17,766  | 0.15% |
|                  |          | Stationary and process emissions     |                          | 40,002  | 0.3% |
| Total Tshwane Corporate |          |                                      |                          | 3,368,200 | 84.4% |
| Total           |          |                                      |                          | 16,624,281 | 100.0% |

Source: City of Tshwane Greenhouse Gas Emissions Inventory 2014/15

Note: “Tshwane Community”, as alluded to in Table 4.6, refers to the geographical area that constitutes Tshwane. “Tshwane Corporate” refers to the City’s municipal operations. The types of vehicles we drive, the distances we travel and the current set-up of the economy, which creates the “need” to travel, all contribute towards increased emissions.

Apart from the clear advantages of a greater shift to NMT for the environment, we live in an age where technological advances provide the option of driving vehicles with greatly reduced emissions, albeit more expensive. Slowly but surely, though, the cost of these vehicles is decreasing.

As a starting point, a municipal policy on greening the City’s entire fleet needs to be put in place, and this should inform the procurement of a green fleet over the next 30 years or so.

The private sector is ahead of the City in terms of policy in that some shopping centres and businesses are already beginning to provide parking bays that allow for charging electrical vehicles. The City needs to create an enabling environment for the private sector to continue to make such interventions going forward. This would include making electric vehicle elements more explicit in the Integrated Transport Plan when it is revised. Aspects of infrastructure for electric vehicles can also be included in the green building by-law for new buildings and retrofitting, thus making it compulsory for developers in residential complexes and malls.

In view of the energy security challenges that South Africa faces at this time, planning for electric vehicles will need to be closely linked to the Energy Mix Policy of the City.

As has been explained earlier in this MSDF, Tshwane is sprawled out, and the need to travel long distances from home to daily destinations is unavoidable for many people. If it is properly implemented, the TOD concept reduces a city’s carbon footprint and allows more people to live, work and play in close proximity to various locations. TOD also espouses NMT, which reduces vehicular movement. Allowing rail to become the
backbone for longer-distance travel will also reduce the number of vehicles (and emissions) on the roads.

The traditional office-based work environment is still prevalent in many parts of South Africa’s society. If the COVID-19 pandemic has taught us anything, it is the ability of individuals and organisations to adapt to trying times. One of the more interesting results of the restrictions on movement is that many people have been forced to work from home. Some have adapted quite well, and it has become self-evident that not all employees need to be office-bound. Making this a permanent option for some will require investment from both the employer and the employed, but in some cases the benefits will outweigh the “sacrifice”. One of the more obvious outcomes will be reduced peak hour traffic, reduced congestion and reduced emissions.

Once again, the private sector is more readily able to adapt to such changes because it is better equipped with the required resources, technological infrastructure and performance management systems to allow for such flexibility.

As we look to the Fourth Industrial Revolution, the City of Tshwane should start thinking about preparing for the need for this kind of flexibility, so that it can be better prepared to face the unknown future.

4.8 REFERENCES


Climate Works, San Francisco. Date unknown. A walkable mixed-use neighbourhood. Image adapted from: https://sunfoundation.tumblr.com/
