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8. THE SPATIAL DEVELOPMENT FRAMEWORK

The Tshwane SDF is informed by a myriad of legislative frameworks, growth trends and policy directives as addressed in the preceding chapters.

The overall cross-cutting objective of the MSDF is to achieve *spatial restructuring*, sometimes referred to as *spatial transformation*. This is a spatial planning concept that aims at redressing an unsustainable spatial form by redirecting growth to areas of opportunity. It encourages development around nodes, densification along corridors, residential developments near areas of economic activity with supporting social facilities, and defines spaces through spatial design.

The MSDF responds to spatial restructuring by addressing the following broad themes:

8.1 Human Settlement Growth Management

Growth management is a spatial concept that encompasses all aspects that ensure efficient, optimal and sustainable development of the physical environment. A key principle of this concept is smart growth. The smart growth principle guides development such that resources and services are provided in such a manner that they meet the demands of the affected population over the long-term. Growth Management tools include:

- Nodes
- Compaction
- Densification
- Urban Edge

Nodal Development and Spatial Targeting

Nodes are those parts of the city where development should be focused. The widest variety of services and opportunities should be provided at nodal points, at degrees relative to their nodal status.

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 will be determined within the spatial vision by indicating where growth will occur in transport, housing, energy, water, recreation, education, health infrastructure and services, as explained by the smart growth concept. This focused investment is known as spatial targeting. Through spatial targeting, the spatial plan will promote efficient and effective resource allocation ensuring that resources such as infrastructure are delivered in the right place and at the right time. The spatial plan also provides a sense of certainty for the future and thus investor's confidence.

From the city profile presented in Chapter 1, it is clear that the must operate within the context of the greater Gauteng City Region so that it can position itself to be competitive relative to the other major nodes within the province. This means that nodes within Tshwane should serve a specific function either within the local, provincial or national context. Various nodes can complement others or be functionally independent. The key issue is that nodes within the city do not compete but complement and support each other so that the synergies between them maximize the potential of the city as a whole. The diversification of various nodes will allow resilience and adaptability by maximizing all spatial opportunities, in

turn maximizing economic growth opportunities through strategic investment decisions.

An important distinction is made between three nodal typologies at the metropolitan scale:

- Capital Core
- Metropolitan nodes
- Urban Cores

Capital Core- the Tshwane Inner city is identified as the Capital Core as it is the city's first order node amongst all metropolitan nodes. Traditionally, the inner city is also the Central Business District (CBD) of major cities. Tshwane is no different.

Historically, the inner city was the geographic heart and centre of what is now the Tshwane area. Over time, though, due to the extension of the Tshwane boundaries, the Inner City is no longer geographically central, but still plays a very important role with regards to the concentration of retail, office and government buildings to be found in the area.

The Capital Core must:

- Be the focal point for housing government departments
- Be developed to a higher than average density, supporting all principles of smart growth

Metropolitan Nodes- these are primary nodes of the highest order. These nodes accommodate the highest degree of service specialisation and offer the widest range of services. Often, metropolitan nodes will have regional/provincial relevance. In the Tshwane context, Metropolitan nodes are those nodes within the City (economically) benefiting primarily from

the investment of the private sector. Equally important is that these nodes serve as economic hubs and focal points for employment opportunities. The role of the public sector in such nodes is to manage the rate of growth, provide infrastructure in line with the growth management plan and maintain the urban environment. Such localities are also where the most extensive land use rights, including densities, are likely to be supported, in line with the growth management strategy.

Urban Cores- former township areas were developed as a result of forced relocation programmes. Inevitably, these townships grew to accommodate large populations of low income or unemployed people. The economic circumstance was clearly evident in the quality of the physical environment. Under the new government which was established in 1994, these township areas were identified, not as a blight in the urban fabric as previously thought of, but as beacons of opportunity, through the human capital that was concentrated within the various communities of the townships. Due to the great need that often belies such nodes, the government has to play a more active role in social and economic restructuring, especially in view of the limited private investment, relative to Metropolitan cores. The Neighbourhood Development Programme (NDPG) is a nationally funded programme that aims to address the improved quality of environment in urban cores.

The City has a number of local and emerging nodes that are addressed at the regional and local planning level. The MSDF is supported by 7 Regionalised Spatial Frameworks, which are, in turn, supported by a number of Local Spatial Development Frameworks and Precinct Plans. The detail of the nodes that have been indicated above, are discussed in further detail within the RSDFs, LSDFs and precinct plans, indicating details such as the relative size, intensity and intended land uses, typologies and spatial character within the different nodes.

In addition to the three nodal typologies, the City also has ‘specialised activity areas’ which are addressed under the *Economic Network* section of this chapter.

Compaction and Densification

Urban density is a key part of the solution towards spatial restructuring; but it is not a one-size-fits-all solution. Higher-density settlement is closely associated with reduced greenhouse gas emissions per person. The growth of Tshwane should be directed inwards, towards the City’s nodes, with the highest densities being directed towards the Metropolitan nodes, mixed-use activity spines and specialised activity zones. Built-up areas should not be allowed to extend further outwards beyond the urban edge where it contributes to urban sprawl.

Greater residential density allows for more and better transportation choices, including mass transit, biking, and pedestrian trails. Such densities also improve the walkability of neighbourhoods and access to services and amenities while decreasing sprawl and the consumption of land. Density depends on both dwelling unit size and household size.

Increased residential densities are needed within business nodes in order to promote more affordable housing (facilitating accessibility to economic opportunities and decreasing travel costs).

Compact, mixed-use, transit-served neighbourhoods have dramatically lower emissions per person – as much as half or less per capita of sprawl developments.

The main objectives of densification and compaction are to:

- minimise the footprint of the city

- prevent the destruction of valuable agricultural land
- reduce pressure for the development of open spaces and environmentally sensitive land due to the optimal use of available land; providing choice in terms of housing typologies
- improve the viability of public transport
- improve the efficiency of urban areas - increased convenience for the residents of the city in terms of improved access to goods, services and job opportunities as well as a reduction in travelling times, cost and distances
- improve use of service infrastructure
- increase the marketability of the city and
- reduce inequality

The programme for densification and the endeavour to reach the set objectives should be measured against a set of conditions or reservations, which ensure that densification occurs in a positive manner and does not occur without proper regard to the impact it may have on the way in which people live and the city functions.

These conditions are:

- Structural environment:

Densification should take place in a focussed and logical manner which can assist in transforming the current ambiguous/amorphous urban form into an area with an identifiable spatial logic and identity. Economic restructuring will benefit from promoting spatial access to economic opportunity and promoting job creation via the multiplier effect associated with building medium density housing stock.

- Choice in housing options:

Balance and diversity in the range of housing options, densities and typologies to serve in the needs, desires and income abilities of all the residents of the city should be ensured. One of the major problems with the establishment of residential areas in the CoT is that these areas more often than not are merely housing estates and not neighbourhoods in the true sense of the word. This applies to both middle income and lower income areas. For example, we see the bland environments that are being created by the RDP housing schemes, but the lack of true neighbourhood creation is also very evident in the middle income areas.

- Diversity:

The population in a metropolitan area is highly heterogeneous. Planners involved in planning the compaction and densification of the city will clearly need to recognise this multiplicity of users and trips that metropolitan areas generate. A standardised, one-size fits-all approach to densification in different parts of metropolitan areas will not do. Densities will be informed by the desirability and appropriateness of specific densities at the related locations. Densities will range from low to high. Some areas may have a mix of densities, while others will have consistent densities throughout.

- High quality environment within a liveable city:

Densification should bring about a positive change in the liveability and urban structure of the city. Compact, well-planned cities tend to be more liveable. Aspects such as low environmental quality, monotonous urban landscape and overcrowding, which can be the result of “one-sided” densification, should be prevented.

The principles and sub-principles for densification are as follows:

- Appropriate higher density housing opportunities at appropriate locations must be provided for all income groups

- Densification must contribute to the overall structure and functionality of the metropolitan area in that it takes place in a balanced, focussed and structured way:

- Open space, farmland, natural beauty, critical environmental areas, and cultural assets should be preserved and enhanced.

- Areas targeted for densification should be well served by public transport, or have the possibility to be well served by public transport in future.

- Areas targeted for densification should be treated as whole environments, with investment in infrastructure, landscaping, open spaces and social facilities ideally preceding higher density developments

- In areas of limited potential focus shall go beyond the provision of basic services, and further include human resource development, labour market intelligence and social transfers. Communities provided with information and opportunities are more likely to exercise their choice to access or even migrate to areas with greater economic potential.

- In rural areas the chief principle is to increase accessibility of rural people to basic services in support of survival strategies in the first instance and, in the second, to establish a base from which to start engaging more in productive activities. Given limited resources, policy should provide for basics for survival to all existing settlements, but no provision for additional settlement growth. Localities with some economic potential should receive higher levels and a wider range of services/facilities.

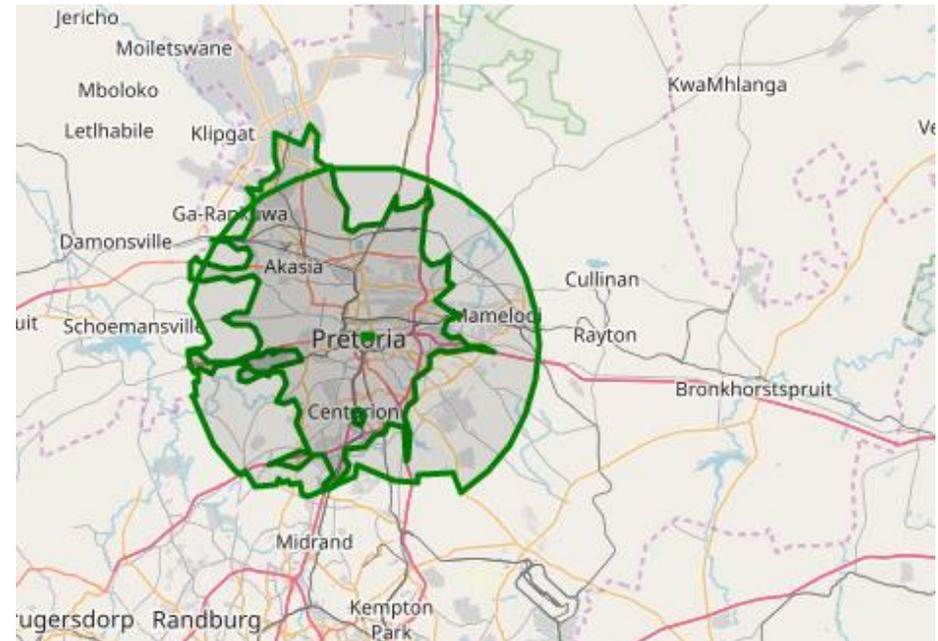
Urban Edge

The urban edge (boundary) is a growth management tool that contributes towards the achievement of strategic objectives by conserving valuable environmental areas which would otherwise be compromised by development, and by promoting the use of existing infrastructure through redevelopment, infill development and densification within the edge, thus achieving development that is sustainable. The urban edge also encourages the agglomeration of economies within the edge, encouraging scattered secondary or emerging nodes to develop into consolidated primary nodes as opposed to leapfrog development. The edge also ensures the protection of land- an exhaustible resource- by encouraging Brownfield developments instead of Greenfield developments.

The urban edge encourages the prevention of urban decay by drawing a boundary around the existing urban area ensuring that development is focused inward, resulting in all opportunities being explored, especially the regeneration of decaying areas.

This further supports the promotion of opportunities for redevelopment, infill development and densification. The conservative approach to expansion also results in opportunities for infill development being explored. As well-located land is often more expensive and vacant land in the urban area often has high levels constraints, higher densities are considered as these result in a higher yield.

25 km Radius around the Capital Core



Using the Geoterrimage Web Platform to determine the parameters of the areas that could be reached within a 30 minute drive time within average traffic conditions. A circle was then drawn around this area and roughly provided a 25km radius around the centre of the Capital Core, taken to be Church Square within the Pretoria CBD.

This area that is found to be within 30 minute drive time then serves as a further layer of focus for investment and development as these areas are

the most 'accessible' relative to the best social and economic infrastructure within the City.

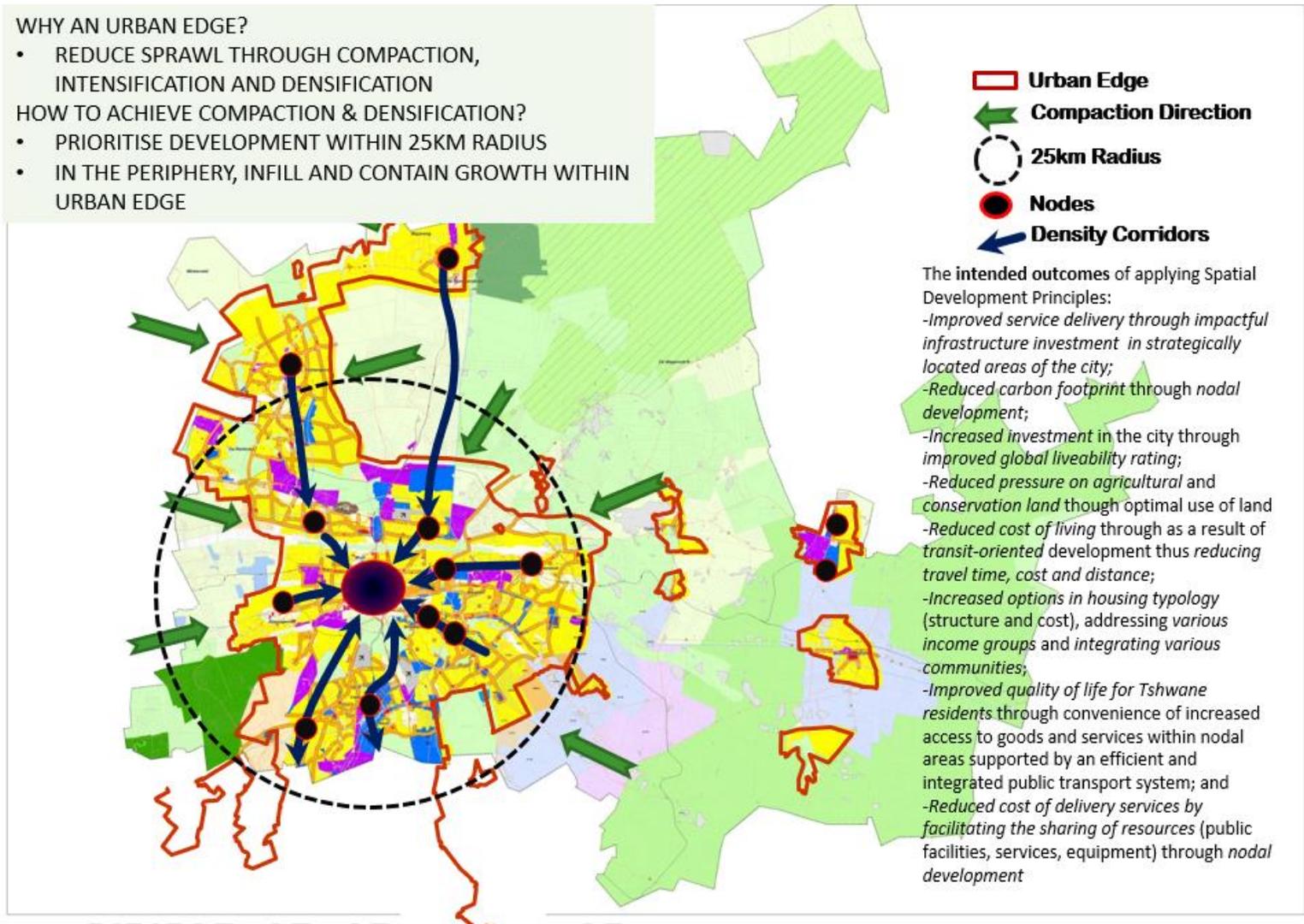


Figure 1: Growth Management Strategies for Tshwane

Climate Responsiveness

The most adverse impacts of climate change are likely to be in urban areas where people, resources, and infrastructure are concentrated. Climate changes are attributed to rising greenhouse gasses (GHGs) emanating from human activities. These include: urbanisation, land use change, deforestation and land conversion from agricultural use. In Tshwane, the largest contribution to the 2014/15 greenhouse gas emissions inventory are the emissions from industrial activities followed closely by community based transport activities.

Climate responsiveness means that the responsibility to respond to climate change impacts and consequences will fall onto city governments and their communities. Therefore a strong local commitment and organization is required influence behavioural and technological change to reduce carbon emissions and the consequences of climate change and regional threats they represent. The response to climate change impacts are in their essence urban governance and management issues.

The effects of climate change can be mitigated through:

- The use of green-green infrastructure
- Organisation of space that reduced urban heat island effect
- Protecting minimally developed or undeveloped areas and biodiversity through compaction, densification and infill of already developed area
- Technological advances in various sectors in order to reduce greenhouse gas emissions
- Being proactive with regards to water and energy demand management

- Being proactive with regards to water harvesting and retention
- Being proactive with regards to alternative (clean) energy sources

Development Trends and Applications

The development trends and applications, as indicated in chapter 1, indicate that between 2012 and 2018, private investment in high density development has been significant, with the highest concentration of these applications being in and around Pretoria North, Pretoria CBD, Hatfield and Menlyn, with a few scattered throughout Pretoria East and in parts of the Centurion area.

By and large, these applications are spatially in line with the policies of the City, within both the urban edge and the 25km radius of the Capital Core. Many of the housing developments that fall within the lower end of the market are located in more peripheral areas, but still within the urban edge and 25km zone.

Affordability and availability of land within more central locations remains a boundary to lower end housing. As a result, some provincial public housing continues to be provided in undesirable peripheral areas, against spatial planning principles of integration and compaction. Tshwane public housing, on the other hand, Provincial public housing continues to be provided in undesirable peripheral areas, against spatial planning principles of integration and compaction

Tshwane public housing is beginning to shift more towards strategic areas of integration and compaction
is beginning to shift more towards strategic areas of integration and compaction.

Public housing investment that is to be developed in the future, inclusive of inclusionary housing, should, as far as possible, be located:

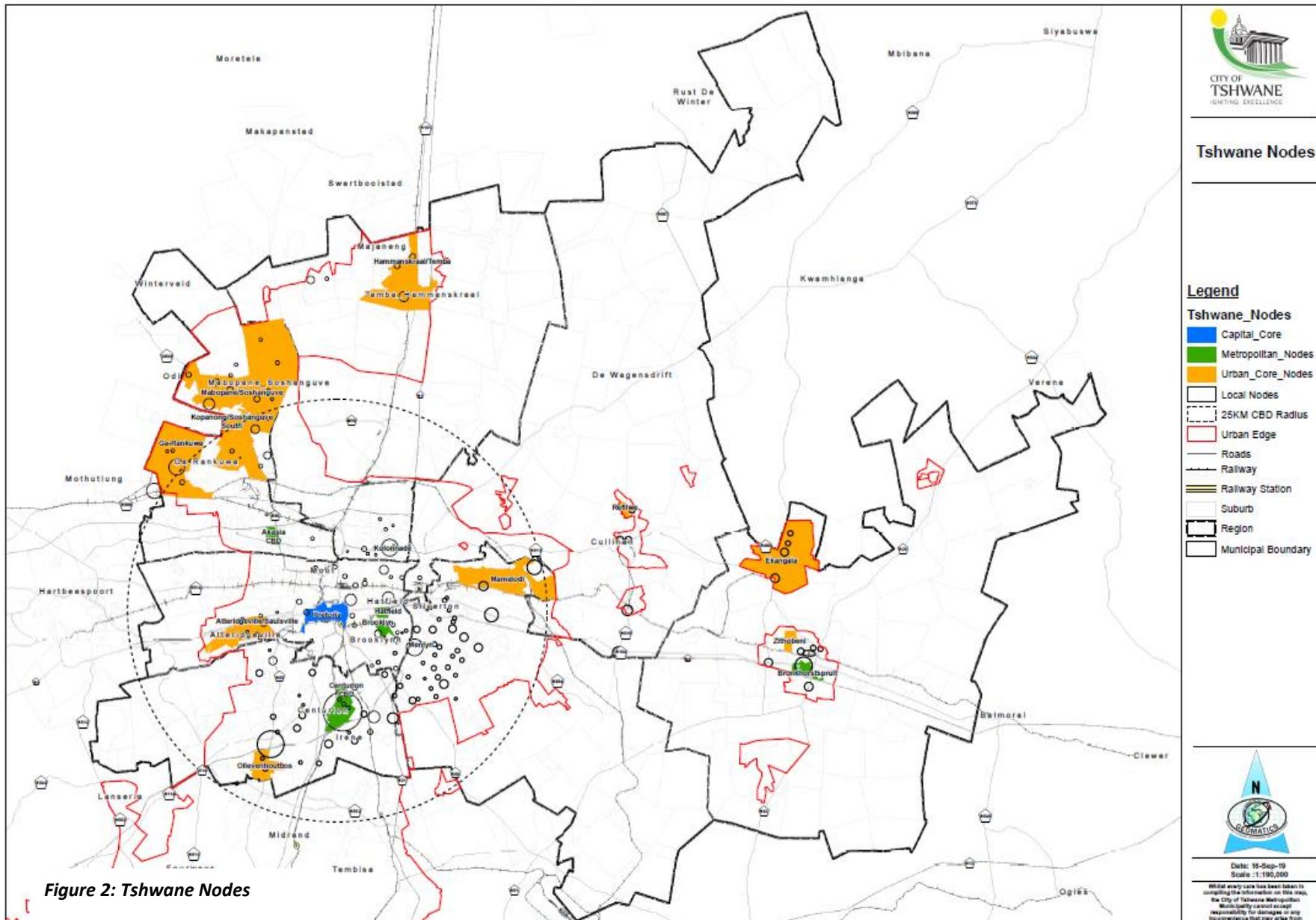
- Within the urban edge
- Within the 25km zone
- Within nodal areas
- Along major transit corridors as part of transit-oriented development

Although most economic opportunities and private investment is located within the 25km zone, many of the City's informal settlements and backyard structures remain located either on the periphery of the 25km zone or outside of it. This is likely due to the availability of vacant land and less stringent capacity for law enforcement in these areas by both the affected communities and relevant authorities. With the growth of backyard structures having outstripped that of informal settlements throughout the province, it may be wise to consider a variation in land use scheme allowances for 'outbuildings' on standard residential sites.

This is especially in view of the the results of the urban simulation undertaken by the CSIR in which the following areas are projected to accommodate the highest number of households

- Atteridgeville
- CBD
- Irene
- Mamelodi
- Mooikloof
- Rosslyn
- Soshanguve
- Temba

Irene, close to the Centurion CBD area, and Mooikloof in the Pretoria East area located within traditionally well-served areas of the City and may attract many entry-level job seekers. Formalised areas such as these may further support densification strategies with well-planned and approved 'backyard structures' that take the form of a new kind of 'outbuilding' or so-called 'granny flat', simultaneously allowing for the integration of lower income individuals within the focal investment areas of the urban fabric.





Human Settlements

Legend

- Urban Edge
- 25KM CBD Radius
- Human Settlement
- Rural Service Centre
- Mega Projects
- Mega Projects Areas
- Informal Settlements 2011
- Informal Settlements 2018
- Future Urban Development Area
- Local Nodes
- Municipal Boundary
- Region

Trends and Applications 2012 - 2018

- RDP and Bonded
- Bonded Low End
- Community
- Low Density Housing
- High Density Housing
- Industrial
- Offices
- Retail

Human Settlement Spatial Targeting

- Affordable Rentals
- Future Service Stand Provision
- Housing Projects
- Infill Developments
- Mega Housing Project
- Social Amenities
- Township Revitalisation
- 800m Density Buffer Zone



Date: 16-Sep-19
Scale: 1:195,000

While every care has been taken in compiling the information on this map, the City of Tshwane Metropolitan Municipality cannot accept responsibility for damages or any inaccuracies that may arise from incorrect and/or incomplete information.

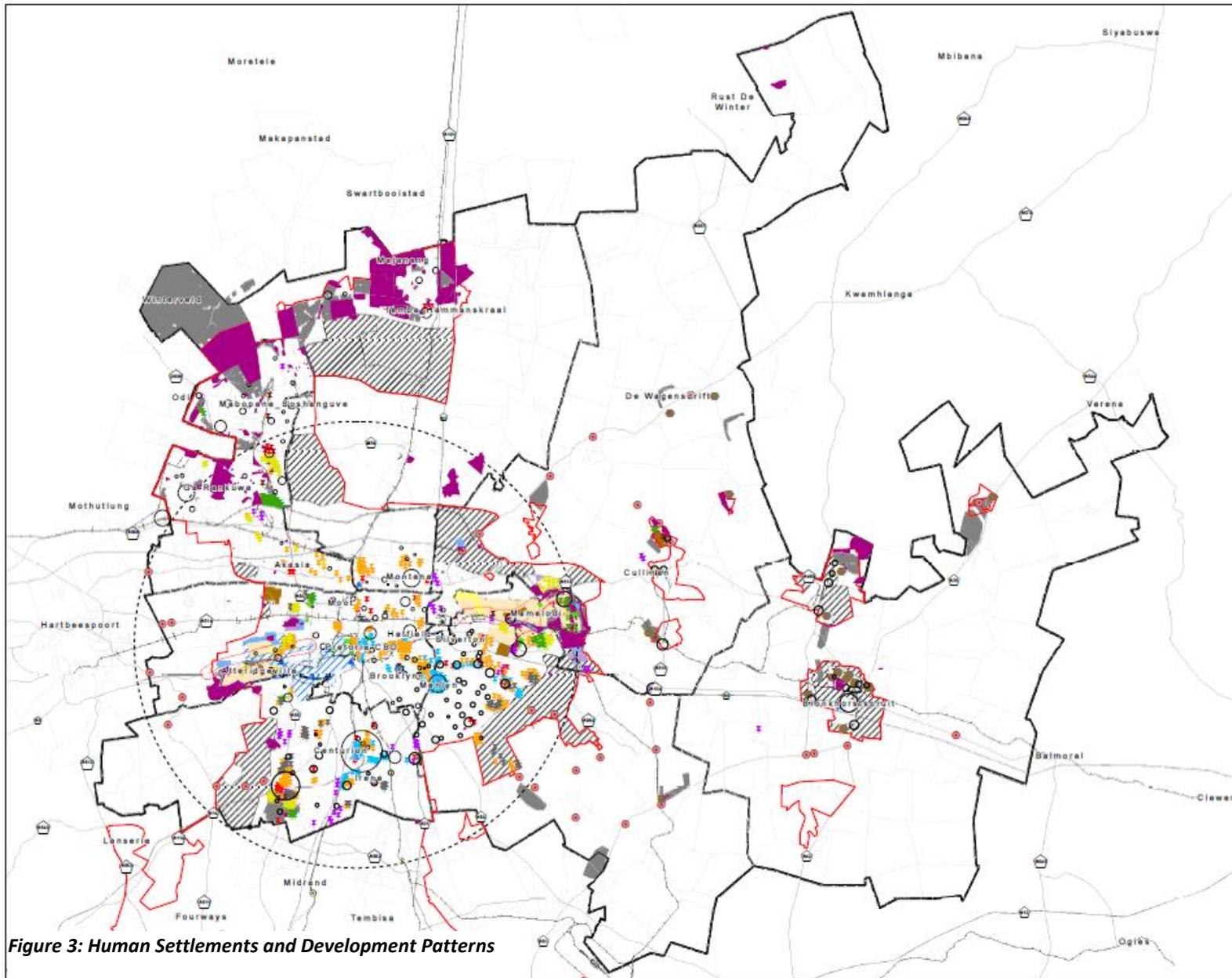


Figure 3: Human Settlements and Development Patterns

8.2 Corridors and Connectivity

Corridors and Connectivity encompasses all aspects of transport, including non-motorised transport. Transport is important because it affects:

- Spatial Form

The goal is to define a spatial structure based on the nodal development (densification and intensification at strategic points) approach which is supported by public transport. An efficient spatial form will address matters of spatial restructuring and socio-economic equality.

- Environmental Impact

Transport systems are large consumers of space. The goal is to reduce the uptake of Greenfield sites through public transport and transit-oriented development. Optimisation of public transport systems with resultant reduction in pollution (air, noise, etc.) and travel time and cost;

- Economic Development

Mobility is one of the most fundamental and important characteristics of economic activity as it satisfies the basic need of going from one location to the other, a need shared by passengers, freight and information. All economies and regions do not share the same level of mobility as most are in a different stage in their mobility transition. Economies that possess greater mobility are often those with better opportunities to develop than those suffering from scarce mobility. Reduced mobility impedes

development while greater mobility is a catalyst for development. Mobility is thus a reliable indicator of development.

- Social Equity

Goal is to reduce the economic impact of travel on communities that are far removed from work opportunities relative to residential location. The Mobility Gap between different populations can have substantial impacts on opportunities available to individuals.

Creating affordable cities for residents can be supported through shorter travelling distances (costs) and efficient use of infrastructure. The long term cost to end-users in terms of commuting costs and obtaining goods and services not available in peripheral areas often outweigh the short term cost of cheap land;

The City's movement system comprises of three of the four forms of transportation i.e. Rail, Road and Air, excluding 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 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 inter-relatedness, 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, 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 within Tshwane includes not only the planning side of things, but also inter-governmental relations. Some of the localities referred to above fall under provincial or national control and not under the local authority. Thus, co-operative planning will remain pertinent to the process required to address such areas.

Spatial restructuring will require that future settlements are to be developed along corridors and within nodes in order to redress the spatial

distortion caused by past policies. These specific actions can be achieved through transit-oriented development (TOD).

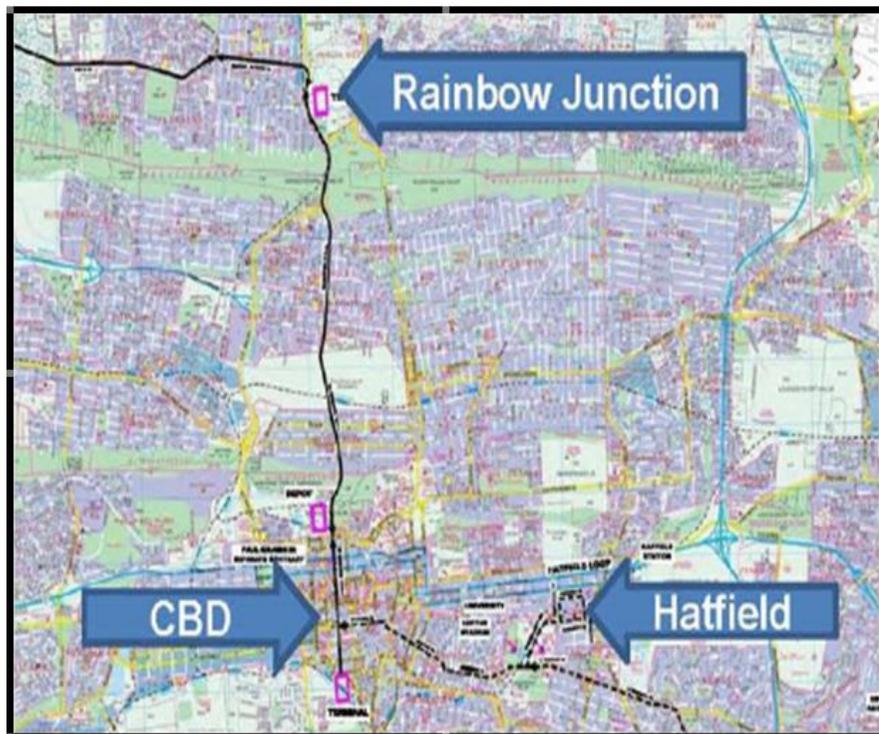
Transit-Oriented Development and Priority Areas for High Density Development

TOD incorporates densification, intensification and compaction of mixed land use in close (walking distance) proximity to significant transit connections. The intention of TOD is to maximise the potential of developed land, create the population threshold required for sufficient ridership of public transport, reduce the carbon footprint by combating sprawl and promoting pedestrianism thus reducing reliance on private vehicle usage and creating vibrant 24-hour centres that provide sustainable human settlements.

The 2018 Regionalised Spatial Development Frameworks (RSDFs) provide the following densification guidelines for TOD:

- Within concentration zones (nodes and transit promotion zones) up to 200 dwelling units per hectare, strictly adjacent to trunk routes
- Within concentration zones (nodes and transit promotion zones) 120 dwelling units per hectare within a 800m walking distance from (fully operational) station
- Along corridors and spines, up to 80 dwelling units per hectare within 200m walking distance from (fully operational) station

In view of the investment that the City has made in BRT infrastructure, the next five years of 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 i.e. BRT Phase 1 Lines 1A (CBD to Rainbow Junction) and Line 2A (CBD to Hatfield).



The following Council documents provide detailed guidelines for development along these lines:

- Tshwane Rapid Transit: Spatial Development Policy: Densification and Intensification Guidelines (2014)
- Tshwane Rapid Bus Transit: Spatial Development Framework for Line 1A: CBD to Rainbow Junction (2014)

- Tshwane Rapid Bus Transit: Spatial Development Framework for Line 2A: Central Business District to Hatfield (2017)

It is important to note the Tshwane owns a number of land parcels along line 1A. Unlike with 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 the City, 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 municipal-owned land along the line- some of which include open spaces. It may be necessary to reconsider the current land uses and lease limitations of the council properties in order to encourage developers to invest along the line and support the City achieving TOD and sustainable human settlement outcomes (see further elaboration under *Land Banking, Chapter 4: Human Settlements*).

Integrated Public Transport: IRPTN vs BRT vs IPTN

The Integrated *Rapid* Public Transport Network (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 the Bus Rapid Transit (BRT)/ Tshwane Rapid Transit (TRT) forms one component of the IRPTN. This may, in some instances, include rail such as the Gautrain. The Integrated Public Transport Network (IPTN) includes both the IRPTN and *all* other forms of public transport i.e. standard bus services, taxis, NMT, rail, BRT, etc.

The BRT is currently the only component of the IRPTN that has been built by the City. Gautrain was built by province and forms a part of the IRPTN.

Long distance rail should also be considered part of IRPTN, but due to some failings in the maintenance of rail infrastructure, there are often several delays experienced by commuters.

For an effective and efficient transport system to support the *entire* extent of the City, 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 the City that currently have no access to the BRT. The long term planning of the BRT network also only covers parts of the City and there are many communities that are still reliant on the other forms of public transport.

Human Settlements and Connectivity

In determining where best to invest in development that are primarily focused on lower-income housing, it is critical to consider the movement and connectivity options of potential residents so that they may have equal access to the social and economic opportunities of the City.

At present, none of the public housing projects benefit directly from the IRPTN. The Tshwane Human Settlements Spatial Targeting Areas do benefit from bus services and taxi services, though. For the kind of projects that are being proposed for Tshwane East and Tshwane West, it is important that the capacity and reliability of those bus services to meet the growth in demand for transport are assessed and improved upon if necessary. Areas such as Refilwe are not provided for at all in terms of the City's IPTN and it is important that the key sector Departments (Transport and Human Settlements) engage on how best to ensure that where high density developments are to be implemented by the City, there is an option for connectivity by the potential residents.

Parking Requirements

Current parking requirements especially for retail and office developments encourage private vehicle use and detract from the potential to create the threshold required to support an efficient public transport system. Development within nodes should be done with a view towards transit-oriented development, minimising provision for private vehicles. Parking requirements of the city should begin to fall in line with current land use policies as espoused in the MSDF and RSDFs.

Development Trends and Applications

There has been a provincial increase of estate and security village housing of 248,8% between 2001 and 2016. It is imperative that none of these development impede the efficient flow of the Integrated Public Transport Network, inclusive of pedestrian traffic.

Relative to areas south of the Magaliesburg Mountain, the bulk of applications north of the Magaliesburg have been for residential developments whereas areas to the south have a higher degree of job creating economic investments. As it is, the north accommodates a higher population than the south. As such it is important that ease of movement from the North to the South is further facilitated in order to provide greater access to new and existing economic opportunities.

The PWV 9 is one such route that would provide improved access on the western side of the City. The PWV 9 is a priority as it will open up the North Western side of Tshwane to both Johannesburg and other economic opportunities in Tshwane. One such other 'Road for Growth' is the PWV2/PWV link that would provide impetus to the proposed Pyramid South Freight Hub by linking it with Tambo Springs Inland Port in Ekurhuleni.



Corridors and Connectivity

Legend

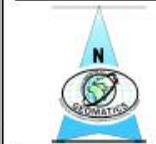
Trends and Applications 2012 - 2018

- RDP and Bonded
- Bonded Low End
- Community
- Low Density Housing
- High Density Housing
- Industrial
- Offices
- Retail

- PW2 - Existing
- PW2 - Proposed
- PW17 - Proposed
- PW9 - Existing
- PW9 - Proposed
- - - NMT_Proposed
- 25km CBD Radius
- TaxiRoutes2018/402
- Gautrain
- BusRoutesPine2018/402
- BRT_Feeder
- Proposed Railway
- Proposed Railway
- - - L_Railway
- Municipal Boundary

IRPTN

- Line 1 Completed
- Line 1 Approved/Under Construction
- Line 2E
- Line 3
- Line 4
- Line 5
- Line 6
- Line 7
- Line 8
- Line 9
- Line 10
- Line 11
- Urban Edge
- Region
- Transit Oriented Development



Date: 2019/09/17
Scale: 1:100 019

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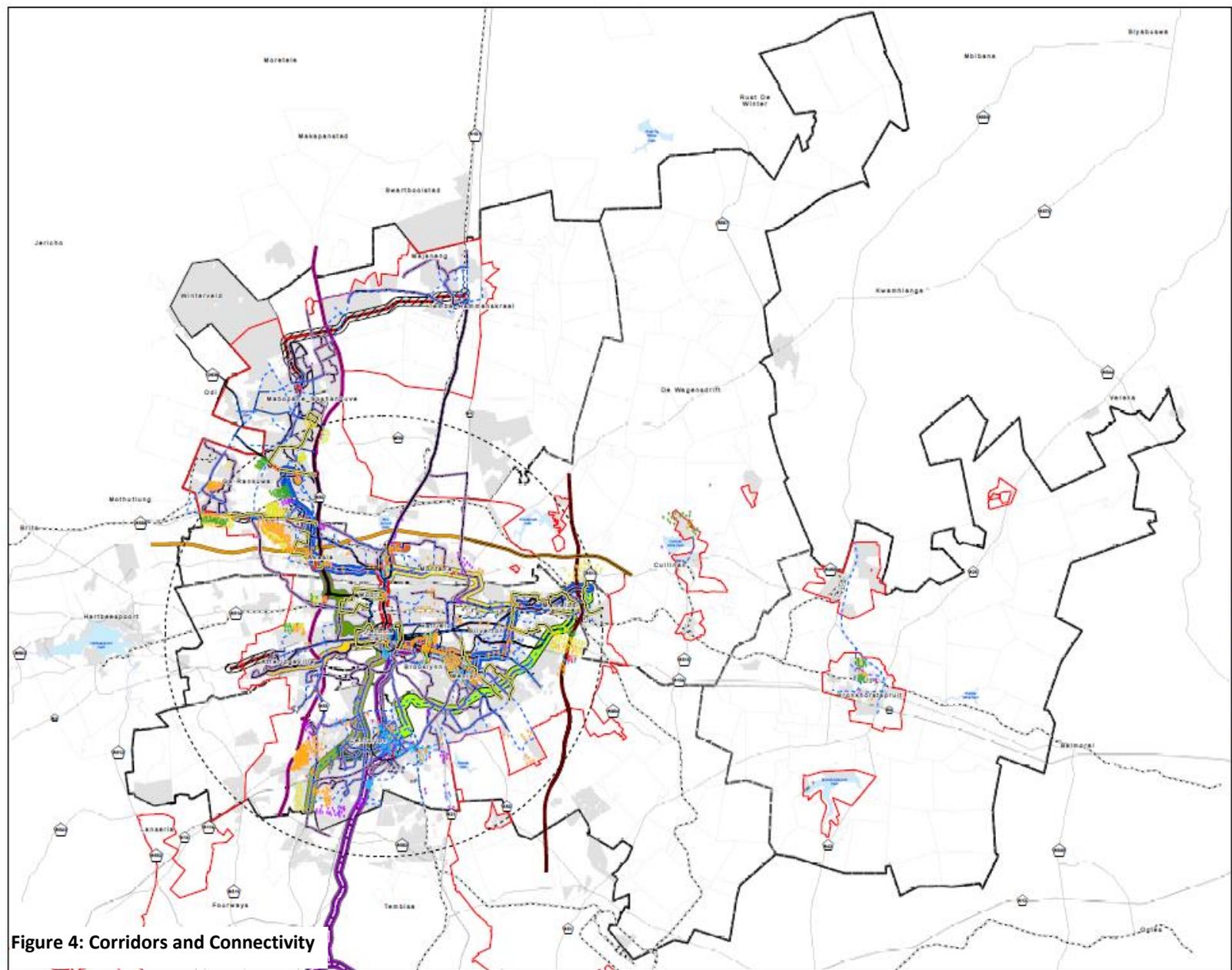
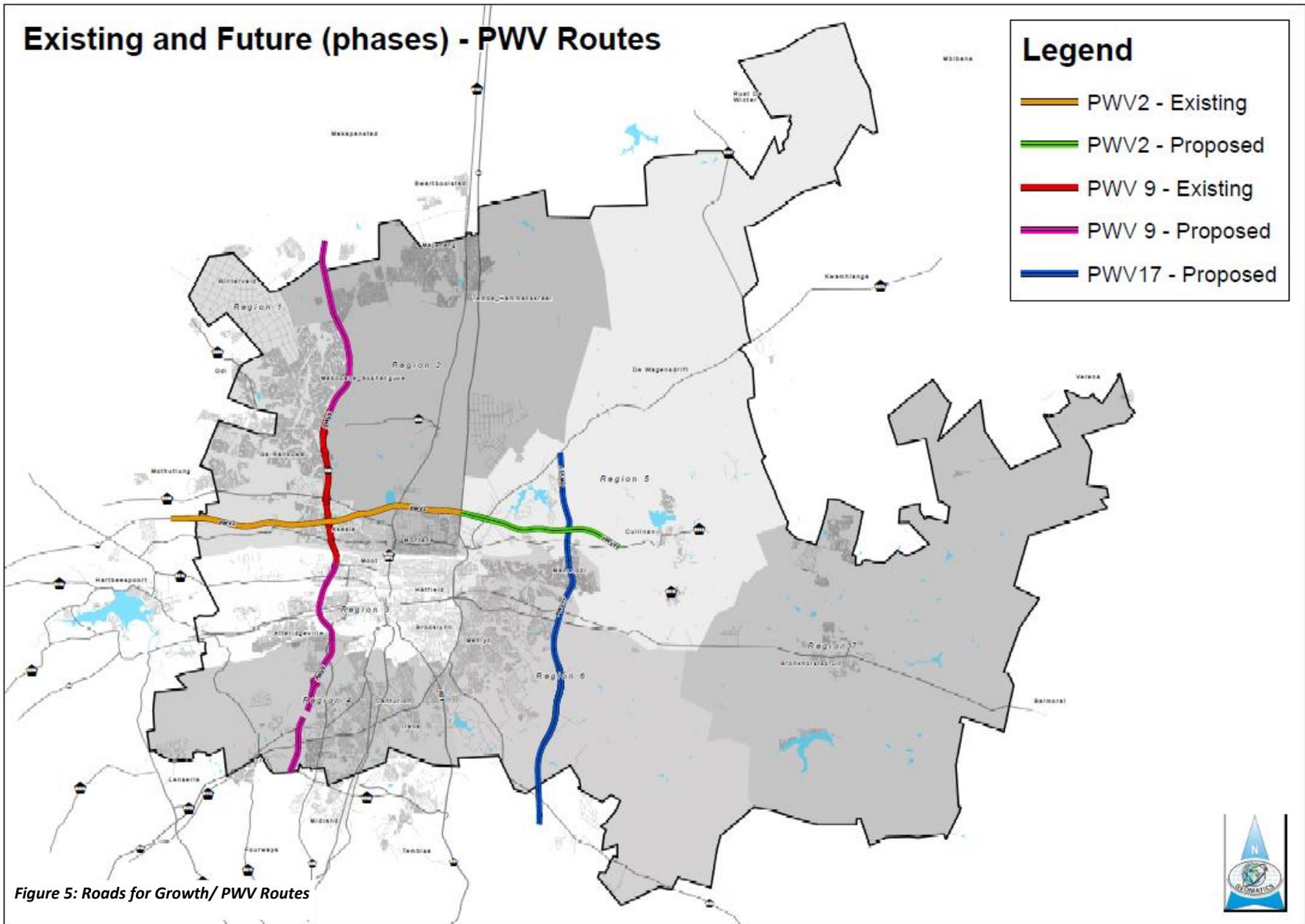


Figure 4: Corridors and Connectivity

Existing and Future (phases) - PWV Routes



Legend

- PWV2 - Existing
- PWV2 - Proposed
- PWV9 - Existing
- PWV9 - Proposed
- PWV17 - Proposed



Figure 5: Roads for Growth/ PWV Routes

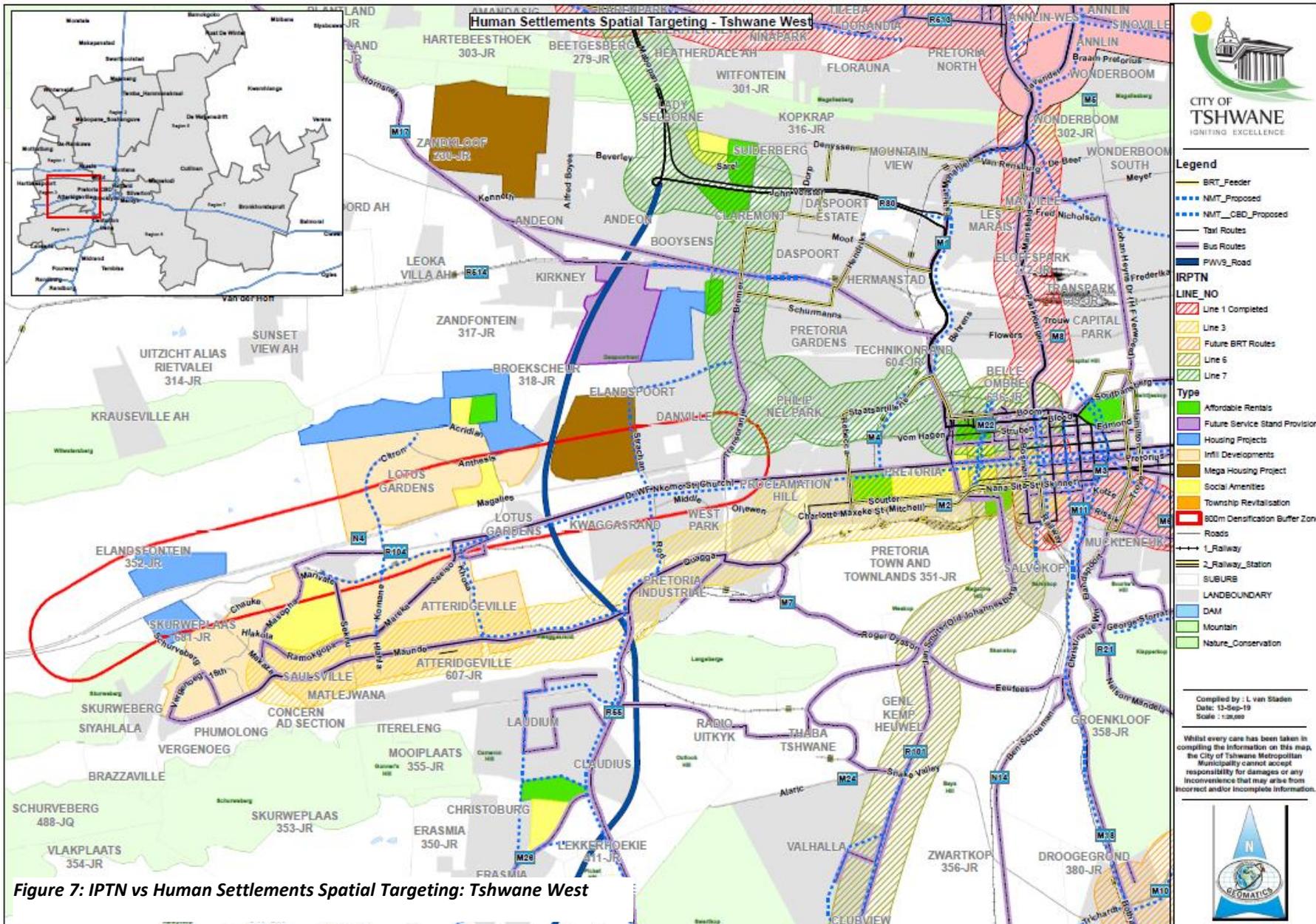
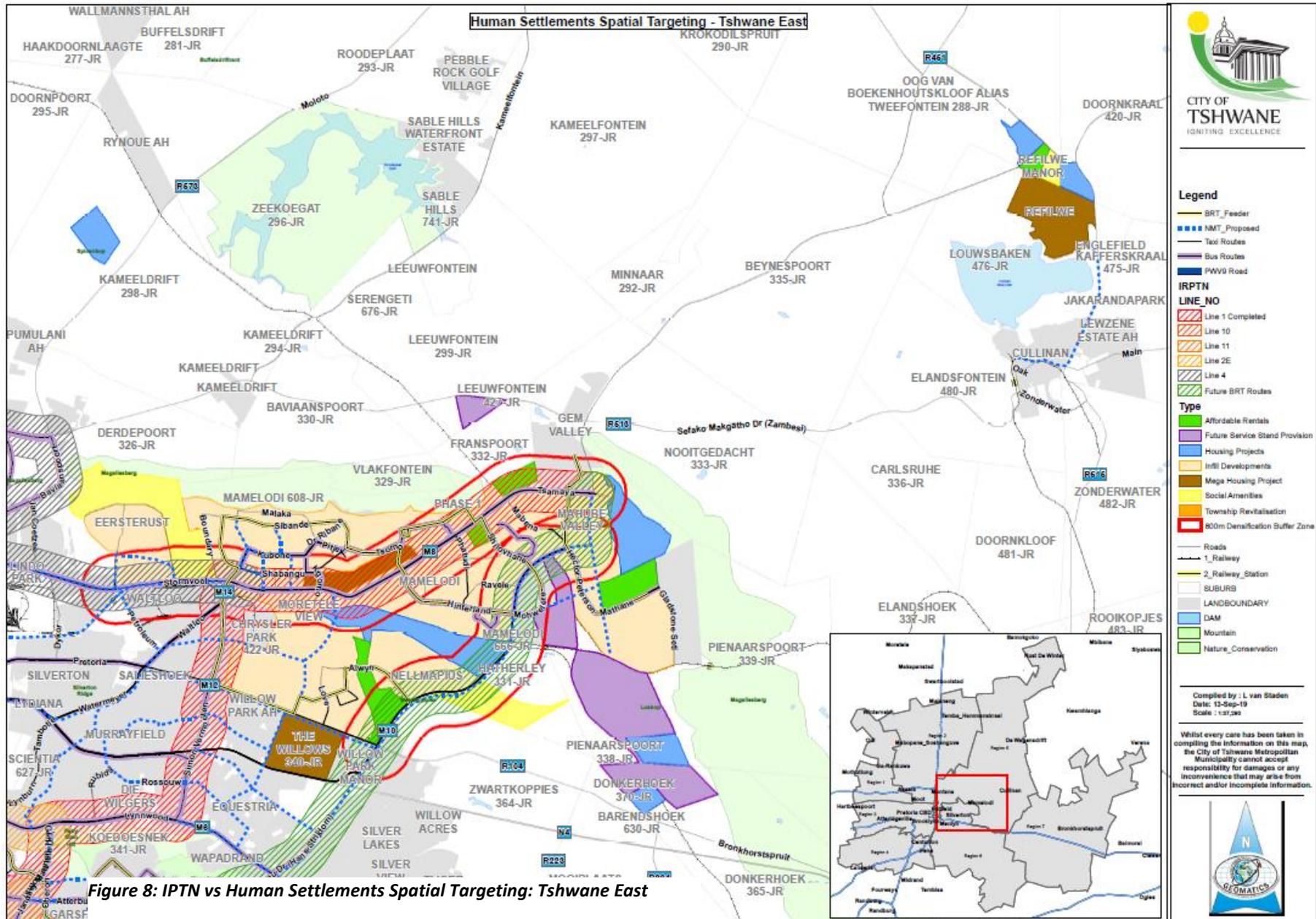


Figure 7: IPTN vs Human Settlements Spatial Targeting: Tshwane West



8.3 Economic Network

Tshwane's economy is varied and nuanced and includes specialised activity areas such as various tertiary hospitals, research and development institutions, academic institutions, tourism areas (such as Dinokeng) and mixed manufacturing in various industrial areas. Tshwane plays an important role in the economy of Gauteng. Some of the best performing sectors include community services, finance and transport.

Understanding which of the sectors and economic localities are most 'job absorbing' as opposed to only being revenue-generating is important. Transit-oriented development will improve economies of scale - more people/km² imply more business opportunities and efficient use of community facilities.

As far as possible, spatial restructuring encourages the placement of residential developments near areas of economic activity with supporting social facilities, and defines spaces through spatial design etc.

The proposed Pyramid South Hub, Tshwane Automotive City in Rosslyn and the potential logistics corridor that can be developed between the two potential logistics relationships that can exist between that location and the Rosslyn Automotive City is an example of an Agglomeration of Economies. Occurs when firms cluster together to produce at an added economy. This can take the form of urbanization economies, where cost decreases as total output of an urban area increases; or localization economies, where costs decrease as firms in a specific industry increase output. And while not physically in the same locality, the co-operation between the two

economic nodes within the City can create such an added logistics economy.

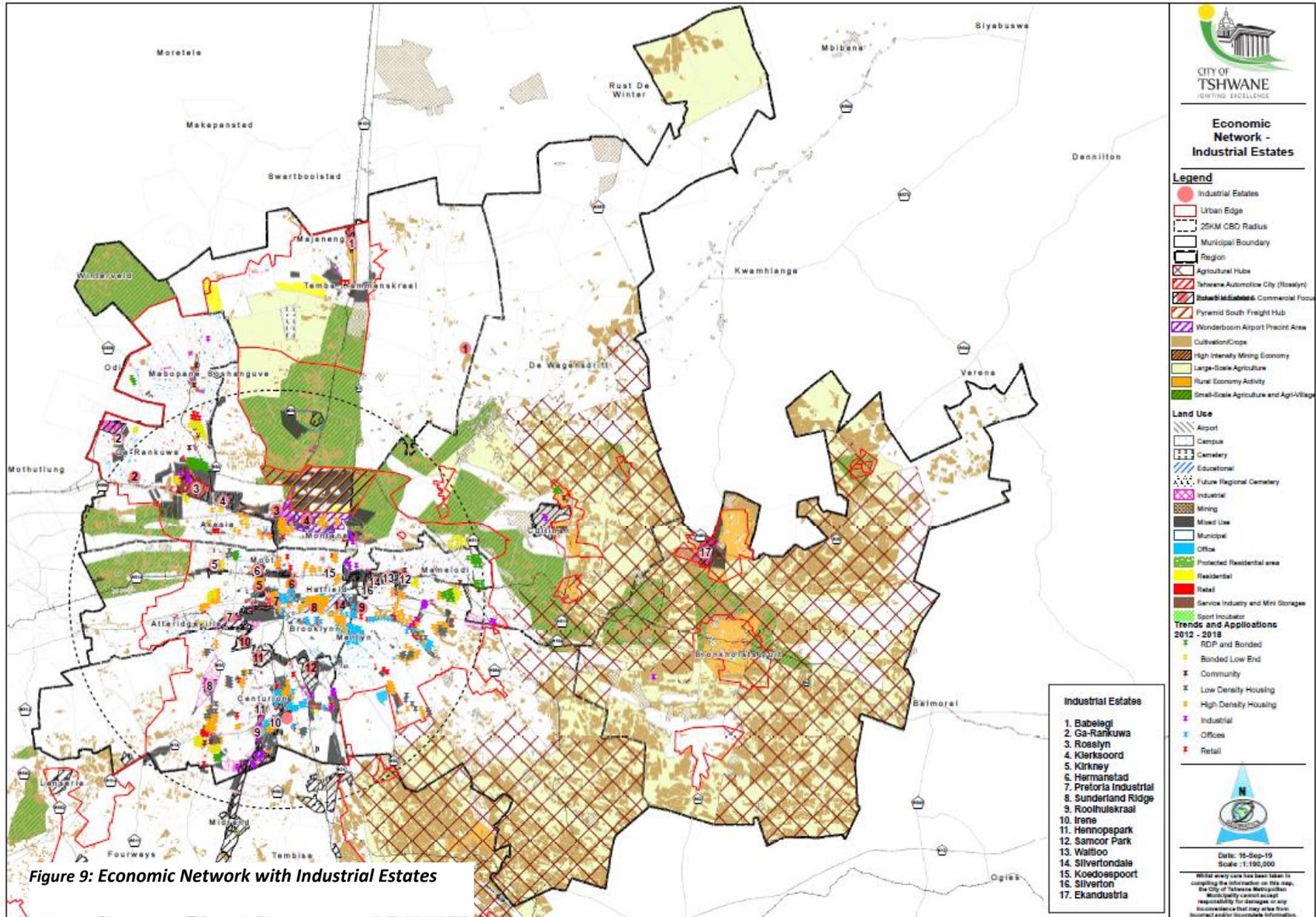
A number of economic activity areas exist within Region 6, but region 6 is near capacity with regards to available electricity.

On the other hand, Region 7 has been identified as a high potential area for agriculture and agri-processing, but the region is water scarce and the scale of agricultural potential that the City envisions for this region cannot be realised without water.

Water and Energy are an economic issue and without seeking sustainable alternatives for providing for both long into the future, some of our economies may begin to suffer.

Development Trends and Applications

The bulk land use applications for offices between 2012 and 2018 are to be found in Regions 3, 4 and 6. Retail applications are to be found throughout the City whereas industrial applications are largely in region 4 with a concentration of applications in the Rosslyn area (Region 1), Silverton (Region 2) and the peripheral areas of region 6.





Economic Network - Specialised Activity Areas

Legend

- Specialised Activity Areas
- ▭ Urban Edge
- ⋯ 25KM CBD Radius
- ▭ Municipal Boundary
- ▭ Region
- ▭ Agricultural Hubs
- ▭ Tshwane Automobile City (Rooskyt)
- ▭ Zone B Industrial & Commercial Focus
- ▭ Pyramid South Freight Hub
- ▭ Wonderboom Airport Precinct Area
- ▭ Cultivation/Crope
- ▭ High Intensity Mining Economy
- ▭ Large-Scale Agriculture
- ▭ Rural Economy Activity
- ▭ Small-Scale Agriculture and Agri-Village

Land Use

- ▭ Airport
- ▭ Campus
- ▭ Cemetery
- ▭ Educational
- ▭ Future Regional Cemetery
- ▭ Industrial
- ▭ Mining
- ▭ Mixed Use
- ▭ Municipal
- ▭ Office
- ▭ Protected Residential area
- ▭ Residential
- ▭ Retail
- ▭ Service Industry and Mini Storages
- ▭ Sport Incubator

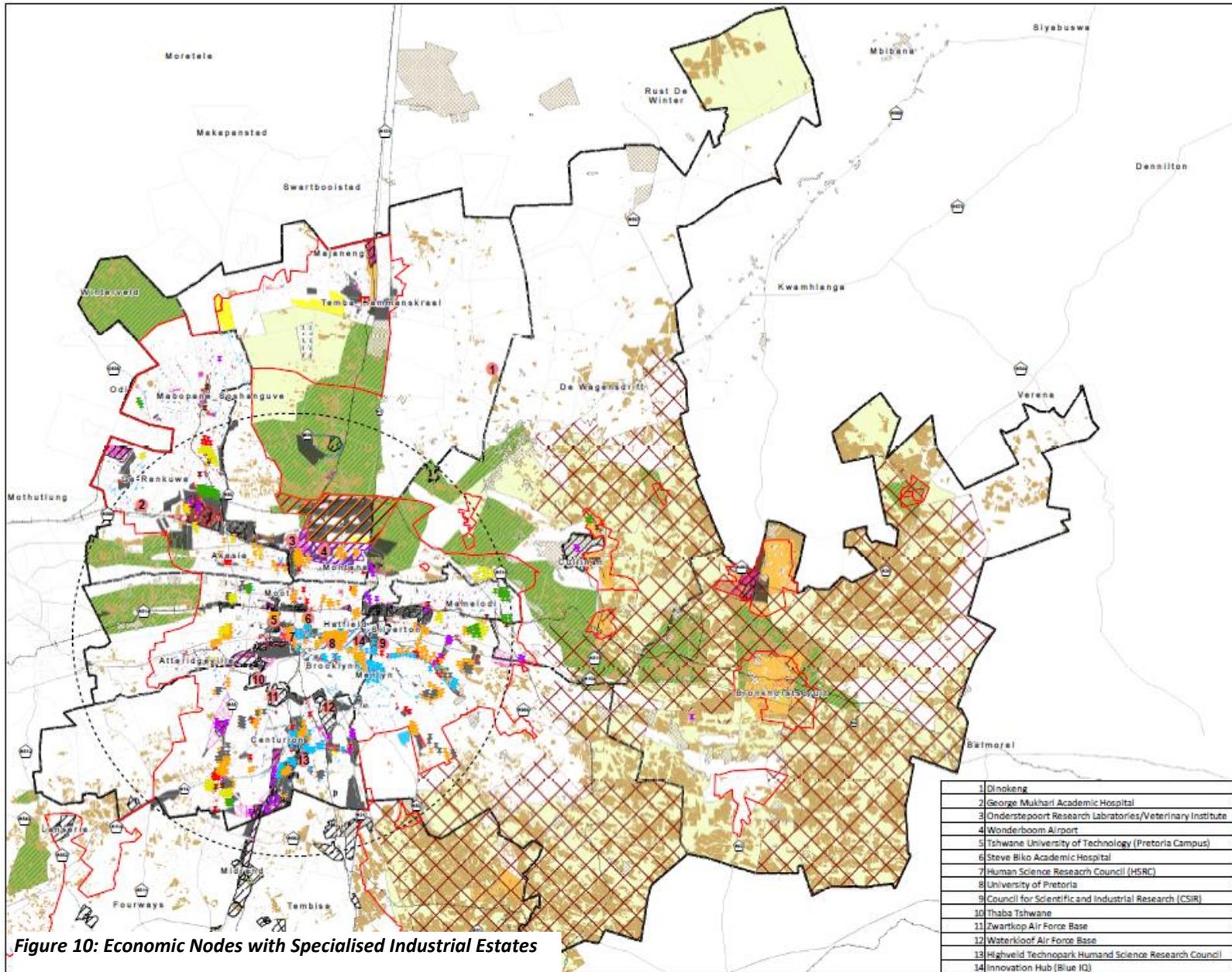
Trends and Applications 2012-2018

- ▭ RDP and Bonded
- ▭ Bonded Low End
- ▭ Community
- ▭ Low Density Housing
- ▭ High Density Housing
- ▭ Industrial
- ▭ Offices
- ▭ Retail



Date: 16-Sep-19
Scale: 1:150,000

While every care has been taken in compiling the information on this map, the City of Tshwane Metropolitan Municipality cannot accept responsibility for damages or any inaccuracies that may arise from incorrect and/or incomplete information.



1	Dinokeng
2	George Mukhari Academic Hospital
3	Onderstepoort Research Laboratories/Veterinary Institute
4	Wonderboom Airport
5	Tshwane University of Technology (Pretoria Campus)
6	Steve Biko Academic Hospital
7	Human Science Research Council (HSRC)
8	University of Pretoria
9	Council for Scientific and Industrial Research (CSIR)
10	Thaba Tshwane
11	Zwartkop Air Force Base
12	Waterkloof Air Force Base
13	Highveld Technopark Humand Science Research Council
14	Innovation Hub (Blue IQ)

Figure 10: Economic Nodes with Specialised Industrial Estates

8.3 Sustainable Infrastructure

Servicing costs are drastically increasing as distances increase and the city has difficulty even maintaining existing infrastructure.

The high capital and maintenance costs of development in peripheral areas thus need to be considered carefully. Particularly the availability of bulk services within an area should be considered.

Due to the high cost of providing bulk infrastructure in low density areas, urban sprawl should be discouraged. It is imperative that available infrastructure within the nodes are used optimally. This requires densification and intensification of land uses through compaction and infill developments. Transit-oriented development will optimise the potential and infrastructure capacity of nodes while combating urban sprawl through movement between and connectivity of focus areas of development.

The NDP further indicates that infrastructure unlocks the development potential of rural areas. Appropriate levels, form and location are important, given that infrastructure investment is less cost effective in lower density areas with small economies. The question is not whether infrastructure should be provided in rural areas, but what levels and forms of infrastructure should be provided, where it should be located and how it should be funded.

As far as possible, upgrading/re-use of infrastructure rather than expansion should be encouraged. Proper maintenance and upgrading of existing infrastructure is more cost-effective than expanding and thus creating more maintenance costs;

Upgrading/re-use of infrastructure rather than expansion. Proper maintenance and upgrading of existing infrastructure is more cost-effective than expanding and thus creating more maintenance costs.

Beyond the engineering infrastructure is the matter of the natural resources that are required in order to provide for the sustenance of human life and the economy i.e. energy and water.

At present, region 6 is almost at capacity with regards to electricity and region 7 is nearing capacity with regards to water and region 1 is most in urgent need of infrastructure maintenance with the Florauna, Pretoria North and Wolmer areas being the most urgent. If the City does not respond to the energy and water constraints that we are already starting to face, a time will come when economic stakeholders will relocate and residents will suffer severely, as we have already seen happen in Cape Town during 2018 with regards to water shortages. Energy and water shortages impact human lives directly and the City needs to be proactive on the long-term strategy for both energy and water security.

Policy Matters for Infrastructure Provision

In order to inform optimal localities for the provision of new infrastructure (where existing infrastructure proves insufficient):

- Infrastructure should be focused where the highest population densities are
- Planning for future infrastructure should be aligned to population growth areas

• Investment should be prevented in areas where population growth is discouraged e.g. inability to provide infrastructure due to geotechnical conditions; or areas too far from economic cores and city nodes; areas within flood zones

- Infrastructure Standards for rural nodes need to be developed for Tshwane
- Proposals will not be supported if bulk infrastructure capacities are exceeded or satisfactory service arrangements cannot be made

There is good evidence that intentionally pursuing green infrastructure as a strategic approach at the city-level can assist in addressing issues of

- Rainwater drainage, which, in turn, can mitigate the effects of drought through supporting collection and storage strategies
- Urban heat island effect, which, in turn, can reduce overall temperatures

Grey-green infrastructure should become part and parcel of infrastructure planning in the city in order to mitigate very real negative health and economic impacts on lives and livelihoods from the impacts of climate change.

Development Trends and Applications

According to population projections based on the current trends, the following areas are expected to have the highest number of households in 2030

- Atteridgeville
- CBD
- Irene
- Mamelodi
- Mooikloof
- Rosslyn
- Soshanguve

All of these- with the exception of Mooikloof- fall within nodal areas. Rosslyn is an economic activity area. The City needs to consider these projections when updating the Infrastructure Master Plan.

In the next 5 years, regions 6 and 7 need to be prioritised for electricity and water infrastructure, respectively.

Region 6, which is running out of energy supply, continues to receive a large number of applications for residential use alongside other mixed land uses and needs to be flagged for solutions to address energy security. The City has drafted an Energy Mix Strategy and Policy and guidelines emanating from this should be incorporated.

The City continues to invest in agri-villages and future agri-business plans in Region 7 where there is almost now water available. As with Region 6, the City urgently needs to develop sustainable methods of water security.



Infrastructure Capacity

Legend

Trends and Applications 2012 - 2018

- RDP and Bonded
- Bonded Low End
- Community
- Low Density Housing
- High Density Housing
- Industrial
- Offices
- Retail

- Municipal Boundary
- 25KM CBD Radius
- Region
- Urban Edge

- #### Water Capacity
- Ficksburg, Pretoria/North and Wolmer (Maintenance Required)
 - Region 7 (Water Deficiency)

- #### Electricity Capacity
- Red Flag (No capacity)
 - Flagged (with some progress)
 - MTS_Sub_Existing
 - MTS_Sub_Planned



Date: 2019/08/16
Scale: 1:150 000

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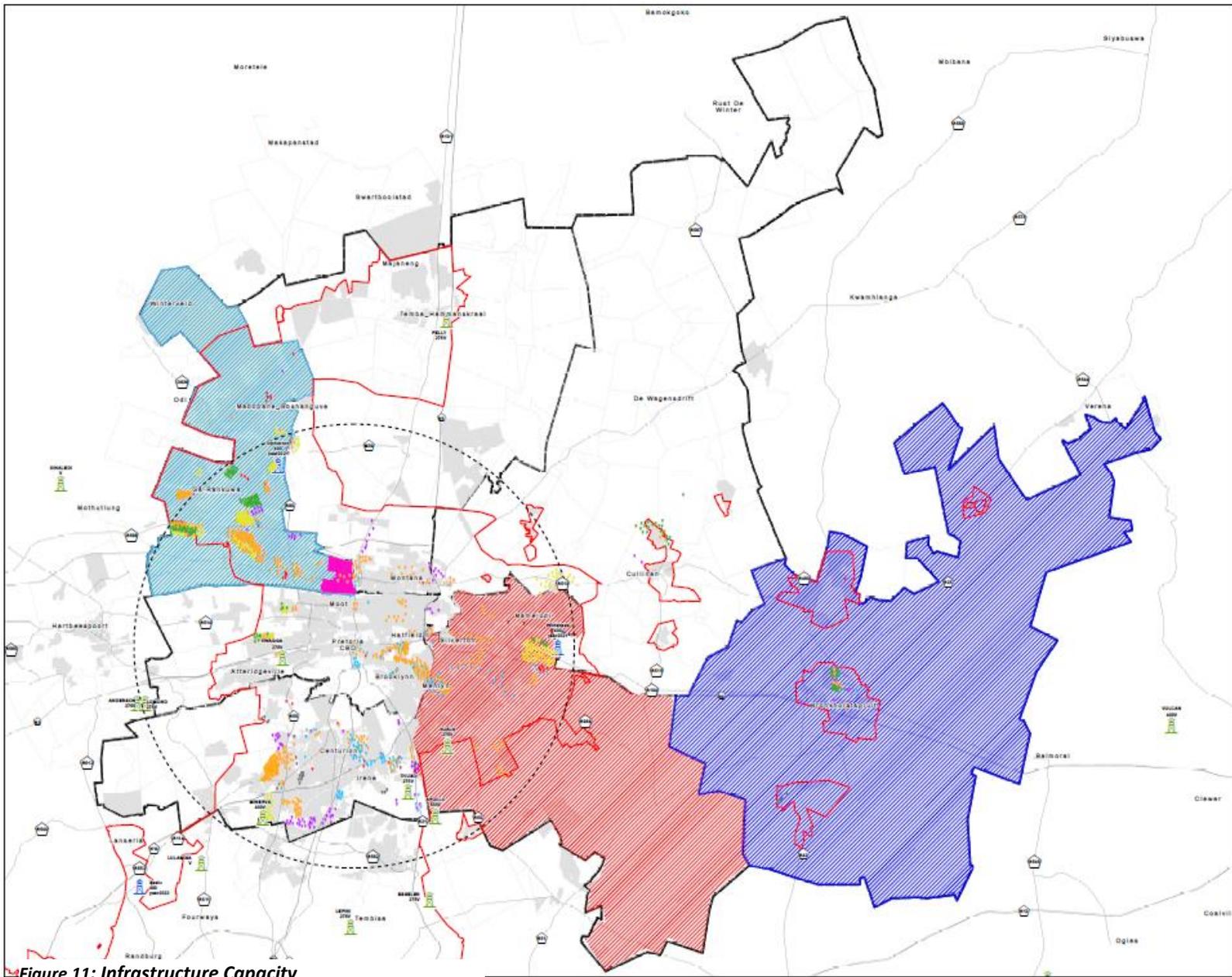


Figure 11: Infrastructure Capacity

8.4 Ecological Infrastructure

Ecological infrastructure refers to naturally functioning ecosystems that generate or deliver valuable services to people to support their economic activities and enhance or maintain their quality of life. Spatially, South Africa's ecological infrastructure is defined as (1) existing protected areas, (2) fresh water bodies, (3) the strategic water source areas, and (4) Critical Biodiversity Areas (CBAs).

The transformation of physical land from one use to another inevitably implies that natural ecological systems and cycles are disrupted, with a consequential loss of the ecological infrastructure that helped maintain the integrity of the land. Ecological resources are irreplaceable and should thus be one of the major structuring elements guiding the development of the city instead of unplanned urban growth taking precedence and open space becoming merely land that is not desirable for urban development and thus 'left over' space.

At present, the economy is overly and unsustainably resource intensive. In view of projections for decreasing rainfall (coupled with extreme weather events) it is imperative that water planning becomes part and parcel of each and every sector across the board. The design of buildings and properties need to incorporate strategies that will allow for water harvesting and retention. Existing fresh water bodies should be protected from any infringements from development.

There is also an understanding that the There is good evidence that intentionally pursuing green infrastructure as a strategic approach at the city-level can assist in addressing issues of

- Rainwater drainage, which, in turn, can mitigate the effects of drought through supporting collection and storage strategies
- Urban heat island effect, which, in turn, can reduce overall temperatures

Green infrastructure should become part and parcel of infrastructure planning in the city in order to mitigate very real negative health and economic impacts on lives and livelihoods from the impacts of climate change.

The spatial plan espouses the conservation of environmental resources – specifically conservation areas, heritage sites, open space and sensitive areas. Areas of high agricultural potential need to be protected for exactly that use within the context of growing this economic sector and also ensuring food security for the future, if necessary.

The objective of the Gauteng Environmental Management Framework (GEMF, 2014) is to guide sustainable land-use management within the province. It determines geographical areas where appropriate activities are allowed (environmental management zones) and is aimed at facilitating economic development in the province. The following environmental management zones were developed to address the challenges posed by urban development on natural systems:

- Zone 1: Urban development zone where urban development activities are streamlined (exempt from environmental assessment requirements), and infill and densification are promoted with the aim of minimising urban sprawl into rural areas.

Zone 2: High control zone (within the urban development zone): Sensitive areas in the urban development zone are conserved.

- Zone 3: High control zone (outside the urban development zone): Sensitive areas outside the urban development zone are protected.

- Zone 4: Normal control zone: Agricultural uses outside the urban development zone are protected.

- Zone 5: Industrial and large commercial focus zone: Non-polluting industrial and large-scale commercial activities are streamlined (exempt from environmental assessment requirements), specifically in areas that are already used for such purposes and areas that are severely degraded but close to required infrastructure.

The Tshwane Biodiversity Plan offers the following guidelines pertaining to development:

Category on the critical biodiversity area map	Description	Land management objective	Land management recommendations	Compatible land use	Incompatible land use
Protected areas	Formal protected areas and protected areas pending declaration under the Protected Areas Act. ⁴	Maintain in a natural or near-natural state. Rehabilitate degraded areas to a natural or near-natural state, and manage for no further degradation.	Maintain or obtain formal protection.	Conservation and associated activities. See the management plan for the protected area concerned.	All other land uses.
Critical biodiversity area 1	Areas required to be maintained in a natural or near-natural state to meet targets for biodiversity pattern (features) or ecological processes.	Maintain in a natural or near-natural state. Rehabilitate degraded areas to a natural or near-natural state, and manage for no further degradation.	Obtain formal protection where possible. Implement appropriate zoning to avoid loss of intact natural habitat or intensification of land use.	Conservation and associated activities. Extensive game farming and eco-tourism operations with strict control on environmental impacts and carrying capacities, where a biodiversity compatible land use is secured across a property. Extensive livestock production on natural rangeland with strict control on environmental impacts and carrying capacities. Urban open space systems.	Urban land uses including residential (including golf estates, rural residential, resorts), business, mining and industrial, infrastructure (roads, pipelines and power lines ⁵). Intensive animal production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Arable agriculture (forestry, dry land and irrigated cropping). Small holdings.
Critical biodiversity area 2	Cultivated landscapes which retain importance for supporting threatened species.	Maintain suitability for key threatened species.	Maintain as an agricultural landscape.	Maintain current agricultural activities. Ensure that land use is not intensified and that activities are managed to minimise impact on threatened species.	Avoid conversion of agricultural land to more intensive land uses which may have a negative impact on threatened species or ecological processes.

Biodiversity-compatible land use guidelines

Ecological support area 1	Natural, near-natural or degraded areas required to be maintained in an ecologically functional state to support critical biodiversity areas or protected areas.	Maintain in an ecologically functional state to maintain ecological processes.	Implement appropriate zoning and land management guidelines to avoid impacting ecological processes, such as key landscape corridors and linkages and avoiding areas important for hydrological processes (eg floodplains). Avoid intensification of land use.	Conservation and associated activities. Extensive game farming and eco-tourism operations. Extensive livestock production. Urban open space systems. Low-density rural residential, smallholdings or resorts where development design and overall development densities allow maintenance of ecological functioning.	Urban land uses including residential (including golf estates, rural residential, resorts), business, mining and industrial. Infrastructure (roads, pipelines), excluding power lines which are compatible with ecological support areas as long as they are designed to avoid impacting on processes, such as water flow. Intensive animal production (all types including dairy farming associated with confinement, imported foodstuffs, and improved/irrigated pastures). Arable agriculture (forestry, dry land and irrigated cropping). Small holdings. Note: Certain elements of these activities could be allowed subject to detailed impact assessment to ensure that developments were designed to maintain overall ecological functioning of ecological support areas.
Ecological support area 2	Areas with no natural habitat which retain potential importance for supporting ecological processes.	Avoid additional impacts on ecological processes.	Avoid intensification of land use, which may result in additional impacts on ecological processes.	Existing activities (eg cultivation) should be maintained or where possible a transition to less intensive land uses should be favoured.	Any land use or activity which results in additional impacts on ecological functioning, mostly associated with the intensification of land use in these areas (eg change of floodplain from cultivation to urban land use, or from recreational fields and parks to housing).
Other natural areas	Natural, near-natural or degraded areas not required to meet biodiversity targets, and not identified as critical biodiversity areas or ecological support areas.	No management objectives, land management recommendations or land use guidelines are provided as these areas are outside the ambit of the Bioregional Plan. These areas are nevertheless subject to all applicable town and regional planning guidelines and policies. Where possible, existing severely modified areas should be favoured for infrastructure development before other natural areas as other natural areas may later be required, either due to the identification of previously unknown important biodiversity features on these sites, or alternatively where the loss of critical biodiversity areas has resulted in the need to identify alternative sites as critical biodiversity areas to meet biodiversity targets.			

<p>No natural habitat remaining</p>	<p>Irreversibly modified areas which are not required as ecological support areas, including intensive agriculture, urban development, industry and infrastructure.</p>	
--------------------------------------------	-------------------------------------------------------------------------------------------------------------------------------------------------------------------------	--

Development Trends and Applications

By and large developments of the last few years have been aligned with both the City’s and Province’s environmental planning. But here are there have been some infringements, housing (both formal and informal) that have been built along the Magaliesburg mountain in Mamelodi . It is clear, then, that in order for environmental policies to be implemented, the matter of clear and consistent enforcement of environmental requirements needs to be addressed.

As part of the process of the approval of land use applications, it is imperative that the environmental impact pertaining to noise, air quality and other health-impacting matters are properly assessed.

Tshwane’s Biodiversity Plan, coupled with the Gauteng Environmental Management Framework, provide clear guidance on the differentiated levels of development that can or cannot be accommodated in specific areas and should a layer of consideration

for the processing of all developments submitted to the City for approval.

All regionalised and local spatial plans (including precinct plans) should include both the Biodiversity Plan and Gauteng Environmental Management Zones in their spatial layers to inform plans.



Tshwane Biodiversity Map

Legend

- Urban Edge
- 25KM CBD Radius
- Municipal Boundary
- Region

CPlan

- Critically Biodiversity Area 1
- Critically Biodiversity Area 2
- Ecological Support Area 1
- Ecological Support Area 2
- Protected Areas
- Non-Natural Areas
- Other Natural Areas

NATURAL STRUCTURING ELEMENTS

- NATURE RESERVE
- OPEN SPACE
- RIDGE

Trends and Applications 2012 - 2018

- RDP and Bonded
- Bonded Low End
- Community
- Low Density Housing
- High Density Housing
- Industrial
- Offices
- Retail



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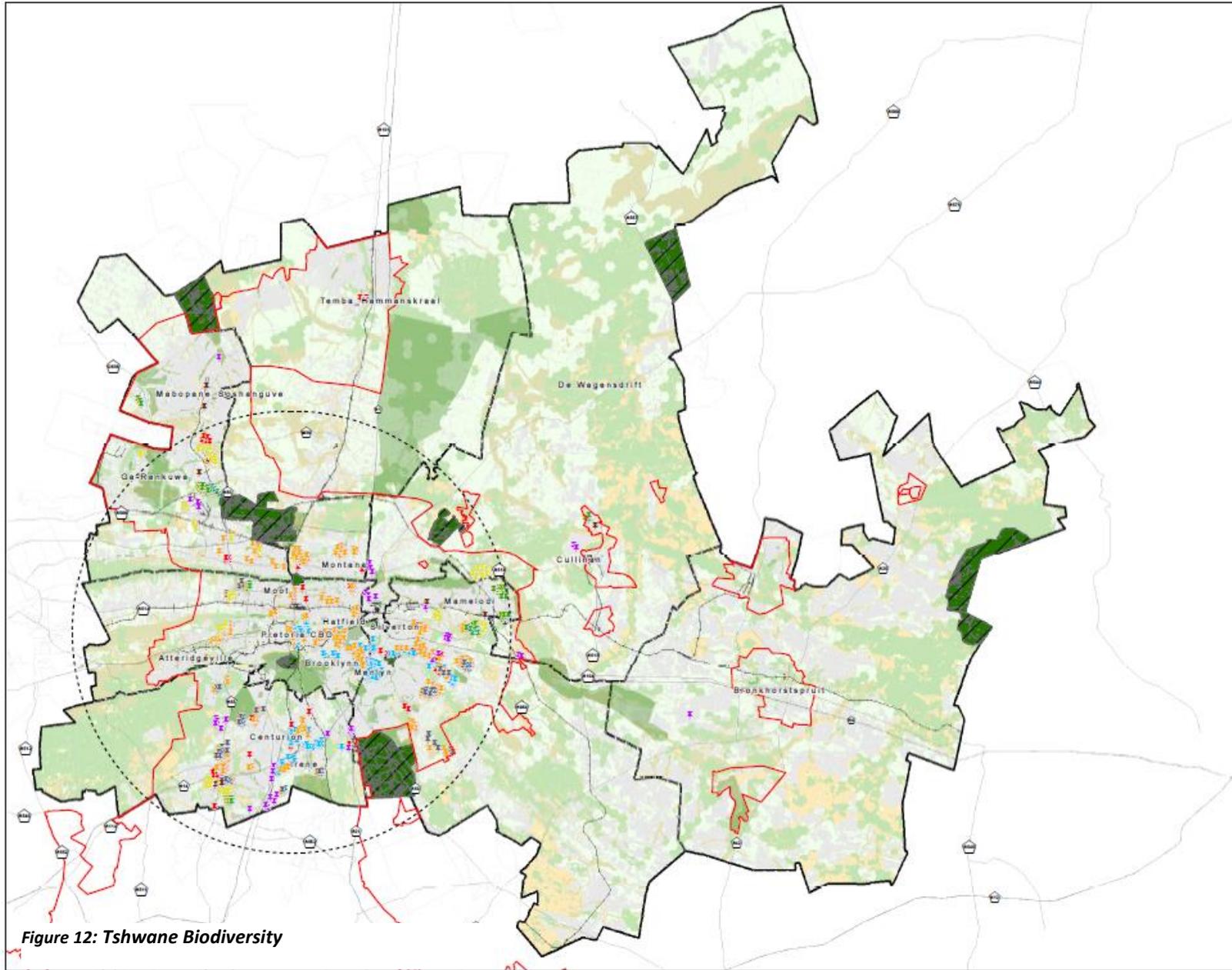
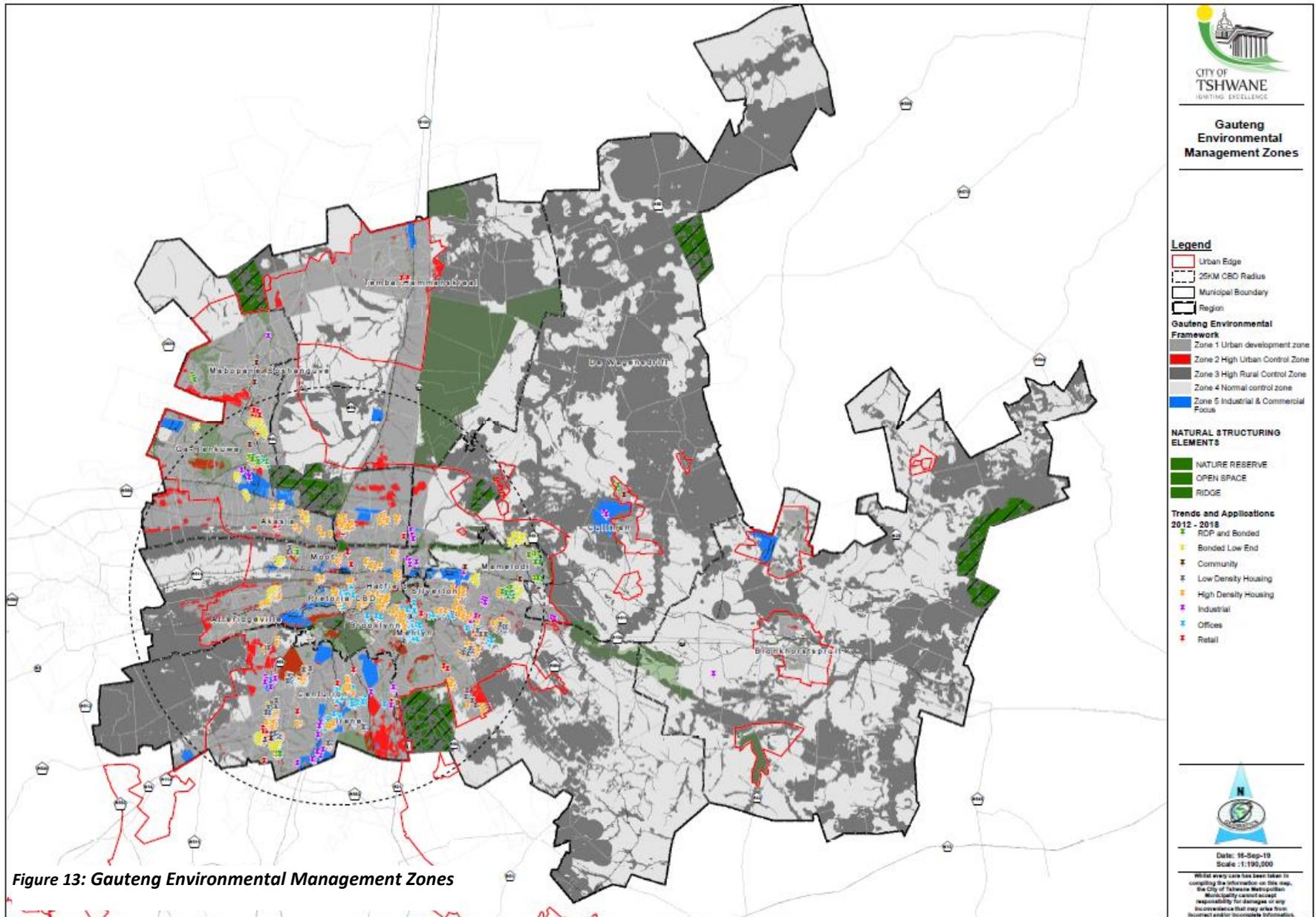


Figure 12: Tshwane Biodiversity



8.5 Urban Network Strategy

The Urban Network Strategy is a spatial targeting tool being implemented UNS as a national policy directive that informs spatial planning at both a provincial and regional scale and forms the basis of the BEPP by providing a spatial approach against which to target investment. The UNS seeks to achieve spatial restructuring through meaningful linkages of marginalised areas to areas of opportunity, including the Capital Core/CBD. The UNS consists of the following main elements:

- Central Business District
- Urban Hubs
- Smaller Nodes
- Activity Corridors
- Secondary Transport Linkages
- Integration Zones

In addition to the UNS, the BEPP Guidelines require that the City has prioritised Economic Development Priority Quadrants (EDPQs) into medium to long-term implementation priorities. The BEPP Guidelines for 2018/19 describes integration zones as planning elements which should facilitate investment within spatially targeted areas in order to promote spatial transformation. In light of this, the city has opted to identify BEPP Economic Development Priority Quadrants (EDPQs) areas as a combination of the Capital Core, Metropolitan Nodes, Urban Cores together with the Activity Corridors as per the City's MSDF.

BEPP EDPQs identified for medium-term implementation at the time of development of this MSDF consist of the following, in order of priority:

- (1) Inner City (Capital Core);
- (2) Rosslyn/Wonderboom quadrant, and;
- (3) Waltloo/Silverton quadrant.

Element	Description/function/role	MSDF description
Central Business District	An area for focused regeneration and management.	Capital Core
Urban Hubs	Includes both traditional and emerging centres of economic activity, within which mixed used development is to be encouraged and managed.	Metropolitan Nodes
Emerging Nodes/ Marginalised Areas	Includes areas of economic activity within which mixed-use development is to be promoted.	Urban Cores
Activity Corridors	Areas along rapid public transport which connect the urban hubs and the CBD, where high-density land development is to be promoted.	BRT line and Gautrain (current IRPTN network)
Secondary Transport Linkages	Routes that ensure the spatial integration of smaller nodes by connecting them to urban hubs.	Integrated Public Transport Network (IPTN) inclusive of taxis, Tshwane bus and non-motorised transport
Integration Zones	Areas which represent a collective of all other typologies and form the prioritised spatial focus areas for coordinated public intervention.	BRT Phase 1 alignment. Priority area: Rainbow Junction to CBD to Hatfield.

Table 1: UNS vs MSDF Descriptions

8.6 Bringing it All Together

Each chapter of the MSDF highlights the challenges, opportunities that exist within the City and what the required action plans are in order to realise the spatial restructuring and transformation we need to see.

Spatial restructuring and transformation is about **improving quality of life**. It's about **maximising employment opportunities**; it's about **not spending unnecessary hours in traffic**- getting a mother that works 60km away from home back to her children earlier in the day than later in the night. Spatial transformation is about **providing a space** for people across different income groups **to interact** with one another in the same communities; it's about **breathing clean air, protecting limited natural resources and living healthier lives**. Spatial transformation is the key to **attracting investment** into our cities though creating economies of scale through an efficient space economy: supplying the demand, in an efficient, effective and sustainable manner. Spatial transformation is about **good governance, advancing the service delivery** imperative in a meaningful, impactful and more affordable manner.

Spatial restructuring and transformation uses **roads and transportation modes, housing, community facilities and services, economic strategy, agricultural and environmental interventions, electricity and water supply** as tools to realise the restructuring of space. But these very same tools were used pre-1994. And these very same tools, though the basic principles of segregation and exclusivity created exactly the spaces we have today and are trying to transform.

Spatial restructuring and transformation, then, is an **all-encompassing strategic approach** for creating a successful city **across all sectors**. And

transformation does not happen by chance. It is a conscious decision to 'undo' business as usual.

It is a decision to alter/ change/ convert/ revolutionise/ make over. If we continue in the ways that we did things yesterday, whatever the reason, we should accept that we will never transform. And even if we do it differently, we must sure that we do it correctly.

Spatial restructuring and transformation informs Tshwane's Spatial Vision to realise a **Spatially Efficient Capital City that is Sustainable, Competitive and Resilient**:

- **Sustainability:** Optimising the use of land through densification, infill and consolidation, resulting in a city with spatially integrated equal opportunities, correcting spatial imbalances, creating sustainable settlements and advancing social equity.
- **Competitiveness:** Instilling investor confidence by ensuring a well-managed quality built environment through enforcement of relevant legislation, maintenance and management of infrastructure and strategic investment in infrastructure focus areas targeting broad-based economic growth.
- **Resilience:** Being innovate and adaptable, whilst maximizing spatial opportunities and in turn maximizing economic growth opportunities through strategic investment decisions.

Although massive investment in fixed assets will be required, strong policies, consistent implementation and political will, will contribute to a spatially transformed Tshwane within the next 10-15 years.

