CITY OF TSHWANE
IGNITING EXCELLENCE

Built Environment Performance Plan 2019/2020

Section B: Spatial Planning and Targeting

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Abbreviations

AIDC	Automotive Industry Development Centre
BEA	Building Efficiency Accelerator
BEPP	Built Environment Performance Plan
BEPPSCO	Built Environment Performance Plan Steering Committee
BSC	Budget Steering Committee
CAP	Climate Action Plan
CAPEX	Capital Expenditure
CAPS	Tshwane's Capital Planning and Prioritisation System
CAPSCO	Capital Planning Steering Committee
CBD	Central Business District
CIF	Capital Investment Framework
CITP	Comprehensive Integrated Transport Plan
CNG	Compressed Natural Gas
COT	City of Tshwane
CPM	Capital Prioritisation Model
CRDP	Comprehensive Rural Development Programme
CR&R	Climate Resilience and Responsiveness
CRS	Climate Response Strategy
CSIR	Council for Scientific and Industrial Research
CSU	City Sustainability Unit
DIPS	Development Intervention Portfolios
DORA	Division of Revenue Act (2 of 2013)
EDPQ	Economic Development Priority Quadrant
EGP	Embedded Generation Policy
EV	Electric Vehicle
EXCO	Executive Council
FDI	Foreign Direct Investment
GBCSA	Green Building Council of South Africa
GCR	Global City Region
GCM	Global Circulation Model
GGMP	Gauteng Growth Management Perspective
GHGEI	Greenhouse Gas Emissions Inventory
GPC	Global Protocol for Community-Scale
GPG	Gauteng Provincial Government
GSDF	Gauteng Spatial Development Framework
ICDG	Integrated City Development Grant
IDP	Integrated Development Plan
IPCC	Intergovernmental Panel on Climate Change
IRPTN	Integrated Rapid Public Transport Network
LED	Local Economic Development
LSDF	Local Spatial Development Framework
MCA	Multi-Criteria Analysis
MFMA	Municipal Financial and Management Act (56 of 2003)
MSA	Municipal Systems Act (32 of 2000)

MSDF	Metropolitan Spatial Development Framework
MTEF	Medium Term Expenditure Framework
MTREF	Medium Term Revenue and Expenditure Framework
NDP	National Development Plan
NMT	Non-motorised Transport
NSDP	National Spatial Development Perspective
OPEX	Operational Expenditure
RSDF	Regional Spatial Development Framework
SAF	Strategic Area Framework
SAL	Small Area Layer (Statistics South Africa Census 2011)
SANEDI	South African National Energy Development Initiative
SDBIP	Service Delivery and Budget Implementation Plan
SIP	Strategic Infrastructure Project
SPP	Sustainable Procurement Policy
SOCA	State of the City Address
SPLUMA	Spatial Planning and Land Use Management Act (13 of 2013)
SRES	Special Report in Emissions Scenarios
TAC	Tshwane Automotive City Project
TACDF	Tshwane Automotive City Project Development Framework
TICRS	Tshwane Inner City Regeneration Strategy
TOD	Transit Oriented Development
TRT	Tshwane Rapid Transit System
UDF	Urban Development Framework
UNS	Urban Network Structure
USDG	Urban Settlements Development Grant
WMP	Wetlands Management Plan

B Spatial Planning and Targeting

B.1 Contextualisation

Spatial targeting is the deliberate focus of a particular action on a particular spatial area, and in a legislative and performance measurement environment, it is a useful tool to help achieve organisational objectives more effectively. Spatial targeting is only possible under the following conditions:

- Spatial strategies of the organisation are expressed in strategic documentation;
- Interventions are spatially referenced;
- The beneficiary or impact are of interventions are spatially referenced, and;
- The scope of interventions or actions are clearly defined.

In terms of the municipal environment, and specifically the BEPP, spatial targeting therefore refers to the deliberate focussing of capital investment in spatially targeted areas in order to achieve municipal objectives more efficiently. Spatial targeting is thus focussed on optimising the spatial distribution of current and future capital investment in terms of the spatial distribution of beneficiary areas, economic nodes, integration zones (current and future) and areas vulnerable to climate change impacts to name only a few.

To respond to the National Development Plan 2030 approach towards spatially targeted investment, the City of Tshwane has not only identified Integration Zones but has also included spatial criteria into the Capital Prioritisation Model (CPM) which will be discussed as part of Section C.

This section will investigate the process of identifying the Urban Network Structure (UNS) from which spatial targeting areas are derived. As part of identifying the UNS, this section aims to establish the current climate change risks and impacts, specifically focusing on vulnerability assessments relating to spatially targeted areas.

Spatial targeting can be best understood using the basic spatial structuring elements[1] of South African cities. This section will start by summarising the city's understanding of the UNS, followed by an analysis that describes the city's UNS. Once the city's UNS has been described, parallels will be drawn between the transport network (both public and private transport), household distribution (drawing from the Human Settlements Plan and CSIR UrbanSim results) and economic opportunities (City of Tshwane Development trends analysis and CSIR UrbanSim results). The identification of spatial targeting areas will then be concluded by describing the delineation and extent of the city's BEPP Economic Development Priority Quadrants (EDPQs) and consequent precinct plans which stem from these areas.

Given that Climate Resilience and Responsiveness (CR&R) mainstreaming should be incorporated into the BEPP reporting process (refer to Section A), the information contained within this section will refer to both climate adaptation and mitigation strategies. From an adaptation point of departure reference will be made to the Vulnerability Assessment to Climate Change (2015) and for purposes of mitigation, reference will be made to the Green House Gas Emissions Inventory for 2014/15. In conclusion to this section, the institutional framework will include the established mandate and structure of the City Sustainability Unit and how climate change expertise have been incorporated into infrastructure investment planning and departmental operations.

The figure below shows the capital planning, budgeting and management process of the City of Tshwane as well as how spatial targeting plays a role in the Built Environment Value Chain.

[1] Urban Network Structure components as described by the 2018/2019 BEPP Guidelines.

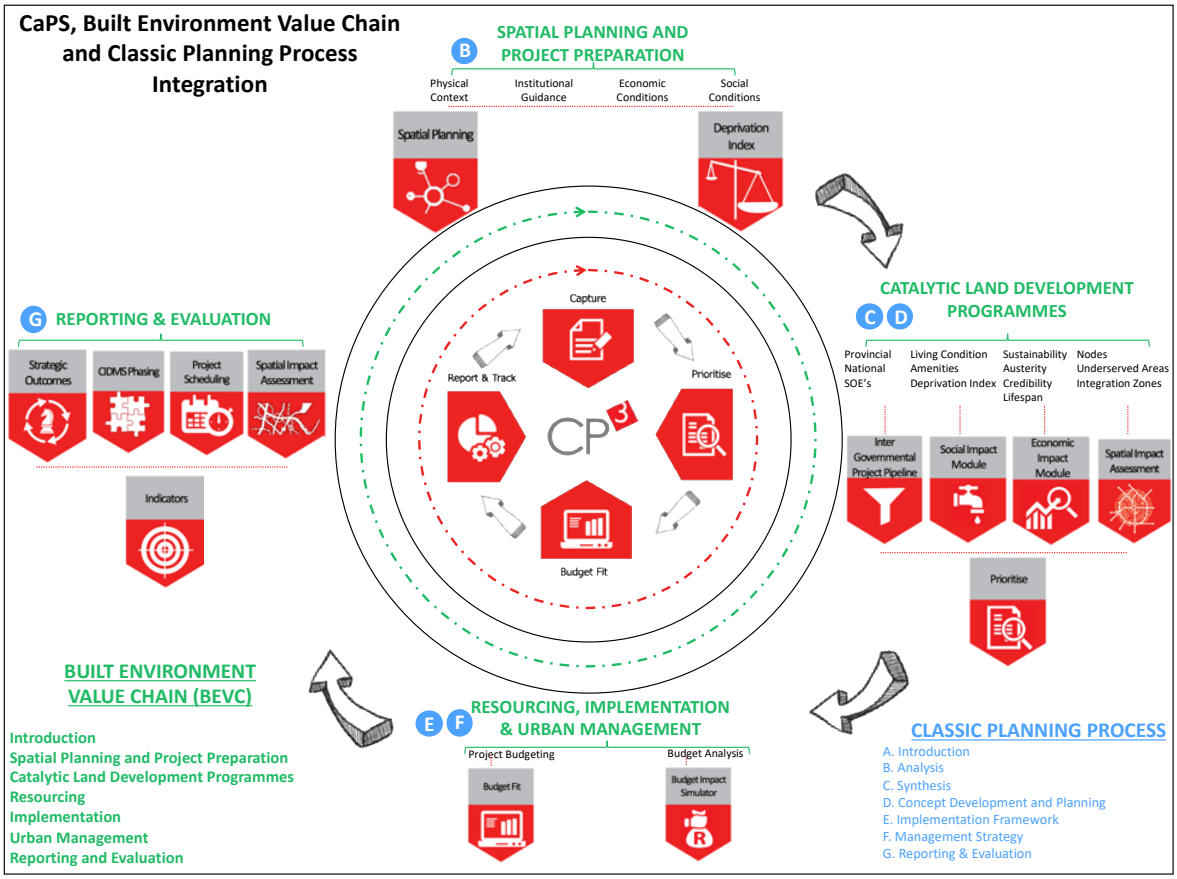


Figure B-1: Contextualisation

B.2 Spatial Targeting

B.2.1 Urban Network Structure

The UNS is a national policy directive[2] 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. In recognition of the role that cities play in the fulfilment of the key government objectives and to improve the spatial transformation through coordinated public investment, National Treasury developed an UNS[3] which enforces a pro-poor/ pro-growth approach to development of cities. The UNS strategy is aimed at the following:

- Facilitating the eradication of spatial inequality to enable the creation of liveable, sustainable, resilient, efficient and integrated human settlements;
- Shift infrastructure investments towards the creation of efficient and effective urban centres through an approach of spatial targeting of public investment, primarily infrastructure, and;
- Identification and investment in city-wide interconnected hierarchy of strategic nodes and public transport links between and within nodes.

The UNS typologies comprises of the following elements:

- Central Business District
- Urban Hubs

[2] National Treasury
[3] The Urban Network Strategy (UNS) is a national policy directive that informs spatial planning at both a provincial and regional scale and forms the basis of the Built Environment Performance Plan (BEPP) by providing a spatial approach by which to target investment

- Smaller Nodes
- Activity Corridors
- Secondary Transport Linkages
- Integration Zones

Each of the UNS typologies are described in more detail in Table B-1 below.

Table B-1: Urban Network Structure Typologies

Element	Description/function/role
Central Business District	An area for focused regeneration and management.
Urban Hubs	Includes both traditional and emerging centres of economic activity, within which mixed used development is to be encouraged and managed.
Smaller Nodes	Includes areas of economic activity within which mixed-use development is to be promoted.
Activity Corridors	Areas along rapid public transport which connect the urban hubs and the CBD, where high-density land development is to be promoted.
Secondary Transport Linkages	Routes that ensure the spatial integration of smaller nodes by connecting them to urban hubs.
Integration Zones	Areas which represent a collective of all other typologies and form the prioritised spatial focus areas for coordinated public intervention.

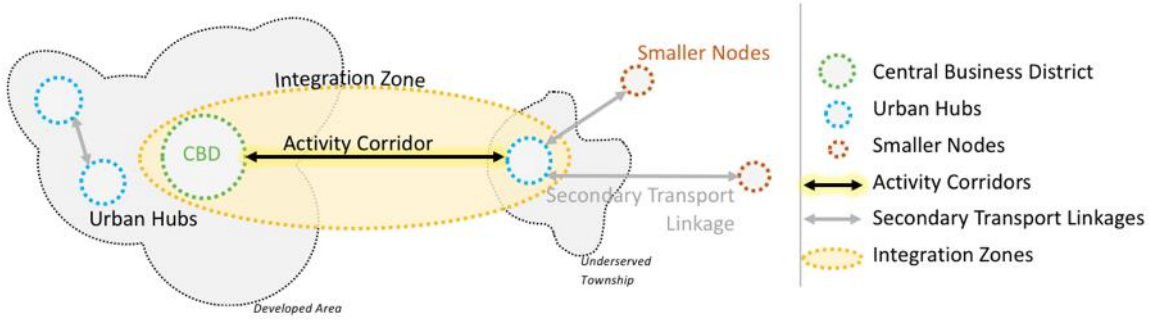


Figure B-2: The Urban Network Typology

B.2.2 City of Tshwane Urban Network Diagnostic Analysis

In order to identify the UNS elements for the City of Tshwane, as per the 2018/2019 BEPP guidelines, the following will be analysed from which a synthesis will culminate to the City of Tshwane Urban Network Structure:

- Socio-economic analysis;

- Transport and movement pattern analysis, and;
- Population distribution and human settlement analysis.

B.2.2.1 *Socio-economic analysis – Identification of the nodal structure*

B.2.2.1.1 Deprivation Index

Basic service delivery is not only a fundamental function and responsibility of the city but is reiterated at a national level within the National Development Plan (NDP) as the means to which poverty and inequality will be eliminated. The City of Tshwane has developed a Deprivation Index that measures the extent to which the residents of the city are deprived of basic services and generally impoverished.

The Deprivation Index serves to elevate projects which impact underserviced areas i.e. the most deprived areas as identified by spatial data analysis. The Deprivation Index is a spatial layer calculated from Statistics South Africa data at small area layer (SAL) from Census 2011, which provides an indication of the level of impoverishment or lack of services across the municipality.

The Deprivation Index considers the following indicators:

- Household Income (Weighted at 25%)
- Household Size (Weighted at 5%)
- Household Dwelling Type (Weighted at 5%)
- Household Cooking (Weighted at 10%)
- Household Heat (Weighted at 5%)
- Household Light (Weighted at 5%)
- Household Piped Water (Weighted at 20%)
- Household Toilet (Weighted at 20%)
- Household Refuse Disposal (Weighted at 5%)

Each of the contributing indicators to the Deprivation Index are show spatially linked to the Census 2011 SAL, in Figure B-3 to Figure B-11 below.

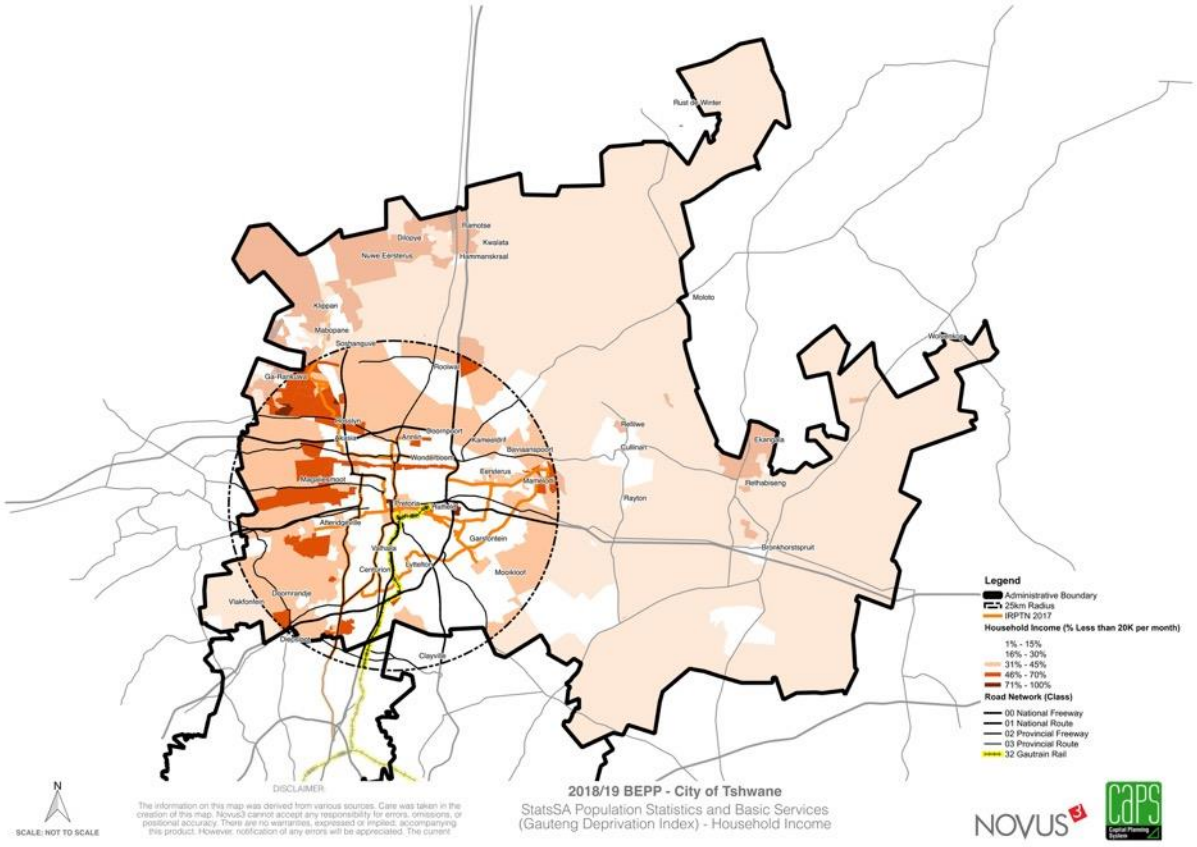


Figure B-3: City of Tshwane distribution of Household Income

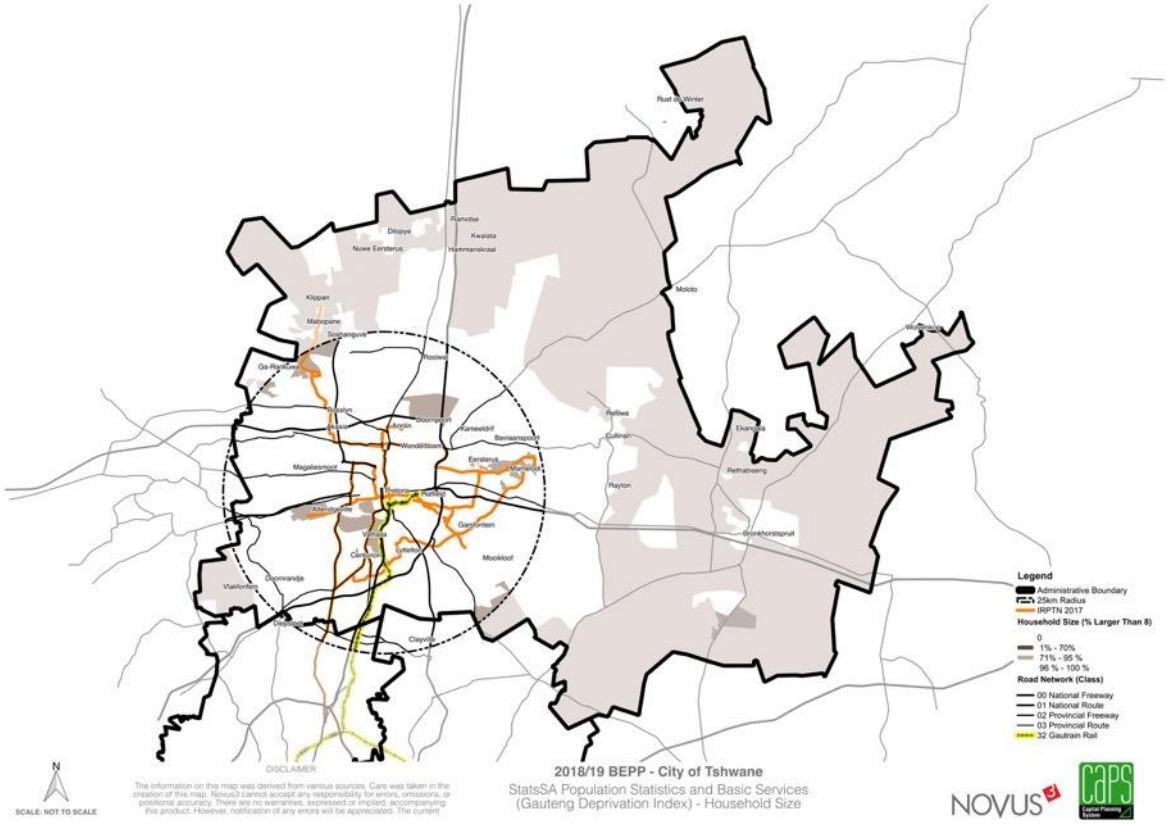


Figure B-4: City of Tshwane distribution of Household Size

Figure B-5: City of Tshwane distribution of Dwelling Type

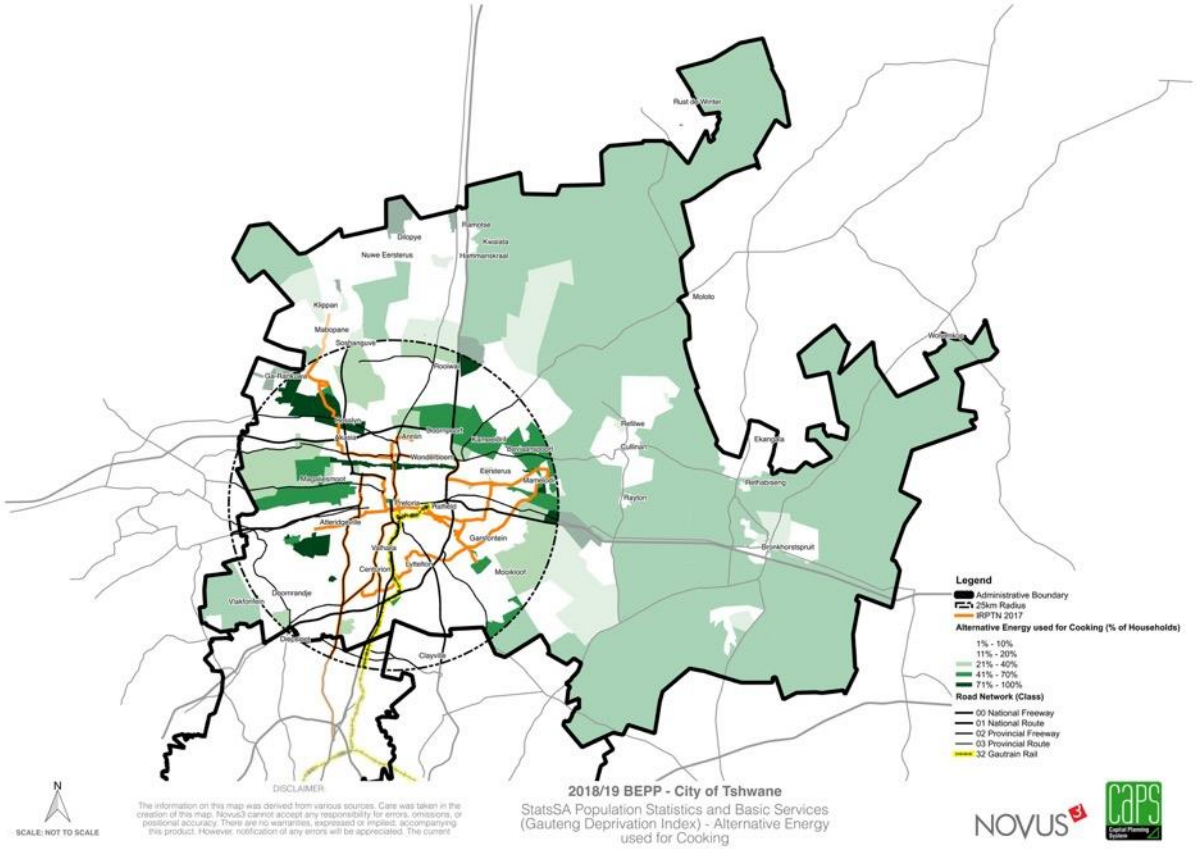


Figure B-6: City of Tshwane distribution of Household Cooking

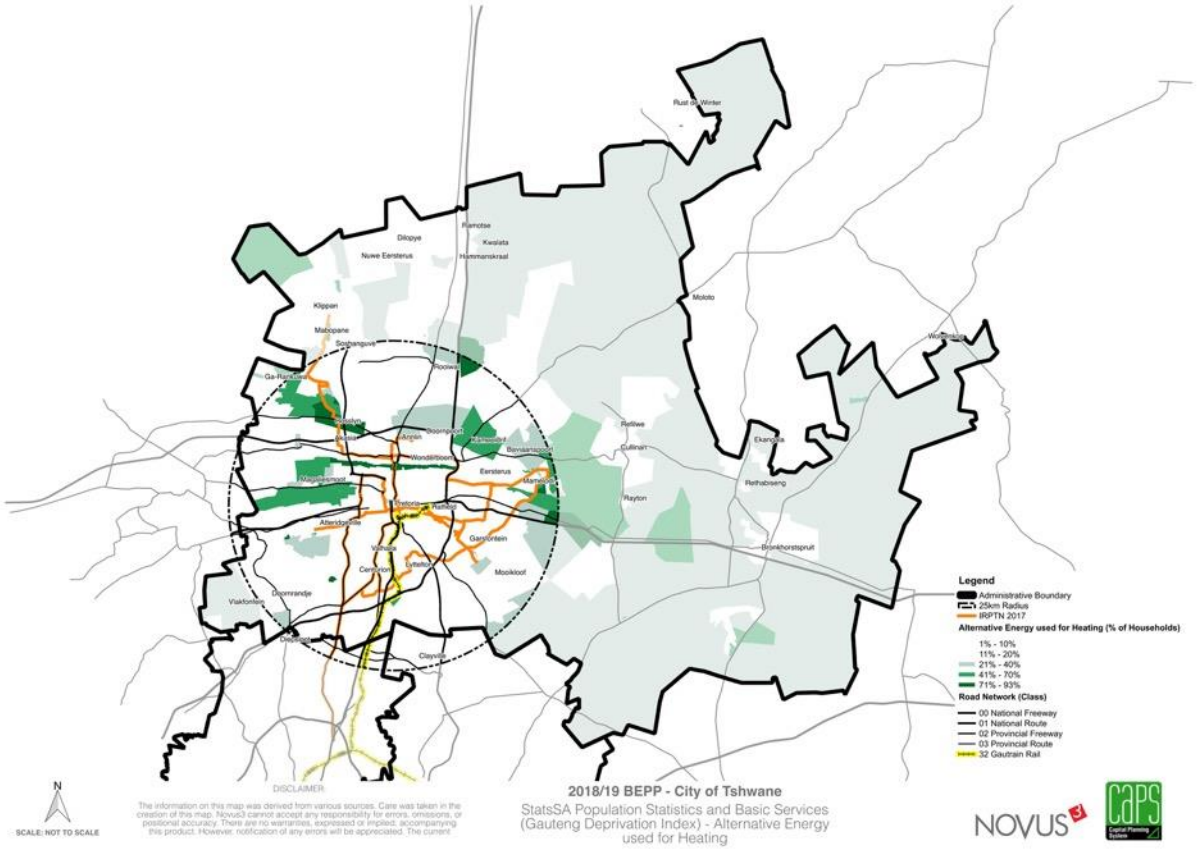


Figure B-7: City of Tshwane distribution of Household Heat

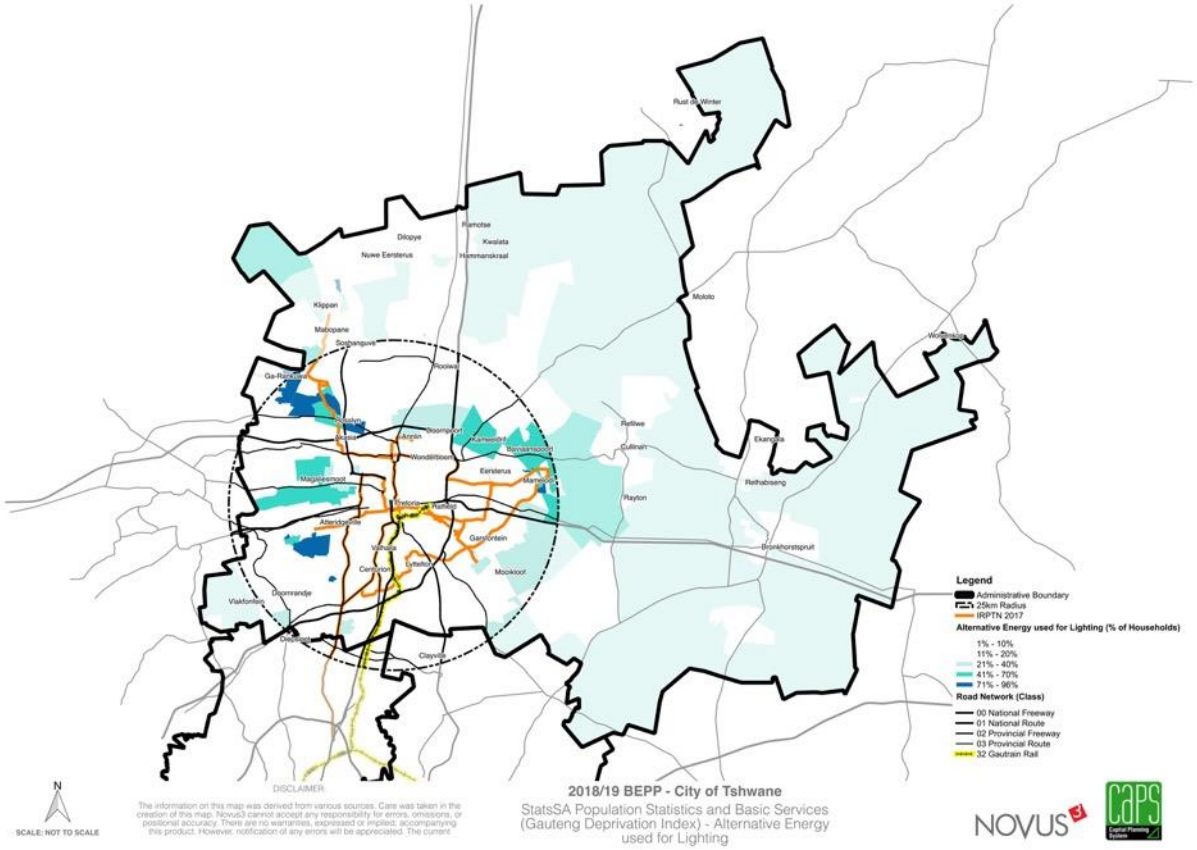


Figure B-8: City of Tshwane distribution of Household Light

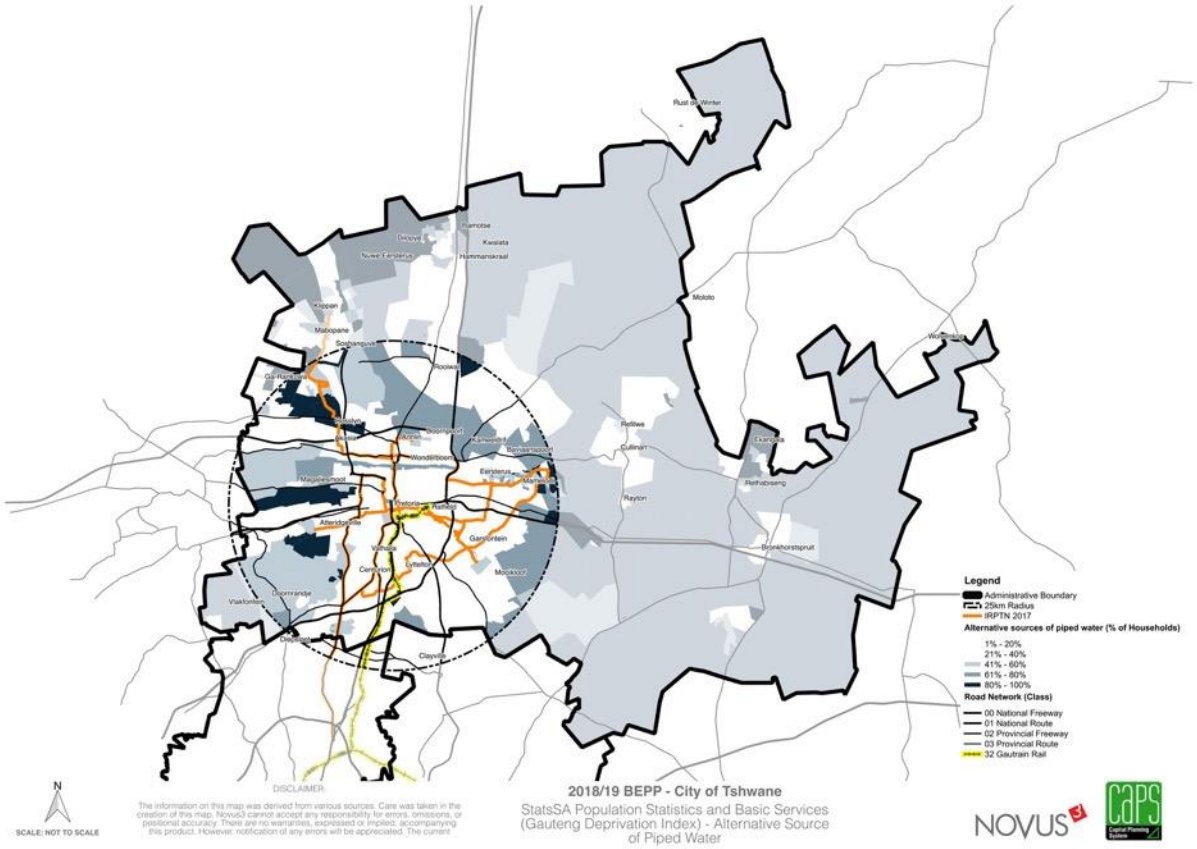


Figure B-9: City of Tshwane distribution of Household Piped Water

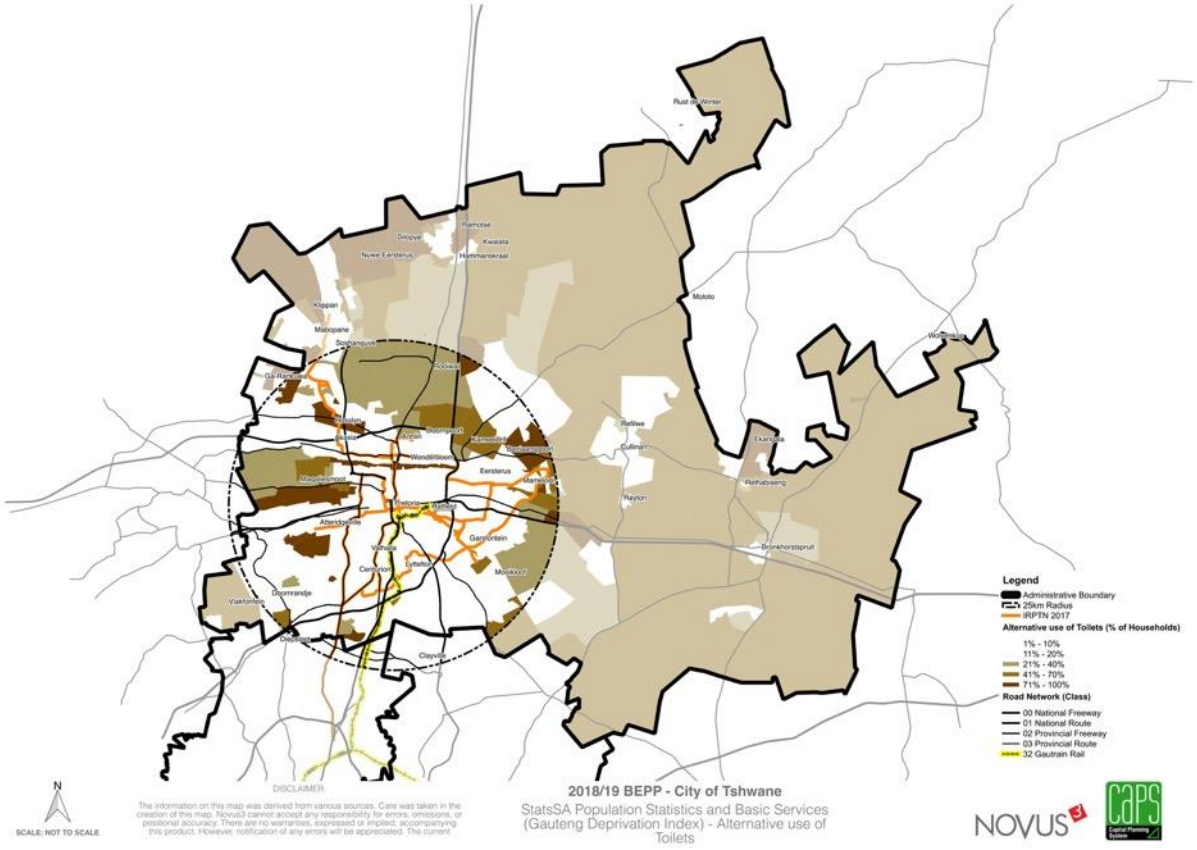


Figure B-10: City of Tshwane distribution of Household Alternative Toilet

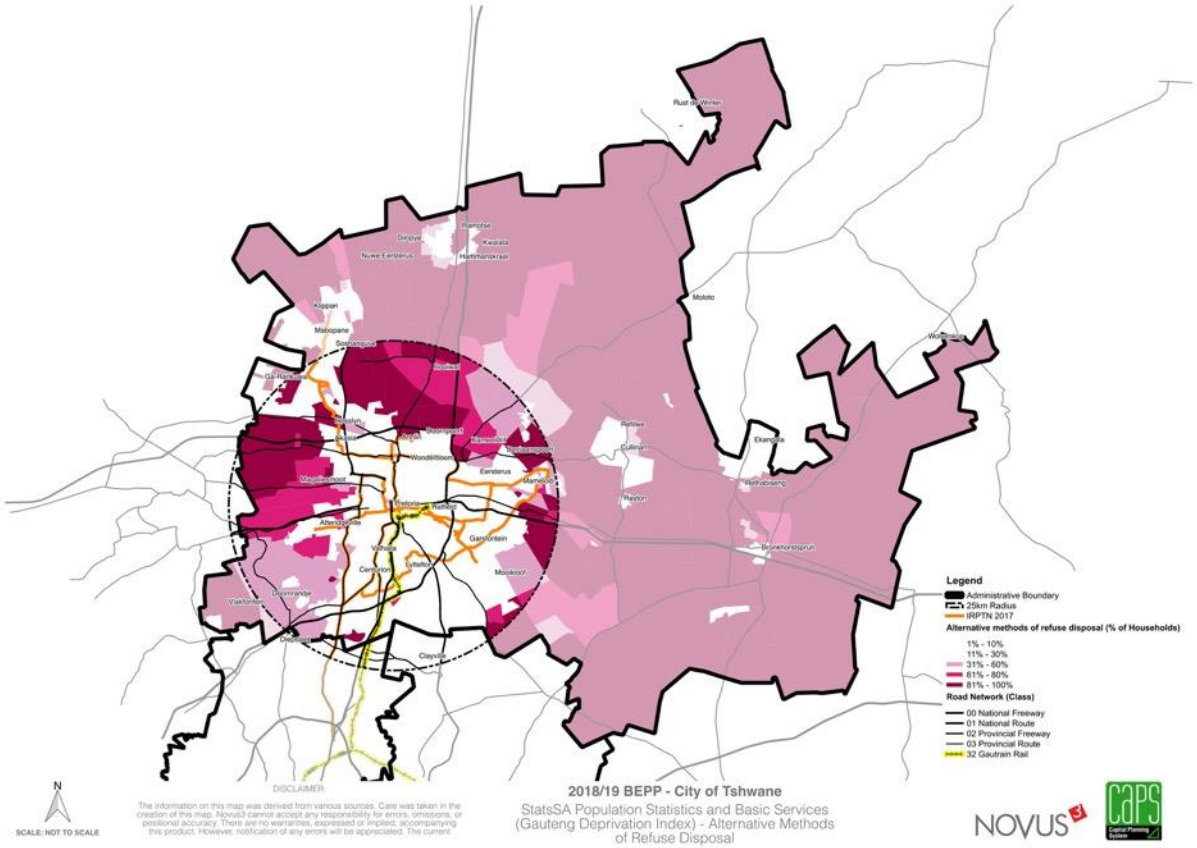


Figure B-11: City of Tshwane distribution of Refuse Disposal

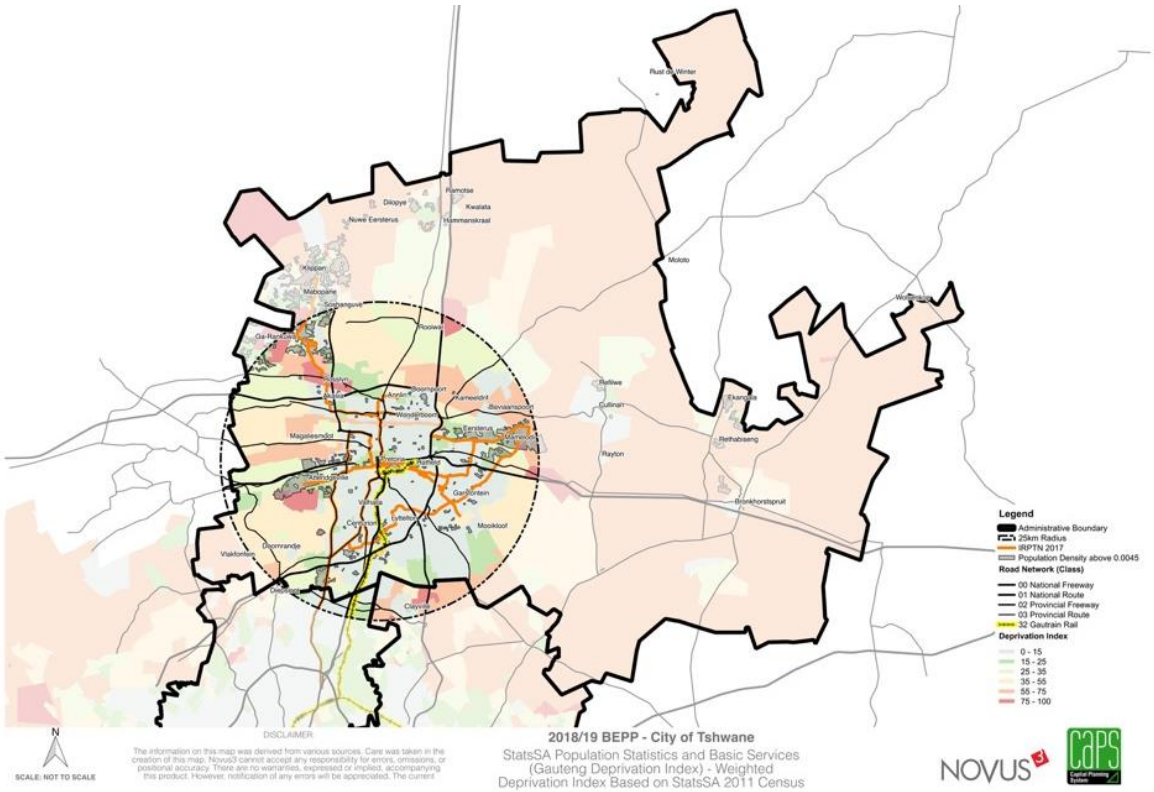


Figure B-12: City of Tshwane distribution of Deprivation Areas

The Deprivation Index indicators are combined as a weighted index whereby warmer colours represent higher degrees of deprivation.

From Figure B-12 the Underserved Townships of the City of Tshwane UNS can be deduced. These areas include:

- Atteridgeville;
- Temba;
- Mamelodi;
- Mabopane, and;
- Soshanguve.

Areas such as the CBD, Pretoria East and Centurion are of the least deprived areas in the city, with some pockets of poverty scattered around the latter grouping of areas.

B.2.2.1.2 Social facility needs

The city has conducted an analysis on the distribution of basic social facilities in relation to population distribution. The following basic social facilities were considered in this preliminary analysis[4]:

- Primary Schools;
- Secondary Schools;
- Community Parks;
- Community Library;
- Fire Satiations;
- Ambulance;
- Clinics, and;
- District Hospitals.

This analysis is based on Central Place Theory Model (Christaller, 1933) which implies some fundamental assumptions which are inaccurate. These assumptions assume amongst others that service provision should be based on proximity and not on travel patterns. The former assume that the determining factor of facility provision is the place of residence whereas the latter assumes the determining factor of facilities as being a function of convenience and preference. It has been found that even though various facilities are provided in underserved areas, they are not being utilised even though they are closest to the population. This typically implies that facilities of preference should rather be expanded and upgraded rather than providing more facilities.

Even though the fundamental approach of Christaller's theory is inaccurate, it is still an indication to see if the ratio between serviced population and facility provision are within acceptable standards. The following figures (Figure B-13 to Figure B-20) shows the areas in the city where population do not have access to social facilities to an acceptable standard.

[4] The City has approached the CSIR to conduct a detailed survey and analysis.

Figure B-13: City of Tshwane population distribution with regards to Primary Schools

Figure B-14: City of Tshwane population distribution with regards to Secondary Schools

Figure B-15: City of Tshwane population distribution with regards to Community Parks

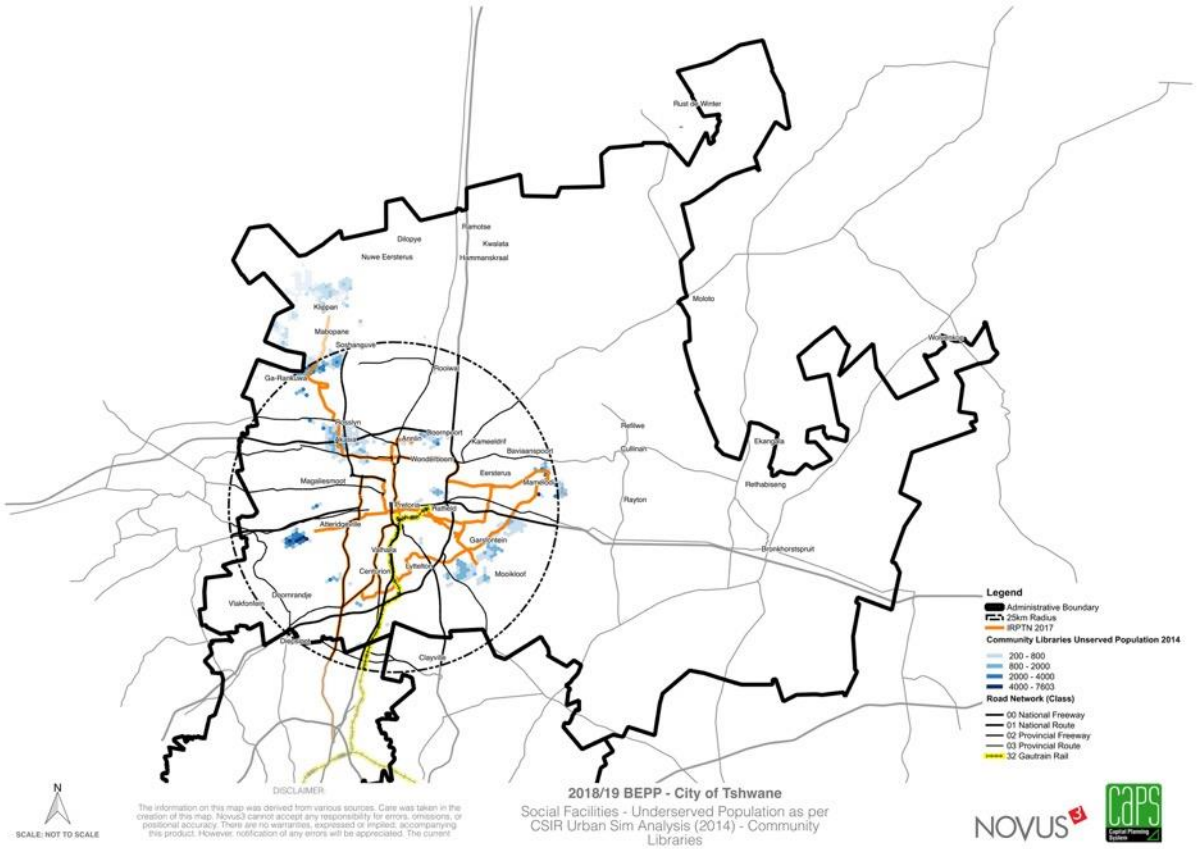


Figure B-16: City of Tshwane population distribution with regards to Community Libraries

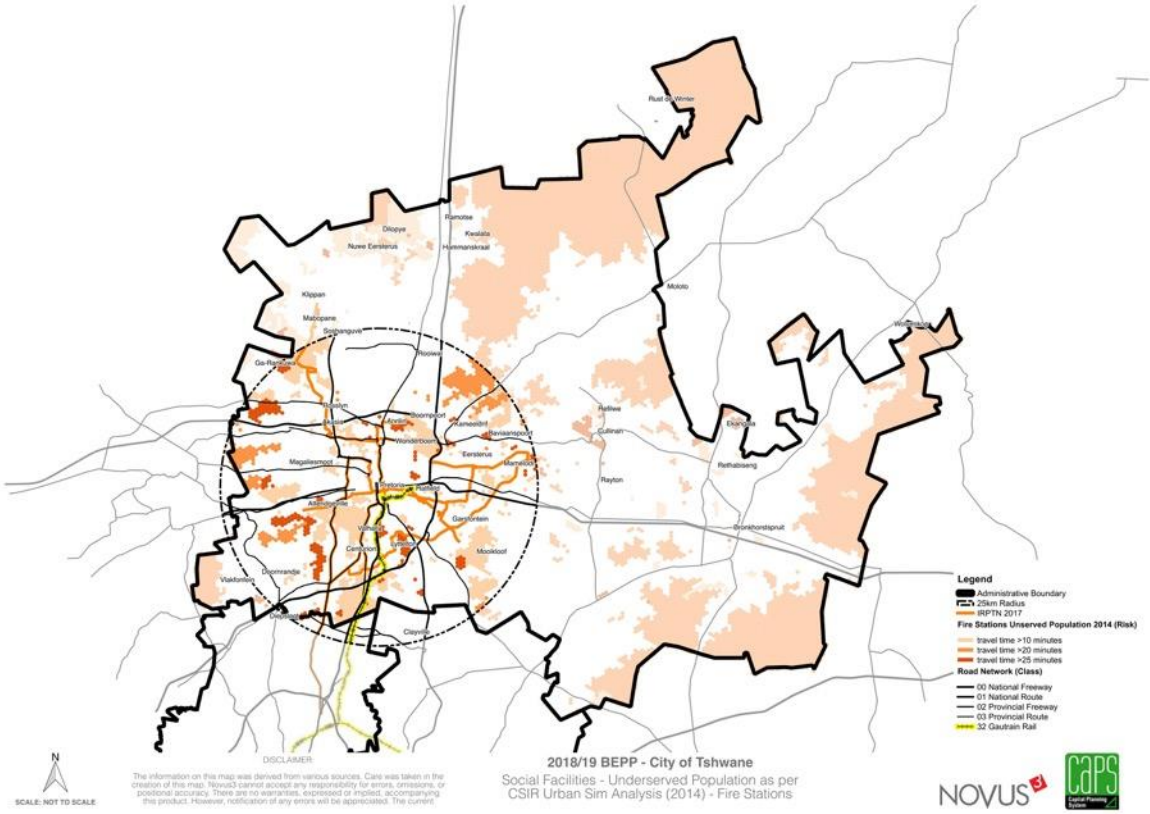


Figure B-17: City of Tshwane population distribution with regards to Fire Stations

Figure B-18: City of Tshwane population distribution with regards to Ambulance Services

Figure B-19: City of Tshwane population distribution with regards to Clinics

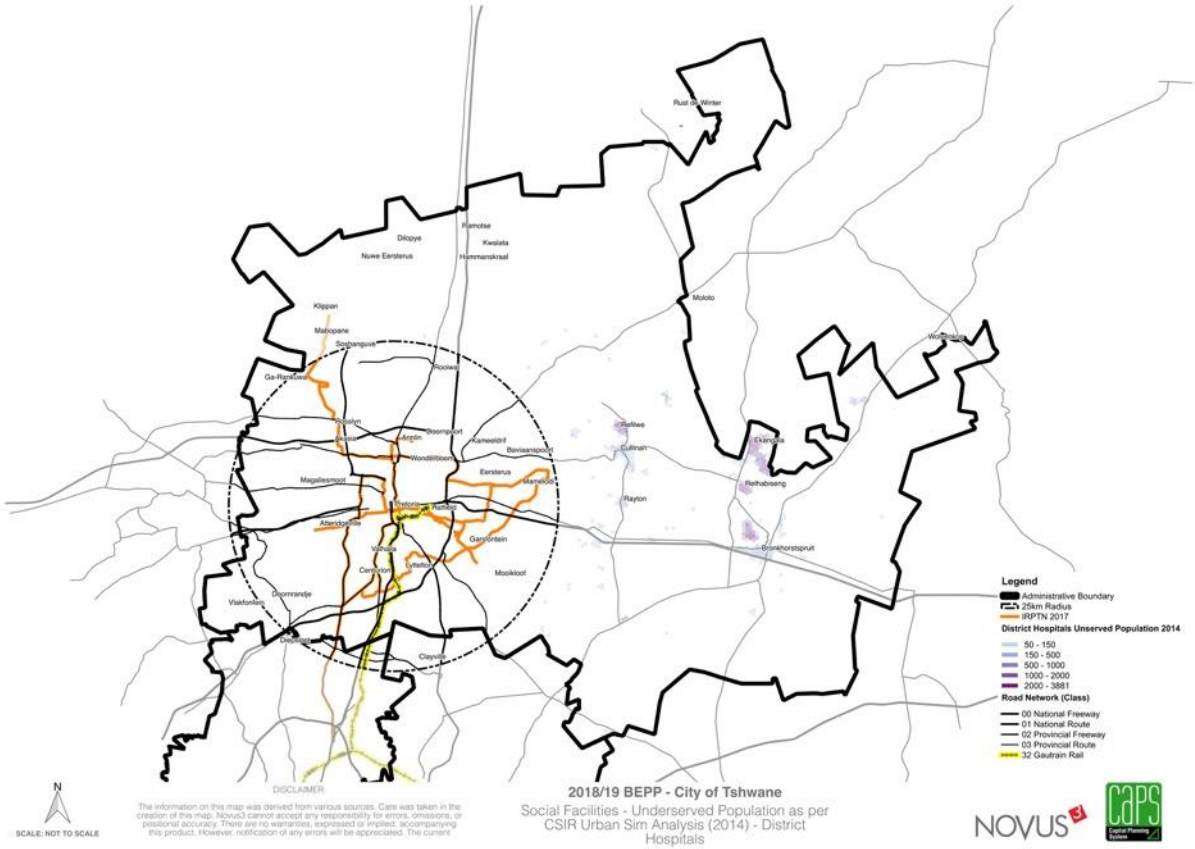


Figure B-20: City of Tshwane population distribution with regards to District Hospitals

B.2.2.1.3 Urban network pressure

In 2016 the Council for Scientific and Industrial Research (CSIR)[5] were appointed by the City of Tshwane to amongst others identify household distribution and growth in line with the city's spatial agenda as well as economic opportunities that will be created in the same period across the city. The CSIR undertook this exercise with the use of an Urban Simulation Model, otherwise referred to as UrbanSim.

The CSIR's study evaluated three scenarios of which the optimal growth scenario has been accepted for the purpose of this document. The selected scenario, Trend scenario with higher population growth, represents what most stakeholders in the simulation process would regard as a given. This scenario is based on a less conservative demographic and employment projections.

According to the study undertaken by the CSIR, urbanisation, population growth and the provision of economic infrastructure became the key considerations for the 'remaking of the Capital City'. As such, thinking about how to address the future of each of these components to realise a future vision becomes critical.

The Gauteng Spatial Development Framework (GSDF) of 2015 is a long term spatial framework which reflects a vision and projections for the year 2055. One of the most significant projections is that the population of Gauteng will grow from its current population of approximately 13 million people (Statistics South Africa, 2014) to a projected growth of 30 million people. This means requirements for more jobs, more housing, more natural resources, more technology and more infrastructure.

The City of Tshwane has been expanding in a sporadic manner not exclusively due to sprawl, but also due to expanding boundaries between 2001 and 2011. These have been political decisions and not planning decisions. As a result, the city form is sprawled and discontinuous. At a size of 6 368 km^2 and a population of just over three million people, Tshwane's population density averages 471 people per km^2.

Between 1946 and 1996, the geographic area formerly delineated as Tshwane experienced slightly higher population growth as it does now, averaging around 3.7 percent over the past 50 years. But then between 1996 and 2001, as in all the other metros of the country, Tshwane experienced a leap of growth, averaging around 18.02 percent over the 5 year period.

[5] As part of the UrbanSim

B.2.2.1.3.1 Projected population densities

The projected population distribution for the city in 2030 according to the UrbanSIM is shown in Figure B-21.

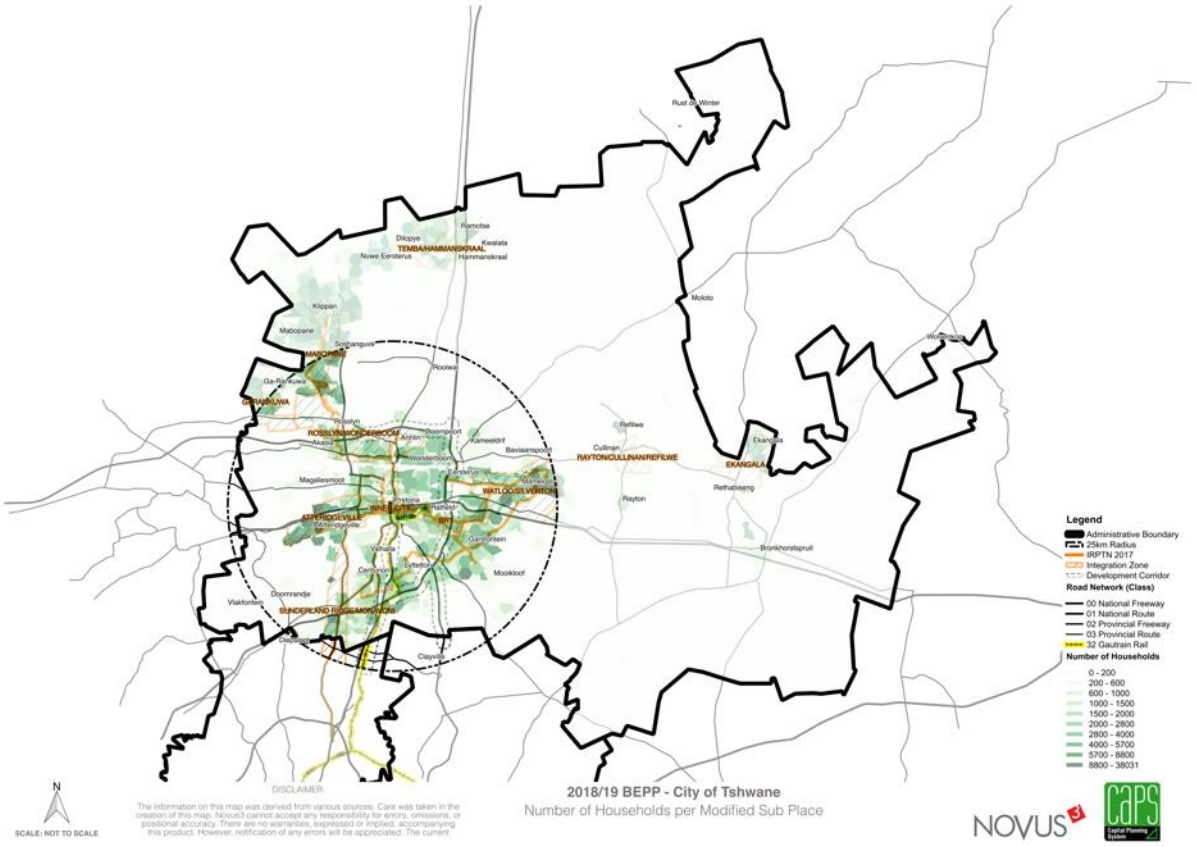


Figure B-21: Spatial distribution of number of household, CSIR

According to the results of the urban simulation undertaken by the CSIR, based on the trend (status quo) scenario with higher population growth rates, the following areas are expected to have the highest number of households:

- Atteridgeville;
- CBD;
- Irene;
- Mamelodi;
- Mooikloof;
- Rosslyn;
- Soshanguve, and;
- Temba.

The projections made by the CSIR show that the current urban distribution of households will follow current spatial formations, but with higher densities. To understand the areas that are expected to have the highest growth pressures it would be valuable to investigate the expected growth rate across the city.

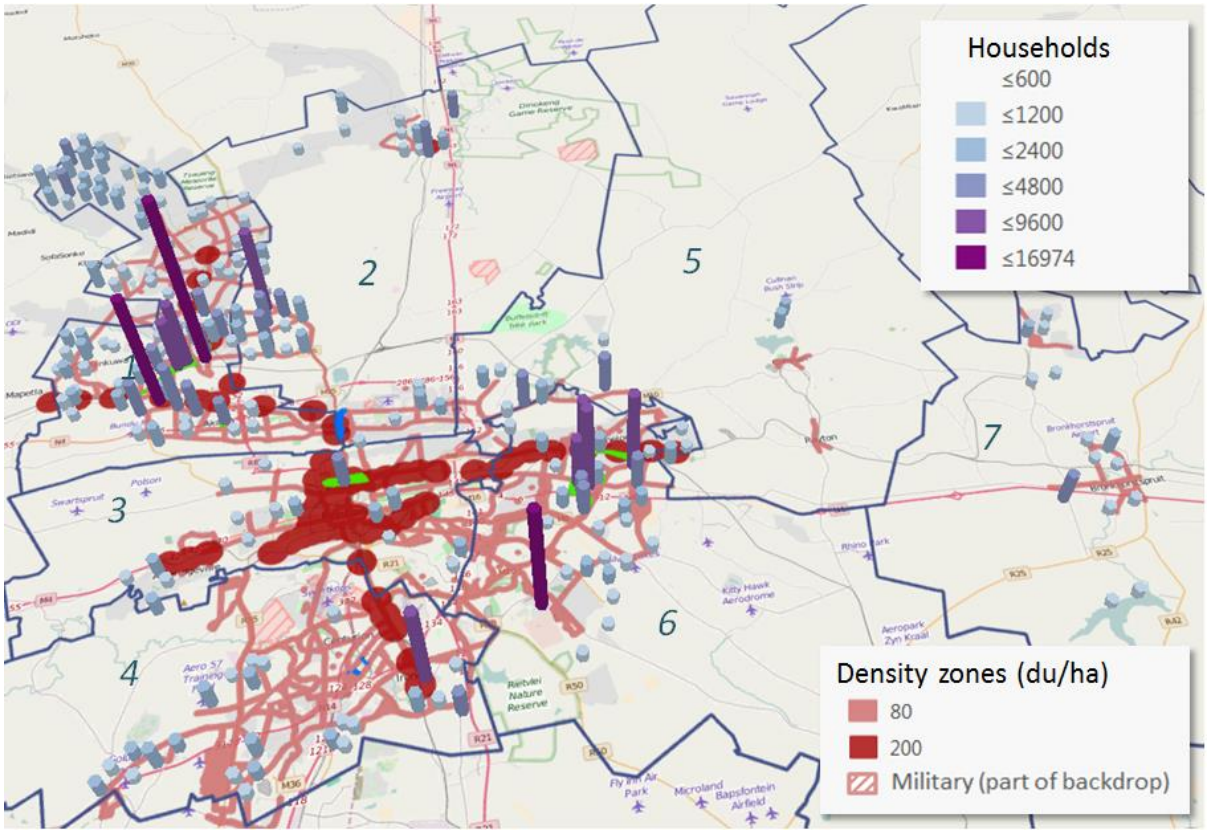


Figure B-22: Projected growth in households between 2011 and 2030, CSIR

The areas identified as the areas with the largest household growth rate between 2011 and 2030 are as follow:

- Irene;
- Mamelodi;
- Mooikloof;
- Rosslyn;
- Soshanguve;
- Temba, and;
- Winterveldt.

The projected growth in households shows clearly that the population density of the city is to expand in the north-western quadrant, as well as on the eastern to south-eastern periphery. To address the urban sprawl to east, and the influx of people to the north, the city will have to intervene in such a way in which the denser household areas are linked to the areas with most employment opportunities to increase the sustainability of the city structure.

B.2.2.1.3.2 Projected employment opportunities

The projected employment opportunities in the city, stemming from the simulation results from the UrbanSim study, are shown in Figure B-23.

Figure B-23: Spatial distribution of employment opportunities, CSIR

According to the simulation, the following nodes in the city exhibit the highest number of jobs:

- CBD;
- Centurion;
- Mamelodi;
- Menlyn;
- Soshanguve, and;
- Akasia.

The model run by the CSIR shows a very high level of employment in the Inner City (CBD). This result reinforces the UNS concept that the CBD is the primary nodal hierarchy element in the city. The growth model is based on the successful implementation of the Tshwane Inner City Regeneration Strategy (TICRS) which is aimed at repositioning National Department headquarters within the Inner City and re-establishing the City of Excellence as the Capital of South Africa. Other than the CBD, significant nodes such as Menlyn / Menlyn Maine and Centurion also boast large number of job opportunities followed by Mamelodi, Soshanguve and Akasia.

It is important to keep in mind though that these projections are based on current infrastructure realities, more specifically in terms of currently available transport networks and modes. Any specific intervention that will create new capacity or new linkages may therefore result in a different simulated outcome.

To better understand the projections made by the CSIR it is useful to investigate the nodes which will experience large growth rates in terms of employment opportunities in the future. The growth rate will not only show where development pressure will be experienced in the next few years, but it will also show where the areas are that should link with the nodes identified through the expected household model. Figure B-24 below shows the growth rate of employment opportunities.

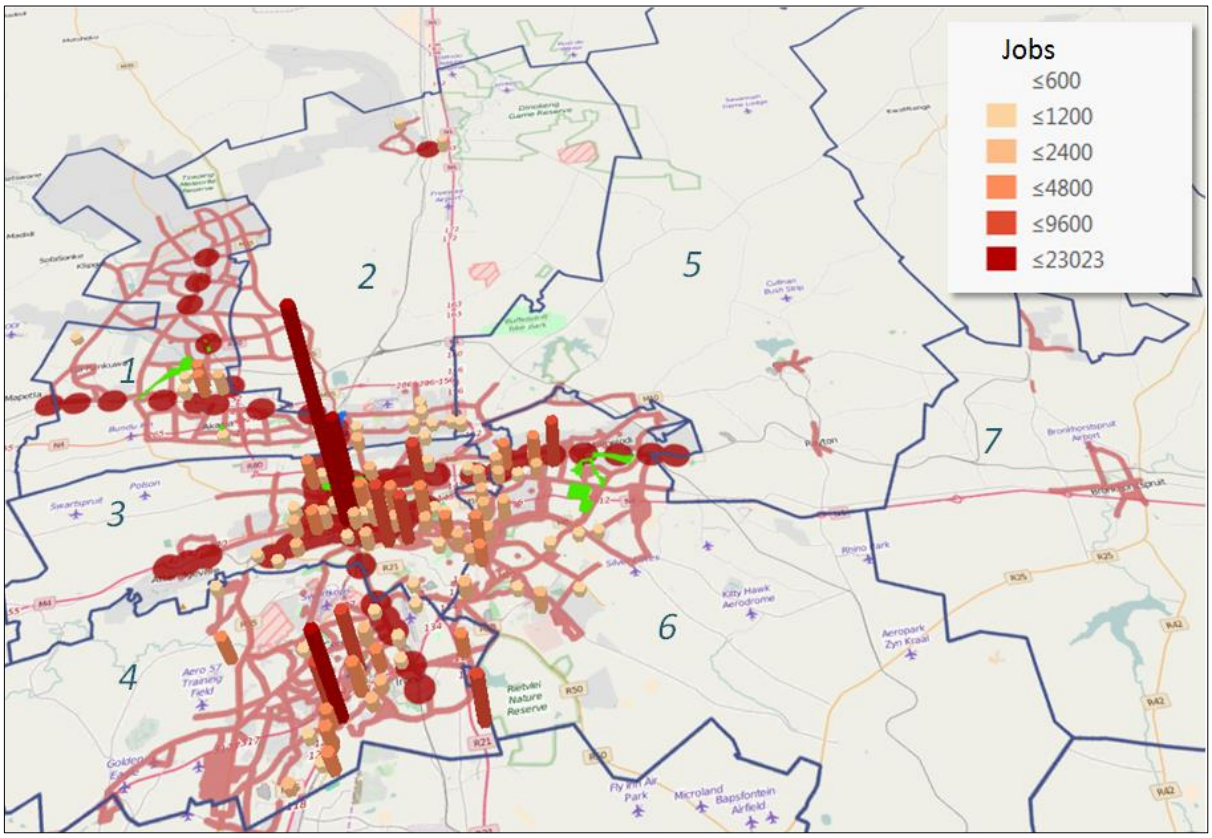


Figure B-24: Projected growth in employment opportunities between 2011 and 2030, CSIR

The following areas exhibit the highest growth rate of future employment opportunities in the City of Tshwane according to the CSIR:

- CBD;
- Centurion;
- Mamelodi;
- Menlyn, and;
- Soshanguve.

The area expected to experience the largest growth of employment opportunities is the Inner City (CBD) as a result of the Tshwane Inner City Regeneration Strategy. Other developments that will contribute to the realisation of this expected growth model is the development of Menlyn / Menlyn Maine and the development of Centurion CBD. Economic opportunity growth patterns tend to grow towards the south, where it links with other economic power houses in the province such as Midrand, Sandton and Johannesburg CBD. Other areas that will have a significant growth in economic opportunities – but not nearly to the extent of the Tshwane and Centurion CBD – is Mamelodi and Rosslyn. Growth to the north of the Magaliesberg mountain range is restricted by transport capacity that is currently insufficient to deal with additional demand.

B.2.2.1.4 Household versus economic opportunity distribution

The CSIR has identified areas where growth in households and growth in economic opportunities can be expected for the next ten (10) to twenty (20) years. To create the ideal UNS as defined by National Treasury, areas where high density of households are expected should be linked to areas of higher employment opportunities are expected. The following figures (Figure B-25 and Figure B-26) evaluate the correlation between household distribution and economic opportunity distribution.

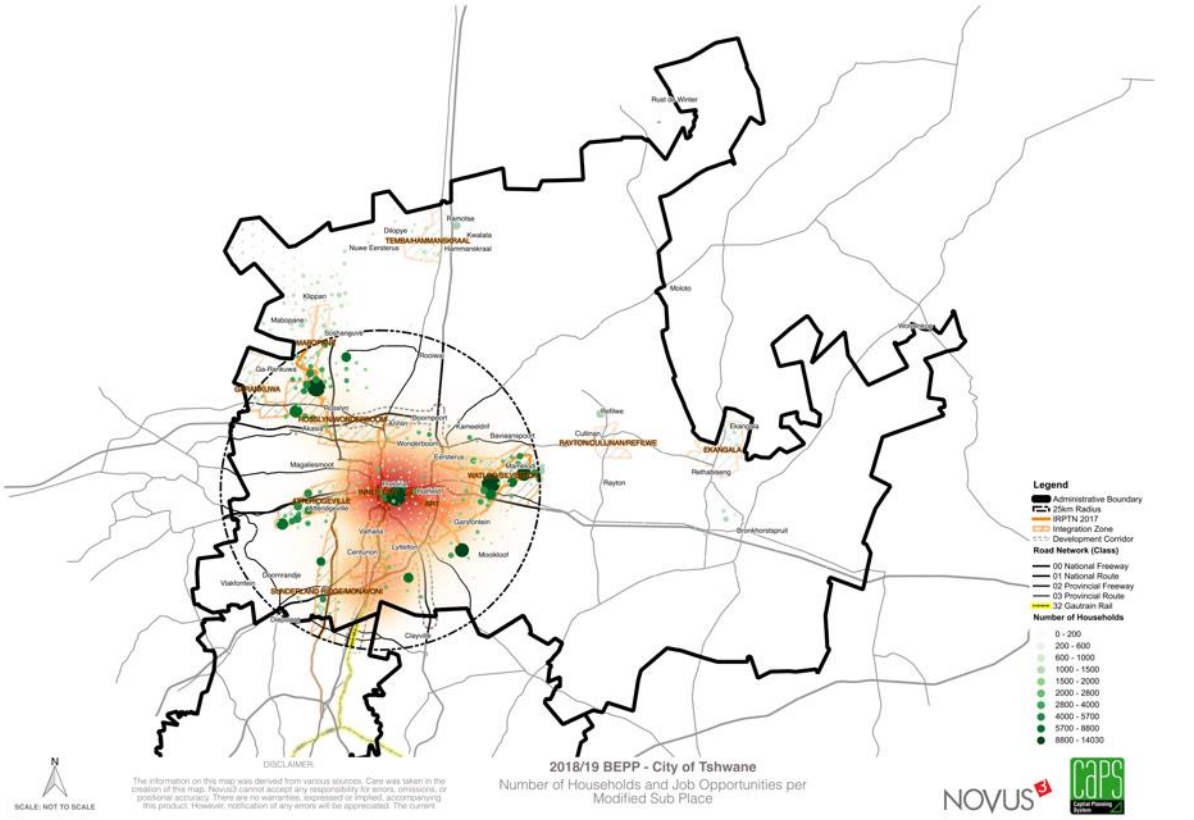


Figure B-25: Spatial distribution of households and employment opportunities, CSIR

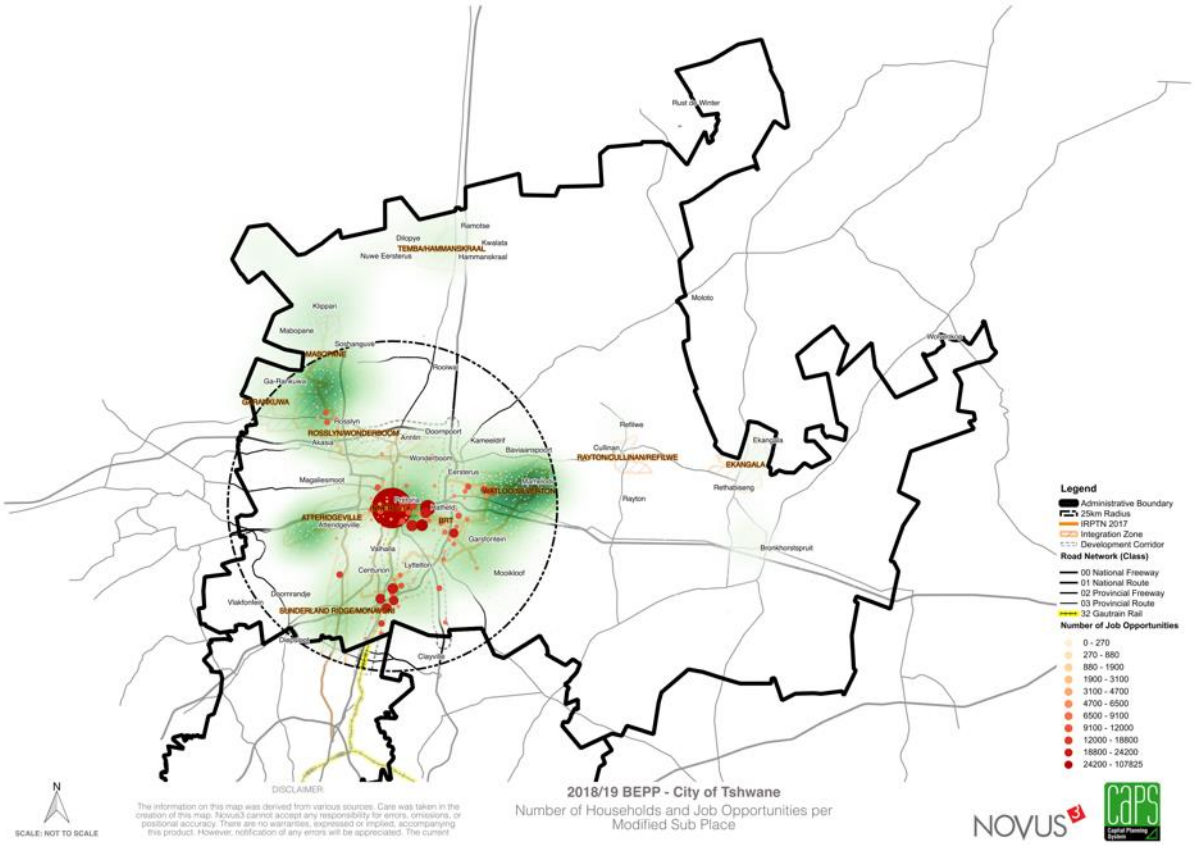


Figure B-26: Spatial distribution of employment opportunities and households, CSIR

The two figures above show a clear spatial disjoint between places of residence and places of employment – typically representing a city facing urban sprawl with economic centres in the middle

of the spatial configuration and high household densities on the outskirts of the urban spatial structure. To overcome this disjoint between places of living and places of working, the city has started to implement the a comprehensive and integrated public transport network.

B.2.2.2 *Transport and movement pattern analysis – Backbone of activity corridors*

The IPTN refers to the Integrated Public Transport Network of the City of Tshwane. The ITPN covers all public transport routes and modes (including rail, bus, minibus-taxis, metered taxis and non-motorised transport). Some of the IPTN covers rapid public transport modes such as rapid rail (Gautrain), light rail transit (LRT), bus rapid transit (BRT) and quality bus services (QBS).

The city's IPTN Operational Plan was prepared in 2014 for a period of 25-years (with the planning horizon year of 2037). The purpose of the plan is to provide the city with a strategy pertaining to the proposed future status of the public transit component of the city's Integrated Transport Plan. Whilst the plan principally conveys detailed information on the routes identified as suitable for rapid transit, it also addresses aspects such as phasing of the routes, mode specification, station locations, types and sizes, operational parameters, guidelines for implementation, associated and supportive land-use planning and cost estimations.

For the purposes of this report, the focus will be on the identified routes, modes, stations and phasing contained with the IPTN. It is important to note that since the preparation of the 2014 report, there have been some changes to the IPTN route, in relation to the alignment of some of the A Re Yeng TRT routes, as well as the introduction of a TRT Light service on some of the planned TRT routes. Details on these changes can be found in the CoT 2016-2028 A Re Yeng Operational Plan of October 2016.

B.2.2.2.1 IPTN: A Re Yeng Tshwane Rapid Transit

The city's TRT makes up a substantial portion of the total IPTN. Currently, two TRT trunk routes are operational namely:

- Between Pretoria CBD and Hatfield, and;
- Between Pretoria CBD and Rainbow Junction.

The city plans to have six TRT trunk lines operational by 2028, accompanied by complementary and feeder systems. The TRT operational network roll out plan is shown in Figure B-27, and the TRT line and operations phasing and "go live" dates, as per the 2016-2028 A Re Yeng Operational Plan, are shown in Table B-2.

Figure B-27: TRT Operational Roll Out

Table B-2: A Re Yeng TRT Project Phasing and Go Live Dates

Infrastructure construction Phasing	Construction area description (from)	Construction area description (To)	BRT Line	Construction Start Date	Significant Construction Completion Date	"Go Live" date
Phase 1A	CBD	Hatfiled	BRT Line 2A	January 2013	Completed	Q4 2014
Phase 1B	Mayville	Hatfield via CBD	BRT Line 1A	April 2013	Completed	Q2 2016/17
Phase 1C	Wonderboom	Mayville	BRT Line 1A	September 2014	Completed	Q2 2016/17
Phase 1D	Hatfield	Menlyn	BRT Line 2B	November 2016	October 2018	Q3 2018/19
Phase 1E	Menlyn	Denneboom Station	BRT Line 2C	November 2016	May 2018	Q3 2018/19
Phase 1F	Rainbow Junction	Akasia	BRT line 1B	June 2018	August 2019	Q2 2019/20
Phase 1G	Rainbow Junction	Akasia	BRT Line 1C	June 2018	August 2019	Q2 2019/20
Phase 1H	CBD	Atteridgeville	BRT Line 3	October 2018	March 2020	Q24 2019/20
Phase 1I	Denneboom	Mahube Valley	BRT Line 2	November 2019	April 2021	Q2 2020/21

Infrastructure construction Phasing	Construction area description (from)	Construction area description (To)	BRT Line	Construction Start Date	Significant Construction Completion Date	"Go Live" date
Phase 1A (of Phase 2 network)	Deneboom	Rainbow Junction	BRT Line 4	July 2021	June 2023	Q2 (2023/24)
Phase 2A (of Phase 2 Network)	Mahube Valley	Garsfontein	BRT Line 5A	July 2023	December 2024	Q4 (2024/25)
Phase 2B (of phase 2 Network)	Menlyn (Atterbury Road)	Garsfontein (Solomon Mahlangu Road)	BRT Line 11	October 2024	June 2025	Q1 (2025/26)
Phase 2C (of Phase 2 Network)	Garsfontein (Solomon Mahlangu)	Centurion CBD	BRT Line 5B	April 2025	December 2026	Q4 (2026/27)
Phase 3 (of Phase 2 Network)	Pretoria CBD	Olivenhoutbosch	BRT Line 6	January 2027	June 2028	Q2 (2028/29)

As mentioned previously, the IRPTN network, in particular along the TRT network sections, have undergone some planning changes since the IRPTN study of 2014. The changes in the proposed TRT route alignment are as follows:

- Line 3 in the Atteridgeville area was shortened and now terminates in the centre of Atteridgeville.
- Two complementary routes were introduced between Rainbow Junction and the Pretoria CBD, one along Steve Biko Road and another Es'kia Mphahlele Drive. This is intended to provide additional capacity to the north-south movement that the trunk route supports along Paul Kruger Road.
- A further change to the TRT system is the proposal to introduce a BRT "light" system along some of the previously proposed TRT trunk routes. This was done in response to low ridership and the high financial and time-related costs of implementing and operating a full BRT trunk service along those particular routes. Although not yet approved as a strategy, the BRT Light is proposed as a lower specification service, with the main BRT Light features being:
    - The service will not have right of way (BRT trunk service has right of way); this reduces the capacity of the service by approximately half;
    - The service will operate mainly in mixed traffic with dedicated bus lanes on small portion of the route (BRT trunk service operates on a dedicated lane);
    - The service stations will be of a lower order, without doors, and located on the left-hand kerb of the road (BRT truck service stations are higher order and located in the median), and;
    - The service will be fed complementary services run by the TRT, with feeder services possibly being provided by the minibus taxi industry (BRT trunk services have both complementary and feeder services operated by the TRT).

To realise the spatial transformation vision of the UNS as a remedy for dispersed human settlements and job opportunities, underserved human settlements in terms of basic services, unlocking economic opportunities and to transform towards a more sustainable urban form, the city must stimulate development along activity corridors, also known as the Integration Zones. However, the city is operating under a constrained financial situation, therefore prioritisation of capital demand is critical in order to focus capital investment in the priority development areas as defined in the Metropolitan SDF and the UNS.

Figure B-28 shows the total planned IRPTN network in relation to the hierarchy of nodes emanating from the MSDF, as described in Table B-2 above, which in the long term should inform the identification and formulation of the Activity Corridors. The Activity Corridors in return should act as a prioritisation mechanism, elevating projects within these areas to a higher priority for financial investment.

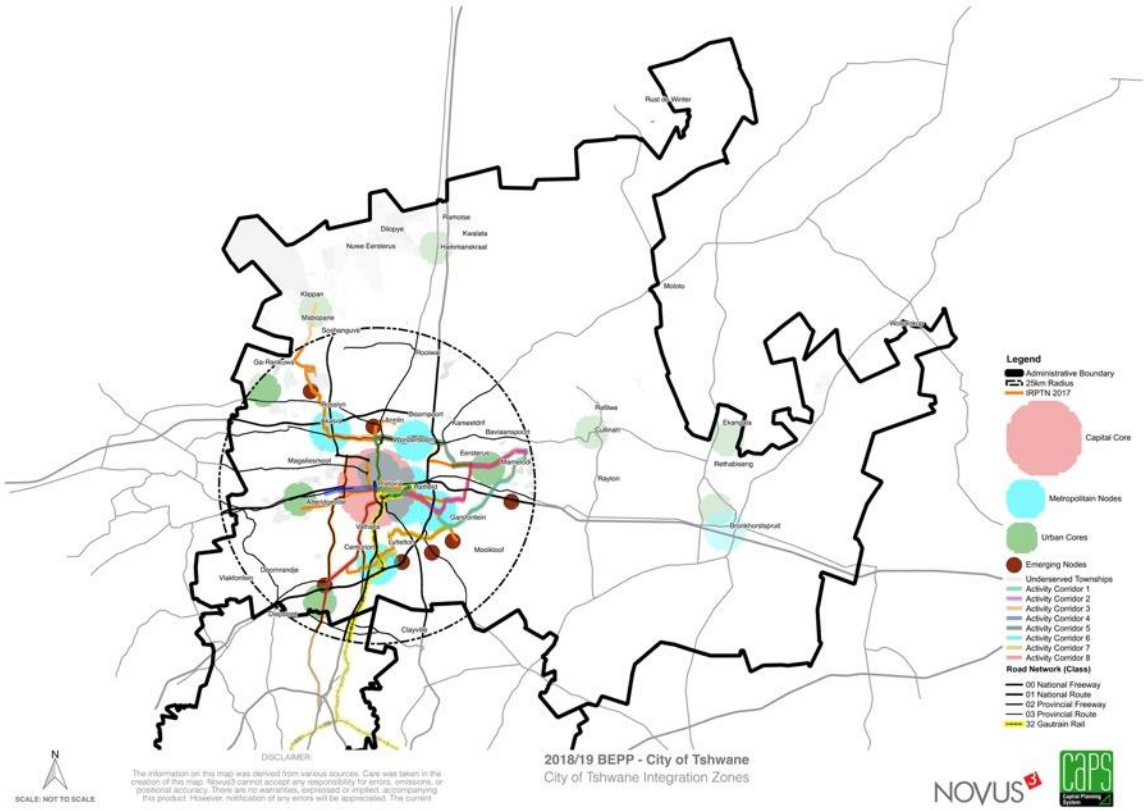


Figure B-28: City of Tshwane Potential Activity Corridors

Table B-3: Categorization of Potential Activity Corridor

BRT Line	Integration Zone	Infrastructure construction Phasing
Activity Corridor 1	Line 2A Line 1A	Phase 1A Phase 1B Phase 1C
Activity Corridor 2	Line 2B Line 2C Line 2D	Phase 1D Phase 1E Phase 1I
Activity Corridor 3	Line 1B Line 1C	Phase 1F Phase 1G

BRT Line	Integration Zone	Infrastructure construction Phasing
Activity Corridor 4	Line 3	Phase 1H
Activity Corridor 5	Line 4	Phase 2.1
Activity Corridor 6	Line 5a Line 11	Phase 2A Phase 2B
Activity Corridor 7	Line 5B	Phase 2C
Activity Corridor 8	Line 6	Phase 3

Activity Corridor 1 is located along BRT line 2A and line 1A which runs from Pretoria Central to Hatfield, and Hatfield to Mayville via Pretoria Central respectively. It links the metropolitan node of Hatfield with the Urban Core (CBD) and Capital Park after which it extends to the north to Rainbow Junction. Given the implementation progress achieved to date on Line 2A and Line 1A, these public transport corridors form the backbone of the Integration Zone network as per the UNS described earlier in this section.[6] The other potential integration zones are still dependant on the roll-out plan of the IRPTN and will not be regarded as Integration Zones at this point in time.

B.2.2.2.2 Heavy Rail (Metro Rail)

The Metro Rail service is owned and operated by Passenger Rail Agency South Africa (PRASA). The City of Tshwane and PRASA agreed in principle that rail would form the backbone of the IRPTN; any future network planning would be based on this principle. It is important to bear in mind that the focus of PRASA's services are planned on dedicated, right-of-way, rail-based commuter services between major nodes. The existing and planned future rail network is shown in Figure B-29.

[6] An Activity Corridor, as described by the Urban Network Structure ideology of National Treasury is areas along rapid public transport which connect the urban hubs and the CBD, where high-density land development is to be promoted.

Figure B-29: Existing and planned PRASA rail

Currently, the PRASA rail network links the Pretoria CBD (as primary employment and education node) with the primary northern, southern, western and central residential areas of Tshwane. There are limited links to the eastern areas, such as Bronkhorstspruit, Kameelfontein and Cullinan. The planned extensions to the network will provide the following links:

Table B-4: Planned future rail network expansion links

Link Number	From	To
1	Soshunguve	Hammanskraal
2	Bronkhorstspruit	Pretoria CBD
3	Pretoria CBD	Kameelfontein and Moloto

A comparison of the existing and planned PRASA rail network with the projected number of households and work opportunities in 2030 is provided below, as modelled by the CSIR. It can be seen from Figure B-30 below that the following projected residential areas will not have access to the PRASA metro rail service (existing or planned future network):

- The far northern areas of Tshwane (Bosplaas, Babelegi, Dilopye, Haakdoornboom);
- The far north-west area of Tshwane (Winterveldt, Tsebe, Makanyaneng);
- The area immediately north of the CBD (Montana, Sinoville, Doornpoort, Wonderboom);
- The area to the west of Atteridgeville;
- The south-west area of Tshwane (Olivenhoutbosch);

- The area south-east of the CBD (Kongwini, Rietfonteing, Mooikloof, Zwavelpoort), and;
- Areas in the east of Tshwane (Refilwe, Ekangala, Rethabiseng).

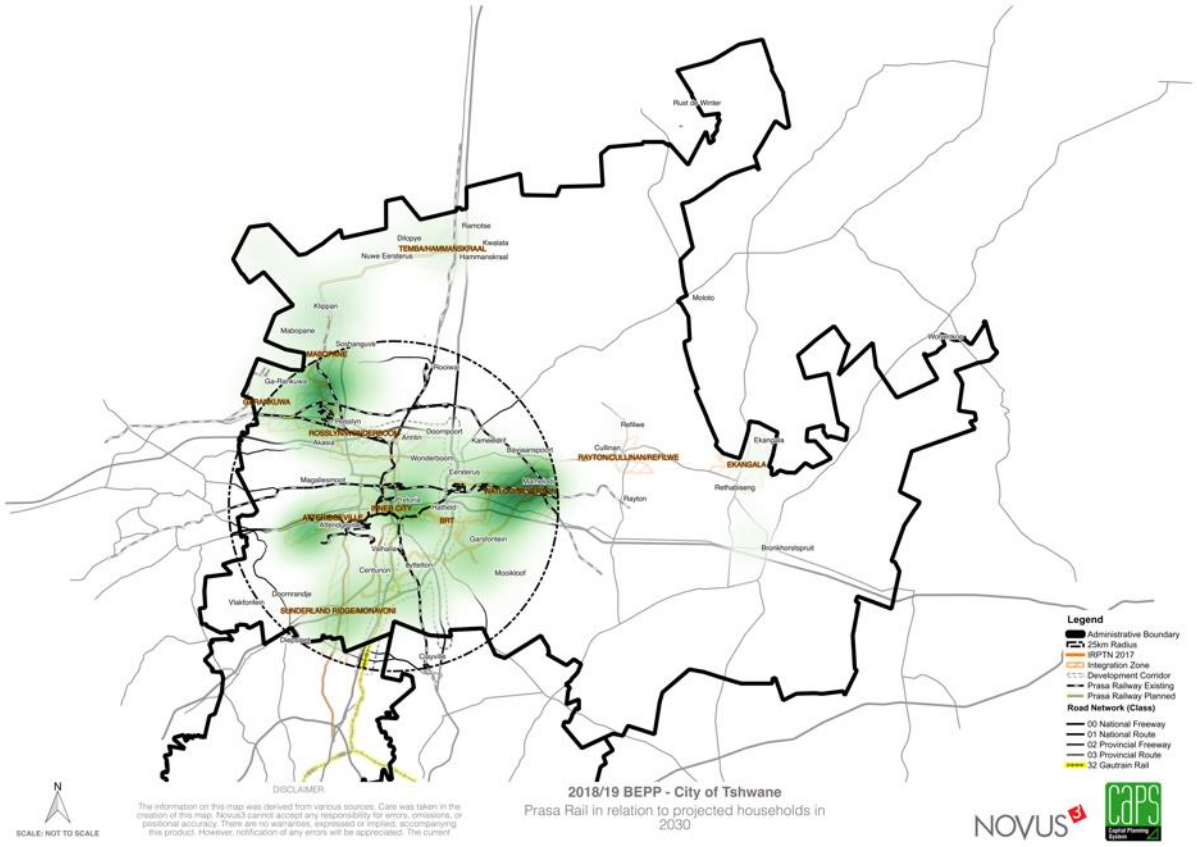


Figure B-30: PRASA rail in relation to projected households in 2030

From the figure above, it is important to note that most of these areas (except for the Montana, Doornpoort, Sinoville and Wonderbooom areas) are expected to house mainly residents from the lower income brackets. Since these residents primarily captive public transport users who require access to an affordable mode of public transport, the connectivity of these areas to the Metro Rail service should be a priority for the City. According to the IRPTN, PRASA and the CoT have an agreement that the city will provide services that feed the rail service – it is strongly recommended that the city provides and prioritises feeder services to the rail system in the areas mentioned above.

Figure B-31 below shows that the following projected employment areas will have not have access to the PRASA metro rail service:

- The area immediately north of the CBD (Montana, Sinoville, Doornpoort, Wonderboom);
- The south-west area of Tshwane (Olievenhoutbosch), and;
- The area south-east of the CBD (Waterkloof, Moreleta Park, Rietfontein, Mooikloof).

The Olievenhoutbosch area (south-west of Tshwane) was also shown to have a lack of connectivity to the rail network in the residential areas assessment above – this finding strengthens the recommendation that the city prioritise implementing feeder services from this area to the rail service.

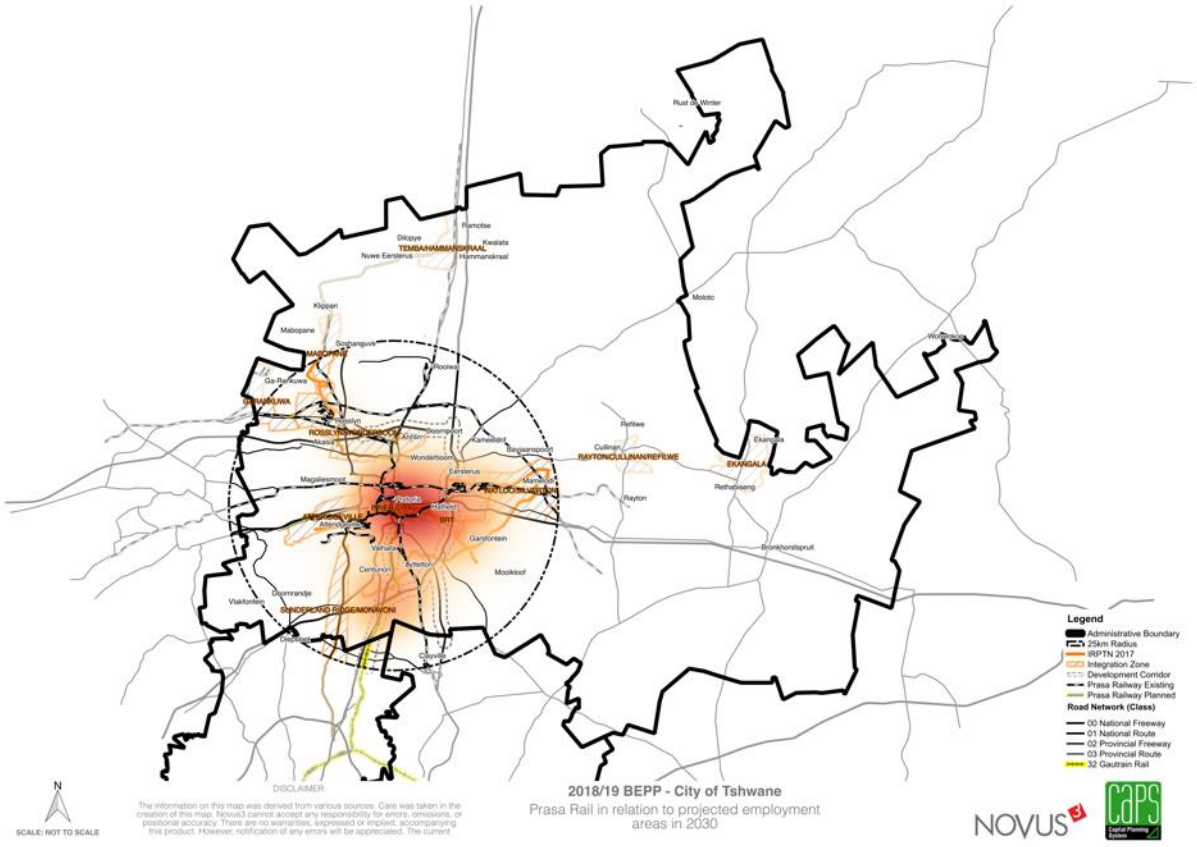


Figure B-31: PRASA rail in relation to projected employment areas in 2030

The Gauteng City-Region Integrated Infrastructure Master Plan 2030, states that PRASA is set to upgrade 19 stations, commission new urban felt and construct new railway lines; however, from the above figure, it can be deduced that a relatively small number of PRASA developments is taking place on the urban edge.

B.2.2.2.3 Gautrain Rapid Rail

The Gautrain Rapid Rail service has been operational since 2010, and links Hatfield to the Johannesburg CBD and OR Tambo International Airport via Pretoria CBD and Centurion. There is future planning in place to extend the network to link to Mamelodi and Pretoria East, and in Johannesburg to link to Fourways, Randburg, Roodepoort and Soweto (refer to Figure B-32).

The Gautrain also provides a bus feeder system at each of its stations. Whilst the Gautrain service does provide some connectivity between areas of high projected residential demand and projected employment opportunities, it is important to note that this service caters to a specific market segment (typically middle to upper income bracket). It is a relatively expensive service to use and therefore do not consider the immediate distribution of its services to all areas in the city – areas which might later become a priority.

The figure below shows the existing and planned Gautrain network in relation to the projected households in 2030. The network provides little connectivity to the high density residential areas (dark shaded green areas on the map); however, it is unlikely that the predominantly low-income residents in these areas would use the Gautrain as it is cost-prohibitive. Some middle to upper income earners in the medium to high density residential areas of Pretoria East and Centurion will likely make use of the planned Gautrain service.

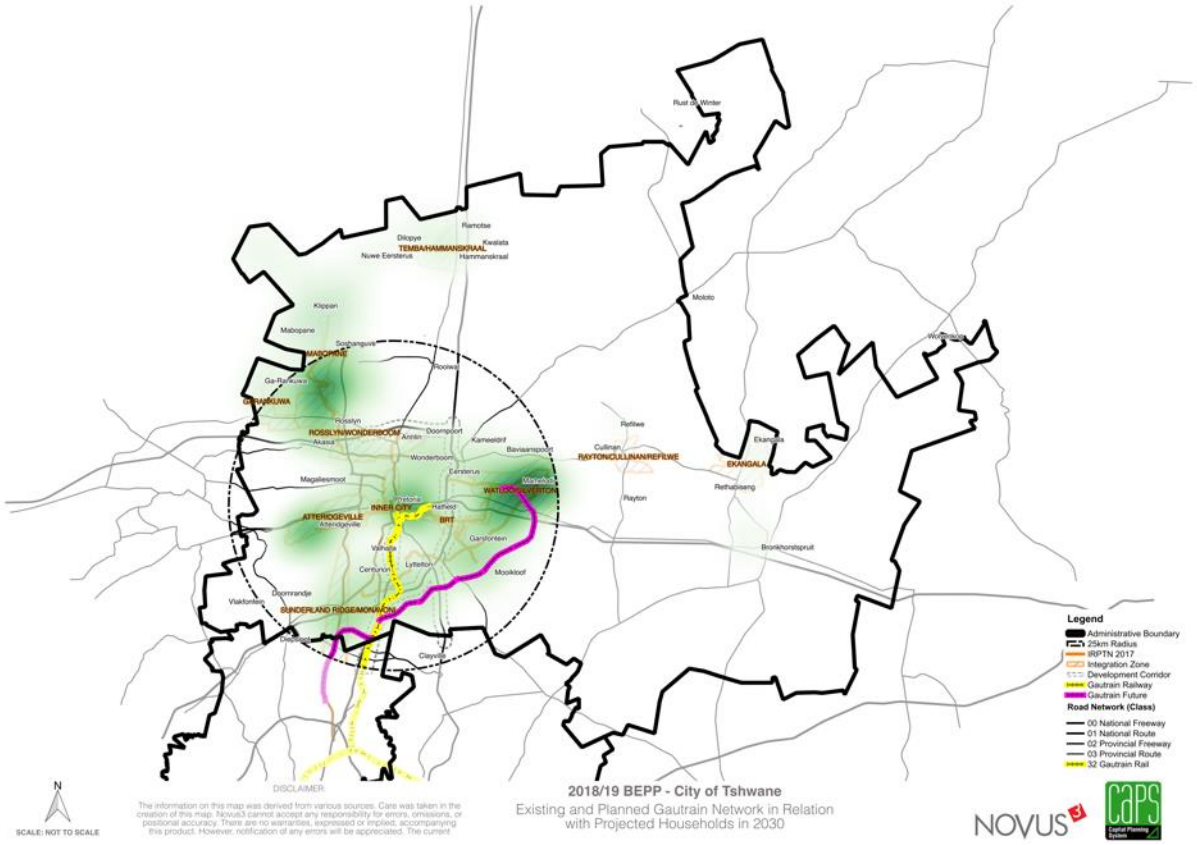


Figure B-32: Existing and Planned Gautrain network in relation to projected households in 2030

Figure B-33 shows the reach of the existing and planned Gautrain network in relation to projected employment opportunities for the 2030 UrbanSIM scenario. The employment areas of Pretoria CBD, Hatfield and Centurion are currently serviced by the Gautrain network. The employment area around Silverton will benefit from future Gautrain connectivity. However, it is important to stress again that the Gautrain service is cost-prohibitive and so inaccessible to lower income earners – the Silverton area is one of predominantly industrial use and so it can be assumed that the majority of employees in this area will be lower income earners.

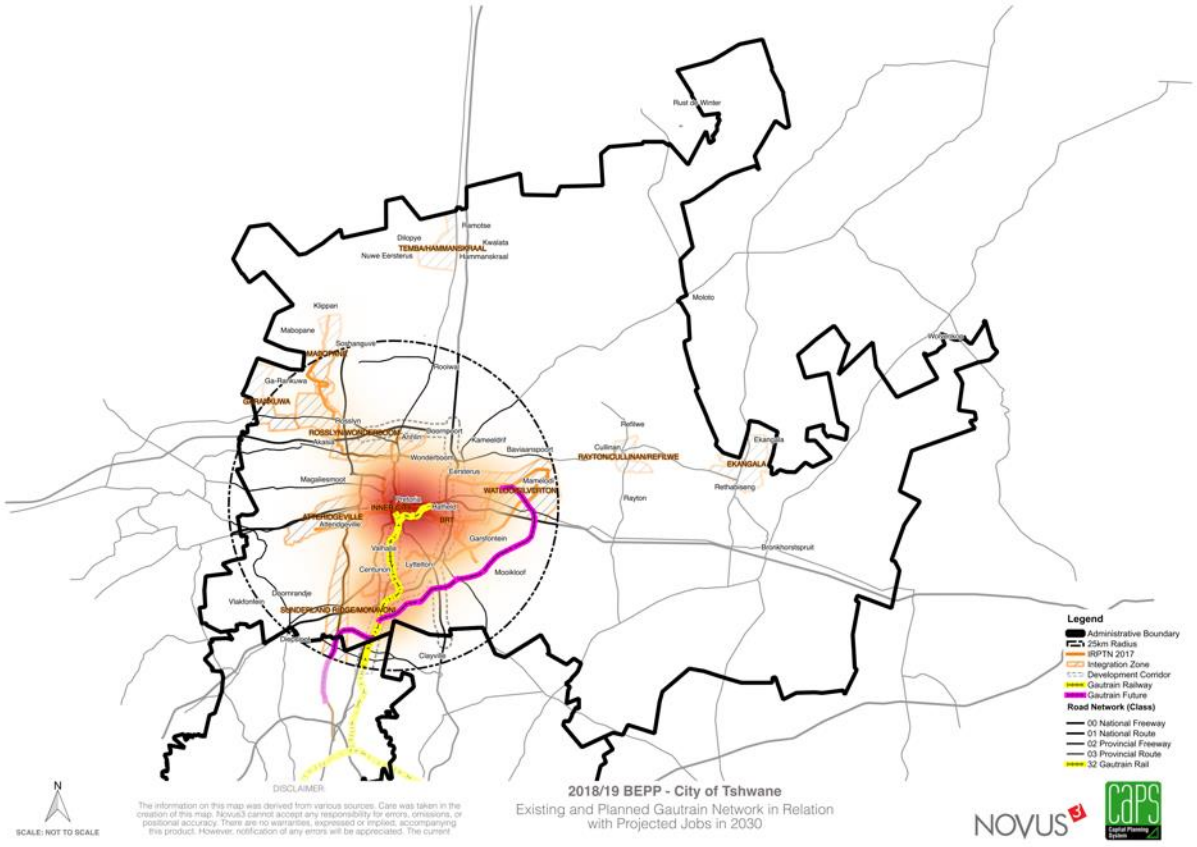


Figure B-33: Existing and Planned Gautrain network in relation to project jobs in 2030

B.2.2.2.4 Origin-Destination Information

Origin-destination data, also known as flow data, shows the flows of people from one place to another. Origin-destination data is a specialised data input to transport modelling and planning. Given that an origin-destination analysis is a cumbersome and in-depth detailed analysis and that the scope of this document is not to undertake an origin-destination analysis, this section will only consider the two most basic components of an Origin-destination data set namely the points of origin of trips in the city versus the points of destinations in the city.[7]

B.2.2.2.4.1 Points of Origin

Figure B-34 below shows that most morning peak (or work-bound) trips originate in areas such as Mamelodi, Centurion and Shosanguve. Other significant points of origin includes the Inner City, Pretoria East, Atteridgeville and Akasia/Wonderboom. This metric gives an indication as to where the population resides and where trips originate. The figure further illustrates the IPTN network and the extent to which the IPTN network serves the greatest points of origin in the city. Figure B-35 shows the points of highest destinations for the city.

[7] It is important to note that no direct correlation should be drawn between the two data sets as this data type should be viewed in pairs in order to determine routes. This analysis simply shows where the population resides as certain times of day.

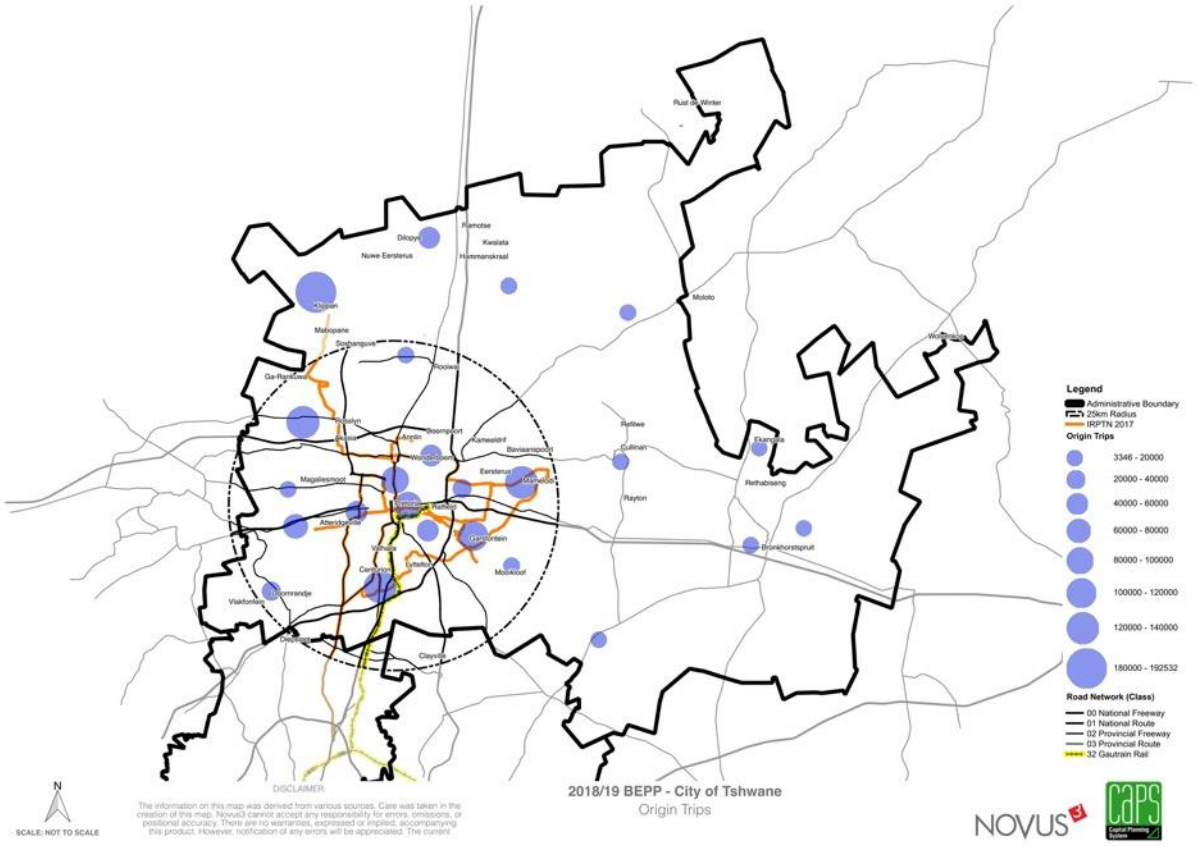


Figure B-34: Points of trip origins in the City of Tshwane

Figure B-35: Points of trip destinations in the City of Tshwane

B.2.2.2.4.2 Origin-Destination guidelines

From Figure B-36 below, the most prominent origin-destination pairs are shown as thicker lines, where more trips converge between the origin and destination point. The most prominent origin-destination pairs in the city are:

- Akasia and Wonderboom
- Atteridgeville and Lotus Garden
- Centurion and Olivenhoutbosch
- Garankua and Shohanguve
- Garsfontein and Moraleta
- Mabopane and Inner City
- Mamelodi and Hatfield

These lines informed the placement of the IRPTN and should encourage not only public transport but also capital expenditure as well as private investment within the city.

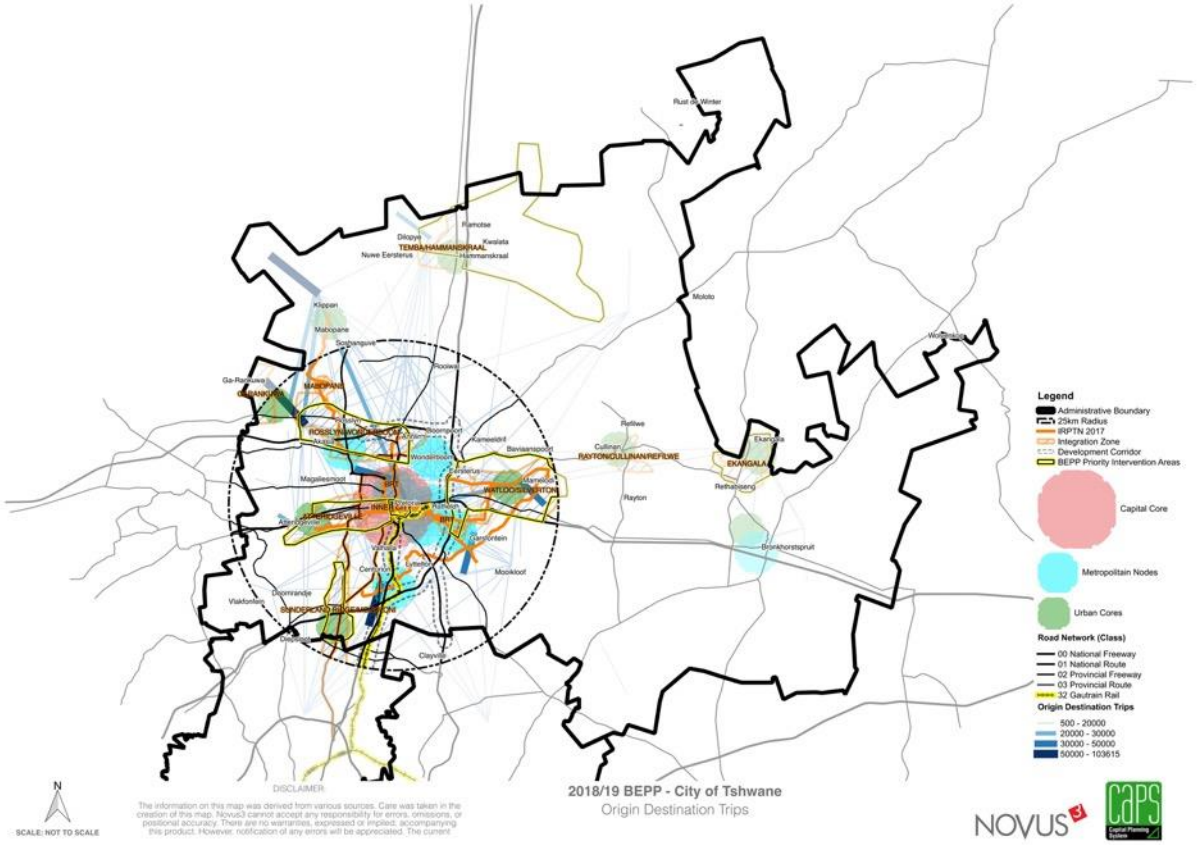


Figure B-36: Origin Destinations guidelines in the City of Tshwane

B.2.2.3 *Identification of underserved areas*

B.2.2.3.1 City of Tshwane Human Settlements Plan

Since 1994 South Africa has embarked on several programmes towards building a better life for all by providing, amongst others, shelter and basic services for the poorest of communities in the country. As part of the system of developmental local government, and in terms of the Municipal Systems Act, municipalities are required to develop Integrated Development Plans (IDPs) that are to serve as the basis for service delivery. According to the Housing Act, 1997 section 9(1)(f), every municipality must, as part of the municipality's process of integrated development planning, take all reasonable and necessary steps within the framework of national and provincial housing legislation and policy to

initiate, plan, coordinate, facilitate, promote and enable appropriate housing and human settlement development in its area of jurisdiction.

The primary objective of the Sustainable Human Settlement Plan (SHSP) is to provide a sound strategic context with regards to housing supply and demand, prior to addressing specific objectives pertaining to the provision of turnkey solutions for rental housing, integrated mixed housing typology solutions, eradication of informal settlements/back yard shacks, etc. Table B-5 summarises the objectives of the SHSP.

Table B-5: City of Tshwane Sustainable Human Settlements Plan 2014 - Objectives

SHSP Objectives	SHSP Outcomes	Points of Departure
To develop a comprehensive housing development and delivery plan for municipalities in Gauteng Department of Human Settlement providing strategic direction and guidance to the municipalities as to key housing delivery priorities and focus in terms of housing delivery in the Province.	To develop a single shared vision and housing delivery plan between various spheres of government role-players and stakeholders for the local municipality.	Provide strategic direction and guidance in terms of a single human settlement delivery plan for the local municipality.
To integrate the SHSP's into the Municipal Integrated Development Plans, and ensure that the SHSP becomes the housing component of the IDP.	Ensure integration of the Housing Delivery process with Provincial Departments and Local Authority initiatives. Ensure an understanding of and address the constraints within which Housing Delivery takes place at a Municipal Level. Supplement the IDP sector plans.	Provide for a single shared housing vision for the City of Tshwane. Ensure political and policy alignment. Establish a common understanding of housing delivery challenges and constraints.
To ensure that the SHSP's provide a consistent tool to evaluate proposals and applications at both a provincial and municipal level, through the development of a GIS based support system.	Provide a user friendly and accessible tool to all authorised users to manage and monitor housing delivery in the local municipality.	Explore and recommend tools to monitor and evaluate housing delivery on a Provincial and Municipal scale.
To establish a framework for housing delivery in terms of the National Housing Program and Gauteng Department of Human Settlement (GDHS) Strategic direction.	Ensure policy alignment at a National, Provincial and a Local level.	Ensure sustainable and spatially integrated housing delivery.
To provide both GDHS and municipalities with a tool to strategically locate future housing settlements, taking into consideration the constraints and opportunities that exist at a municipal level.	Ensure the establishment of sustainable housing developments and spatial integration and adherence to SPLUMA Principles.	Ensure relevance and effectiveness of housing delivery programs and products.
To identify key issues to be addressed.	Lessons Learnt and best practices regarding housing delivery in the Province. Assess effectiveness of	Provide a framework for incorporation of the SHSP's into the IDP Reviews in the form of an

SHSP Objectives	SHSP Outcomes	Points of Departure
	Departmental programs and products delivery.	IDP Housing Chapter.

The point of departure of the SHSP can be summarised as follow:

- To ensure effective allocation of limited resources, financial and human, to a wide variety of potential development initiatives;
- To provide guidance in prioritising housing projects in the Tshwane area to obtain consensus for the timing and order of their implementation;
- To ensure more integrated development through coordinating cross-sector role players to aligning their development interventions in one plan;
- To ensure budget allocations to the City of Tshwane are most effectively applied for maximum impact;
- To provide effective linkages between the City of Tshwane SDF and the location of housing projects which include a range of social, economic, environmental and infrastructure investments;
- To ensure there is a definite housing focus in the IDP and SDF with clear direction for future housing delivery across all social and economic categories and locations in the municipality;
- To provide the City of Tshwane IDP and budgeting process with adequate information about the housing plan, its choices, priorities, parameters as well as strategic and operational requirements;
- To ensure that the contents and process requirements of planning for housing are adequately catered for in the IDP process, and;
- To ensure that there is indicative subsidy budgeting and cash flow planning at both the municipal and provincial levels.

Housing demand focuses on quantifying demand in terms of the number of housing units required, and more specifically, the type of housing demand (tenure), i.e. full ownership, rental units, subsidised units or bonded housing. Depicting this demand spatially (geo-referenced) is also an important factor to consider when evaluating and considering housing demand. The city has identified, by means of the SHSP, the current housing demand of underserved townships. The plan differentiated between the following categories:

- In-situ Upgrading
- Formalised
- Existing Townships
- Receiving Area

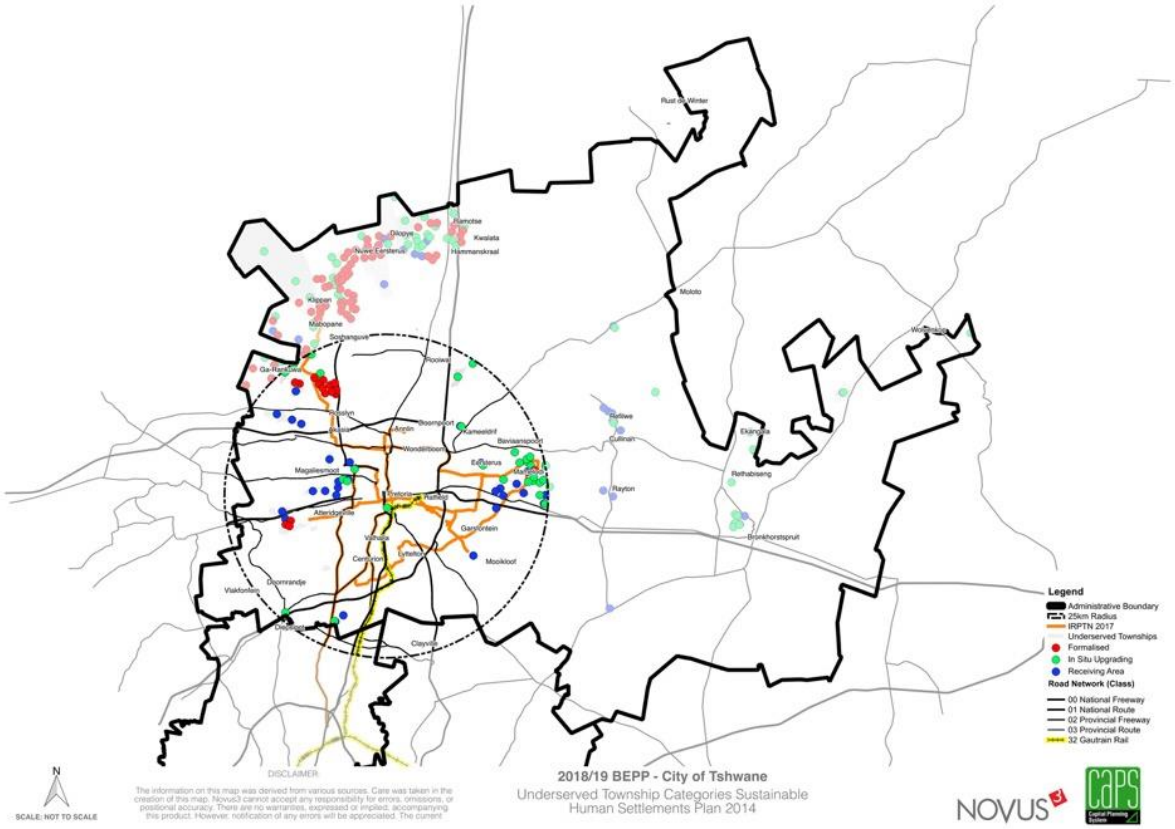


Figure B-37: Underserved Township categories, Sustainable Human Settlements Plan 2014

The spatial distribution of the underserved townships is clearly on the periphery of the city. Any development that does not stimulate economic activity within these areas, primarily Mamelodi, Attridgeville, Olievenhoutsbosch and Soshanguve up to Temba, will reinforce the spatial inequality of the city. Table B-6 below indicates the estimated housing backlog within the City.[8]

Table B-6: Demand for Housing in the City of Tshwane

Demand	Units/Structures
Informal Housing Counts	155 948 households (2013 stats)
Backyard Units	83 378 (2013 stats)
Demand Database/ Housing Needs Register	166 832 (2017 stats)

There is an estimated 155 9489 informal structures in the city. These informal structures exist in a total of 178 clusters of informal settlements throughout the city. Since the 2013 survey, 14 more informal settlements have been identified. Not all these units are “shacks” as many of the houses located in areas under traditional authorities are permanent in nature. Backyard units were approximately 83 378 in 2013 and it can be assumed that the majority of these represent rental demand, and more specifically affordable rental. The Housing Demand Database as per the National Housing Need Register changes on a regular basis as and when people register on the needs register and/or qualifying beneficiaries are approved and allocated houses.

[8] Provided by the City of Tshwane Department of Human Settlements
[9] 2013 Survey

Having determined the size, location and nature of demand, it is then necessary to determine and assess the physical resources available at the respective areas of demand. Physical resources entail the assessment of availability of well-located and environmentally suitable land, and whether the land is public or privately owned. Well-located land is normally close to economic activity (job opportunities), where infrastructure in the form of bulk engineering services (water, sanitation, electricity, roads and stormwater) is readily available, and access to social services and facilities (health, education, welfare, safety and security and sports and recreation).

Rural and marginalized settlements have experienced continuous population growth in areas where access to land is possible and transport services are accessible. Population densities in these rural settlements are approaching those of urban areas, but the economic base and the infrastructure services are still at unacceptable levels. The city is in the process of developing the Rural Settlement Strategy aimed at retaining the existing rural/ agricultural areas. Research will also be conducted to investigate implementation of different subsidies when settlements located in these areas are implemented.

Agri-village establishment is a relatively new concept in the policy environment which has a focus on self-sustaining living. The focus on the establishment of specialised centres in the form of agri-villages in appropriate locations will specifically help to facilitate agrarian transformation and land reform as envisioned by the Comprehensive Rural Development Programme (CRDP). The key to the success of agri-village development is rooted in the principle of focused and deliberate government investment spending to ensure that these centres develop to provide an extensive range of community facilities and becoming the spatial focal points of agriculturally driven LED interventions and land reform initiatives. By doing so, an agri-village possesses the inherent potential to act as a potential secondary centre around which the critical mass required to initiate formal and informal local economic development can develop over time.

B.2.2.4 *Development Trends*

The city has conducted a development trend analysis in order to identify whether the City is actually encouraging development in the desired spatially targeted areas. The trends analysis deals specifically with development trends in the built environment from July 2012[10] up to July 2015.

The aim of the development trends analysis was to act as an indicator towards how successful the spatial planning in the city is achieving spatial transformation and densification in targeted areas. Further it would give an indication of problematic areas in terms of trends that do not align to the desired spatial patterns as foreseen by the city. The information used for the trends analysis includes:

- Information as provided to Statistics South Africa on a monthly basis regarding buildings completed;
- The city's township and application database was used to determine future trends. Only applications submitted or approved between July 2012 and June 2015 were used to determine future trends;
- Interviews with developers and private town planners, and;
- Site inspections were done along corridors and at nodes.

It is important to indicate that only major development trends were investigated in the trend analysis. Major developments were regarded as retail development of more than 5000m², offices of more than 1000m², commercial / industrial development of more than 1000m², higher density housing of more than 60 units per hectare and low density housing of more than 100 units. Lower density developments such as second dwelling use applications and subdivision applications did not form part of the trend analysis.

[10] July 2012 was used as the base year due to the fact that large areas were incorporated into the City in 2012.

Figure B-38 below indicates the trends of housing development in the city by the private sector. A densification overlay zoning is allowed within a 500m buffer zone around the TRT corridors which enables private development investments at higher densities. Based on the trend analysis, this policy mechanism has stimulated significant densification by the private sector along the TRT corridors.

Figure B-38: Private Sector Housing Developments

B.2.2.4.1 Building and land use applications

The city received a total of 21 235 building plans in the financial year 2014/2015. This is a 5% growth on the previous year when 20 140 plans were received during the 2013/2014 year. Between 2012/2013 and 2013/2014, there was 3% growth. Between 2011/2012 and 2012/2013 there was 20% growth which can be attributed to the inclusion of the new areas (i.e. Metsweding) into the city's jurisdiction during 2012.

Table B-7: Building applications with the City of Tshwane: 2009 - 2015

Financial Year	Number of Applications
2009 / 2010	10 269
2010 / 2011	13 495
2011 / 2012	16 310
2012 / 2013	19 529
2013 / 2014	20 140
2014 / 2015	21 235

Applications received may include township establishments, rezoning, consent use, permission, removal of restrictive conditions, consolidation and subdivision applications. The number of applications received per year was around 1 400 per year between 2009 and 2012. After 2012, the number then escalated to about 1 700 and to 1 900 for the next two financial years. The increase in the number of applications after 2012 is attributed to the inclusion of the Metsweding areas to the City of Tshwane jurisdiction during 2012. It is expected that the number of applications received per year will remain at the 2 000 level over the foreseeable short term. Regions 4 and 6 are expected to remain the most active regions in terms of applications received.

B.2.2.4.2 Buildings completed

Table B-8 below indicates the number of dwelling units completed between 2010 and 2017. The number of buildings constructed were constantly about 6 000 until 2012, where after the inclusion of the Metsweding area, the figure increased to about 9 000 buildings per year.

Table B-8: Building Applications with the City of Tshwane: 2010 - 2017

Financial Year	Number of Applications	Dwelling Units
2009 / 2010	5 764	
2010 / 2011	5 835	
2011 / 2012	6 977	
2012 / 2013	8 234	
2013 / 2014	8 750	
2014 / 2015	8 626	6 463
2015 / 2016	6 175	8 441
2016 / 2017	5 961	8 600

B.2.2.4.3 Development trends interpretation

From the development rends analysis above, the following conclusions can be drawn:

- The development in the City of Tshwane between 2012 and 2017 was the highest in Gauteng as reported to Statistics South Africa;
- The majority of the development was in line with the spatial planning of the city and was in the nodes and corridors identified in the SDF;
- The TRT corridors were specifically active in terms of line 2A and line 2B. The development corridor around the N1 also received a large number of development with the focus on office developments;
- A relatively small number of development took place on the urban edge far away from public transport, but this is due to latent rights that were approved before the approval of the MSDF and RSDF in 2012;
- The applications received between 2012 and 2017 indicated a strong trend in terms of proposed developments in the nodes and corridors;

- The residential densification applications are also near existing or planned public transport facilities;
- Line 2B received the bulk of the applications and this trend is expected to continue. The applications for office and commercial developments were mostly in nodes or corridors. The application trends area also indicates a preference for the N1 development corridor, and;
- The application trends indicate that development in the short term will take place in line with the spatial planning of the city and province.

Considering the above, the dominant reality however is that the city has highly dispersed, mono-functional land use structure that affect not only public service and spatial planning but also the city's residents. Residence of Tshwane need to travel long distances to and from places of employment, which translates into higher travel costs and less time and money to spend on other social, investment or recreational aspects that result in more rewarding lifestyles. Yet many of the poorest people live in the most peripheral locations of the city and are most disadvantaged by the long travelling distances and the fact that other developments do not occur in close proximity.

Focused investment of densification[11] on IRPTN corridors by the city, more specifically the Housing and Human Settlements Department, should be investigated further to ensure social equality and improved lifestyle quality for all within the municipality.

B.2.3 Identification of Urban Network Structure

The earlier parts of this section have analysed the spatial and socio-economic reality of the City of Tshwane. In order to report in terms of the Urban Network Structure ideology of National Treasury, this next section of this report will discuss the interplay between the various elements – specifically regarding the alignment between Public Transport and Human Settlements – and will be followed by a synthesis of the analysis run which will lead to the identification of the UNS for the City of Tshwane.

The National Development Plan (NDP) 2030 states that shifting settlement patterns should be investigated to align public investment in infrastructure and services with these trends, and to develop appropriate systems of land tenure and growth management. It continues to mention that special attention must be given to areas of densification along transport corridors within previous homelands.

B.2.3.1 *IRPTN versus Projected Population*

The future planning process of IRPTN considered several factors using information available at the time. However, since then new studies have been completed which may have some impact on the IRPTN plan. These include the city's Sustainable Human Settlement Plan, completed in late 2014, and the Urban Simulation (UrbanSim) in support of the city's Road Map 2030, undertaken by the CSIR in August 2016.

This chapter will summarize the analysis and findings of the latest Sustainable Human Settlement Plan and the CSIR's Urban Simulation findings, in relation to the latest available IRPTN. This analysis will seek to determine to what extent the IRPTN will connect the future residential areas with job opportunities in the city, and to what extent public transport planning aligns with housing and human settlement planning. Any gaps with respect to connectivity or alignment will be highlighted, with recommendations on where additional future transport links should be considered.

Figure B-39 indicates that the existing and planned TRT network aligns well with the UrbanSim projected residential areas, except for the following locations:

- The far north-western area of Tshwane (Winterveldt);
- The far south-western area of Tshwane (Atteridgeville West), and;

[11] Specifically, incentivized investment.

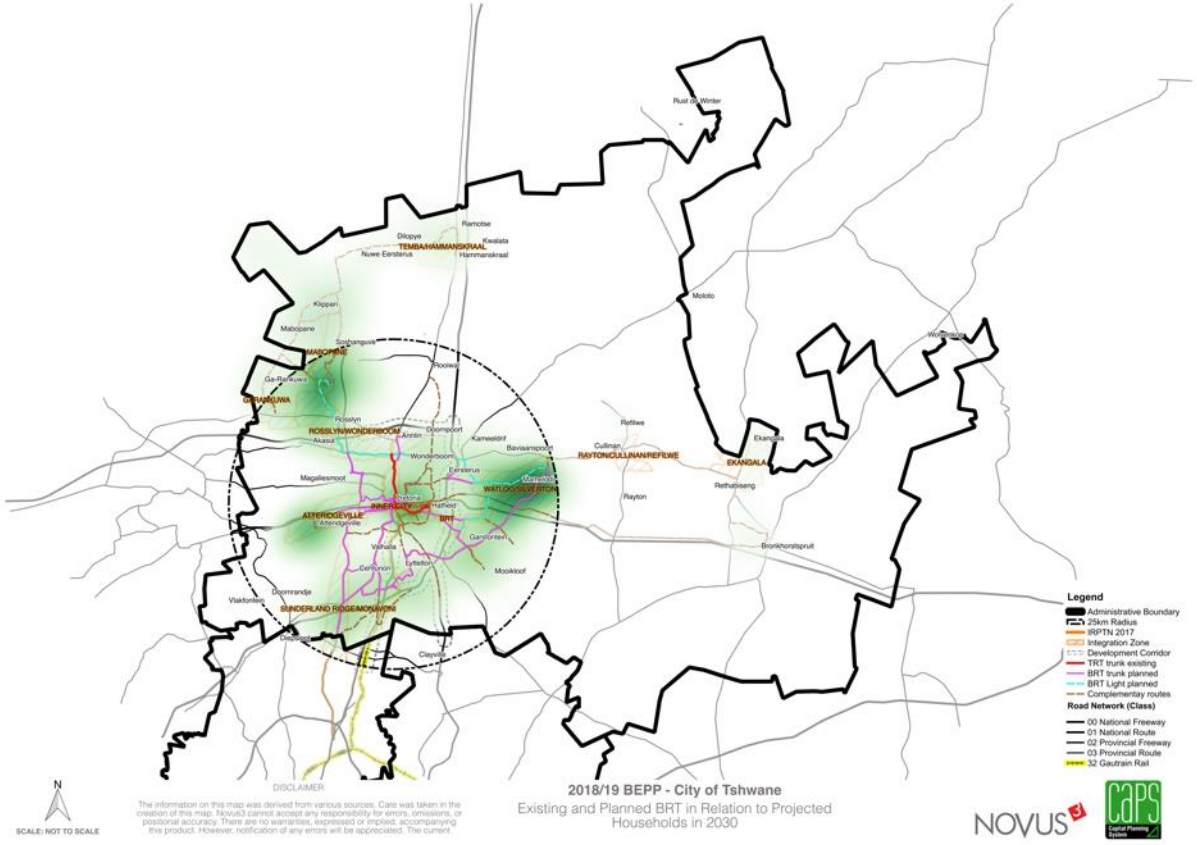
- Refilwe.

Based on the above analysis, the following is recommended:

- That a feeder service be planned to service the Winterveldt area which is projected to have a significant residential population in the future;
- That the TRT trunk route to Atteridgeville (Line 3) which was recently shortened, be reassessed to include services to the far west of Atteridgeville, and;
- That the complementary route between Pretoria, Cullinan and Bronkhortspruit be reassessed to consider a route realignment into Refilwe.

Further, the significant projected residential density in the entire north-western Tshwane area (from Hammanskraal to Winterveldt, Soshunguve and Mabopane) will require a mass transit system to provide sufficient transport for the area. The planned TRT complementary routes are unlikely to be sufficient. It is recommended that along with the extension of the PRASA Metro Rail line between Soshunguve and Hammanskraal, consideration be given to extending the Atteridgeville TRT trunk route northwards.

Furthermore, the Olievenhoutbosch (in the south-west of Tshwane) benefits from future coverage of the TRT network – this part of the network should be given a higher order of priority[12] to transport residents and employees alike between the area and the PRASA Metro Rail or the Pretoria CBD.



[12] Please see the second part of this section for an elaborate discussion regarding the City's Prioritization methodology.

Figure B-39: Existing and Planned BRT in relation to project households in 2030

B.2.3.2 *Alignment of Public Transport and Human Settlements*

[13]There is approximately 2 482 hectares of land suitable for residential development within the functional area of the Tshwane IRPTN. This land holds potential for 198 577 residential units at an average density of 80 units per hectare. The capacity around railway stations amounts to 65 048 units and along the TRT routes the number stands at 133 529 units. Based on the nature and character of surrounding areas which the network runs through, the development potential is estimated at 77 330 (39%) low income (subsidised rental full ownership) units, 57 357 (29%) middle income units and 63 890 (32%) high income units.

The nature of development varies between redevelopment (in old areas), densification (subdivision etc.), and infill development (on green fields sites), and the typical housing typologies to be developed comprise 2, 3 and 4 storey walk-up facilities.

The table below shows the development potential per region and per income category. From this it is evident that the highest potential for low income development around the IRPTN is in Region 1 (36%), then Region 3 (35%), followed by Region 6 (17%).

Table B-9: IRPTN: Developable Land (Stations and Lines) – Alternative Alignment by Region

			Residential Units				Residential Units			
IRPTN NETWORK	Developable Area ha	Residential Area ha	High Income	Middle Income	Low Income	TOTAL	High Income	Middle Income	Low Income	TOTAL %
Region 1	640	470	3 759	5 842	27 987	37 588	6%	10%	36%	19%
Region 2	187	159	6 524	4 231	2 004	12 758	10%	7%	3%	6%
Region 3	1339	848	15 410	25 277	27 120	67 807	24%	44%	35%	34%
Region 4	509	381	16 306	10 150	4 049	30 505	26%	18%	5%	15%
Region 5	93	55	804	585	3 010	4 399	1%	1%	4%	2%
Region 6	711	569	21 087	11 271	13 160	45 519	33%	20%	17%	23%
Region 7	0	0	-	-	-	-	0%	0%	0%	0%
TOTAL Alternative	**3479**	**2482**	**63 890**	**57 357**	**77 330**	**198 577**	**100%**	**100%**	**100%**	**100%**
%			**32%**	**29%**	**39%**	**100%**				

Feasibility studies will be conducted on the abovementioned land parcels to confirm the development potential. Privately owned portions have also been identified for acquiring and partnerships.

The intervention programme[14] aimed at promoting higher density, mixed income (inclusionary housing) and mixed land use developments around the IRPTN and nodal network will also be considered. This programme supports the following two objectives as reflected in the Tshwane Spatial Development Strategy:

- To provide as many affordable housing opportunities in central parts of the city as possible, according to the higher density affordable housing model, and;
- Provision of institutional (social) housing (rental accommodation) in central areas.

Figure B-40 below shows the spatial distribution of land development potential associated with the IRPTN and nodal network.

[13] Source: City of Tshwane Department of Human Settlements

[14] The intervention programme essentially comprises of the following three initiative: Breaking New Ground/Inclusionary Housing; Social Housing and Community Residential Units focusing on affordable rental stock and Medium to higher density full ownership housing (fully subsidised walk-ups).

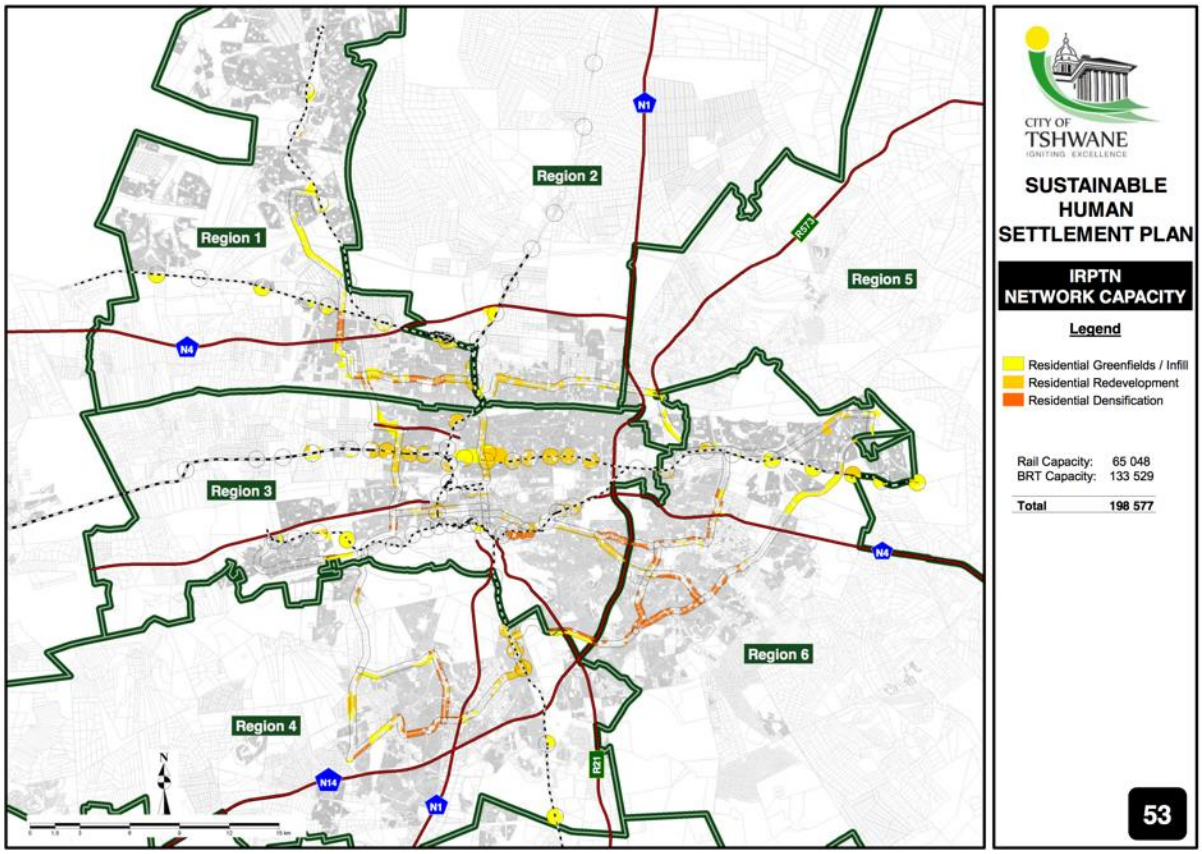


Figure B-40: Possible housing development along IRPTN

B.2.3.3 *Alignment of Public Transport and Economic Opportunities*

In Figure B-41 below, the existing and planned TRT network aligns well with the areas of employment opportunities. If the TRT system is completed in 2028 as planned, workers will be able to access the highest projected areas of employment in Tshwane using the TRT system.

The city's IRPTN makes provision for the rollout of a public transport network which aims to link underserved townships with urban cores (underserved township areas with latent economic development capacity). This concept of linkage is expanded by the city by encouraging development along the IRPTN by means of densification and compaction. The densification and compaction strategy aims to:

- Enable fruitful spending;
- Discouraging sprawl;
- Secure land value;
- Optimising urban infrastructure usage;
- Stimulate economic activity in areas with economic potential, and;
- Conserve valuable agricultural land.

The IRPTN identifies these linkages and are referred to as Activity Corridors. The UNS interprets the concept of activity around linkages between places of residence to economic nodes, by defining these areas as Integration Zones. In essence, activity corridors and integrations zones are synonymous concepts. Development along the Integration Zone is ideal from the city's perspective. The investments and ongoing densification of the corridors alongside the said public transport intervention needs to be matched by the city to ensure spatial transformation by means of social equality.

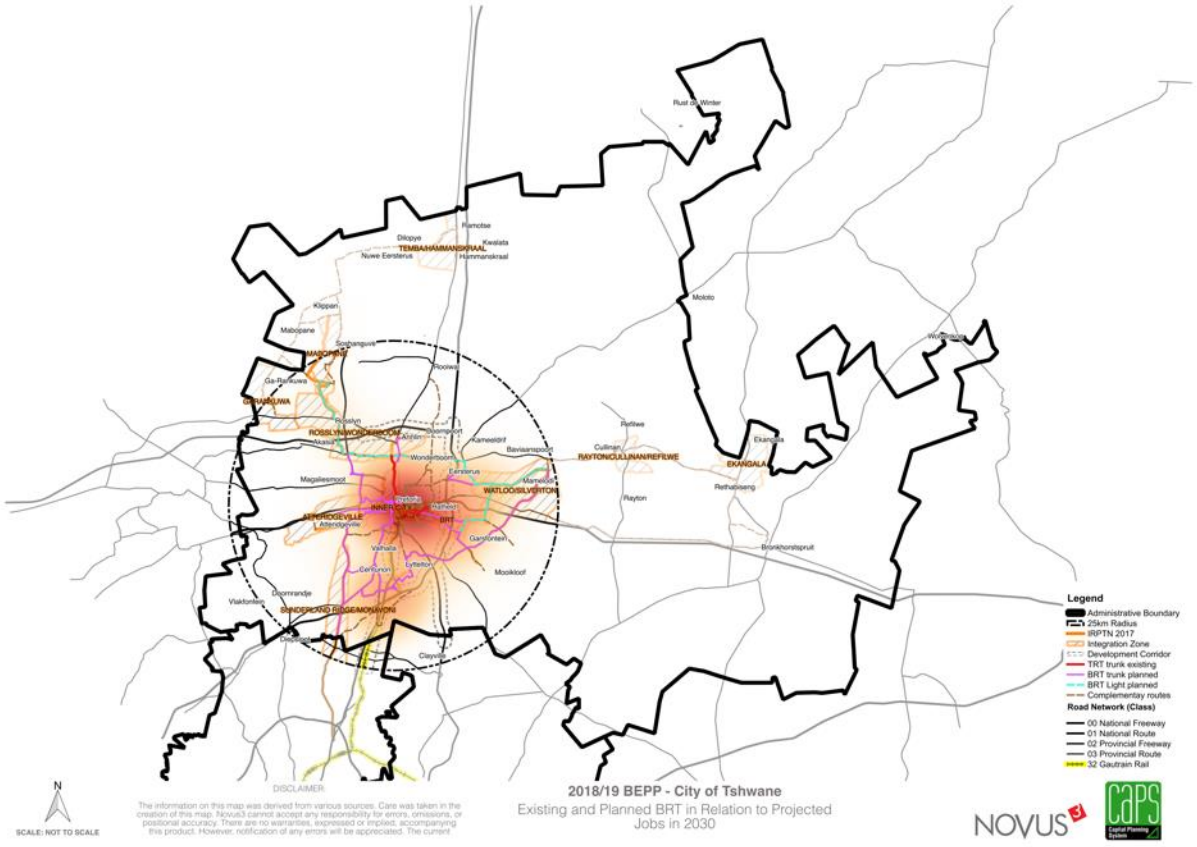


Figure B-41: Existing and Planned BRT Network in relation to projected jobs in 2030

B.2.3.4 *Urban Network Structuring Elements*

B.2.3.4.1 Capital Core

The Tshwane inner city or central business district is identified as the Capital Core as it is the city's highest order node amongst all metropolitan nodes within the nodal hierarchy. Historically, the inner city was the geographic heart and centre of what is now the Tshwane area. Over time, 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.

The Capital Core is defined as an area for focused regeneration and management. Figure B-42 below shows the location of the CBD relative to the rest of the Tshwane metropole and other spatial structuring elements in the city.

B.2.3.4.2 Urban Hubs

Urban Hubs includes both traditional and emerging centres of economic activity, within which mixed used development should be encouraged and managed. Figure B-43 below shows the location of the city's Urban Hubs.

Identified as primary nodes, second only to the capital core in the metropolitan nodal hierarchy, metropolitan nodes or urban hubs accommodate the highest degree of specialisation services and offer a wide range of these services. Often, metropolitan nodes will have regional and/or provincial relevance. 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 range 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, also in line with the growth management strategy.

Figure B-42: City of Tshwane – Capital Core

Figure B-43: City of Tshwane – Urban Hubs

Metropolitan nodes or urban hubs include the following areas:

- Akasia
- Bronkhorstspruit
- Brooklyn
- Centurion
- Hatfiled
- Menlyn
- Rosslyn
- Wonderboom

B.2.3.4.3 Smaller emerging nodes

Former township areas are 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, Tshwane needs to play a more active role in social and economic restructuring, especially in view of the limited private investment, relative to Metropolitan nodes. The Neighbourhood Development Programme (NDPG) is a lead City programme and the main instrument 'township renewal'. Smaller emerging nodes include areas of economic activity within which mixed-use development is to be promoted. Figure B-44 below shows the location of the City of Tshwane's smaller emerging nodes.

Figure B-44: City of Tshwane – Smaller Nodes

Smaller emerging nodes include the following areas:

- Akasia
- Bronkhorstspruit
- Cullinan
- Ekangala
- Garankuwa
- Hammanskraal
- Hazeldean
- Irene
- Mabopane
- Mamelodi
- Monovia
- Olivenhoutbosch
- Pretoria North
- Rayton
- Refilwe
- Roslyn
- Silverton
- Sunderland Ridge
- Temba
- Watloo
- Wonderboom
- Woodlands

B.2.3.4.4 Marginalised Areas

Marginalised areas are areas, primarily residential in function with supportive land uses, which are in decline and/or where people are deprived. They are typically informal settlements and dormitory residential townships in need of redress. Figure B-45 below shows the location of the City of Tshwane's Marginalised Areas. Marginalised areas include:

- Eersterust
- Ekangala
- Garankuwa
- Hammanskraal
- Mabopane
- Mamelodi
- Olivenhoutbosch
- Soshanguve
- Temba

Figure B-45: City of Tshwane – Marginalised Areas

B.2.3.4.5 Activity Corridors

Activity Corridors are described as areas along rapid public transport which connect the urban hubs and the CBD, where high-density land development should be promoted. Figure B-46 below shows the location of the City of Tshwane's Activity Corridors. Activity corridor areas include:

- Brooklyn
- BRT Phase 1
- Hatfiled
- Menlyn

Figure B-46: City of Tshwane – Activity Corridors

B.2.3.4.6 Integration Zones

Integration Zones are areas which represent a collective of all other typologies and form the prioritised spatial focus areas for coordinated public intervention. Figure B-47 below shows the location of the City of Tshwane's Integration Zones. Areas include:

- Akasia
- Atteridgeville
- Bronkhorstspruit CBD
- Brooklyn
- Cullinan CBD
- Ekangala
- Garankuwa
- Hammanskraal
- Hatfiled
- Inner City
- Mabopane
- Mamelodi
- Menlopark
- Menlyn
- Monovia
- Moot
- Olievenhoutbosch
- Rayton
- Refilwe
- Rosslyn
- Silverton
- Sunderland Ridge
- Temba
- Watloo
- Wonderboom

Figure B-47: City of Tshwane - Integration Zones

B.2.3.4.7 Combined Urban Network Structure

Figure B-48: City of Tshwane – Combined UNS

B.2.4 Aligning the Tshwane MSDF to the Urban Network Structure elements

In conclusion to this section of the report, it is important to understand how the BEPP UNS relates to the city's Spatial Development Framework. Figure B-49 shows the relationship between the city's planning framework, as articulated in the SDF, and the BEPP Urban Network Structure.

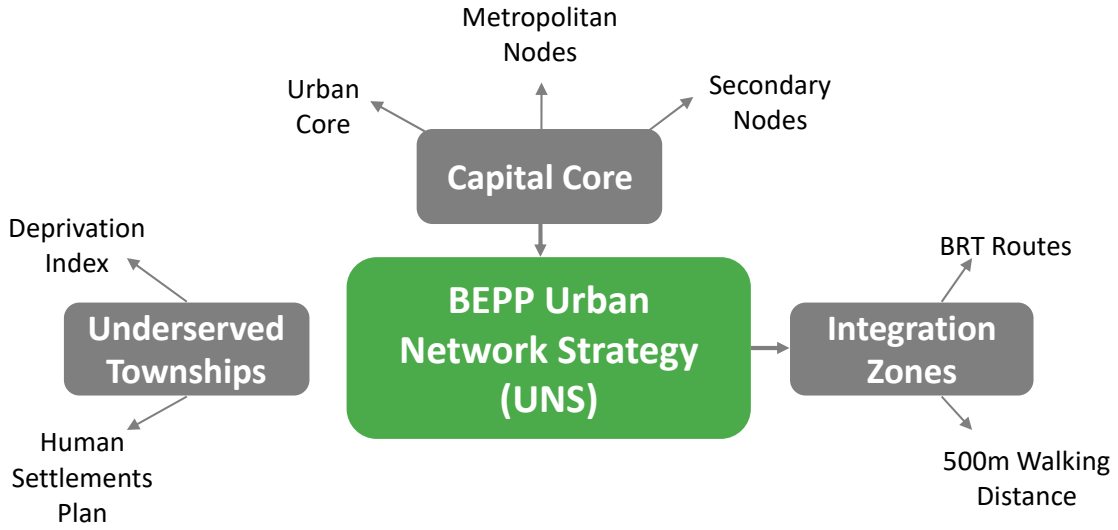


Figure B-49: Relationship between the city's planning framework and the BEPP UNS

The city's spatial planning framework, as required by the municipal Systems Act (2000), is the latest approved Tshwane Metropolitan Spatial Development Framework (MSDF) of 2012[15]. The MSDF has defined a hierarchy of nodes. The nodal hierarchy of the city, as outlined in the SDF, is outlined in Table B-10 below.

Table B-10: City of Tshwane nodal hierarchy

Node	Areas within Node	
Capital Core	Central Business District or Inner City	
Metropolitan Nodes	Akasia; Kolonnade; Brooklyn; Hatfield; Menlyn; Centurion; Bronkhorstspruit	
Urban Cores	Hammanskraal/Temba; Mabopane/Soshanguve; Ga-Rankuwa; Atteridgevile/Saulsville; Mamelodi; Ekangala; Refilwe Zithobeni; Olievenhoutbosch	
Emerging Nodes	Soshanguve/Kopanong; Pretoria North/Rainbow Junction; Hazeldean; Woodlands; Wingate Park; Irene; Monovani.	
Specialised Activity Areas	Industrial Estates	Babelegi; Ga-Rankuwa; Rosslyn; Kelrksoord; Kirkney; Hermanstad; Pretoria Industrial; Sunderland Ridge; Rooihuiskraal; Irene; Hennopspark; Samcor Park; Waltloo; Silvertondale; Koedoespoort; Silverton; Ekandustria.
	Research, Innovation, Education and Technology Institutes	Council for Scientific and Industrial Research (CSIR) and Innovation Hub (Blue IQ); Highveld Technopark; Human Science Research Council (HSRC); George Mukhari Academic Hospital; Onderstepoort Research Laboratory/Vetinary Institute; Steve Biko Academic Hospital; Tshwane University of Technology; University of Pretoria; Thaba Tshwane

[15] The Spatial Development Framework for the City of Tshwane is currently being revised / updated, but will only be available at the end of this financial year.

Node		Areas within Node
	Airports	Waterkloof Air Force Base; Zwartkop Air Force Base
	Tourism Nodes	Dinokeng Nature Reserve; Cullinan

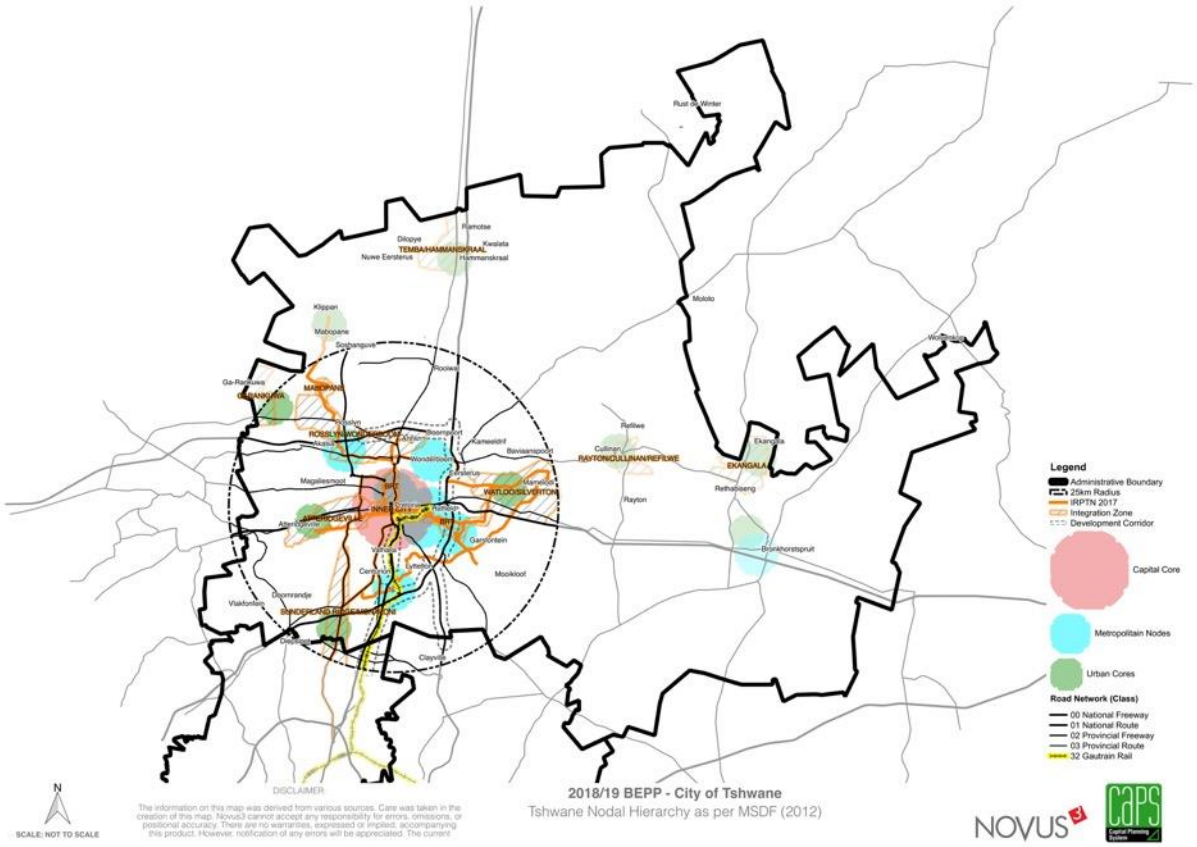


Figure B-50: Tshwane Nodal Hierarchy as per MSDF (2012)

According to the MSDF (2012), the following definitions apply to the spatial structuring elements if the City of Tshwane's movement network:

- **Mobility Corridor**: The primary reason for the existence of this type of corridor is to move large numbers of people from one point to another in the city and often over relatively long distances. This corridor will typically move people from the peripheral areas to work opportunities and back during the day. Because of the long distances separating many people from their work opportunities there is a great need to move people around the city during peak hours in the fastest, most cost-effective manner with as little stops as possible between the origins and destinations.
- **Activity Corridor**: The integration between land use, economic activity and movement is the key function of this corridor. People do not only move between the two outer points of the corridor but also between various points along the corridor. A mature activity corridor displays most of the positive aspects associated with activity corridors, such as high residential densities and high non- residential land use intensities. Such a corridor will be most appropriate in the more central parts where several nodes with a certain degree of intensity and mix of uses already exist in relative proximity to each other.

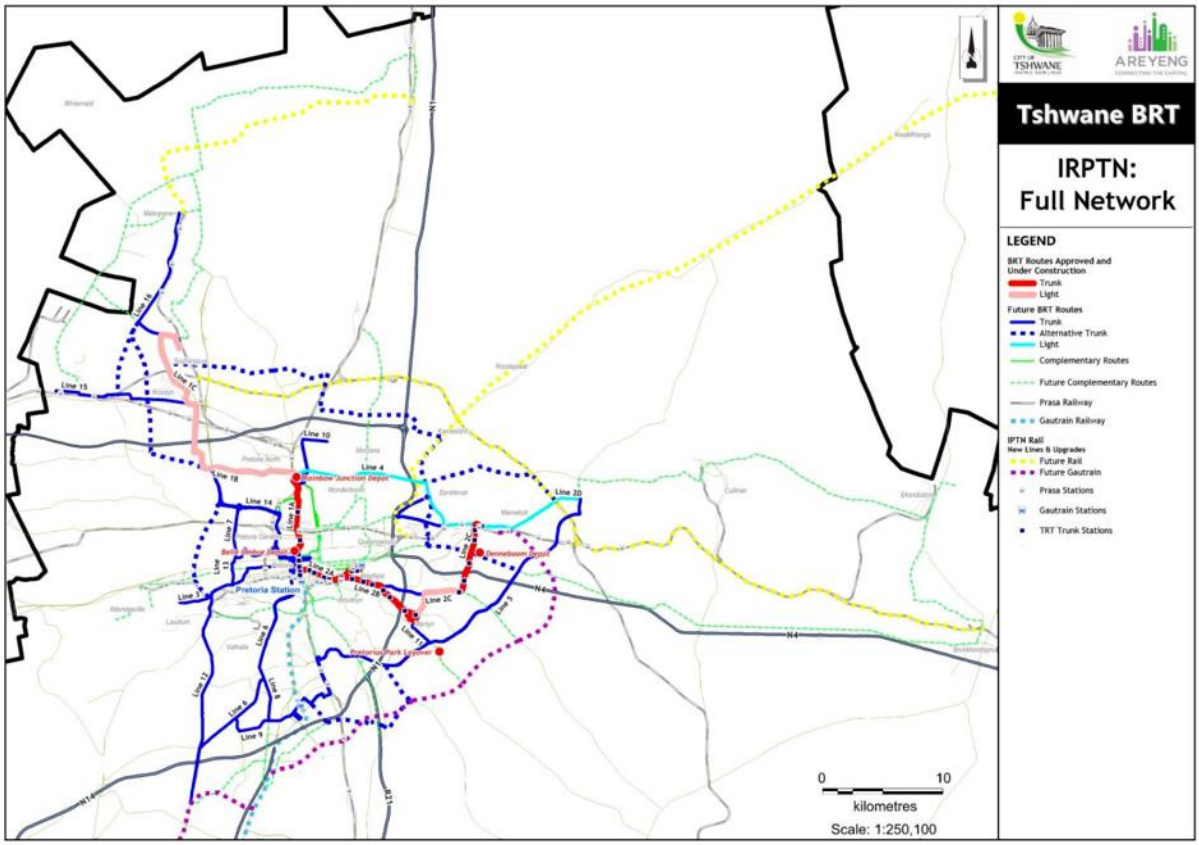


Figure B-51: Integrated Rapid Public Transport Network, A Re Yeng Operation Plan 2016-2028

Table B-11 shows the relation between the UNS and the Tshwane MSDF (2012).

Table B-11: Relationship between the UNS and the MSDF

Urban Network Structure (National Treasury Terminology)	Tshwane Metropolitan Spatial Development Framework 2012 (City of Tshwane Terminology)
Central Business District (CBD)	Metropolitan Nodes
Urban Hubs	Urban Cores
Smaller Nodes	Emerging Nodes
Activity Corridors	Activity Corridor
Secondary Transport	Mobility Corridor
Integration Zones[16]	Activity Spine Mobility Spine

[16] Since the Development of the 2012 MSDF the understanding and approach toward integration Zones in the City has matured and considers various other elements additional to the Activity Spine and Mobility Spine.

Figure B-52: Tshwane MSDF (2012) in terms of National Treasury's UNS

B.2.5 Climate Change Risk and Impact Assessment

Climate change and consequent global warming has adverse impacts on a region's climate system which could lead to a number of potential catastrophic events including flooding, drought, air pollution, heat stress and water scarcity. Urbanised cities together with densely populated areas are areas of high risk due to the impact that these events could have on the built environment such as roads, water networks, human settlements and social infrastructure.

Given that the city characterised by continued urban growth and consequent population pressures, measures of climate responsiveness and resilience should from part of the city' strategies to achieve a sustainable and compact city structure. The following section has been structured into four (4) parts:

- The first section outlines the results of the vulnerability assessment in line with the adaptation programme within the City Sustainability Unit (CSU),
- The second section discusses the City of Tshwane energy futures report in line with the mitigation programme within the CSU,
- The third section outlines the ten (10) key interventions identified by the city to build a climate resilient and resource efficient city.
- The fourth section identifies climate change risks and impacts within the BEPP EDPQs.

B.2.5.1 *City of Tshwane Climate Risk and Vulnerability Assessment (Adaptation)*

Adaptation is wide-ranging and the current approach is mainly advocacy-based, ensuring that different role-players are aware of and responding to the city's climate hazards and risks as identified in the city's Climate Risk and Vulnerability study[17].

[17] Completed in September 2015

The most notable indicator is rising temperatures. In the Tshwane region these have been increasing significant over recent decades – at about twice the global rate. Although there are as yet no significant changes in rainfall, there is a downward trend in the maximum number of consecutive wet days per year.

How these climate patterns will develop in the future is described by the outputs of computer based models in line with the global climate system called Global Circulation Models (GCMs). The models are used to predict how regional climate systems will respond to changes in the troposphere resulting from an intensified greenhouse effect. A 60km^2 resolution downscaling of six different GCMs is used for the purposes of understanding how the climate of the Tshwane region will develop up to the year 2100. Each of the models are run under the assumption that coordinated global efforts at mitigating carbon emissions will remain limited and that CO_2 concentrations double (as compared to pre-industrial values) by about the mid-21st century – also known as the A2 scenario of the Intergovernmental Panel on Climate Change (IPCC) Special Report on Emission Scenarios (SRES) .

The model outputs confirm that temperatures will continue to climb, with a rise of up to 2°C for the near-future period (2015-2035), between 1 and 3°C For the mid-future period (2040-2060), and 4 to 7°C projected over the region for the period 2080-2100. Rainfall anomalies exhibit a clear pattern of drying, which strengthens over time, although the scale of drying will be limited.

Extreme weather also becomes a concern. The climate model shows a drastic increase in the number of very hot days (days with maximum temperatures exceeding 35°C) in the second half of this century. Whereas the current annual average is 40 very hot days per year, the annual number of very hot days will range between 100 and 180 days by 2100. This implies that it is plausible for almost all days during the summer half-year to have maximum temperatures exceeding the 35°C threshold.

Extreme rainfall events (>20 mm of rain falling within 24 hours over an area of 50km^2) are of less concern, although the climate models point towards an increased frequency of extreme events in future. These events typically exceed the capacity of infrastructure to deal with the runoff, leading to flash floods or general flooding of low-lying areas. Three prominent themes emerging from the assessment is the correlation between poverty, social vulnerability and climate impacts, as well as disaster preparedness and the role of natural buffers in building city resilience. These then find similar focus in programmes driven particularly by the CSU.

B.2.5.1.1 Social Vulnerability Assessment

The impacts of climate change are more notable within urban poor populations, in particular extreme weather events. The vulnerability of the urban poor stems from the lack of crucial infrastructure and basic services, together with poor quality housing. It is therefore essential for the city to identify and map high areas of vulnerability, in order to focus adaptation strategies towards the most vulnerable within the City. The social vulnerability index aims to identify and map high areas of vulnerability and has been calculated based on a number of socio-economic variables.

Figure B-53 below indicates the results of the vulnerability assessment[18]. Region 1 together with Region 2 contains the highest social vulnerability to climate change impacts. Both regions are characteristic of highly populated areas located within informal settlements and aligns to the results of the deprivation index, prepared as input to the CPM. The deprivation index outlined underserved township areas including Atteridgeville, Temba, Mamelodi, Mabopane and Soshanguve as the most deprived areas which have the lowest levels of access to basic services.

[18] Areas that have been indicated as “blank” areas have very low population densities and/or fewer households.

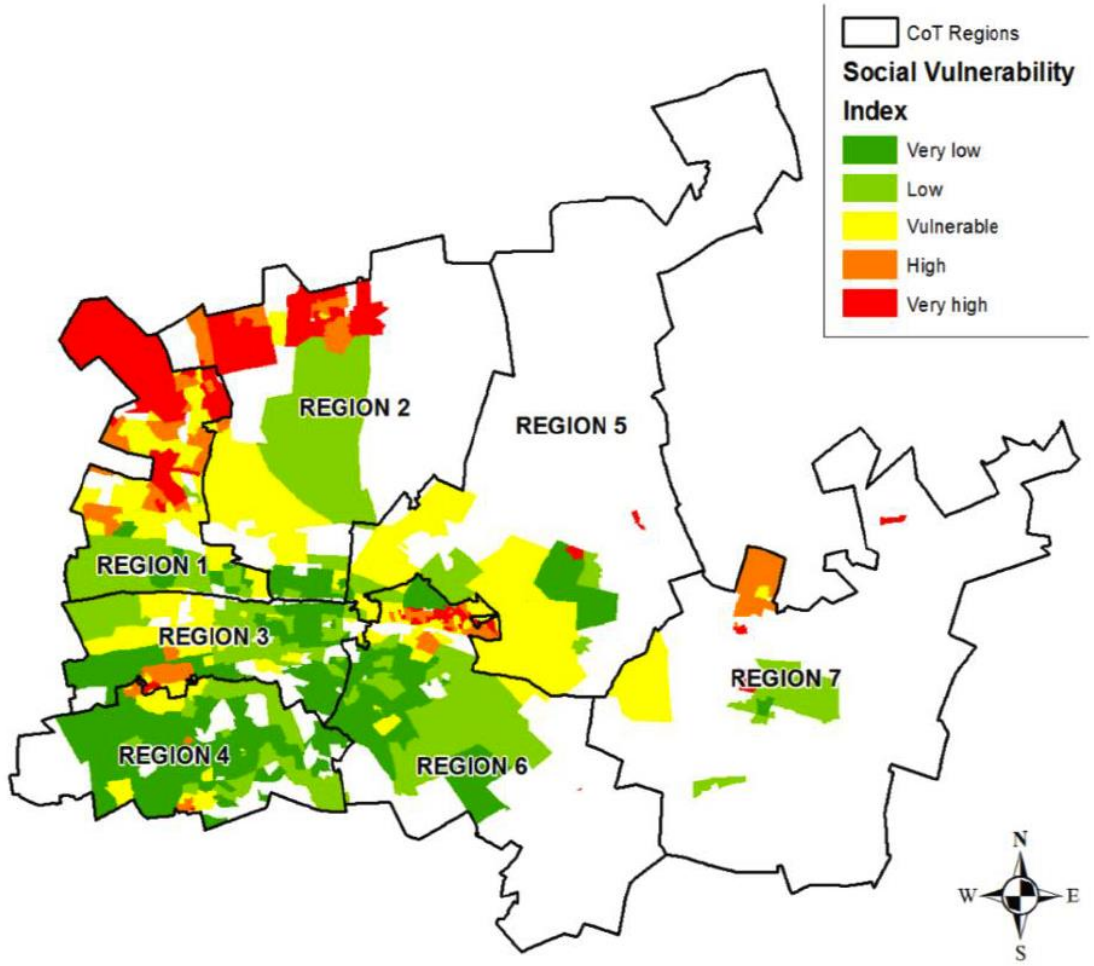


Figure B-53: Social vulnerability index

The socio-economic indices used to calculate the vulnerability index were based on national census data, which has been spatially linked to Census 2011 sub-place boundaries. Table B-12 below outlines the socio-economic indices used as input variables to the vulnerability assessment together with the region containing the highest comparative score.

Table B-12: Socio-economic variables included within the vulnerability assessment

Attribute	Region with highest comparative score	Regions						
		1	2	3	4	5	6	7
Type of housing (shacks)	5							
Education (older than 25 years, no education)	7							
Employment: unemployed	1							
Household density (> 4 people/room)	1,5,6							
Poverty line (hh earning < R400/month)	1							
Economic dependency (young and old compared to economic active population)	3							
Physiological dependency (young and old)	2							
Air pollution (fuel use other than electricity)	5							
Access to water (no piped water)	2							
Single parents (female-headed households)	1							
Child-headed households	7							
Access to transport (no car)	1							
Access to information (neither radio or cell phone)	1,2,5,7							
In need of assistance (determined by problems with hearing, mobility, seeing, self-care, speaking)	1							
Social cohesion (non-South Africans in informal areas for < 2 years).	1							
Nutrition (malnutrition of children < 5 years old)	1							
Population density	1							
Total Score								

Vulnerability classifications:

Low vulnerability High vulnerability

Based on the table above, Region 1 remains the most vulnerable area due to factors associated with unemployment, poverty, poor access to public transport, high dependency ratios and high population density.

B.2.5.1.2 Priority risk factors and adaptation options

Together with the social vulnerability indicated above, the climate risk and vulnerability assessment identifies four (4) major types of weather events affecting the city together with seven (7) key sectors at risk.

B.2.5.1.2.1 Extreme weather events

The four major weather events which affect the city includes floods, drought, heat waves and hail storms. The impact of these weather events fluctuates based on the social vulnerability indicated above together with the severity of each event. Table B-13 below indicates the impact of each weather event, together with contributing factors and the areas or regions which are most affected.

Table B-13: Extreme weather events and affected areas

Weather event	Description	Areas most affected
Floods	Flooding occurs within low-lying areas around the City, with a larger impact on densely populated informal settlements located within floodplains. **Contributing factors:** • Ageing infrastructure; • Inadequate storm water drainage systems; • Geographical location of human settlements, and; • Poor and vulnerable communities.	• Region 1 – Soshanguve, Hammanskraal, Ga-Rankuwa and Mabopane • Region 2 - Annlin and Sinoville • Region 3 – Atteridgeville • Region 4 – Centurion • Region 6 - Mamelodi and Moretele
Droughts	Droughts mainly affect the agricultural sector.	• Region 1 - Soshanguve, Winterveld • Region 3 – Atteridgeville • Region 6 - Moretele Park
Heat Waves	Heatwaves are described as pro-longed periods of excessive heat which can be detrimental to human and animal health. In addition to health concerns, heatwaves also affects the agricultural sector.	The occurrence of heatwaves cannot be specifically attributed to areas or regional boundaries. Populations groups more susceptible to heatwaves include: • Children; • People with respiratory diseases; • Elderly people and people with disabilities, and; • People with diseases such as epilepsy.
Hailstorms	Hailstorms are the result of convective summer climates which lead to thunderstorms. Damage which stems from hailstorms include automobiles, aircrafts, skylights, glass-roofed structures, livestock and crops, and sometimes human fatalities.	Areas surrounding the Magaliesberg mountain range

B.2.5.1.2.2 Key sectors at risk

The following key sectors have been identified as most vulnerable to the impacts of climate change.

Table B-14: Key sectors at risk

Key Sector at Risk	Description	Impacts
Biodiversity	Natural ecosystems are at risk due to land-use changes which results in land degradation and the introduction of alien plant species. **Contributing factors:** • Temperature increase; • Rising levels of atmospheric CO2, and; • Changing rainfall patterns.	The City consists of two (2) biomes namely grassland and savannah which contain ecosystems under threat. The grassland biome is highly-vulnerable to land-use and climate change and has been ranked as the second-most vulnerable. The Department of Environmental affairs have projected substantial change and loss of habitat for the grassland biome (DEA, 2013a; Driver et al., 2011). Loss of the grassland biome will impact the following: • Goods and services including water resources from highland catchments used for agricultural activity, and; • Conservation and ecosystem processes such as wild fires.
Water Resources	The city contains a number of water sources in the form of dams, rivers, wetlands and groundwater. Continued population growth together with the increase of economic development and higher standards of living will ultimately provide increased pressures on the current water resources available to the city. Climate Change adds to these pressures due to the impact it has on rainfall variability, weather events and increased surface water loss due to warming temperatures.	Impacts of reduced water resources include: • Water availability for functioning processes; • Water quality; • Changes in rainfall intensity; • Human and animal health; • Aquatic systems; • Functioning of existing infrastructure like that of waste water treatment plants and storm-water networks; • Drought; • Economic sector impacts (agriculture, power generation, industrial processes), and; • Food security.
Agriculture	Agricultural areas are mostly located within the eastern parts of the city which contain mostly extensive chicken farming, cattle farming and dryland and irrigated cultivation.	Impacts of climate change include: • Food security; • Economic development; • Maize crop yield; • Livestock mortality rates, and; • Higher frequency in veld fires which increases the risk of damage to grain and cattle farms.
Health	Increase in the depth and intensity of high-pressure systems during winter is associated detrimental effects on air pollutants and the production of near-surface ozone.	Increased temperatures directly affects heat-induced stress for humans and animals, giving cause to health related concerns.

Key Sector at Risk	Description	Impacts
Urban Planning	Key driver for adaptation strategies through spatial planning. Focus areas include informal settlements and densely populated areas built within the flood line. The risk profile for types of housing and density of settlements encouraged through urban planning strategies determines the risk profile of certain areas.	Due to the lack of basic infrastructure and services, informal settlements are at greater risk during the occurrence of climate change events. The city has 150 informal settlements containing dense populations of which the majority are located within Region 1, Region 3 and Region 6.
Energy	The bulk of electricity generation within the city is generated by coal power plants in surrounding areas.	The city is vulnerable to the impacts of climate change in the form of weather events like that of lightning, increased occurrence of heatwaves and veld fires which damage power transmission lines. Due to increased temperatures, energy demand is likely to increase during summer and decrease during winter.
Infrastructure and Transport	Damage to infrastructure stems from flash floods as a result of slow-moving thunderstorms associated with lighting, damaging winds and hail.	The main climate risk within the city includes that of flash floods which damages existing infrastructure.

B.2.5.1.2.3 Priority risk factors

In conclusion to the city's Climate Risk and Vulnerability study, a number of priority risk factors were identified. These risk factors originated as a result of the social vulnerability assessment together with the risks identified in terms of extreme weather events and impacts on key sectors. The eight (8) priority risk factors identified include the following:

- Risk factor 1: Loss of ecosystem goods and services
- Risk factor 2: Increased energy demand
- Risk factor 3: Increase in diseases affecting human and animal health
- Risk factor 4: Damage to infrastructure (i.e. stormwater systems, roads, bridges)
- Risk factor 5: Water insecurity
- Risk factor 6: Flooding and damage to human settlements and private property
- Risk factor 7: Increase in sinkholes
- Risk factor 8: Decreased productivity of agro-ecosystems affecting food security

Together with each risk factor, the Climate Risk and Vulnerability study outlines possible adaptation measures together with regions of focus (targeted regions), refer to "City of Tshwane Climate Risk & Vulnerability Assessment (abridged version)" for details pertaining to the suggested adaptation measures.

B.2.5.2 *City of Tshwane Greenhouse Gas Emissions Inventory (Mitigation)*

The key driver behind the Mitigation Programme is the Greenhouse Gas Emissions Inventory (GHGEI). The GHGEI for 2014/15 financial year complies with the Global Protocol for Community-Scale (GPC) Greenhouse Gas Emissions Inventories and this has been independently verified. It reveals that the city is emitting 21 million tonnes of carbon dioxide equivalent (21mtCO_2e) per annum, which is

equivalent to 7 tCO_2e per capita. The three broad areas of emissions are energy (59%), transport (21%) and waste (20%) and these inform the response in terms of the Mitigation Programme.

Energy emissions are related to the manner in which the city powers buildings and various industries. Energy is primarily sourced from the national utility (Eskom) which has built up a national network of coal-fired power stations and has been slow to embrace sustainable alternatives.

Waste emissions are due to the manner in which the city manages waste, primarily landfilling which includes organic waste. This is one area that the CSU has identified as being directly within the city's control, thus having the ability to adopt more modern and environmentally sensitive waste management practices that will reduce emissions.

The third source of emissions is from the transport sector which is primarily affected by the city's spatial legacy. The spatial legacy has been based on principles of separated development and a lack of comprehensive networks which provide safe and reliable public transport modes. The city has a direct influence within the transport sector and has identified long-term intervention. Long-term intervention of the city's transport sector includes increased investment into public transport, amongst others the TRT system.

Table B-15 below indicates a high level overview of the mitigation focus within the CSU and characterises the intervention requirements as per the energy, waste management and transport sectors.

Table B-15: Mitigation interventions

Low Carbon Energy Future	Sustainable Waste Management	Clean Mobility
Promoting energy efficiency: Green Building By-law which reinforces passive design features. **Self-generation:** a focus on self-generation under 1 MW facilitated by the Embedded Generation Policy and Guidelines **Waste-to-energy:** Cost neutral green economy projects targeting our waste water treatment works and residual waste (municipal solid waste)	**Promote separation at-source:** all households and businesses separate recyclable waste from non-recyclable waste to enhance levels of recycling **Divert waste from landfill:** cost neutral green economy projects to enable the private sector to put recycling infrastructure in place **Waste-to-energy:** production of energy from the processing of residual waste and Waste Water Treatment Works (Formalisation of informal waste-pickers and protect their human rights)	**Spatial planning** to yield compact and dense cities (MSDF, RSDFs, Precinct Plans) **Sustainable Public Transport:** Bus Rapid Transit system inclusive of CNG buses in support of the C40 Clean Bus Declaration **Innovative & modernising service delivery:** CNG buses with WIFI, electric vehicles for messenger fleet, solar charging stations. **Promoting non-motorised transport:** The annual Green Ride, Kasi Rides and 2018 Car-Free day and advocating for NMT infrastructure to accompany road infrastructure development and upgrades; Tshwane Bike-Share Pilot at UP

B.2.5.3 *Climate response strategy – Ten (10) key interventions*

The city's Climate Response Strategy (CRS) was released as a final draft document during 2018, with the aim of establishing the current climate change context within the city together with the identification of ten (10) key intervention programmes focussed at building a climate resilient and resource efficient city. It should be noted that this document is regarded as a precursor to the City of

Tshwane's Climate Action Plan (CAP), which will be developed under the C40 Cities Programme[19], and to be submitted at Council for approval by March 2021.

The ten (10) key intervention programmes identified within the CRS has been outlined below and was established based on a strategic review of current climate assessments together with stakeholder engagements. Each intervention includes a short description, for details pertaining to each intervention refer to the "The City of Tshwane - Climate Response Strategy (2018)".

B.2.5.3.1 Intervention 1: Enhance and protect the city's natural ability to buffer climate change impacts

The city has an abundance of natural resources which provide invaluable eco-services such as heat mitigation, flood attenuation and enhanced water quality. These are under threat partly due to development patterns in the city. The city is striving to put protective measures in place for 31 priority wetlands by 2021 according to its Wetlands Management Plan (WMP). The city's land use planning and natural resource management will be closely guided by the bioregional plan which identifies biodiversity priority areas.

B.2.5.3.2 Intervention 2: Develop an integrated approach to water management in the city

Water scarcity has been anticipated within the Climate Risk and Vulnerability Study. The city is dependent on bulk water supplied by Rand Water, a quarter of which is lost through ageing infrastructure. The city is aiming to develop an integrated and holistic approach to water management, diversifying the water mix and exploring the re-use of groundwater, stormwater and rainwater. A Water Demand Management Programme inclusive of leaks management will be intensified with penalties for non-compliance.

B.2.5.3.3 Intervention 3: Build climate resilient communities

The nexus between exposure and vulnerability to climate risks and social vulnerability is self-evident. The urban poor bears the brunt of climate impacts and have low levels of resilience. Urban populations with access to resources indicate an increase in water and electricity consumption to cope with climate impacts. Disaster management is yet to fully and explicitly address climate change. The city is ensuring that a set of interventions address poverty, exposure to climate hazards, status of informal and high risk dwellings together with general health and wellbeing. Initially, resources will be focused on refining knowledge and an understanding of climate impacts together with multi-disciplinary and stakeholders' forums which will focus on building urban resilience. Disaster management will prioritise disaster risk reduction measures.

B.2.5.3.4 Intervention 4: Promote mixed-use densification and transit oriented development

The city's historic spatial form is characteristic of urban sprawl, which resulted in high population densities on the periphery resulting in unreasonably long, and costly, commuter distances. The unsustainable nature of historic spatial planning is the cause of more than four (4) million tonnes of carbon dioxide equivalent yielded annually within the transportation sector. Modern and efficient modes of transport such as the TRT system and strategies to densify and diversify urban nodes are central to overcoming these spatial inefficiencies. Transit Oriented Development (TOD) will integrate spatial planning, building design and transport infrastructure.

[19] City of Tshwane was accepted as the 70th member of the C40 Cities Climate Leadership Group (C40) in September 2014. C40 is currently rolling out the African leg of its Global Climate Action Planning Programme. Launched in May 2018, the programme currently provides comprehensive technical support to 11 cities on the continent, including the City of Tshwane, to develop ambitious and equitable Climate Action Plans in line with the objectives of the 2015 Paris Agreement.

B.2.5.3.5 Intervention 5: Promote cleaner mobility

Current trends indicate that motorised transport will remain the main mode of transport within the city. However, mass transit and cleaner modes of transport have been introduced with the aim of reducing transport-related emissions. The following has been implemented within the city:

- The TRT system has forty CNG-propelled buses which will be fuelled from landfill gas;
- The corporate fleet of the city has introduced ten (10) electric vehicles together with solar-powered Electric Vehicle (EV) charging stations;
- Infrastructure for electric vehicles will be rolled out in the city through partnerships with the private sector and the South African National Energy Development Institute (SANEDI), and;
- Non-motorised transport (NMT) will become an increasingly viable mode of transport.

B.2.5.3.6 Intervention 6: Retrofit existing buildings and build green buildings

Buildings have been classified as a source of high resource consumption during the process of construction and maintenance. This has prompted the city to endorse a Green Building Policy and By-law. The city is a member of both the Green Building Council of South Africa's (GBCSA) Green Building Leadership Network (GBLN) and the World Resources Institute's Building Efficiency Accelerator (BEA) Programme. Through the BEA programme, the city is in the process of retrofitting the HB Phillips building located within the inner city as part of a general upgrade. This project aims to illustrate that older buildings can operate optimally through retrofitting and green building initiatives. Tshwane House, home to the municipal headquarters, is a 5-star rated green building.

B.2.5.3.7 Intervention 7: Promote energy efficiency

The city's main sources of energy stem from carbon heavy resources. However, before the city can focus interventions towards the source of energy, reduction in energy consumption should be achieved. The achieve this the city has opted to introduce the following:

- Energy efficiency measures which include energy-saving lightbulbs within municipal buildings and streetlights;
- Installation of solar water heaters in low-income housing;
- Assessing the efficiency of operations such as the waste water treatment works, and;
- Exploring ways of enhancing the thermal efficiency of poor designed and constructed homes through simple but effective interventions such as the application of cool coatings.

B.2.5.3.8 Intervention 8: Promote cleaner and renewable energy

The city is primarily dependent on electricity derived from coal-fired power stations which is also a source of revenue for the city. This dependence translates into close to half of the city's carbon emissions. An Embedded Generation Policy (EGP) has been established and there is a steady progression of renewable energy installations within the city that are below the licensing threshold. The city is investing in renewable energy systems for own use to reduce operational costs, with hydro-energy gaining traction in the water reticulation system. Together with the above, the city is advocating for low carbon alternative energy solutions to meet suppressed demand, particularly within informal settlements.

B.2.5.3.9 Intervention 9: Divert waste from landfills and find innovative uses for waste

The GPC Greenhouse Gas Emission Inventories indicates that 10,848,006 of CO_2 is produced annually, based on current waste management practices. Little diversion of waste takes place and recycling typically occurs through informal recycling practices. The city aims to facilitate and implement the following:

- Diversion of waste from landfills, through the implementation of separation at-source and recycling infrastructure;
- Processing of residual waste to produce energy, and;
- Capturing of landfill gas to power vehicles.

B.2.5.3.10 Intervention 10: Pursue sustainability support mechanisms

A key lever for change is the city's purchasing power and hence a Sustainable Procurement Policy (SPP) has been adopted. The SPP aims to ensure that the city's capital and operational expenditure supports a sustainability agenda. Uptake is being prompted through supplier development programmes to enable suppliers to fulfil the requirements of revised, more sustainably oriented specifications. The city is a member of the Global Lead City Network on Sustainable Procurement. Examples of sustainable procurement implemented, include:

- Tshwane House, the city's municipal headquarters, which was scoped to be a five-star green building;
- The purchasing of electric vehicles for the corporate messenger fleet, and;
- CNG propelled buses for the TRT system.

The interventions which have been outlined above speaks to city wide adaptation and mitigation strategies. In planning and effecting these ten (10) interventions, the climate response strategy emphasises the importance of climate mainstreaming by having sustainability champions in each department and ensuring representation in key decision-making forums such the Budget Steering Committee (BSC), the Built Environment Performance Plan Steering Committee (BEPPSCO) and Capital Planning Steering Committee (CAPSCO). Refer to Section A of the BEPP for institutional arrangements pertaining to the BEPPSCO and CAPSCO, together with the introduction of CR&R focus areas within these forums and the capital planning and prioritisation process. Section C outlines the Capital Prioritisation Model (CPM) of the city and indicates where the results of the social vulnerability assessment together with the ten (10) intervention programmes have been incorporated into the model.

Currently, there are several C40 Network leaders in the key line function departments and each department has a nominated Green Ambassador. Refer to the Section B.4 below which outlines the institutional framework in place for the CSU as well as the introduction of climate change expertise into various departments and infrastructure planning.

B.3 Planning for Priority

The structure and contents which form part of Section B aligns to the City's hierarchy of planning documents, which starts with an overarching City strategic vision (Tshwane Vision 2055) and ends with specifically and strategically located precinct plans which focusses on small scale nodes, areas or corridors. Figure B-54 outlines the City's hierarchy of planning documents together with a description which indicates the scale of focus for each document.

Urban Network Structure (UNS) elements align to elements as identified within the Metropolitan Spatial Development Framework (MSDF) and identifies spatial planning priorities from a metropolitan perspective. The MSDF feeds into the Regional Spatial Development Framework (RSDF), which is more focussed towards regional contexts. The identification of spatially targeted areas typically occur from a local scale and aligns to Local Spatial Development Frameworks (LSDFs) and the identification of precinct plans. Each of these planning documents feed into budget and implementation plans.

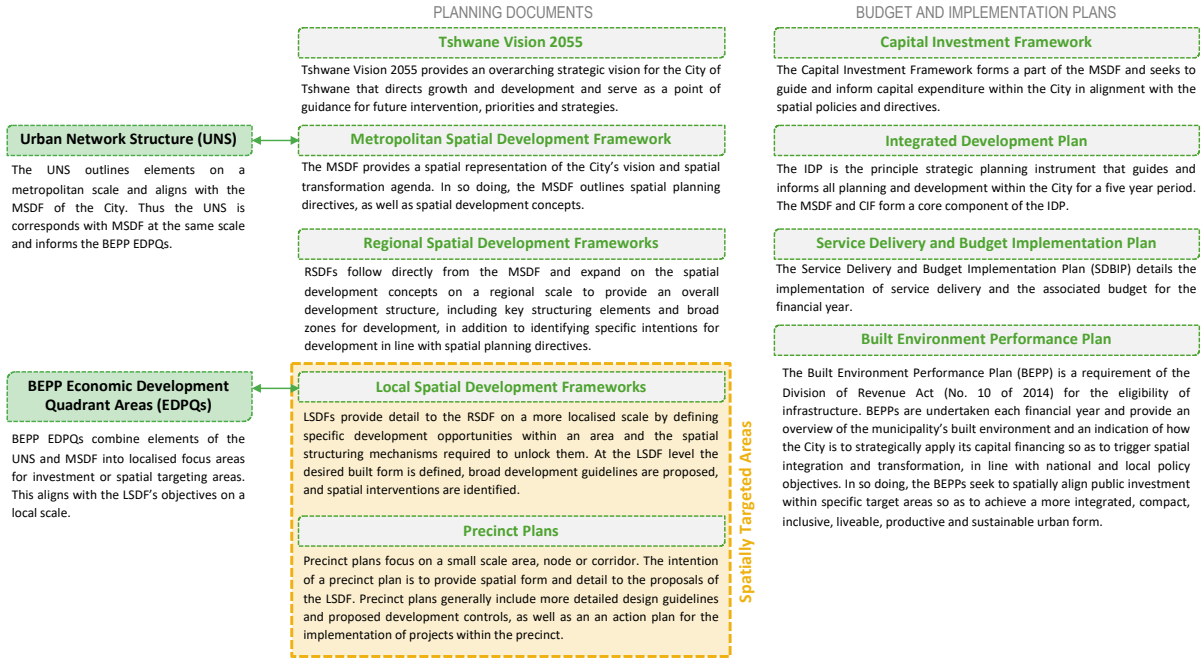


Figure B-54: City of Tshwane Package of Plans

Section B.2 contextualised elements of the UNS together with the City's current climate change risks and impacts. The contents included within Section B.2 speaks to the hierarchy of plans indicated in Figure B-54 and includes the Tshwane Vision 2055, the MSDF and the RSDF.

As a point of departure, Section B.2.2 established the urban form of the City in terms of the socio-economic nodal structure; current transport and movement patterns; identification of underserved areas and analysis of development trends. The urban form analysis informs elements of the UNS which aligns to the City's MSDF and is outlined in Sections B.2.3 and B.2.4. Section B.2.5 contextualised the current climate change impact and risks within the City, with the aim of integrating climate change mainstreaming into the municipal planning process.

Section B.3 aims to identify spatially targeted areas based on the UNS elements described in Section B.2, which will ultimately lead to the identification and prioritisation of precinct plans related to spatially targeted areas. Spatially targeted areas align with the LSDFs and Precinct Plans of the City as depicted in Figure B-54.

B.3.1 Identification of the BEPP Economic Development Priority Quadrants

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. As outlined in Table B-11, these elements as described within the MSDF aligns to elements of the UNS. The identification of the BEPP EDPQs will serve the purpose of the Integration Zones (refer to Section B.2.3.4.6), by delineating priority areas for investment and spatial targeting in die CPM.

The identification of EDPQs stems from the Mayoral Strategic Session convened by the Executive Mayor in November 2017[20] , whereby members of the Executive Council (ExCo) identified areas which are in need of accelerated service delivery and capital project implementation. These areas of focus included the following:

[20] Memorandum for the Implementation of the Outcomes of the Mayoral Strategic Planning Session, December 2017.

- Targeted spatial economic infrastructure investment, which includes areas such as:
  - Rosslyn / Wonderboom Quadrant
  - Waltloo / Silverton Quadrant
  - Sunderland Ridge / Monavoni Quadrant
- Targeted spatial social infrastructure investment, which includes areas such as:
  - Temba / Hammanskraal
  - Mabopane
  - Ga-Rankuwa
- Prioritizing key development along public transport routes in line with the Integrated Transport Plan.

In line with the priorities identified through the Mayoral Strategic Session and elements from the UNS and MSDF, the following integration zones were identified (refer to Figure B-55 below):

- Inner City (Capital Core)
- Integration Zone along the TRT alignment, as outlined within the MSDF
- Rosslyn/Wonderboom
- Waltloo/Silverton
- Sunderland Ridge/Monavoni
- Temba / Hammanskraal
- Mabopane
- Ga-Rankuwa
- Attridgeville
- Ekangala
- Rayton / Cullinan / Refilwe

The BEPP Guidelines for 2018/19 requires that municipalities prioritise integration zones in order to focus spatial targeting and investment in line with the strategies of the city. The city has prioritised the BEPP EDPQs (Integration Zones) into medium to long-term implementation priorities. BEPP EDPQs (Integration Zones) identified for medium-term implementation consist of the following, in order of priority:

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

These areas will be referred to as the BEPP EDPQs for purposes of BEPP reporting and will inform the identification of Catalytic Urban Land Development Programmes (CLDPs).

B.3.1.1 *Inner City (Capital Core)*

The Inner City or Capital Core is of strategic significance from a local, national and international perspective and has been identified as a strategic focus area within the City Development Strategy, IDP and MSDF. It also forms an integral part of the UNS and functions as a key economic node. The importance of the Inner City as a BEPP EDPQs stems from the Inner City Development and Regeneration Strategy (2016), which aims to regenerate and reposition the city through the introduction of key intervention strategies[21]. The vision which drives this strategy is derived from the fact that the Inner City serves a functional purpose as the Nation's Capital and is home to main government offices and significant land marks. In order for the city to successfully implement this strategy, commitment should be reflected in the annual budget process.

[21] Tshwane Inner City Development and Regeneration Strategy (2006)

B.3.1.2 *Rosslyn/Wonderboom Quadrant*

The Tshwane Automotive City Project (TAC)[22] originated in 2009/10 as a high level concept design, aimed at achieving a sustainable built environment which promotes mixed land-use initiatives. Since the inception of TAC, the Rosslyn/Wonderboom area has seen a substantial increase in industrial and residential development and investment which also features collaboration between different spheres of government, the private sector and local communities. The Rosslyn/Wonderboom industrial node has been earmarked as a large focus for future development within the Regional Spatial Development Framework (RSDF 2017) and contributes greatly towards the economic well-being of the city due to its existing predominantly automotive sector-based economy. Implementation of TAC will also encourage and promote intra- and inter-regional connectivity, which consequently provide for strong economic growth opportunities. In order for the TAC project to be successfully implemented, the city has prioritised this area as a key area for infrastructure development and investment.

B.3.1.3 *Waltloo/Silverton Quadrant*

The Waltloo/Silverton is classified as an industrial node within the city's MSDF and is home to the Ford Motor Company production plant. Through the implementation of the TAC strategy, strong inter-regional connectivity will be established of which one includes the Waltloo/Silverton industrial node, further promoting regional economic growth. The RSDF (2017) outlines Waltloo/Silverton as the second most important industrialised area which provides the majority of job opportunities within Region 6. Given that Region 6 includes Mamelodi, Eersterust and Nellmapius which are classified as large-scale marginalised areas with a high unemployment rate, the focus on the Waltloo/Silverton industrial node will primarily focus on job creation. In order for the city to achieve this, together with establishing successful inter-regional connectivity with the Rosslyn/Wonderboom node, the Waltloo/Silverton industrial node has been classified as a key area for infrastructure development and investment.

Figure B-55 below illustrates the inter-regional connectivity between each of the above mentioned BEPP EDPQs and how each of these areas form an integral part of achieving the city's strategic vision. The identification of the above medium term investment focus areas strives to align infrastructure investment planning to the spatial priorities of the city and will ultimately aim to achieve a more sustainable and compact city structure.

[22] Tshwane Automotive City Development Framework (Draft 2016)

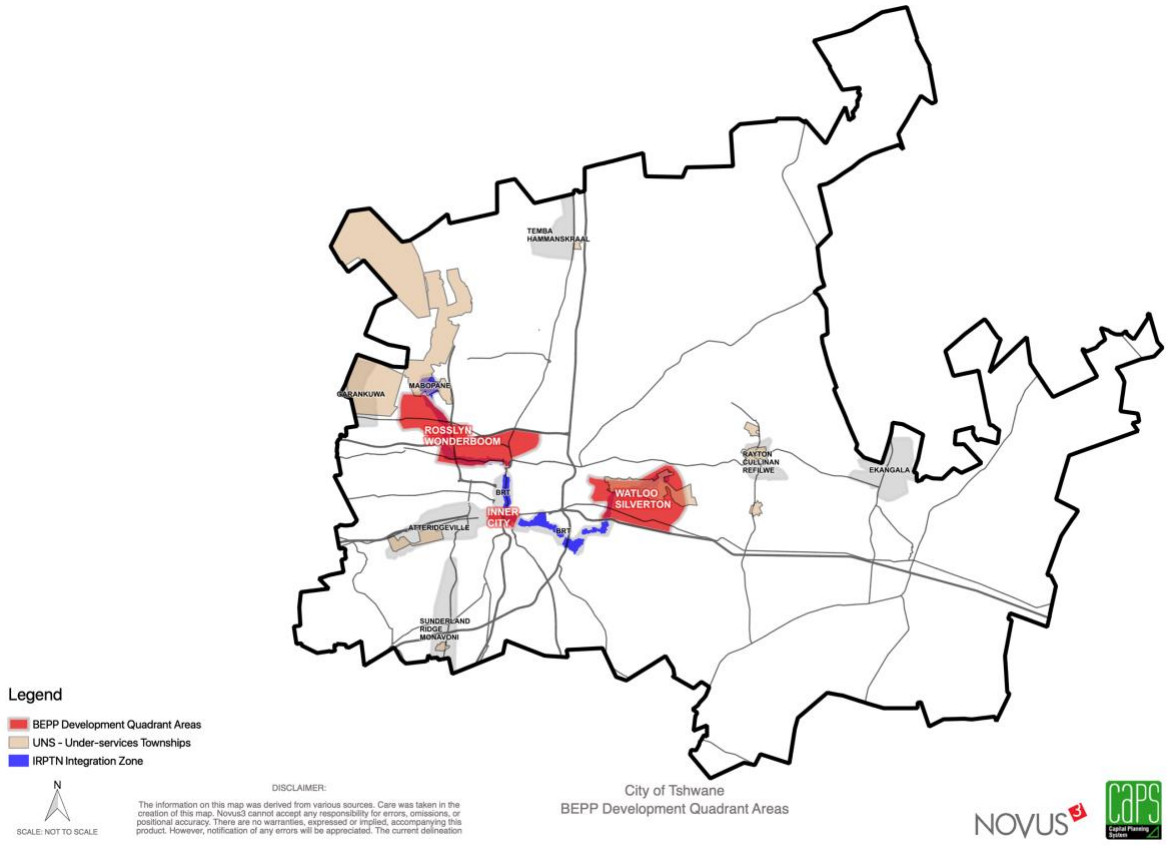


Figure B-55: BEPP Economic Development Priority Quadrants

B.3.2 Spatially targeted areas climate risks and actions

Section B.3.1 indicates the prioritisation of the EDPQs (Integration Zones) into medium- to long-term investment priority focus areas. The three (3) BEPP Economic Development Priority Quadrants which have been identified within the city includes:

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

An overview of climate change impacts and risks have been listed below and is based on the climate response strategy and vulnerability assessment outlined in B.2.5.

B.3.2.1 *Inner City / Capital Core*

With respect to the Inner City / Capital Core, there are several critical issues that need to be addressed that have been linked to the impacts of climate change:

- Firstly, temperature rise as established in the climate risk and vulnerability assessment is exacerbated in the Inner City due to the absence of greenery, open space and soft surfaces. Therefore heat management measures are especially required for the city of which one includes the implementation of green roofs and pocket parks. Temperature rise also affects the performance of buildings, with older buildings being afflicted by sick building syndrome[23]

[23] A condition affecting office workers, which includes headaches and respiratory problems, attributed to unhealthy or stressful factors in the working environment such as poor ventilation.

and underperforming HVAC[24] systems. The work being done through the Green Buildings Programme (Refer to Section B.4.2.2) will address concerns with regards to building performance.

- Secondly, congestion and related air pollution from vehicles compromises air quality and this combined with temperature rise creates a very unhealthy environment for residents who live, work and commute through the city. Measures need to be put in place to minimise the sources of air pollution. The concept of congestion charges and the banning of diesel-powered vehicles has been implemented in other cities and could be a viable option for the City of Tshwane.
- Thirdly, extreme weather events can be a source of flash floods where stormwater drains become blocked. As per the climate risk and vulnerability assessment, there is a direct correlation between extreme weather events and the built environment including infrastructure such as roads, pavements and traffic lights. The negative impacts of climate change on the built environment give rise to additional impacts on the efficiency of the road networks, accessibility and public transport.

B.3.2.2 *Rosslyn/Wonderboom and Waltloo/Silverton*

As outlined in Section B.3.1, the Rosslyn/Wonderboom area is home to the TAC which has recently seen a large increase in public and private investment together with industrial and residential development. The CSU represents the city as part of the Automotive Industry Development Centre (AIDC), which also includes automotive manufactures within the region. The AIDC provides a platform within which the city has the opportunity to share best practices regarding the running of resource efficient manufacturing plants. This aligns with the city's strategic vision to be more resource efficient and resilient. The Tshwane Automotive City Development Framework (TACDF) outlines a large focus towards greening within the Rosslyn/Wonderboom area together with rehabilitation strategies aimed towards existing open spaces. The rehabilitation of open spaces and greening of areas will contribute significantly towards heat management measures.

Although the Waltloo/Silverton area does not directly from part of TAC, the principles applied to the Rosslyn/Wonderboom area through the AIDC platform applies to manufacturers across the city, and by implication those located in the Watloo/Silverton area.

B.3.3 Priority Precinct Identification

Figure B-54 indicates that precinct plans focus on a small scale area, node or corridor. The intention of a precinct plan is to provide spatial form and detail to the proposals of the LSDF. Precinct plans generally include more detailed design guidelines and proposed development controls, as well as an action plan for the implementation of projects within the precinct.

The BEPP EDPQs identified above should inform the identification, prioritisation and implementation of the city's precinct plans together with the LSDF. The following section identifies the precinct plans currently under consideration by the city together with the prioritisation of these precinct plans for short, medium and long term implementation. In conclusion the prioritised precinct plans will be analysed within the BEPP EDPQs, in order to establish a framework for the identification of Catalytic Land Development Programmes (CLDPs).

[24] A HVAC system is a system used for heating, ventilation, and air-conditioning within buildings. The objective of an HVAC system is to ensure that the indoor environment is both safe and comfortable for humans.

B.3.3.1 *Precinct Plans within the City*

The city has identified a number of precinct plans that will serve a specific purpose within a given region. These precinct plans will unlock socio-economic support, economic growth opportunity and assist in developing liveable vibrant community spaces. Table B-16 outlines the current precinct plans envisioned for the city together with the purpose of each precinct and the impact on the spatial planning environment.

Table B-16: City-wide Precinct Plans

Spatial Policy	Purpose	Changes in planning Context
Region 1		
Pretoria North Precinct Plan	Demarcate an area where non-residential uses can be supported and the applicable density for residential developments.	• Alignment with the RSDF, Tshwane Open Space Framework (TOSF) and other applicable policies
Ga-Rankuwa Gateway Node Precinct Plan	Educational and student accommodation purposes.	• Density will increase and housing typology will be affected • Roads and transport will need changes • Cycling and walking infrastructure for students need to be provided
Tshwane Automotive City (TAC) Precinct Plan	To refine the Development Framework and Master Plan proposals.	• Land use changes • Increased accessibility • Additional demand for utility services
Mabopane station / Soshanguve station Precinct Plan	Revitalization of Mabopane station, Soshanguve station and Mabopane Section N (industrial township).	• Promote economic development at the two stations and propose applicable uses to promote employment opportunities in Mabopane Section N.
Development guidelines and access management along activity spines and activity streets in the Soshanguve Areas	To provide guidelines on the establishment of non-residential land-uses along activity spines- and streets.	• To address issues of access • How to treat street interfaces
Spatial Development Framework for the Akasia Metropolitan Core.	To establish spatial guidelines for development in the Akasia core area.	• Land use changes • Increased density • Increased capacity of utility services to accommodate the above • Expanded range of housing typologies
Spatial Development Framework / Urban Design Framework for BRT Line 1 B & C.	To establish spatial guidelines for development Line 1 B & C. corridor.	• Density will increase and housing typology will be affected. • Roads and transport will need changes. • Cycling and walking infrastructure for students need to be provided
Region 2		
Wonderboom Airport Precinct Plan	Guide and exploit development potential of an aerodrome area.	• Wonderboom Airport has introduced commercial flights.

Spatial Policy	Purpose	Changes in planning Context
Tshwane Freight and Logistic Hub Precinct Plan	Exploit the existing economic infrastructure to create job opportunities.	• Land has been identified for the hub and studies are being conducted.
Onderstepoort and Haakdoornboom Precinct Plan	Guide and exploit development potential of the area.	• Increase in densification.
Rainbow Junction Development Node Precinct Plan	Maximise the greater potential concealed within the node.	• Increase in densification.
Hammanskraal CBD Precinct Plan	Formalise the informal urban economy and form in order to optimise the growth and development of the node.	• Increase in densification.
Region 3		
Hatfield Urban Design Framework for public space and streets.	To guide Planning and Densification and Mixed land uses in the precinct. Focus must be on the public space and streets.	• Guidelines for densification and mixed land-use Including transport and NMT
Spatial Development Framework / Urban Design Framework for BRT Line 1 A.	To Guide Planning and Densification and Mixed use along the BRT including Public open spaces and social facilities. Focus must be on the public space and streets.	• Guidelines for densification and mixed land-use Including transport and NMT
Spatial Development Framework / Urban Design Framework for BRT Line 2 A.	To Guide Planning and Densification and Mixed use along the BRT including Public open spaces and social facilities	• Guidelines for densification and mixed land-use Including transport and NMT.
Spatial Development Framework / Urban Design Framework for BRT Line 2 B.	To Guide Planning and Densification and Mixed use along the BRT including Public open spaces and social facilities	• Guidelines for densification and mixed land-use Including transport and NMT.
Lotus Gardens and Fort West Precinct Plan	To improve the linkages between the two (2) township as they will function as one. Focus must be on the public space and streets.	• The expectation is that the precinct plan must detail the linkages between the two areas and links through public transport and NMT, open spaces as the area is densifying.
Marabastad and West Capital Precinct	To Guide Planning and Densification, Mixed use and Public Transport including Public open spaces and social facilities.	• Guidelines for densification and mixed land-use including transport and NMT.
Arcadia North, Eastclyfe, Eastwood, Kilberry and Lisdogan Park	To Guide Development in these areas such as densities and Mixed land uses offices etc.	• Guidelines for development and mixed land uses such as offices
Koedoespoort Industrial Area Management	Exploit the existing economic infrastructure to create job opportunities.	• Guidelines for mixed land-use including transport and NMT.
Eugene Marais Hospital Precinct	Management of Medical Facilities in area and surrounding residential Area.	• Guide the expansion of the medical facilities and the surrounding residential character. Provide development guidelines in relation to vehicle, and pedestrian movement as well as structural placement.

Spatial Policy	Purpose	Changes in planning Context
A precinct plan for the Council property in Menlo Park/Ashlea Gardens on 26th street.	Management of Club Facilities in area and surrounding residential Area. Focus must be on the public space and streets.	• Provide development guidelines and space allocation in relation to vehicle, and pedestrian movement as well as structural placement.
Hazelwood Node Urban Design Framework for public space and streets.	Management of mixed uses in area and surrounding residential Area. Focus must be on the public space and streets.	• Provide development guidelines and space allocation in relation to vehicle, parking and pedestrian movement.
Salvokop Urban Design Framework	To establish spatial guidelines for future Salvokop developments.	• Guidelines for mixed land-use including transport and NMT.
Region 4		
Precinct Plan for Gautrain Station (Centurion/ West Avenue).	To Guide Planning and densification, mixed-use and public transport including public open spaces and social facilities. Focus must be on the public space and streets.	• Guidelines for densification and mixed land-use including integration of transport and NMT.
Urban Design Framework and Infrastructure Management Framework for the Centurion Metropolitan Core.	To guide planning and densification, Mixed-use and public transport including public open spaces and social facilities. Focus must be on the public space and streets.	• Guidelines for densification and mixed land-use including integration of transport and NMT.
Precint plan for the provision of services and guideline for development in green area for the eastern boundary outside of the urban edge where rapid development associated with the Lanseria Regional Spatial Policy, currently being drafted by Gauteng	To guide planning and densification, mixed-use and public transport including public open spaces and social facilities.	• Guideline for infrastructure development for the eastern boundary with the rapid development associated with the Lanseria Regional Spatial Policy, currently being drafted by Gauteng.
Urban Design Framework and Infrastructure Management Framework Monavoni Nodal Area (extension to Lanseria Regional Spatial Policy above).	To guide planning and densification, mixed-use and public transport including public open spaces and social facilities. Focus must be on the public space and streets.	• Guidelines for densification and mixed land-use including integration of transport and NMT.
Urban Design Framework and Infrastructure Management Framework for the Kosmosdal/ Samrand/ Olievenhoutvbos area.	To guide planning and densification, mixed-use and public transport including public open spaces and social facilities. Focus must be on the housing provision and work opportunity generation	• Guidelines for densification and mixed land-use including integration of transport and NMT.

Spatial Policy	Purpose	Changes in planning Context
Urban Design Framework and Infrastructure Management Framework and Road infrastructure plan for the Raslouw AH	To guide planning and densification, mixed-use and public transport including public open spaces and social facilities. Focus must be on the public space and streets.	• Guidelines for densification and mixed land-use including integration of transport and NMT.
Region 5		
Derdepoort area TAC Precinct	Promote and encouragement of development of the Industrial area in the identified precinct for intensification of Industrial use in line with and in support of the Tshwane Automotive City Concept.	• Create development guidelines and perimeters to guide the industrial development in the area.
Refilwe-Cullinan Tourism Precinct and Rayton-Cullinan Tourism Precinct	Precinct planning to guide the linkage between the linkage between the town ship and the Cullinan tourism hub	• Create opportunity for the community to tie in with the Tourism facilities in Cullinan. • Promote the township economy by encouraging guesthouses, township tours etc.
Gem Valley, Glenway and Leeuwfontein area	Manage the development in the area.	• Create detailed plans to manage the growth and provide the linkages between the areas and the Tshwane CBD. • Promote public transportation and main focus.
Region 6		
Spatial Development Framework / Urban Design Framework for BRT Line 2 C and D.	To Guide Planning and Densification, Mixed use and Public Transport including Public open spaces and social facilities.	• To improve public and private investment at a sufficient scale.
Denneboom and Surrounding Precinct Plan	Incorporate plans by Treasury for the development of a plan managing the BRT densifications around Denneboom, the Proposal by Public Works for a Government Precinct and well as the surrounding residential development interface with the precinct.	• Create a management plan that focuses on the proposed frameworks for the area. • Manage the transformational planning processes.
Greater Mamelodi Transitional zones (Train station) Precinct plans	Precinct planning to guide the densification planning, and engineering services upgrade requirements for the areas around the identified stations.	• Guide development and provide infrastructural requirements for the areas within the transitional zones at the following Stations: - Eerste Fabrieke - Mamelodi Gardens - Green View and - Pienaarspoort stations
Max City and Surround Precinct.	Guidelines for Densification and Mixed land use Including transport and NMT.	• To improve public and private investment at a sufficient scale.

Spatial Policy	Purpose	Changes in planning Context
Mooiplaats Area Precinct. For areas within the Urban Edge currently under mixed use development pressure.	Create development guidelines and perimeters to guide the industrial development in the area.	• To improve public and private investment at a sufficient scale.
Menlyn Node Urban Design Framework for public space and streets.	To Guide Planning and Densification, Mixed use and Public Transport including Public open spaces and social facilities.	• To improve public and private investment at a sufficient scale.
Region 7		
Sokhulumi Agri-village	In line with the Gauteng Rural Development Plan, 2014- the Agri - village concept should be investigated in the Sokhulumi Village. As defined in this document, the concept seeks to integrate residential development with agriculture in order to improve the livelihood of rural communities; the expansion of this area should place more emphasis on agriculture.	• This is to create a settlement that is vibrant, equitable and sustainable in the rural context. • To improve public and private investment at a sufficient scale.
Ekangala Area	With focus on the emerging node at the R513 and Isitjaba Road intersection. There is a need for a retail and or mixed use development to service the residence of the Ekangala area. In addition, non-residential activities along local activity streets should be encouraged in order to contribute towards the township economy. Similarly, the development and conservation of public open spaces must be considered.	• The area includes the industrial area, Ekangala and the informal taxi rank area. • To improve public and private investment at a sufficient scale.
Zithobeni Area:	The area between the Bronkhorstpruit Town and Zithobeni. This is to improve integration between Bronkhorstspruit Node and approved and proposed Townships within that area	• To improve public and private investment at a sufficient scale.

Table B-16 indicates that the largest concentration of precinct plans identified within Region 3, which includes the Inner City. Region 1 also contains a large concentration of precinct plans which aligns with the focus established trough the TAC project located in Rosslyn/Wonderboom. The precinct plans listed above is displayed in Figure B-56.

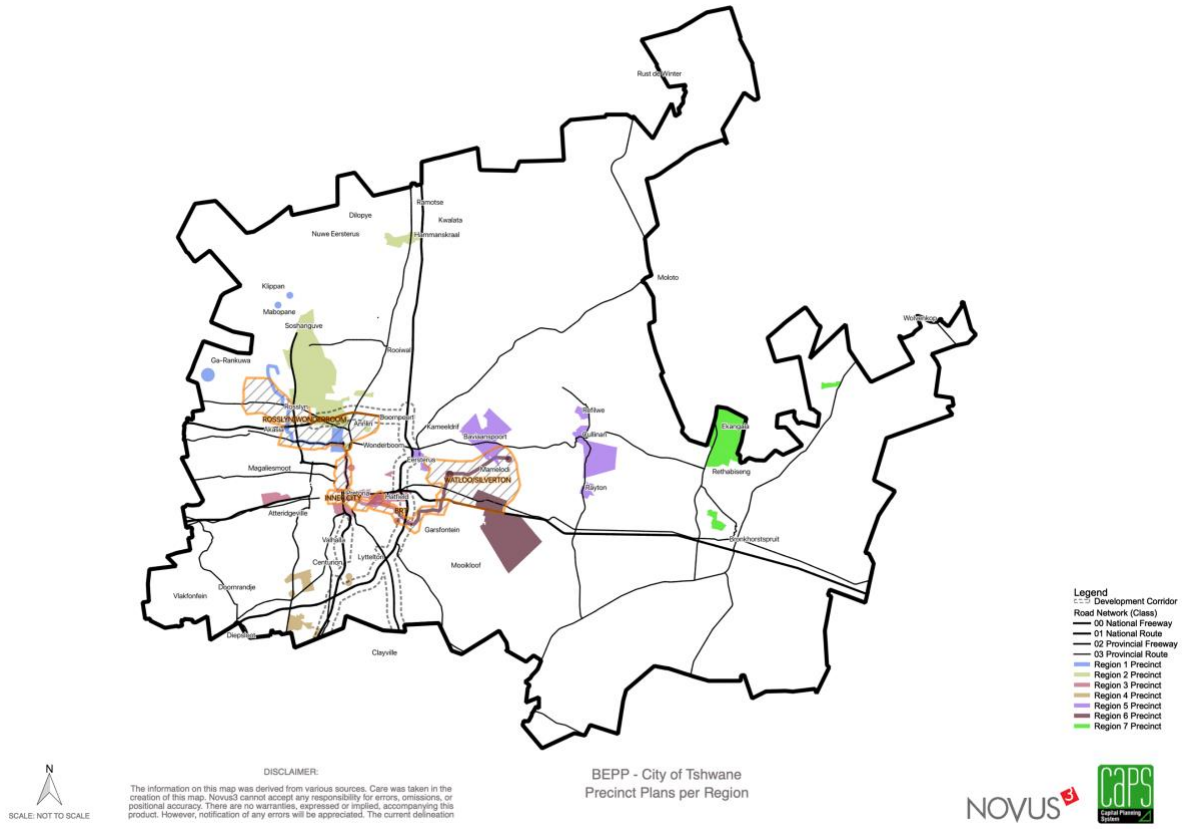


Figure B-56: Spatial distribution of Precinct Plans

It is important to note that the majority of the above mentioned precinct plans are currently still in draft format and do not have an established outline or precinct delineation. For purposes of the BEPP, an estimated location pertaining to each precinct has been indicated.

B.3.3.2 *Precinct Plan Prioritisation*

The previous section established the current precinct plans identified within the city together with a description of each precinct plan and the impact thereof on the spatial planning environment. Section B.3.3.2 aims to describe the prioritisation methodology applied to the precinct plans envisioned for the city for short-, medium- and long-term implementation. The city's strategic vision, IDP development pillars, MSDF and climate change mainstreaming focus plays a key role in determining the priority of each precinct plan.

B.3.3.2.1 Determining Factors

The city has identified spatially-led development programmes based on focus areas within the MSDF, which aims to inform interventions pertaining to the city's settlement restructuring agenda. Table B-17 indicates a list of programmes, which consists of sub-programmes, and a description outlining the aims and objectives of each programme.

Table B-17: Spatially-led Development Programmes

Programme	Sub-Programme	Description
Movement and Connectivity	• Linkages	• This refers to motorised transport including the rail, buses, taxis, etc.

Programme	Sub-Programme	Description
	• Corridor Development • Public Transport (include Public transport facilities) • Non-Motorised Transport	
Environmental	• Green Economy (Waste Management) • Open Space Management Framework (Parks, Cemeteries)	• These are areas with high environmental value. These areas include large tracks of ridges, rivers, parks etc.
Sustainable Human Settlements	• Land Tenure • Proclamation of unproclaimed townships • Social Housing • Formalisation into provision of a serviced stand • Social Facilities	• Informal settlements are areas that do not have a formal layout and are not proclaimed.
City-wide Densification (cross cutting issues)	• Densification • Infill • Maintaining and managing investments in developed residential areas • Places of Economic activity (Nodes) • Places of Economic activity (Industrial Areas)	• Intensification of land use. • Eradicating gaps within the spatial fabric. • Formal areas with high level of infrastructure. These areas normally have old infrastructure need maintenance. • Area with wider economic influence within the city and usually includes mixed land use. • Focus on Metropolitan Nodes. • Industrial areas that include manufacturing, warehousing, etc.
Rural Management	• Agri-villages • Rural Tourism	• Regional agriculture and rural areas including rural tourism areas.

The above listed programmes and focus areas provides a framework for the identification of prioritisation criteria, as described in Section B.3.3.2.3, and informs the future spatial planning directive of the City in terms of precinct plan identification.

B.3.3.2.2 Climate Change Mainstreaming

Based on the climate change mainstreaming objective identified within the city, refer to Section B.2.5, the city has opted for the inclusion of climate change adaptation or mitigation action planning as part of the precinct plan prioritization process.

Although climate change impacts are experienced at a city-wide level, impacts and risks may vary at different scales or within different local areas. The variation in climate change risks and impacts depend on factors which include the condition of existing infrastructure, the extent of hard and impermeable surfaces, the ratio of open and green spaces and the condition of vegetation. In order for the city to successfully adapt or mitigate impacts associated with climate change, the magnitude and risk of each impact should be identified and addressed at a precinct level.

Precinct plans provide a local framework in which specific climate change concerns can be addressed through mitigation and adaptation measures, which include:

- Heat stress;
- Air quality management;
- Climate proofing of infrastructure;
- Green buildings development;
- NMT promotion (pedestrianization, cycling lanes);
- Pocket parks and greening;
- Storm water retention and management of storm water drains, and;
- Separation at source and recycling programmes.

The identification of climate change intervention measures at a precinct level provides a framework for the establishment of prioritisation criteria, as described in Section B.3.3.2.3, and promotes climate change action planning in terms of a bottom up approach.

B.3.3.2.3 Prioritisation Criteria

The determining factors derived from the city's MSDF and spatially-led development programmes (Section B.3.3.2.1), together with climate change action planning (Section B.3.3.2.2) informs the criteria for prioritising precinct plans for short-, medium- and long-term implementation. Table B-18 outlines the prioritisation criteria and weighting applied to the precinct plans envisioned for the city as described in Section B.3.3.1 above.

Table B-18: Precinct Plan Prioritisation Criteria

Criteria Categories	Criteria Details	Scoring	Climate Responsiveness Scoring	Total Score
Integration Zones	• Fulfilling the outcomes of Spatial Transformation. • Within Integration Zones, as reflected in BEPP.	35	5	40
Transport	• Falls within a node, as identified in the MSDF. • Precinct plan to address Roads for (economic) Growth e.g. PWV 9 as identified in the MSDF and CITP. • Within 5km radius of an active (not decommissioned) public transport station. • Study area is geared specifically to address TOD and NMT in line with MSDF and CITP. • Precinct plan geared to address detailed, integrated infrastructure planning in order to achieve spatial transformation outcomes as identified in the MSDF. • Precinct plan geared to address the socio-economic needs of Marginalised areas as identified in BEPP.	15	5	20
Economy	• Specialised activity node, as identified in the MSDF. • Precinct plan to address Roads for (economic) Growth e.g. PWV 9 as identified in the MSDF and CITP.	15	5	20

Criteria Categories	Criteria Details	Scoring	Climate Responsiveness Scoring	Total Score
	• Study area is geared specifically to address job creation in line with Economic Strategy of the City. • Industrial node as identified in the MSDF and in line with the Economic Strategy of the City. • Precinct plan geared to address detailed, integrated infrastructure planning in order to achieve spatial transformation outcomes as identified in the MSDF. • Precinct plan geared to address the socio-economic needs of Marginalised areas as identified in BEPP.			
Sustainable Human Settlements	• Study area is geared specifically to address public housing implementation in line with MSDF and Sustainable Human Settlements Planning. • Precinct plan geared to address detailed, integrated infrastructure planning in order to achieve spatial transformation outcomes as identified in the MSDF. • Precinct plan geared to address the socio-economic needs of Marginalised areas as identified in BEPP.	15	5	20

Table B-18 indicates that the BEPP EDPQ (Integration Zone) category receives the highest score. This aligns with the objective of achieving spatially targeted areas which promote socio-economic growth and optimises the spatial distribution of current and future capital investment. The climate responsiveness criteria applies to precinct plans which aim to address climate change impacts through adaptation or mitigation measures, and promotes climate change mainstreaming within the city's spatial planning environment. The following section outlines the results of the prioritised precinct plans, after the prioritisation criteria and weightings have been applied.

B.3.3.2.4 Prioritised Precinct Plans

The list of envisioned precinct plans for the city, as described in Section B.3.3.1, underwent a process of prioritisation (Section B.3.3.2) to identify priority precinct plans for short-, medium- and long-term implementation. Table B-19 shows the results of the precinct prioritisation process in terms of implementation priority and region, together with the actions required.

Table B-19: Prioritised Precincts

Spatial Policy	Comment	Review of Existing Plan?	New Plan Required?
Region 1 – Short Term Implementation			
Pretoria North Precinct Plan	• Needed urgently as a large amount of application has been received and current SDF policy is outdated.	Yes	Pretoria North Precinct Plan

Spatial Policy	Comment	Review of Existing Plan?	New Plan Required?
Ga-Rankuwa Gateway Node precinct plan.	• Needed urgently as a large amount of application has been received and current SDF policy is outdated.	Yes	
Tshwane Automotive City (TAC) Precinct Plan	• Medium Term priority and normally work is being completed and it also on-going.		Yes
Region 1 – Medium Term Implementation			
Mabopane Station / Soshanguve station Precinct plan	• Medium Term priority and normally work is being completed and it also on-going.	Yes	
Region 1 – Long Term Implementation			
Development Guidelines and access management along Activity Spines and Streets in the Soshanguve Areas.	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 1B & C. • Exact route and station locations are needed.		Yes
Spatial Development Framework for the Akasia Metropolitan Core.	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 1B & C. • Exact route and station locations are needed.		Yes
Spatial Development Framework / Urban Design Framework for BRT Line 1 B & C.	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 1B & C. • Exact route and station locations are needed.		Yes
Region 2 – Short Term Implementation			
Wonderboom Airport Precinct Plan			Yes
Tshwane Freight and Logistic Hub Precinct Plan			Yes
Region 2 – Medium Term Implementation			
Onderstepoort and Haakdoornboom Precinct Plan		Yes	
Rainbow Junction Development Node Precinct Plan		Yes	
Hammanskraal CBD Precinct Plan		Yes	
Region 3 – Short Term Implementation			
Hatfield Urban Design Framework for public space and streets.	• Work has started. The University of Pretoria have appointed consultants to do Hatfield Urban Design Framework for public space and streets.		
Spatial Development Framework / Urban Design	• Draft Framework has been approved by Council for public participation purposes.		Yes

Spatial Policy	Comment	Review of Existing Plan?	New Plan Required?
Framework for BRT Line 1 A.			
Spatial Development Framework / Urban Design Framework for BRT Line 2 A.	• Draft Framework has been approved by Council for public participation purposes.		Yes
Hazelwood Node Urban Design Framework for public space and streets.	• Work has started by private sector. • Line 1A is operational and needs a plan.		
Salvokop Urban Design Framework	The work has been done by the Private sector.		
Region 3 – Medium Term Implementation			
Spatial Development Framework / Urban Design Framework for BRT Line 2 B.	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 2 B. • Exact route and station locations are needed.		Yes
Lotus Gardens and Fort West Precinct Plan	• Can only commence with plan / framework once detail design has been finalized in terms of BRT for the west. • Exact route and station locations are needed		Yes
Marabastad and West Capital Precinct	• The Precinct is experiencing some development especially the social housing and urban management pressure		Yes
Koedoespoort Industrial Area Management			Yes
Eugene Marais Hospital Precinct			Yes
Region 3 – Long Term Implementation			
A precinct plan for the Council property in Menlo Park/Ashlea Gardens on 26th street.	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 2 B. • Exact route and station locations are needed. • Project should be done Property Management section.		
Arcadia North, Eastclyfe, Eastwood, Kilberry and Lisdogan Park	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 2 B. • Exact route and station locations are needed.		Yes
Region 4 – Short Term Implementation			
Precinct Plan for Gautrain Station (Centurion/ West Avenue).	• Needed urgently as a large number of applications have been received and current SDF policy is outdated.	No	Yes

Spatial Policy	Comment	Review of Existing Plan?	New Plan Required?
	• Growth Point prepare to pay for the upgrade in West Avenue in association with Tshwane Engineering Departments.		
Urban Design Framework and Infrastructure Management Framework for the Centurion Metropolitan Core.	• Needed urgently. The construction of the terminus not in line with previous plan will have a profound influence in the development of the rest of the development envelop of the precinct. • New plan should give direction to the development of the rest of the precinct to include the future development of the International Convention centre and rest of mixed use land uses in terms of the BCX agreement.	Yes	Yes
Region 4 – Medium Term Implementation			
Urban Design Framework and Infrastructure Management Framework Monavoni Nodal Area (extension to Lanseria Regional Spatial Policy above).		Yes	
Urban Design Framework and Infrastructure Management Framework for the Kosmosdal/ Samrand/ Olievenhoutvbos area.		Yes	
Urban Design Framework and Infrastructure Management Framework and Road infrastructure plan for the Raslouw AH		Yes	
Region 4 – Long Term Implementation			
Precint plan for the provision of services and guideline for development in green area for the eastern boundary outside of the urban edge where rapid development associated with the Lanseria Regional Spatial Policy, currently being drafted by Gauteng			Yes
Region 5 – Short Term Implementation			
Derdepoort area TAC Precinct			Yes
Refilwe-Cullinan Tourism			Yes

Spatial Policy	Comment	Review of Existing Plan?	New Plan Required?
Precinct and Rayton-Cullinan Tourism Precinct			
Gem Valley, Glenway and Leeuwfontein area			Yes
Region 6 – Medium Term Implementation			
Spatial Development Framework / Urban Design Framework for BRT Line 2 C and D.		Yes	
Denneboom and Surrounding Precinct Plan		Yes	
Greater Mamelodi Transitional zones (Train station) Precinct plans			Yes
Max City and Surround Precinct.			Yes
Mooiplaats Area Precinct. For areas within the Urban Edge currently under mixed use development pressure.			Yes
Region 6 – Long Term Implementation			
Menlyn Node Urban Design Framework for public space and streets.	• Can only commence with plan / framework once detail design has been finalized in terms of BRT Line 2C. • Exact route and station locations are needed. Project should be done Property Management section.		
Region 7 – Short Term Implementation			
Sokhulumi Agri-village	• The area does not have a plan guiding spatial planning and land use management. • This area only depends on the Agri-village concept to guide land use.		Yes
Region 7 – Medium Term Implementation			
Ekangala Area	• There is an application for a proposed mall in the area which has not been finalise. • This will be a catalyst for other developments.		Yes
Region 7 – Long Term Implementation			
Zithobeni Area:			Yes

Table B-19 outlines the precincts which have been prioritised for short-, medium- and long-term implementation. Short-term implementation requires urgent work to be conducted by the city due to development pressure. Medium-term implementation indicates that precincts are not ready for

implementation, due to additional work that is required which include incomplete detail designs or feasibility studies. Long-term implementation indicates that precincts are still in planning phase and that detail designs or feasibility studies are still outstanding or incomplete.

B.3.3.3 *Precinct Plans within BEPP EDPQ's*

Figure B-57 illustrates the prioritised precinct plans for short-, medium- or long-term implementation in line to the BEPP EDPQ's. The alignment of the prioritised precinct plans should correlate with the BEPP EDPQ's which have been prioritised in Section B.3.1. These areas have been highlighted in Figure B-57 as dark purple areas and include (in order of priority):

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

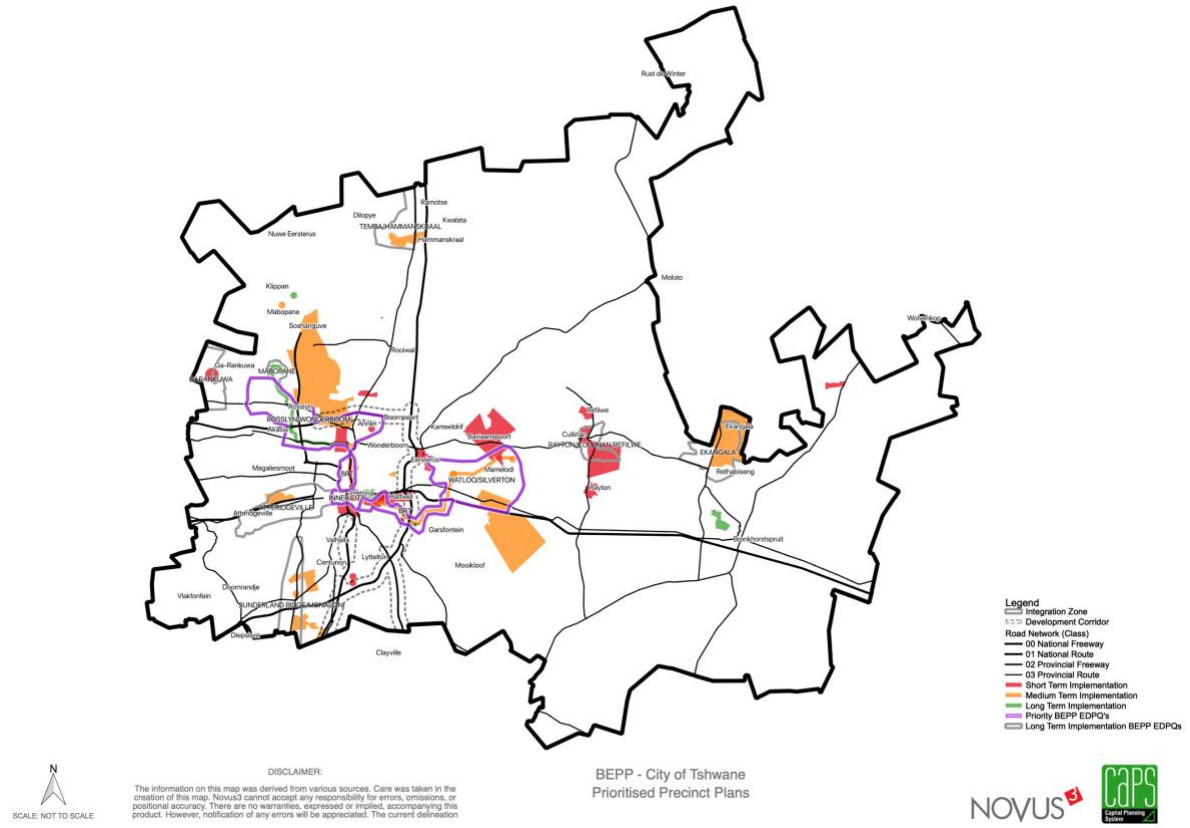


Figure B-57: Prioritised Precinct Plans within BEPP EDPQs

Figure B-57 indicates a strong correlation between precincts which have been prioritised for short-term implementation and the prioritised BEPP EDPQ'S. The majority of the short-term priority precincts are located within the Inner City, Rosslyn/Wonderboom area and the Waltloo/Silverton area. Medium-term precincts also indicate a strong alignment with the priority BEPP EDPQs, as the BEPP EDPQs identified for medium to long-term implementation. The contents illustrated above indicate that the prioritisation of precinct plans were primarily based on the "Integration Zones" priority criteria as outlined in Table B-18. The prioritisation of the above mentioned precinct plans will ultimately inform the identification of Catalytic Land Development Programmes (CLDPs), which will be discussed as part of Section C.

B.4 Institutional Arrangements

B.4.1 Spatial Development Framework

The city is in the process of reviewing and updating the 2012 Metropolitan Spatial Development Framework (MSDF). The Regional Spatial Development Framework (RSFD) has been approved at Council on 26 July 2018. The RSDF focusses on the spatial, economic and ecological transformation and is considered as the implementation mechanism for the spatial component of the Roadmap Towards Tshwane 2030. The objective of the newly approved RSDF aims to achieve the following:

- To address deficiencies and distortions within the city's spatial structure, moving towards spatial transformation;
- To respond to legislative, policy and provincial development planning requirements, and;
- To enhance and facilitate desired development trends and community needs.

The public participation process required for the provisions of the Local Government Municipal Systems Act, 32 of 2000 (MSA), the Integrated Development Plan and the Spatial Planning and Land Use Management Act, 16 of 2013 (SPLUMA) was completed by 10 December 2018.

The collective of the RSDF's informs the MSDF and will serve as additional implementation mechanisms for the MSDF together with other strategic policies containing a spatial focus including:

- Densification and Compaction Strategy;
- Retail Strategy;
- Rural Strategy;
- Tshwane Integrated Transport Plan, and;
- Tshwane Open Space Framework.

The approach applied to updating the RSDF for council approval 2018, included the following:

- Comprehensive Integrated Transport Masterplan (CITP) 2015 – 2020 approved at Council on 30 June 2016.
- Regions were updated with the City of Tshwane Bioregional Plan (2016).
- The maps used within the RSDF were improved in terms of scale (erf Level).
- Definitions were amended to avoid misinterpretation, such as "mixed use".
- The consistency of densification across all seven (7) regions were established, together with decreasing the number of densification as recommended within the CITP.
- Additional provision of economic activity streets to cater for economic growth opportunities for small and medium enterprises.
- Aligning the RSDF's with the approved IDP, BEPP 2017/18 and BEPP 2018/19.

B.4.2 City Sustainability Unit

As mentioned in Section A of the BEPP, the city's institutional commitment to address climate change manifested in the establishment of a specialist unit in the Office of the Executive Mayor, known as the City Sustainability Unit (2013). Figure B-58 below outlines the structure of the CSU, which speaks to the three (3) core elements of the City's Climate Change Programme namely:

- Mitigation;
- Adaptation, and;
- Sustainability Financing and Support Mechanisms.

There are currently two vacancies and four unfunded positions, which require the current officials to address more than one focus. The total number of staff within the unit amounts to nine (9) officials.

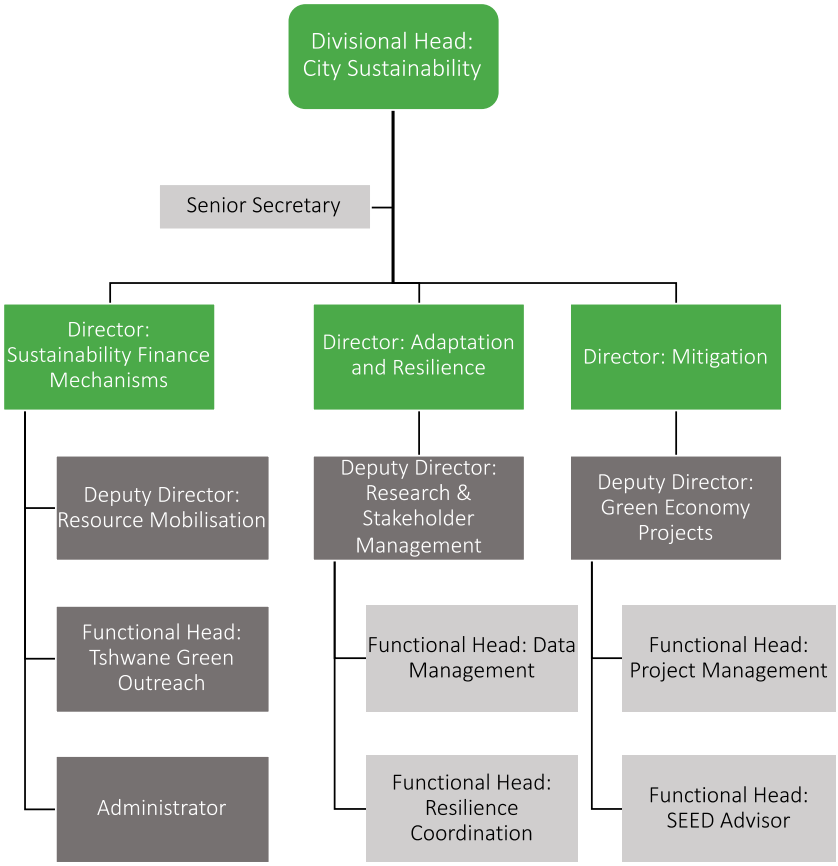


Figure B-58: Structure of the CSU

B.4.2.1 *Sustainable finance mechanisms: Sustainable Financing and resource mobilisation*

The financing and resource mobilisation component of the City Sustainability Support Programme facilitates both the adaptation and mitigation focus of the CSU and ensures progress in sustainability. It includes sourcing of innovative funding solutions via:

- The Sustainable Financing Strategy (SFS);
- Feasibility studies where concepts or approaches are untested or hamstrung by limited knowledge;
- The facilitation of partnerships with relevant entities to support implementation; documenting and communicating of sustainability progress in order to promote further support;
- Conceptualising outreach programmes which serve as drivers of behaviour change, and;
- Driving sustainability mainstreaming with a major focus on sustainable procurement, whereby city procurement is encouraged to consider its ecological footprint and make provision for sustainability criteria in its procurement specifications.

The Sustainable Procurement Programme is anchored in the Sustainable Procurement Strategy (SPS) developed in 2016 after the city became a member of the Global Lead City Network on Sustainable Procurement in 2015. Currently, the city chairs the Global Lead City Network on Sustainable Procurement, a position held by the Executive Mayor.

One official is responsible for driving the SFS and SPS and managing the implementation of the C40 relationship and other partnerships (including but not limited to USAID, SANEDI, UNIDO, GIFA, GIZ). The Divisional Head primarily focusses on managing the C40 and ICLEI[25] relationships due to the Executive Mayor's role herein. Technical work or input is directed to relevant officials within the unit, which primarily includes the Directors for Mitigation and Adaptation.

B.4.2.2 *Mitigation Programme*

As mentioned in Section B.2.5.2, the key driver behind the mitigation programme is the Greenhouse Gas Emissions Inventory (GHGEI). The mitigation team comprises of three people with different responsibilities. One official is responsible for updating the GHGHEI with the current focus on 2015/16 and energy related aspects of the mitigation programme. The second is responsible for the Green Buildings Programme, particularly in respect of the energy efficiency measures in new builds which forms part of the C40 New Buildings Programme. The third official has oversight of all mitigation related matters with an emphasis on the Green Buildings Programme.

The Green Buildings Programme focuses primarily on new builds and addresses all forms of structures. The city is a member of the Green Building Council of South Africa's Green Building Leaders Network, the only municipality to be part of this network. This is largely attributed to the city having a Green Building By-law, which will reviewed during the next financial year, with the aim of improving its uptake. The C40 has assigned a New Buildings Advisor to assist the city to ensure energy efficiency measures are incorporated into all new buildings, as part of an approach to help the city become carbon neutral by 2050. The Green Buildings Programme is also part of ICLEI's Building Efficiency Accelerator (BEA) Programme and this requires practical interventions to ensure the uptake of energy efficiency in the built environment. In February 2019, the Tshwane Green Building Hub was launched as a community of practice for city officials and in March 2019, the Tshwane Green Buildings Advisory Group was launched to drive a stronger sustainability agenda amongst practitioners in the built environment.

B.4.2.3 *Adaptation Programme*

As mentioned in Section B.2.5.2, the key driver behind the adaptation programme is the city's Climate Risk and Vulnerability study. Presently, the adaptation programme has a single official responsible for the adaptation programme and relies heavily on external and internal partnerships and stakeholders. Heat management is the primary focus for the adaptation programme and includes the commissioning of a Heat Management Strategy. The Heat Management Strategy, in partnership with SANEDI[26], aims to improve the thermal efficiency and in-door temperatures of informal settlements.

The adaptation programme also focusses on additional adaptation strategies, which include the following:

- Integrated water resource management (Sustainable Urban Drainage Systems, development of an IRWM for the City);
- Disaster management (Involvement in the Local Disaster Management Advisory Forum, Councillor training);
- Health (Health working group, Air Quality Management Plan);
- Urban Climate Resilience (participation in the DEA Cities Climate Resilience Forum), and;
- Food Security and Agricultural Innovation (Roof-top Urban Agriculture).

It should be noted that the adaptation focus areas listed above are secondary focus points, and will receive more attention once increased capacity and resources become available.

[25] Local Governments for Sustainability, founded in 1990 as the International Council for Local Environmental Initiatives (ICLEI), is a global network of cities committed to building a sustainable future.
[26] South African National Energy Development Institute

B.4.3 C40 Cities Climate Leadership Group

The city was accepted as the 70th Member of the C40 Cities Climate Leadership Group (C40) in September 2014. C40 is a network of the world's megacities committed to addressing climate change. Acting both locally and collaboratively, C40 cities have a meaningful global impact in reducing both greenhouse gas emissions and climate risks through webinars, workshops, and meeting exchanges. Through a number of Thematic Networks, C40 offers cities an effective forum for collaboration which drives measurable and sustainable actions to address climate change. C40 networks are dynamic working groups of cities organized around a set of common challenges or priorities. The goal of the C40 networks is to accelerate the identification, development and implementation of programmes, policies and projects in C40 Cities through facilitated peer-to-peer collaboration.

B.4.3.1 *C40 Technical Assistance*

Tshwane has benefited from the appointment of two technical C40 advisors in 2018 which include:

- a new buildings advisor, and;
- a climate action advisor.

Both have been accommodated in the municipal headquarters and are form part of the CSU. The appointment of the climate action advisor supports the city's commitment to translate its Climate Response Strategy into a Climate Action Plan (CAP). In preparation of the CAP a process has been established to involve City stakeholders in the development of the plan. This process was initiated through a Climate Action Planning workshop in Lagos, Nigeria in May 2018.

B.4.4 Climate Change Expertise

B.4.4.1 *Tshwane Green Outreach Programme*

The Tshwane Green Outreach Programme is a comprehensive programme that targets every city stakeholder and aims to inspire and engender sustainability thinking and behaviour change. Tshwane Green is comprised of six elements, of which one includes Green Service Delivery. The focus of the Green Service Delivery element includes identifying and enabling sustainability champions in each of the departments (Green Ambassadors). Green Ambassadors should be empowered to identify and drive areas for change, whilst receiving training and support from the CSU.

B.4.4.2 *CSU initiatives and collaboration*

The CSU has embarked on a number of initiatives/collaborations with various departments within the city and includes the following focus areas within the Operations Cluster.

Table B-20: CSU initiatives and collaboration

City department	CSU focus to date	Areas for further attention
Health	• Relationship with Environmental Health Practitioners (EHPs). • Awareness sessions with EHPs on climate risks. • Working with department to include specifications in the building of clinics.	**Adaptation focus: Heat Mitigation** • Being able to measure health impacts through clinics. • Health services to recognize and treat climate-related health impacts. • Cooling centres to provide residents with refuge from heat waves. • Awareness campaign on climate impacts and protection measures.

City department	CSU focus to date	Areas for further attention
Housing & Human Settlements	• Demonstration projects: - Lighthouse project. - Cool coatings.	**Mitigation and Adaptation Focus:** • Application of Green Building By-law to housing projects. • Roll out of rainwater harvesting and solar geysers. • Cool coatings programme for informal settlements. • Applying sustainable livelihoods principles to Informal Settlement Upgrade Programme. • Low flush toilets.
Regional Operations and Co-ordination	• Limited awareness presentations to 5 of the RCFs. • Engagement in the Local Disaster Management Advisory Forum.	**Adaptation focus:** • Exacerbation of climate impacts such as extreme rainfall events that may culminate in an increase of flash floods due to storm water blockages. • Strengthening the urban forestry programme. • Working conditions – sunscreen not regarded as a PPE.
Roads and Transport	Extensive engagement primarily focussed on: • Integrated Transport. • Low carbon mobility. • Non-motorised transport.	**Adaptation focus:** • Construction of roads and pavements which can withstand heat and extreme weather events. • Road design standards to be reviewed in order to address current and projected climate impacts. **Mitigation focus:** • Understanding of how road surfaces contribute to the urban heat island effect.
Roads and Transport: Storm water Management	• Extensive engagement on storm water management and the impact of climate change on wetlands and rivers.	**Adaptation focus:** • Storm water systems to manage floods. • Design of storm water systems to retain water and to diversify the water mix.
Utility Services: Energy and Electricity	Greenhouse Gas Emissions Inventory (GHGEI): • Energy Mix Policy. • Waste-to-Energy.	**Mitigation focus:** • Reducing GHG impacts associated with electricity consumption.
Utility Services: Water and Sanitation	• Water Resilient Sanitation Solutions.	**Adaptation focus:** • Diversify water mix.
Environmental Management and Agriculture Services: Agriculture	• Tshwane Food and Energy Centre.	**Adaptation focus:**

City department	CSU focus to date	Areas for further attention
	• Urban agriculture rooftop initiative.	• Food security and agricultural policy.
Environmental Management and Agriculture Services: Waste Management	• Feasibility study on Alternative Waste Technology solutions. • Facilitation of the Atteridgeville Eco-Park. • Financing mechanism to support roll out of recycling infrastructure.	**Mitigation focus:** • Promotion of separation at-source, amending the Tshwane Waste Management By-law to incentivize recycling. • Ban landfilling of garden greens due to methane production. • Landfill gas harvesting
Environmental Management and Agriculture Services: Air Quality	Facilitating a relationship with GIZ to secure technical support for updating of Air Quality Management Plan.	**Adaptation focus:** • Update of the Air Quality Plan and synergies with the Urban Heat Mapping study. • Department to be involved in the Heat Mapping Study as per the BAC resolution.
Environmental Management and Agriculture Services: Open Space Management	CSU promoting the principles of the Bioregional Plan.	**Adaptation focus:** • Update of the Open Space Framework.
Environmental Management and Agriculture Services: Environmental Education	Collaboration on Environmental Education training programmes, CSU to provide training in terms of Climate Change.	**Mitigation and Adaptation:** • Climate Change Education
Environmental Management and Agriculture Services: Natural Resources Management	• CSU actively promoting the Wetlands Management Plan and partnership with DEA. • Rehabilitation of fence at the Colbyn Valley Wetland.	**Adaptation focus:** • Full implementation of Wetlands Management Plan. • Concerns about the alleged failure of the Urban Forestry Programme (currently a responsibility managed by ROC).
Metropolitan Spatial Planning, City Strategies and Group Financial Services	**Refer to Section A of the 2019/20 BEPP.** • The CSU will form part of the Capital Planning System Technical Task Team (CaPSTTT). • The CSU forms part of the BEPP Steering Committee. • The CSU provided inputs into the City's Capital Planning and Prioritisation Process.	• Establishment of mitigation and adaptation specific projects in the form of portfolios. • Training to departments regarding the CR&R and UN Sustainable Development Goals Strategic Outcomes. • Further investigation into the concept of a climate change budget.