

An aerial photograph of Johannesburg, South Africa, showing a dense urban landscape with numerous skyscrapers and buildings. The city is set against a backdrop of rolling hills under a clear blue sky. The foreground shows a mix of greenery and urban development.

**Africa**<sup>E</sup>  
*monographs*

# Small Atlas of Johannesburg

A Graphical and Critical Analysis of Urban Trends and Issues

**Karen Lévy**

**December 2014**

French Agency for Development  
French Institute of South Africa

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Translator: Laurent Chauvet

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## ABSTRACTS

After two decades of significant change, Johannesburg has been expanding and undergoing deep restructuring. Today, the city is going through an unprecedented development phase, initiated by new territorial dynamics resulting from urban policies, resident practices and market trends. While Johannesburg aims to become a “World Class African City”, as a part of managing its growth it is essential to offer an accurate image of its strengths and weaknesses.

The issue of urban resilience has become central to the discourse on cities and calls for light to be shed on the evolutions that have shaped and continue to shape the city of Johannesburg.

In this light, we focus on major urban phenomena including:

- The spatial evolution of the city where densification is not always synonymous with urbanity;
- Increasing spatial differentiations according to population and housing;
- Increasingly fragmented and extensive spatial structuring.
- In this publication, special attention has been given to the compilation of former and recent data. These data, depending on objective geographic elements, show how “various cities” exist within the city.

Overcoming the limitations of the data was the main difficulty. Urban evolutions are rapid, but existing data are difficult to access and are often out of date or localised, as part of unsuitable divisions. Various comments have been written to shed light on the maps and facilitate their reading. The objective of this work is to create a coherent set of maps so as to offer a homogeneous vision of the city and urbanisation processes underlining it.

## KAREN LÉVY

Karen Lévy is an expert in urban planning and architecture programmes in the South. In 2018, she completed her PhD thesis in urban studies: “An average city for the middle class? : urban factory discourse and actors : the case study of Johannesburg (with a Detour in New Delhi).” See: <http://www.theses.fr/en/2018PA100077>.

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AFD - Agence française de développement.

## EDITOR'S NOTE

This ‘urban atlas’ has been developed within the framework of a research project on the city of Johannesburg, conducted jointly by the Urban Resilience Research Project at the University of the Witwatersrand, the Urban Morphology and Complex Systems Institute and the French Agency for Development.



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Layout & Printing

**Werner Prinsloo**



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***The views and opinions expressed in this publication are those of the author only.***

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<sup>1</sup> The Urban Resilience project is collaboration between the School of Architecture and Planning, University of the Witwatersrand (Wits), the Gauteng City Region Observatory (GCRO) and the School of Law, Wits.



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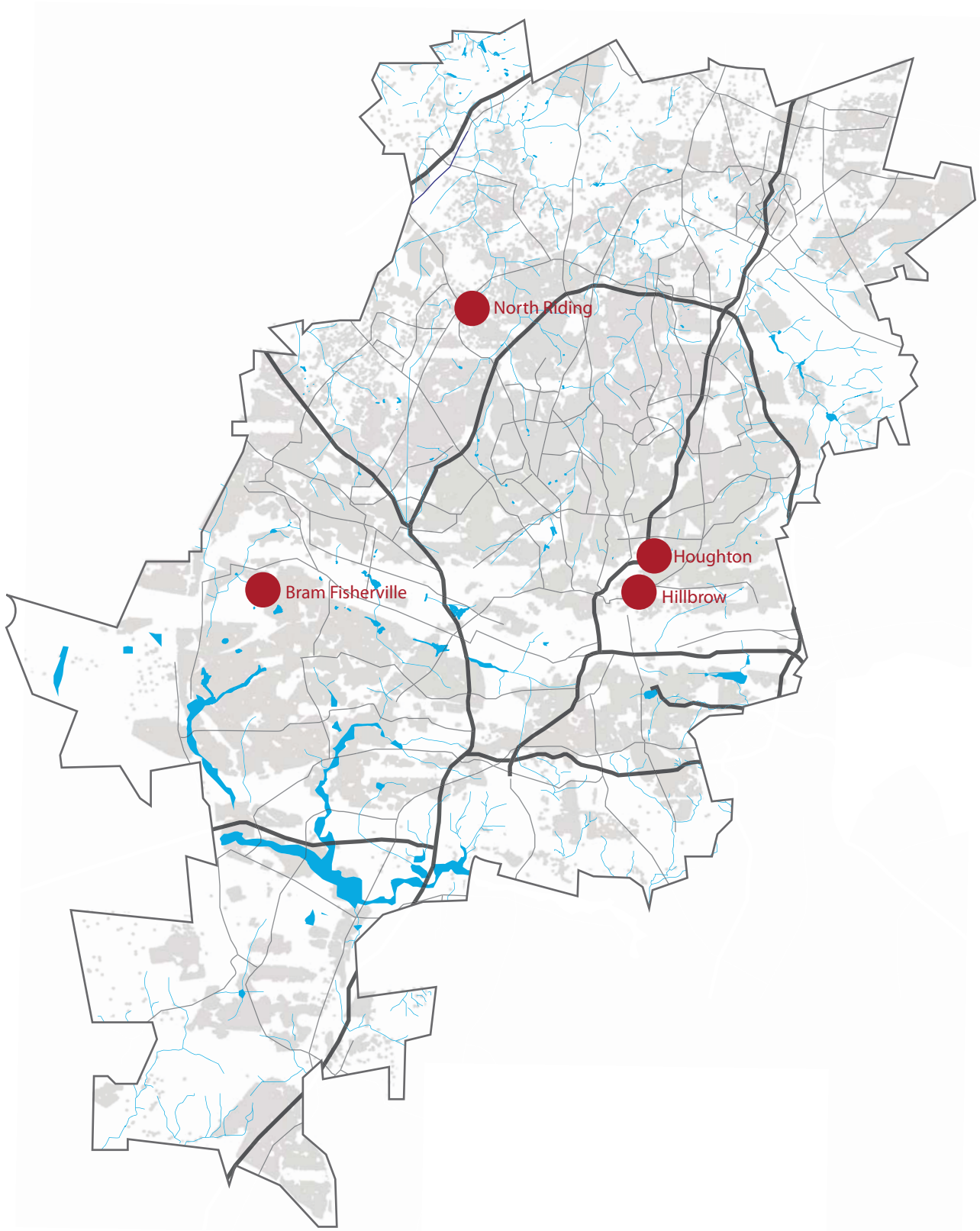


# **Portrait of Johannesburg**


## **Graphic Analysis of the Urban Structure**

# 1.1 Methodology

## Location of the Four Case Studies







**D**emographically and economically, Gauteng is the major province of South Africa. It contains around 18% of the country's population and is mainly urban in nature. 99.6% of the province's residents are city dwellers, one third of whom live in the City of Johannesburg Metropolitan Municipality, which represents only 6.4% of the surface area of the province. Local governance in the province is carried out via three Metropolitan Municipalities and two District Municipalities, with these District Municipalities further broken down into three and four local municipalities respectively<sup>2</sup>. These municipalities are further broken down into 130 wards that cover the province.

Gauteng corresponds to the administrative grouping of Pretoria, the former Witwatersrand and Vereeniging. After being known as Pretoria-Witwatersrand-Vereeniging (PWV) between May 1994 and June 1995, the province was officially renamed Gauteng ("Place of Gold" in Sotho-Tswana). The analyses presented in this report focus on the municipality of Johannesburg.

This study relies on several scales, where each level of observation reveals only certain phenomena. The atlas seeks to combine and link together different levels of spatial analysis, in order to study the urban morphological evolution of the city, in an attempt to grasp its various facets. Indeed, strong interactions exist between the various levels, and a multi-level analysis makes it possible to integrate the myriad of aspects.

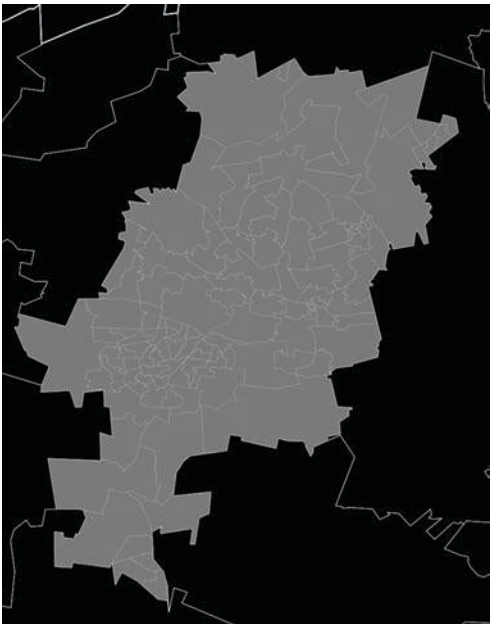
The first level under study concerns the city, which is defined by its administrative limits. The current structure of Johannesburg as a unified space of governance is still marked by the historical evolution of the city, in a context where urbanisation realistically goes well beyond the administrative limits. The metropolitan scale is ideal to analyse major urban phenomena. This is complemented by a general representation of the physical characteristics of the city, constrained by phenomena such as the relief or the hydrography and other economic and political particularities that will be discussed.

The second level under study concerns a number of selected suburbs. This intermediary level calls for a more detailed analysis so as to highlight other, more qualitative, dimensions of urban functioning. The idea is to capture elements that do not necessarily appear on bigger scales, where averages often conceal high internal differences and contextual specificities.

Four suburbs have been selected as case studies. These have been defined by a concurrent study on densification undertaken by Wits University. These cases were chosen as areas of the city that have densified in Johannesburg, but all in different ways:

- **Bram Fischerville**, a recent extension of Soweto (a large formerly black 'township' south west of Johannesburg) with a significant population increase, as testified to by the construction of informal housing inside private plots;
- **Houghton**, a historical suburb with an upper income population, which is densifying via the division of large plots into townhouse complexes;
- **Hillbrow**, a suburb of central Johannesburg with many high-rise blocks of flats that has densified through increased occupancy in largely structurally unchanged buildings. This change occurred through the evolution of the suburb from a predominantly middle-income one, to a lower-income community with many migrants from both rural South Africa, and other countries in Africa;
- **North Riding**, a recently developed residential middle-class suburb, located in the outer suburbs of Johannesburg, where urbanisation has occurred through converting small holdings into large townhouse complexes.

These suburbs are characterised by the fact that, in the past few years, they have experienced strong urban densification. While these sites are not statistically representative, they illustrate unique situations in terms of location, integration into the urban environment, and local real estate market prices among other things. While they are all located in areas with important issues, these differ from one site to another. The projects developed there are also very diverse.

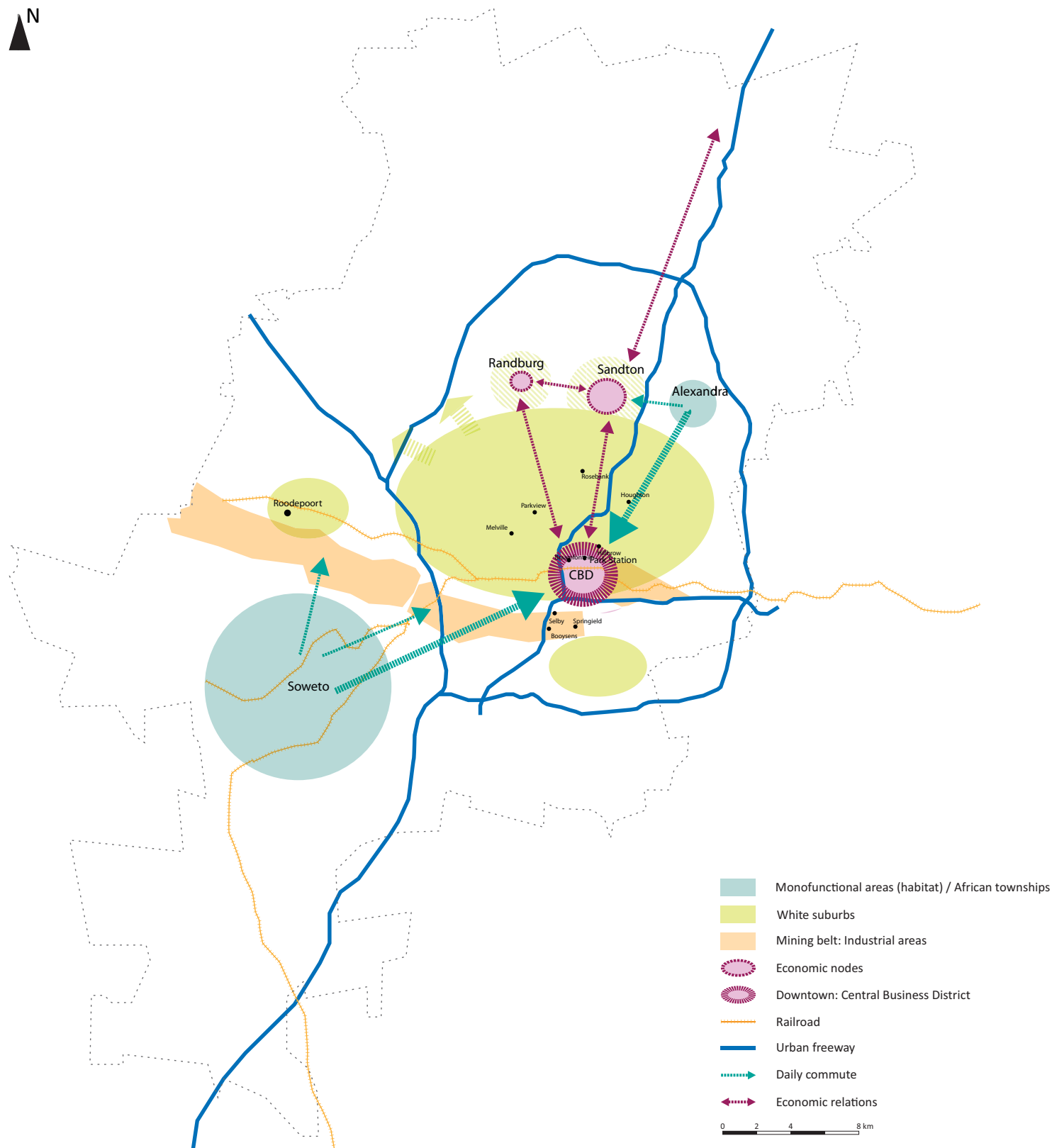


*The 130 wards of Johannesburg*

<sup>2</sup> Metropolitan Municipalities include the City of Johannesburg, Tshwane and Ekurhuleni. District Municipalities include West Rand and Sedibeng, with these made up of the local municipalities of Randfontein, Westonaria, Mogale City and Merafong, and Emfuleni, Lesedi and Midvaal respectively.

# 1.2 Overall Presentation of the Urban Structure

## Map 1: Urban Trends at the End of the 1980s





Johannesburg is one of the largest cities in Africa. It is the business capital and arguably cultural centre of South Africa, a unique destiny for what was originally a mining camp at the end of the 19<sup>th</sup> century. As gold mining sites moved further away from the city, mining was no longer a key sector of the urban economy which was also marked, since the middle of the 1970s, by a constant decline in the manufacturing production. This evolution was accompanied by the rapid development of tertiary activities, as testified to by the increased number of offices established in the Central Business District (CBD) and, more recently, in the wealthy northern suburbs such as Sandton.

Today, public policies are confronted with important challenges for the future development of Johannesburg. The strong inertia linked to the racial policies of apartheid, and the evolutions of economic structures, are long-lasting legacies which have starkly left their marks on the city.

Maps 1 and 2 show the evolution of major urban trends in Johannesburg.

Due to the lack of data, it was not possible to precisely map the growth of Johannesburg. These two maps are therefore

diagrammatical representations of general growth trends in Johannesburg over time.

The city of Johannesburg, at the end of the 1980s, appeared as a fragmented city. The east-west mining belt of the Reef, around which the city was built, physically separated the residential suburbs of the black, coloured and Indian populations in the south from those of the white populations in the north. Much of the land left unoccupied on the Reef, between mine dumps, and immediately to its south, saw the establishment of industrial activities. The main industrial area includes Selby, Stafford, Booyens, Turffontein, Kenilworth and Springfield, south of the business district.

The city centre, as the economic heart of Johannesburg, lost its hegemony largely to Sandton as many businesses moved north, but also to other areas such as Rosebank and Midrand. The rich previously white suburbs occupy the sunny slopes of the north and the urban expansion is facilitated by the establishment of a motorway and road infrastructure.

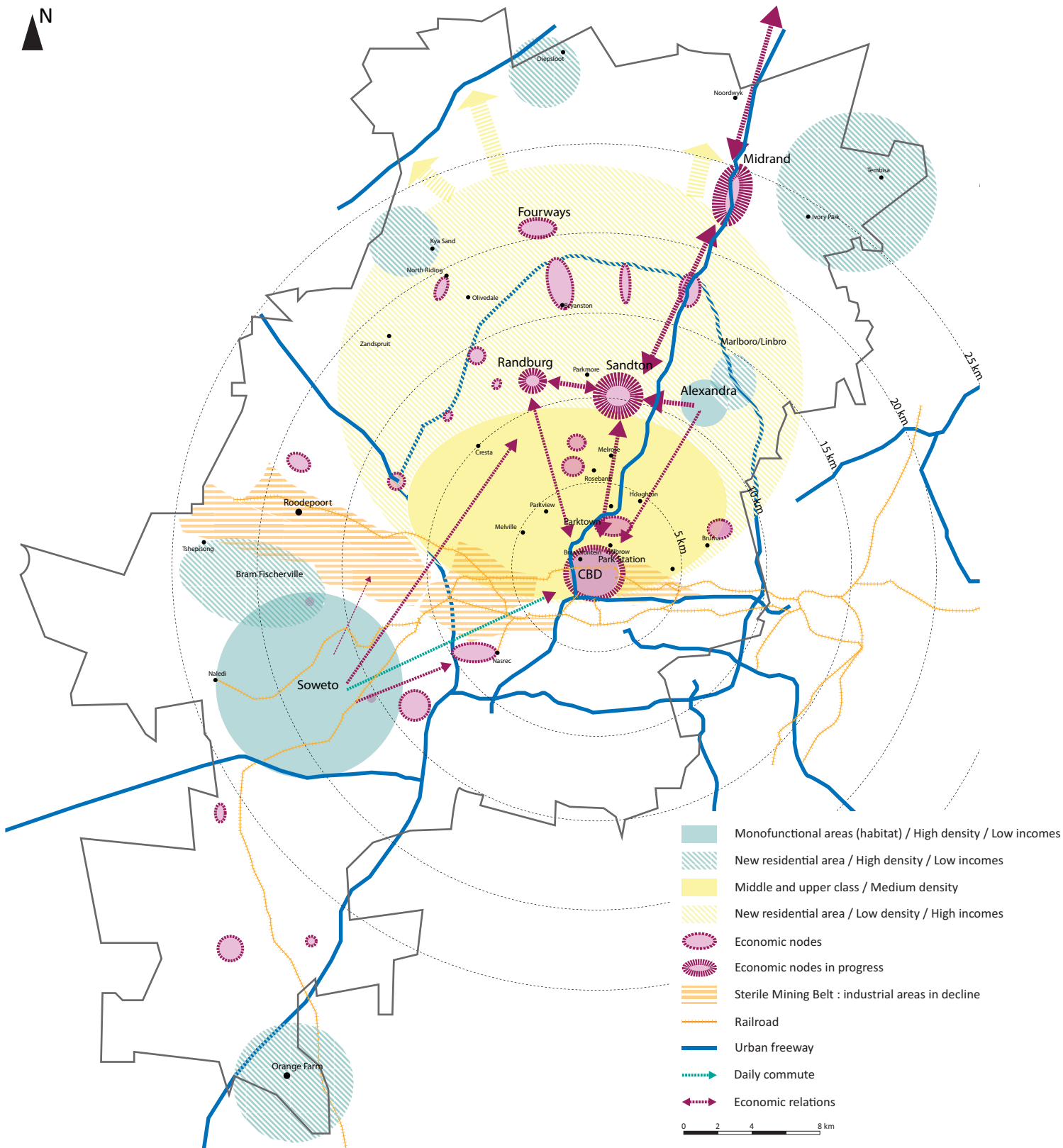
Whether white or black, the suburbs are largely mono-functional housing areas, disconnected from one another by unused buffer areas.



*The mining belt: physical separation between Soweto and the CBD.  
Photo taken from a helicopter, on the 08-06-2014*



# Map 2: Today's Urban Trends





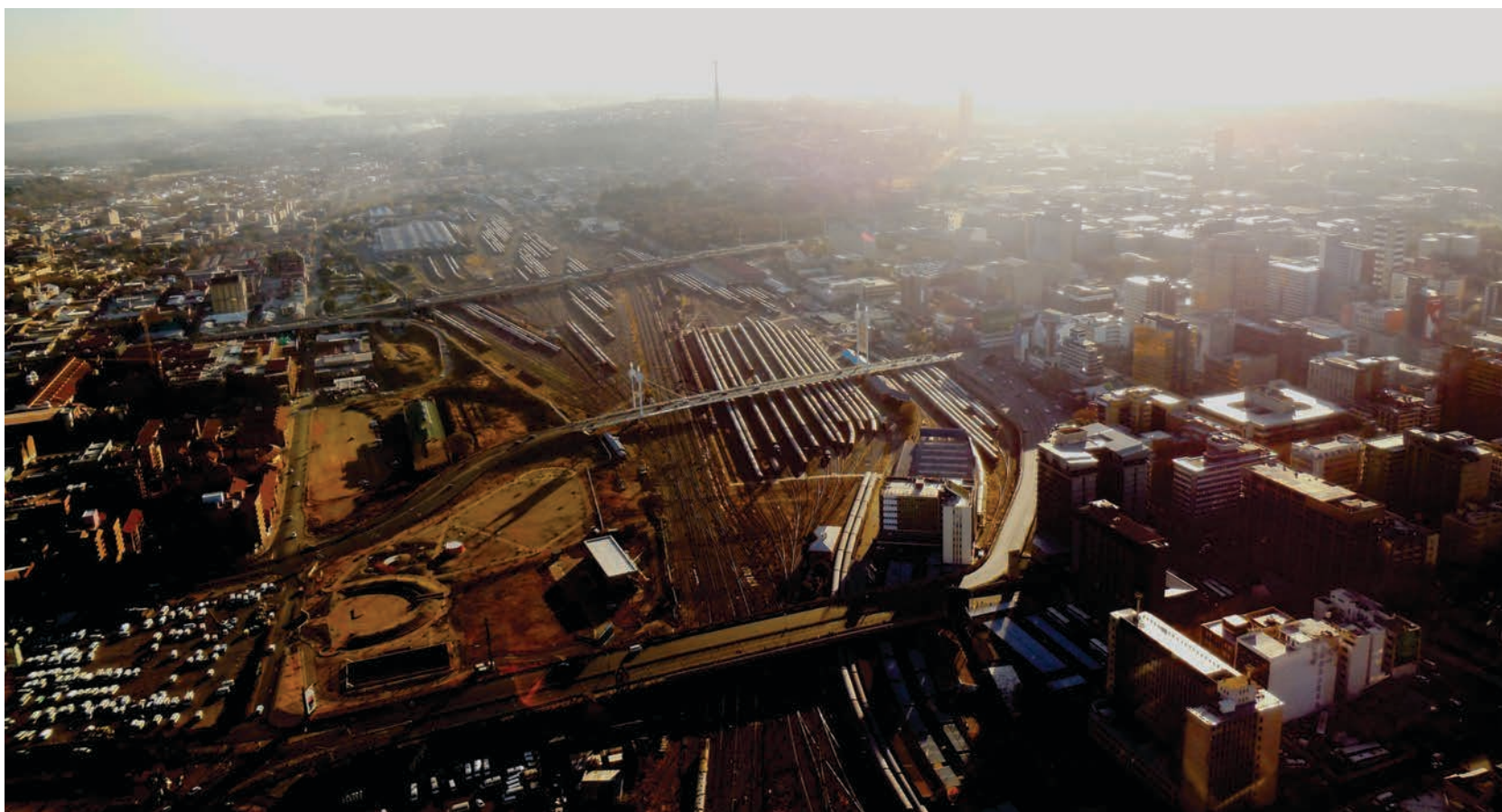
The end of the industrial era gave impetus to new modes of urbanisation. At the turn of the 1980s, the post-Fordist economic shift took on the form of large urban marketing operations, with the development of new business centres where land was cheap and available. This evolution, linked to that of cars, transformed the city all the more deeply since it was concomitant with the fall of the apartheid regime. The end of segregative policies amplified the movement of self-exclusion of the wealthy, and accelerated the gap between haves and have-nots which can otherwise be observed in many post-industrial cities across the world.

Today, Johannesburg must face high urban growth and is more than ever divided between the wealthy northern suburbs, where most areas of economic activity and jobs are concentrated, the city centre which seeks to rediscover dynamism and economic influence and, finally, the southern suburbs which are relatively densely populated but did not manage to level up (from the point of view of

infrastructures as well as social mix) with the rest of the city.

The spatial fragmentation of the city is widening, all the more since the choices made by politicians as well as technical choices have contributed largely to physically dividing the territory:

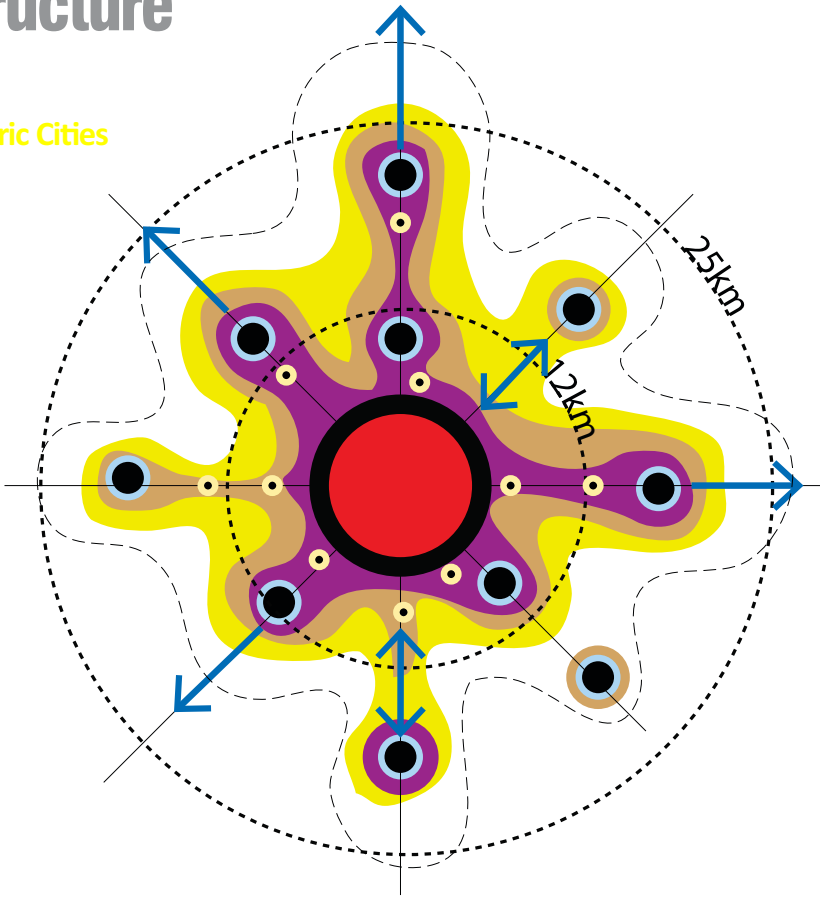
- The main transport routes (railway and roads) represent urban divides;
- Decrease in the mining sector has led to the decline of industrial zones, which means that the number of industrial wastelands has increased, thereby widening the mining belt, and creating urban enclaves throughout the city;
- The multiplication of economic hubs continues, thereby reducing job zones. Companies fled the city centre which is no longer a structuring economic hub at the metropolitan level;
- The development of mono-functional housing areas in the outer suburbs of Johannesburg, established without any real links to the central area of the city.



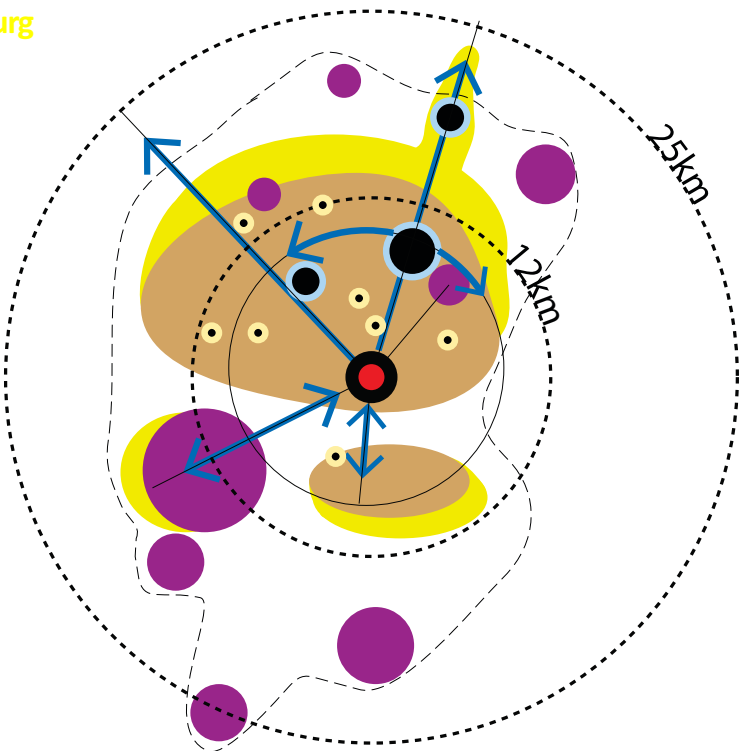
*Spatial impact of transport infrastructures in the city centre  
Photo taken from a helicopter, on the 08-06-2014*

# Map 3: Spatial Structure

Spatial Structure Principle: Polycentric Cities



Spatial Structure Principle: Johannesburg



- Metropolitan core (high density)
- Major inter-city road, commuter rail
- Principal metropolitan sub-Center
- Secondary metropolitan sub-Center
- High density suburban
- Medium density suburban
- Low density suburban
- Very low density suburban





The spatial structure of cities, just as the spatial distribution of densities, explains the necessity of commuting as a stimulator of urban economy. Areas that have better access to employment zones have greater land value, and therefore a higher density when municipal by-laws do not hinder market operation. The way employment zones are distributed or concentrated across the city, is therefore going to define movement patterns which, in turn, is going to influence land value and density<sup>3</sup>.

A city is considered polycentric when a majority of jobs is spread in secondary centres other than the city centre. Land value then decreases less rapidly from the centre than in a monocentric city; the same applies for density profiles.

The top diagram opposite, stemming from World Bank studies, schematises how the spatial structures of polycentric metropolises function. This observation is made by referring to models according to which urban densities and forms of urban spreading are organised. The structure of a city is always created through the rational reaction of individuals and companies to constraints represented by the topography, urban regulations and the location of primary infrastructures<sup>4</sup>. Households, just like companies, always want to minimise distances and commuting time.

The spatial structure of Johannesburg is complex and organised contrary to the classic models of distribution of population densities in the metropolitan area, as can be seen on the bottom diagram opposite. Densities increase with distance to the centre. Indeed, the different political choices in terms of housing, have dissociated dense housing areas from centres of activities and jobs.

For the past twenty years or so, the city has experienced deep changes: as a reflection of post-apartheid policies, Johannesburg has been constantly redefining its political borders. Yet, each time, interventions by the authorities have led to greater dispersal in the city, unlike the more spontaneous forms of urbanisation. The commuting logic did not have any influence on the dynamic leading to change in the urban structure, with the market being largely impacted by social and security considerations.

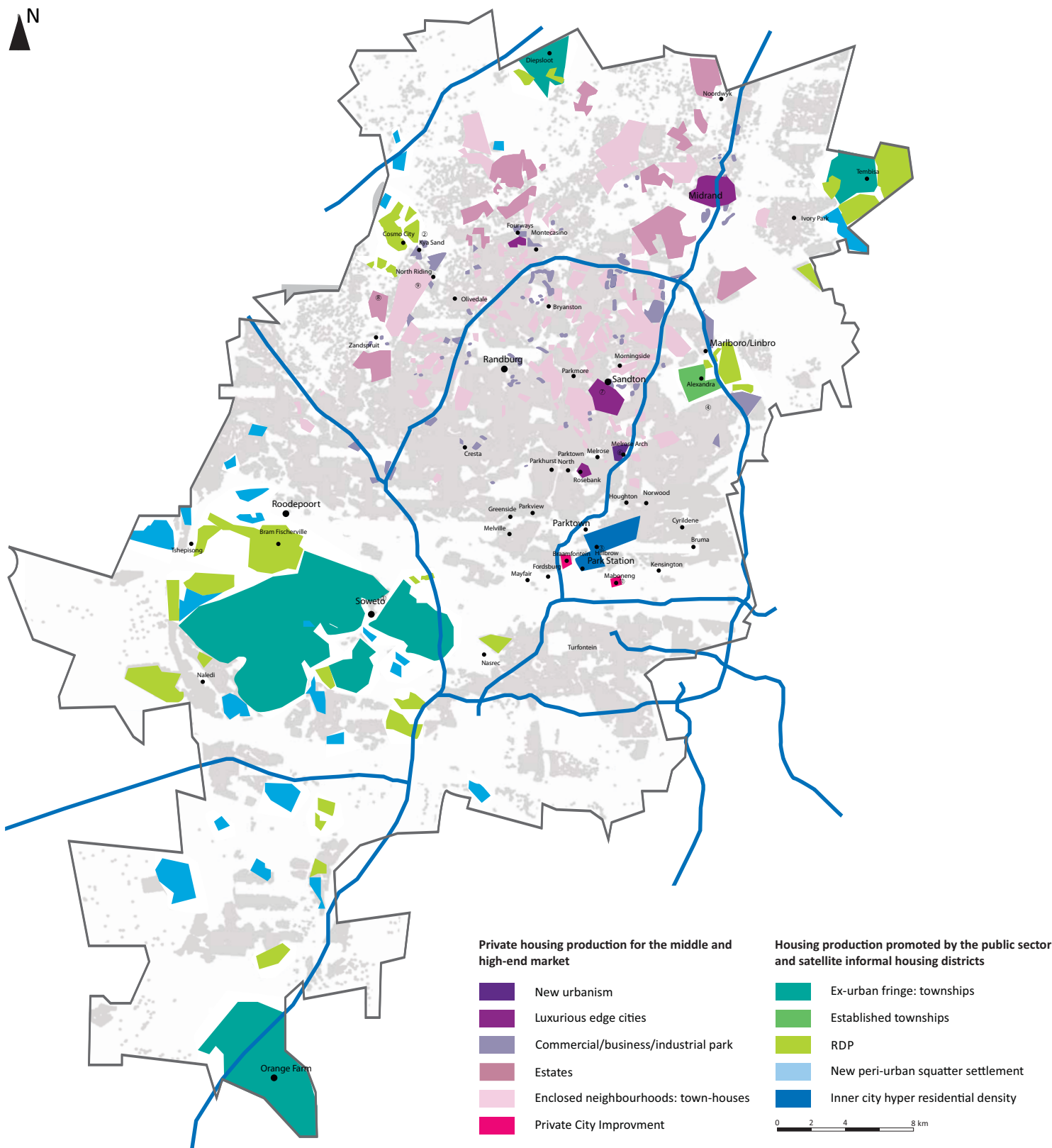
On the other hand, the structural divisions of the city which are linked to transport networks (mainly rail freight transport and urban highways) and to industrial wastelands partake of the spatial fragmentation characterising the city. The centre which has become impoverished during the last two decades, has lost its economic weight at the metropolitan level, to the benefit of other centres of activities, thereby disrupting the global balance of the city.

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<sup>3</sup> Challenges resulting from the development of cities of the South: the spatial diagnostic of a city, Alain Bertaud, consultant, World Bank, 2000.

<sup>4</sup> Ibid.

# Map 4: Urban Morphologies



While international trends show that, since the 1990s, cities have become less dense due to urban sprawl, Johannesburg has, in the last decades, experienced an important densification. Between 1991 and 2000, the population increased by 33% and built areas by 14%. Between 2001 and 2009, the overall density increased by 28.9% while population density in built areas increased by 16.4%. Housing production has taken on two distinct forms:

- The first is essentially private concerning the middle and upper income markets, and is found in the northern suburbs in particular. The residential suburbs of Randburg and Sandton are very spread out and their development is reminiscent of that found in American cities, attracting most investments. The creation of low density residential estates generally does not include public spaces.
- The second is largely promoted by the public sector: the housing policy initiated by the post-apartheid government's Reconstruction and Development (RDP) policy led to the creation of vast mono-functional areas consisting of standardised houses intended for the most disadvantaged sections of the population. High rise constructions remain an exception.

On the map opposite, we can see the different forms of urbanisation, clearly marking the urban fragmentation which is increasingly affecting the city. Recent urban forms, linked to metropolisation and globalisation, are organised in such a way that they are largely disconnected from the rest of the city, thereby creating, according to Gervais-Lambony's definition (2001), an absolute divide between sections of the city, whether at the social, economic or political levels.

Suburbs develop according to a cellular model: infrastructure (roads in particular, such as urban highways and other forms of expressways) aim to bring spaces closer together rather than integrate them. The separation of land use and social groups contributes to the biased distribution of work, social and commercial facilities and opportunities, and reinforces the gap between haves and have-nots.

The morphology of these new forms of urbanisation is characterised by a low density, uncontrolled and explosive urban sprawl. The map opposite offers a striking illustration of the discrepancy between operations planned by the private sector, where low density appears as a norm, and spaces where social housing is predominant, with a relative density often amplified by the creation of informal housing.

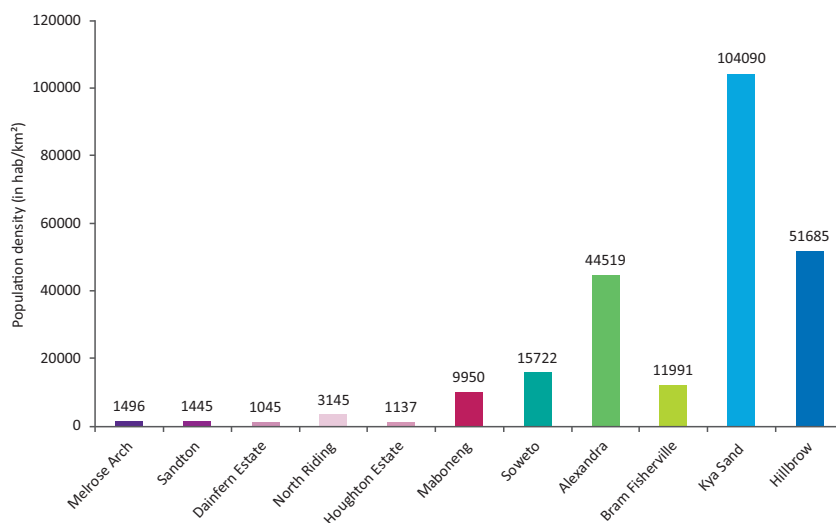
While one-family housing is the most developed model in Johannesburg, as in most South African cities, the land use

coefficient is particularly low in the majority of suburbs. The city centre is an exception with an important initial density.

However, suburbs which are planned according to the New Urbanism movement, seek to establish town planning principles in the inner and outer suburbs, such as architectural diversity and public space, and to confer upon housing estates a higher density than that of conventional estates, as well as functional mixing. This phenomenon, which remains marginal, can be observed in Melrose Arch or even Sandton, although these areas remain mostly upper income and fairly exclusive.

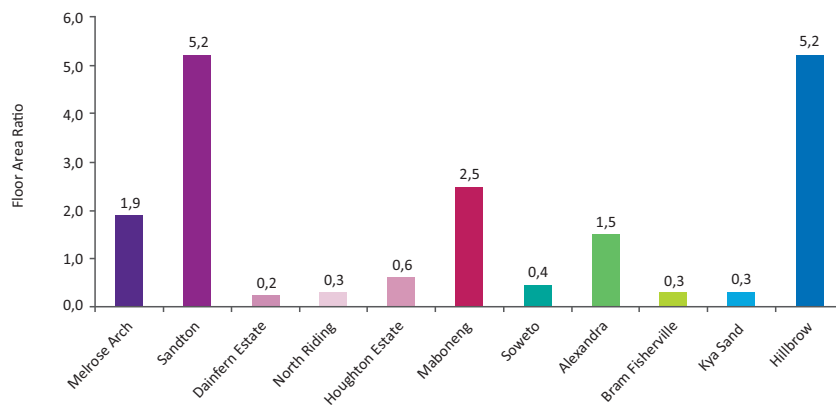
## Population Density

Ten suburbs representative of new forms of urbanisation



## Altimetry

Ten suburbs representative of the new forms of urbanisation



# Morphological Characteristics of Ten Recent Housing Areas

● **New Urbanism**  
Melrose Arch

Covered area: 29%  
COS: 1,9  
Density: 1 496 habitants/km<sup>2</sup>



Road Structure

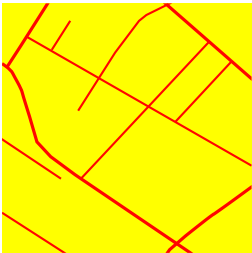


Altimetry



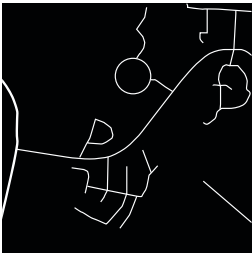
● **Luxurious Edge Cities**  
Sandton

Covered area: 46%  
COS: 5,2  
Density: 1 445 habitants/km<sup>2</sup>



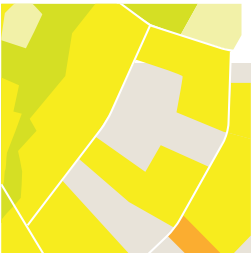
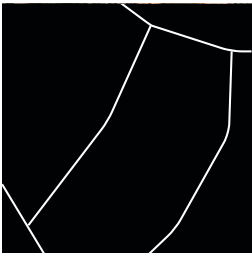
● **Estates**  
Olive Crest Estate

Covered area: 11%  
COS: 0,2  
Density: 1 045 habitants/km<sup>2</sup>



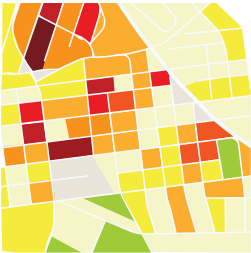
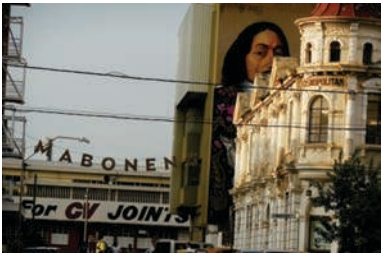
● **Enclosed Neighbourhood**  
North Riding

Covered area: 16%  
COS: 0,5  
Density: 3 145 habitants/km<sup>2</sup>



● **Private City Improvement**  
Maboneng

Covered area: 45%  
COS: 2,5  
Density: 9 950 habitants/km<sup>2</sup>

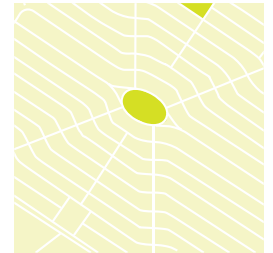
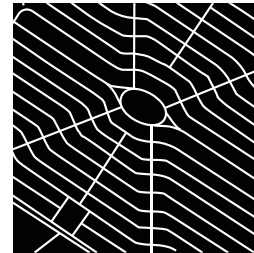






● **Ex-Urban Fringe**  
Townships and satellite informal settlements

Covered area: 27%  
COS: 0.4  
Density: 15 722 habitants/km<sup>2</sup>



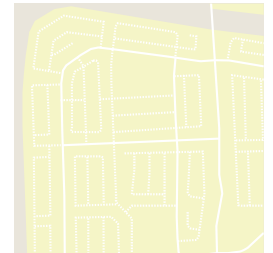
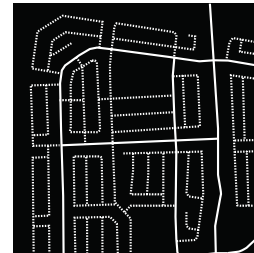
● **Established Township**  
Alexandra

Covered area: 55%  
COS: 1,5  
Density: 44 519 habitants/km<sup>2</sup>



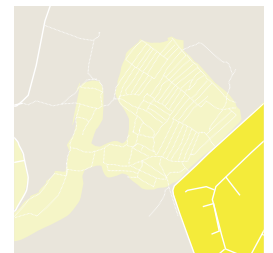
● **RDP**  
Bram Fischerville

Covered area: 26%  
COS: 0,3  
Density: 11 991 habitants/km<sup>2</sup>



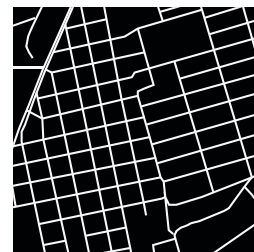
● **New Peri-Urban Squatter Settlement**  
Kya Sand

Covered area: 48%  
COS: 5,2  
Density: 51 685 habitants/km<sup>2</sup>



● **Inner City Hyper Residential Density**  
Hillbrow

Covered area: 36%  
COS: 0,3  
Density: 104 090 habitants/km<sup>2</sup>





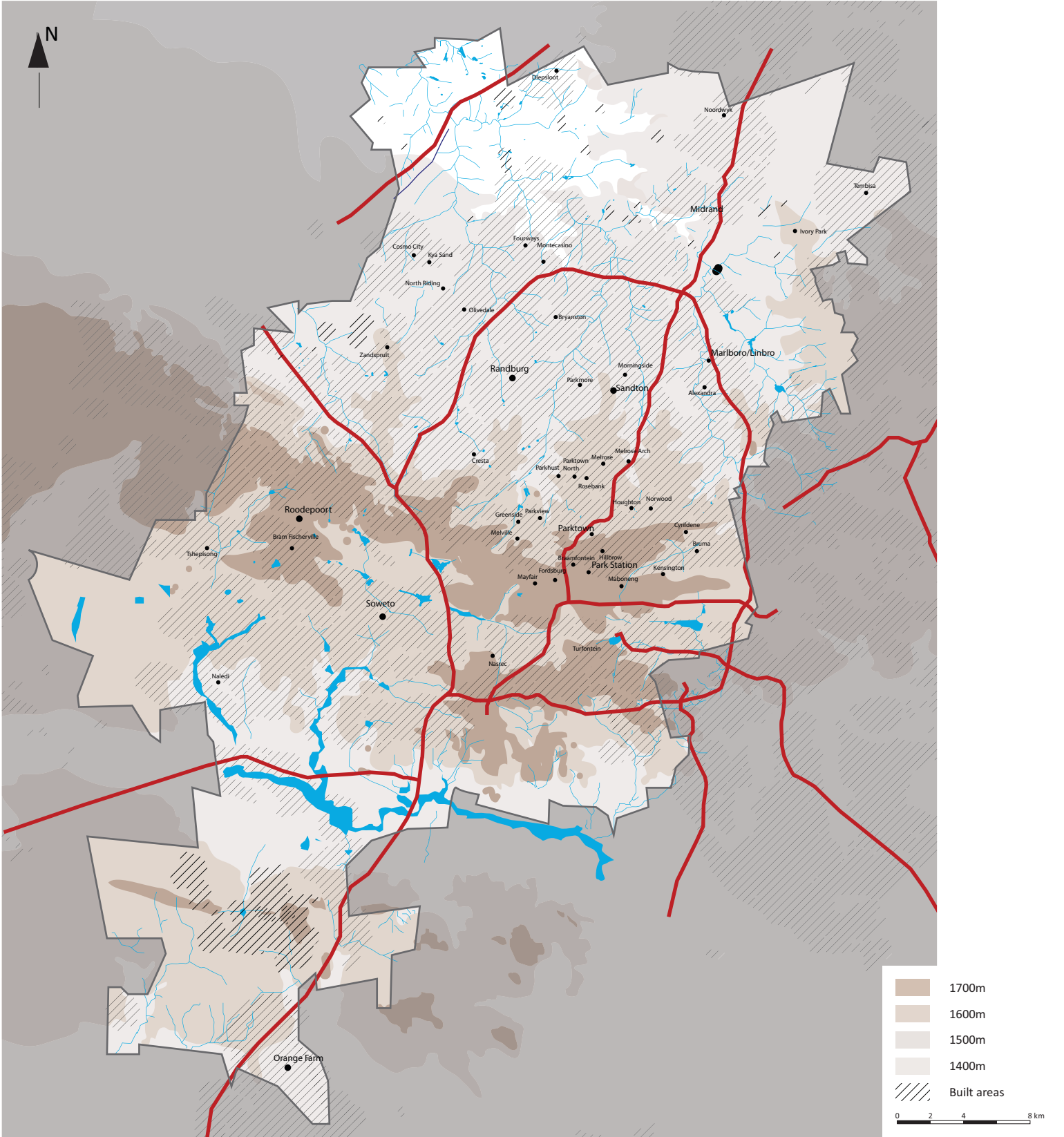


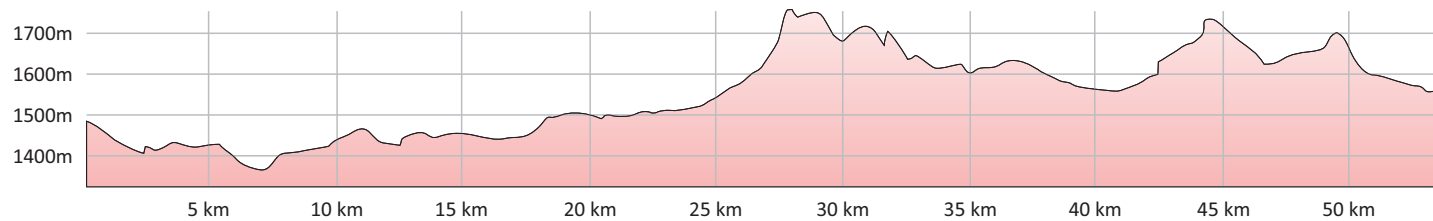


# **The Evolution of Johannesburg's Spatial Form**

# 2.1 Physical Geography

## Map 5: Physical Geography





*North-south Cross Section of Johannesburg, source Google Earth*

Situated at close to 1 600 meters above sea level in the landscape of the Witwatersrand<sup>5</sup>, the City of Johannesburg is characterised by an undulating topography, with relatively significant slopes, exceeding 5% at times. The crest line cutting the city in half in an East-West direction is a real division between the North and the South of the city. The unavoidable geological features of the spatial landscape – such as the crest lines, slopes, hills, valleys and watercourses – at times create urban zones that are naturally cut off from one another.

Today still, the topography strongly affects the way the city is organised. The city centre, which was developed close to some of the first gold deposits discovered, overlooks the entire urban area from an altitude of around 1 700 meters. The city grew progressively on the sides of the ridge and down valleys (as is the case for Soweto and the outer suburbs in the north-eastern section of the city).

Other than the development of wealthy areas such as Doornfontein located on south facing slopes, well-off residential areas have logically and preferentially settled on the sunny northern slopes of the city, close to the centre.

The topography is particularly complex to manage from a technical point of view concerning infrastructure networks, particularly water distribution. The design and layout of water grids must take relief effects into account, and manage the complex issue of storm water management. The progressive waterproofing of the soils (resulting from constructions and roads), particularly in strategic basins, makes this issue increasingly glaring.

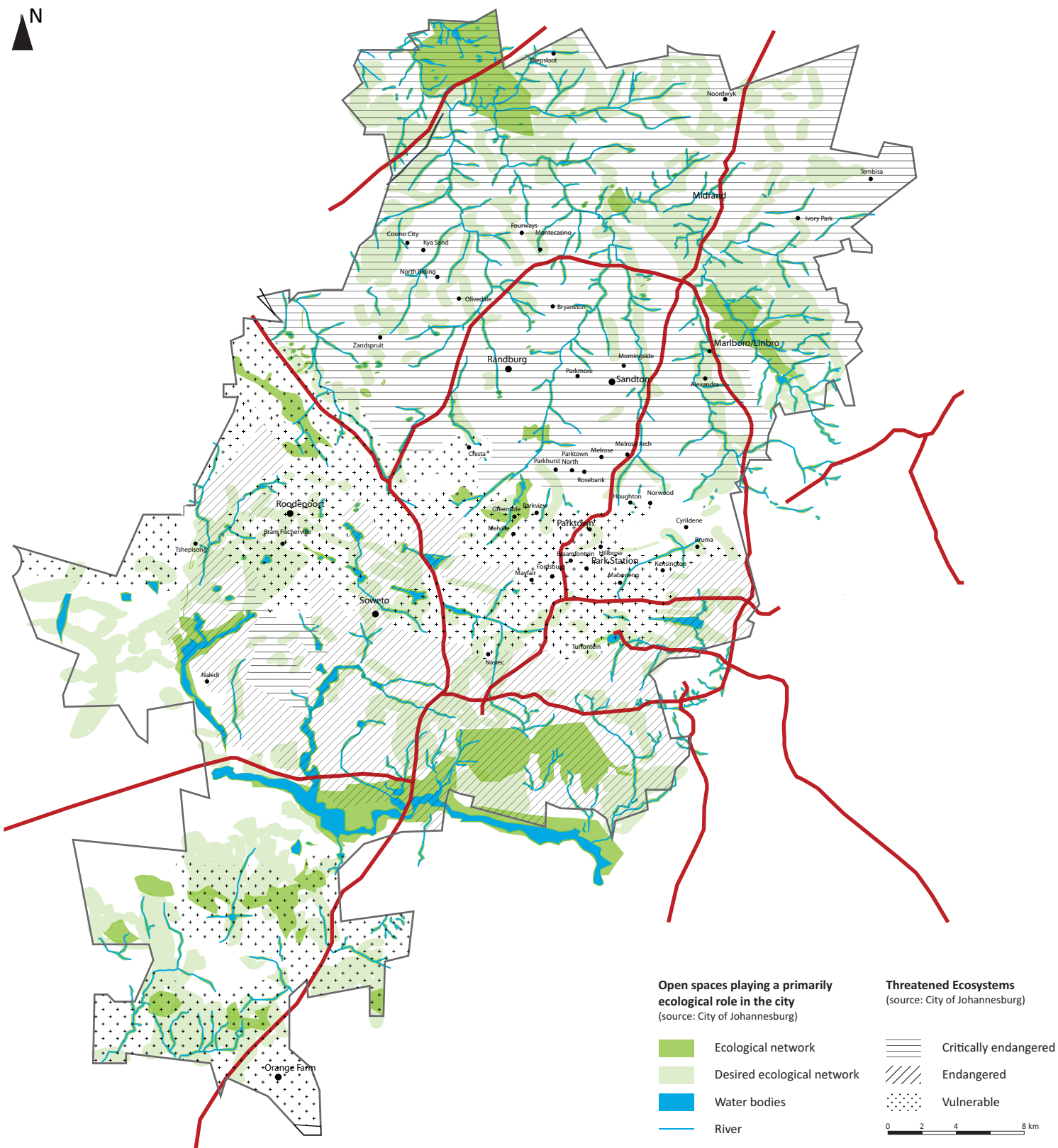
The sections of the city situated in valley bottoms, suffer from air stagnation and therefore high pollution rates, particularly in winter.




*The CBD. Photo © Laurent Chauvet*

<sup>5</sup> The Witwatersrand means “the crest of the white waters”.

# Map 6: Environmental Geography







Geologically, the ridge crossing the centre of Johannesburg in an east-west direction marks a strong distinction between the north and south of the city. The ridge forms the watershed between the Vaal River Basin to the south that leads into the Orange River and the Atlantic Ocean, and the Limpopo River Basin to the north, that runs into the Indian Ocean.

- In the north, mainly around the suburbs of Randburg and Sandton, the soil is generally stable and not subject to erosion; since it is mostly made up of granite, it is permeable.
- South of the crest, near the city centre, the soil, mainly composed of quartz and conglomerate, is characterised by high erosion linked to steep slopes exceeding 10% at times.
- The whole area around Soweto, which is shaped like a basin, represents a high flood risk because of the urban density and the soil composition, but also a water pollution risk because of the housing density.
- On the extreme southern part of the city, towards the suburb of Lenasia and the Orange Farm area, the soil is composed of dolomite, allowing the formation of depressions and cavities in the soil, which lead to erosion and in some cases to sinkholes.

The city of Johannesburg was developed after gold was discovered there in 1886, and as such does not have any of the usual geographic characteristics required when building a city, as far as waterways or coasts are concerned. Johannesburg is an atypical example and its geological characteristics affect deeply its spatial structure.

The city has a semi-arid climate and can therefore be subjected to droughts as well as floods. On the other hand, temperatures are moderate thanks to the fact that it stands at 1 600 meters above sea level.

A number of watercourses exist in the northern suburbs and can transform into torrents during thunderstorms. They are the source of many tributaries flowing into the Limpopo and Orange Rivers. Today, most of these watercourses are covered and canalised.

Finally, of note is the lushness of the vegetation in the northern part of the city which is considered as “the largest man-made urban forest in the world”, with over 10 million trees.

The pressure for land, the role of the private sector, as well as the little consideration shown for the ecological diversity of the city, are putting a lot of pressure on the environment, leading to the rapid deterioration of the remaining natural ecosystems. As a result, natural environments are in regression and most often fragmented or endangered.

Urban sprawl and the density of linear infrastructures are being continued to the detriment of natural environments, isolating them and disturbing any interaction between them. The lack of structuring or planning prevents the different functional units of the city from linking with one another.



*Dam, Soweto, June 2013*



*Johannesburg and its green Northern suburbs.  
Photo © Laurent Chauvet*

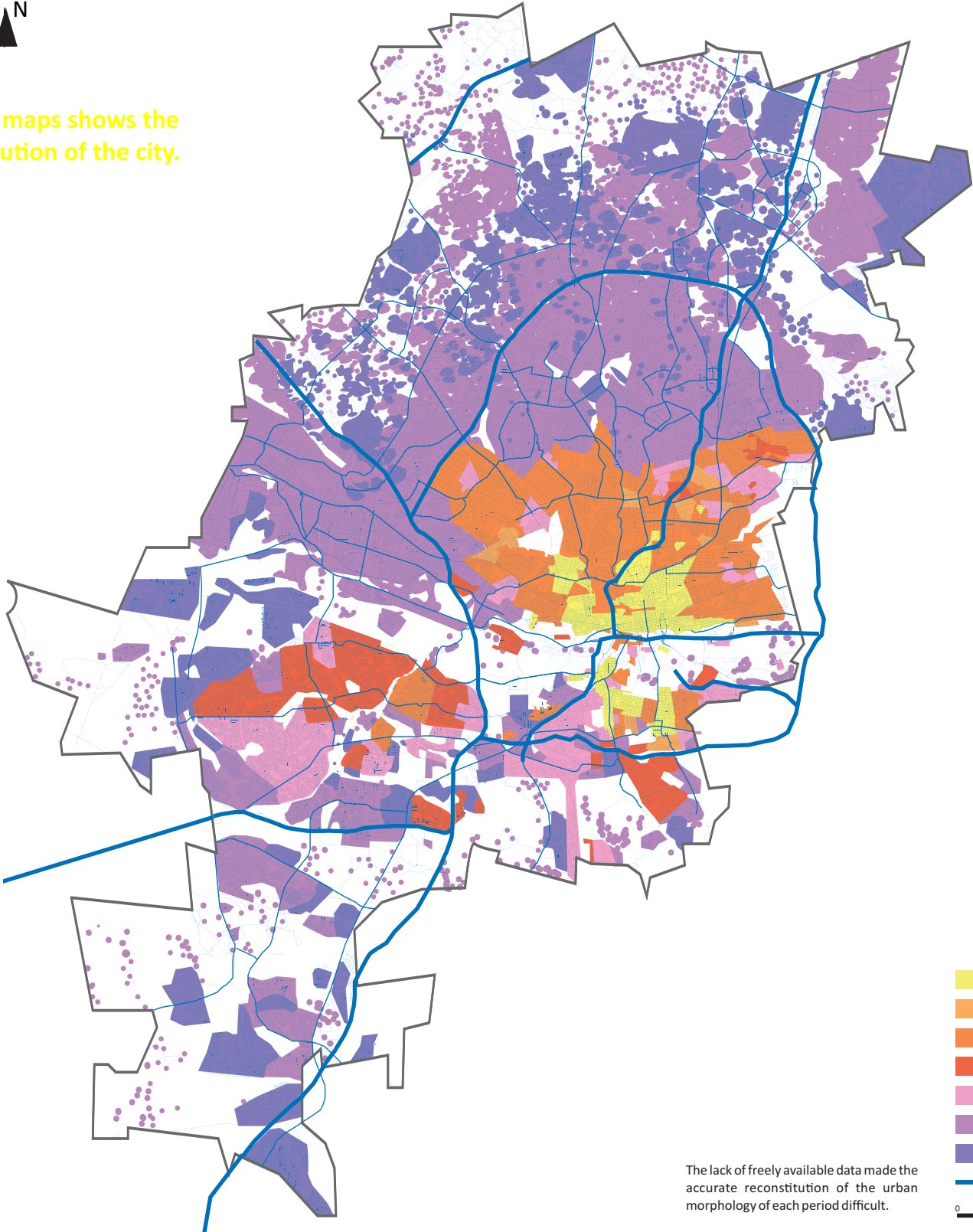


# 2.2 Historical Urban Growth

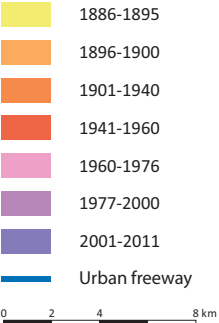
## Map 7: Historical Evolution



The following maps shows the  
historical evolution of the city.



The lack of freely available data made the accurate reconstitution of the urban morphology of each period difficult.



The lack of freely available data made the accurate reconstitution of the urban morphology of each period difficult.

The urban morphology of Johannesburg was largely defined by two concomitant phenomena which reinforced each other, and lay the foundations of a structurally and sociologically fragmented city.

Initially, gold mining with its massive need for labour, led to population growth as well as significant migrations in the city.

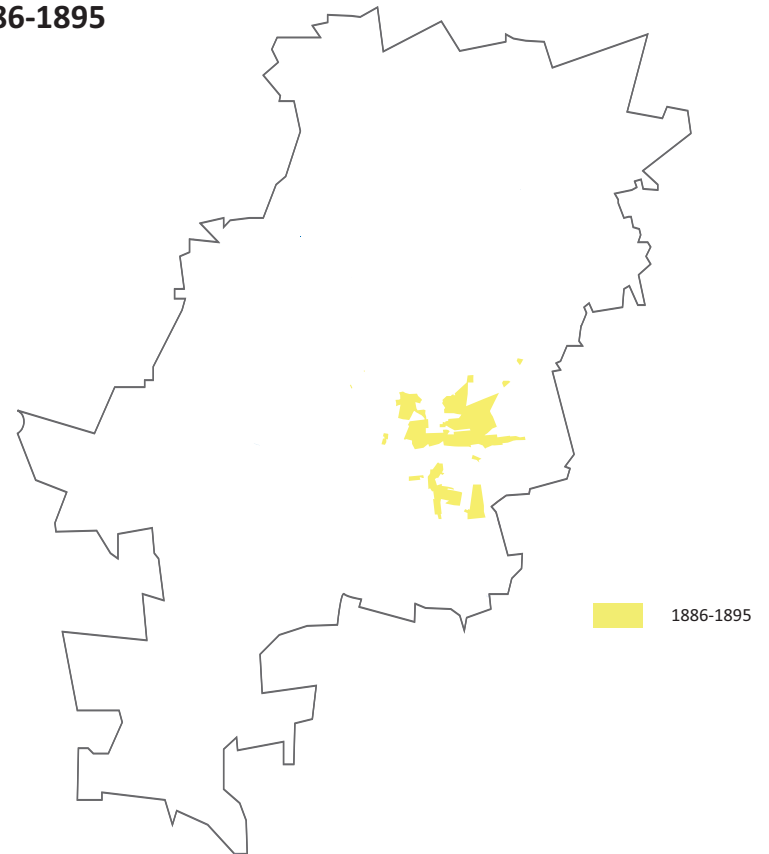
The city was initially inhabited essentially by men who came to work. Housing was then supervised by the authorities in the form of a land use plan, which means that different residential areas were delimited early in the development of the city.

In the north-east, near the city centre, were three enclaves: segregated into racially defined groups for people of Indian decent, those of Malay decent and black Africans.

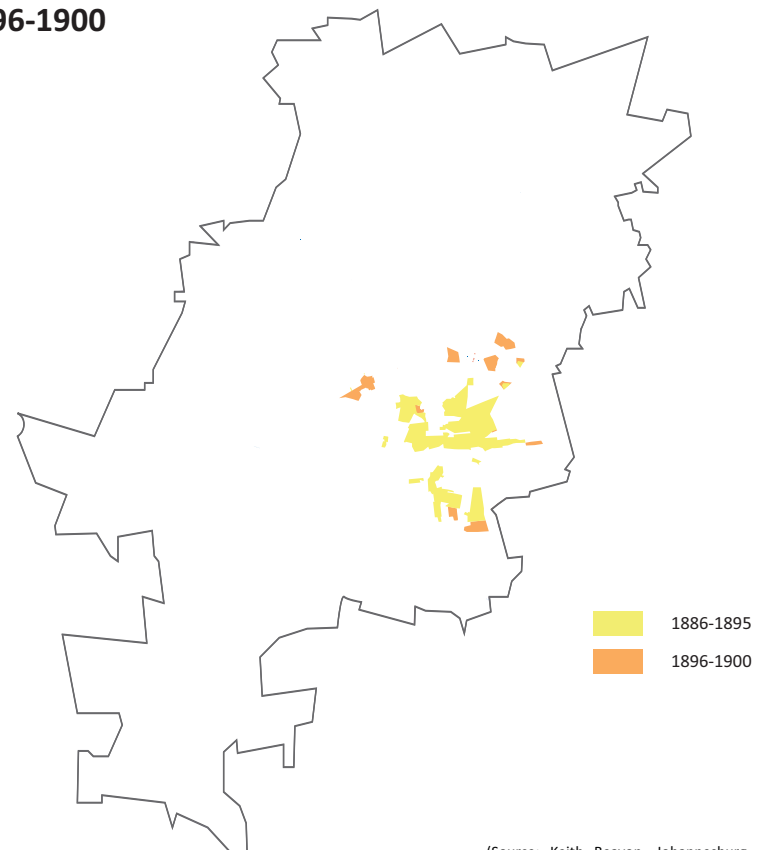
Likewise, all Whites did not reside in the same place. A group of low income Afrikaners was allocated an area west of the city centre, near the Indian location, called Burghersdorp, then one near Vrededorp. Despite the creation of these enforced segregations, racial mixing subsisted. Influential Whites and the (mainly English-speaking) middle class settled more to the east of the city centre, in Doornfontein. Later, they moved more towards the north of the city centre, on the Parktown ridge<sup>6</sup>.

Due to its status as a mining city, the rail network became the essential infrastructure for its economic prowess, with all merchandises transiting by train towards Cape Town or Durban. As such, as early as 1892, Johannesburg enjoyed a long distance rail network that was certainly successful, but that divided the city in two. The railway ran (and still runs) in an east-west direction and was situated south of the mining belt. The layout of the railway lines depended on the location of the mine shafts, not the city, since they were used in priority for the freight. Transporting passengers was secondary..

## 1886-1895



## 1896-1900



<sup>6</sup> Beavon, Keith S. O., (1999), «Johannesburg, 112 ans de division, de la ségrégation à la ville d'apartheid», in Onana, Jean-Baptiste (ed.), Questions urbaines en Afrique du Sud, Paris: L'Harmattan, pp. 17-23

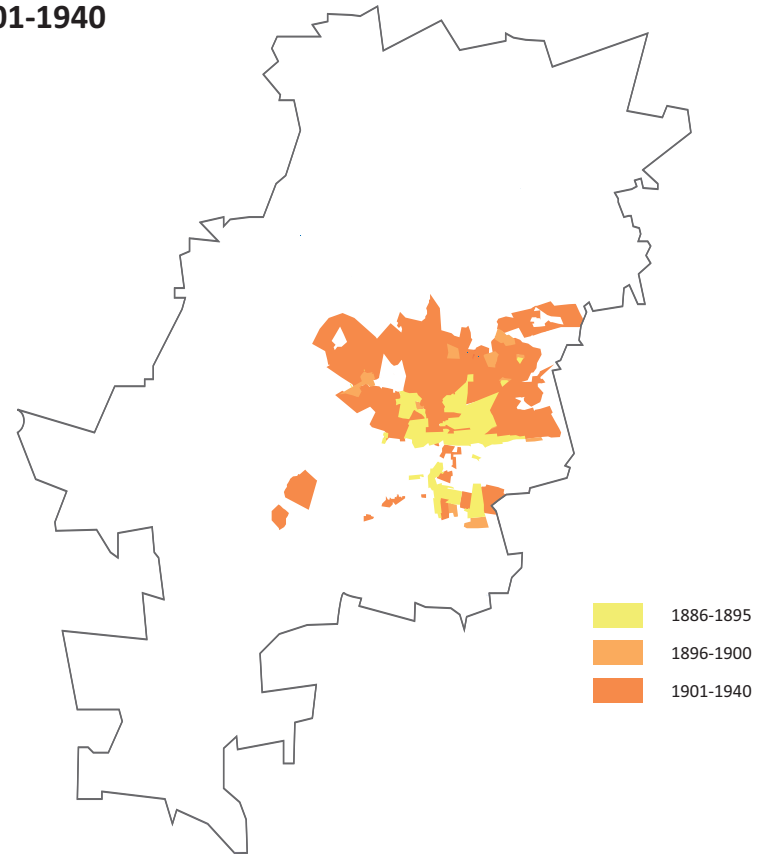
## The Evolution of Johannesburg's Spatial Form

**A**lso, from the very beginning, the city was organised around a buffer zone taken up by the railway lines, industrial areas and warehouses. The map shows clearly this spatial division and central urban gap. The original city, in yellow on the map, can be seen expanding to the north and south of this buffer zone.

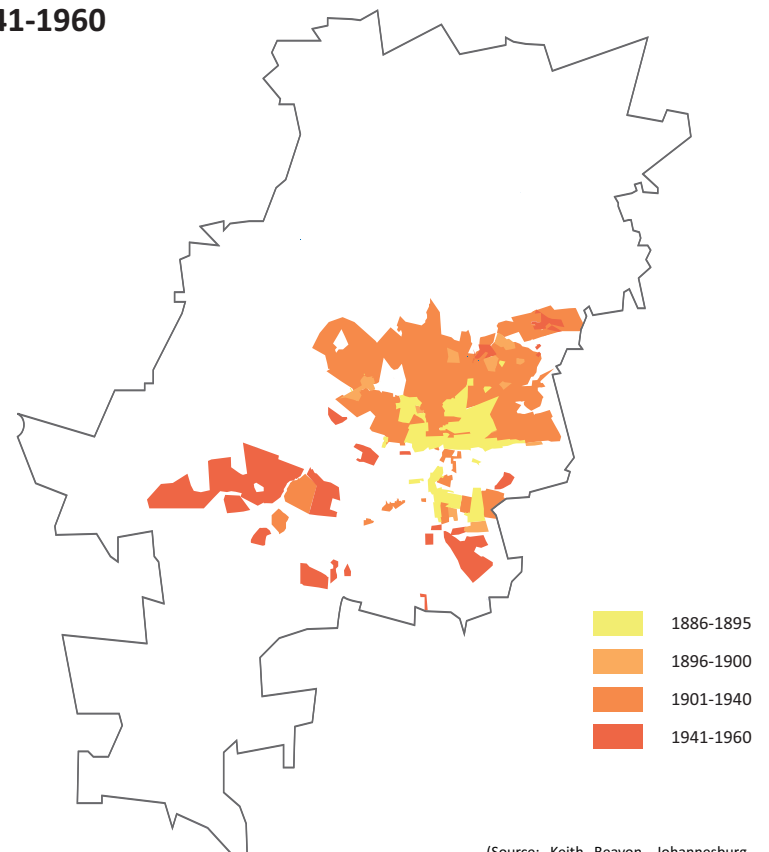
Yet the network of the “modern” city of Johannesburg dates from the inter-war years, when the municipality tried to remedy the lack of housing, mainly in favour of the “poor” white population, but also in favour of black Africans. The construction of houses for the latter was consolidated in the south-west section of the city, with the municipality hoping to keep the black populations separate from white areas, but close enough to work in the city. The northern suburbs developed rapidly (in orange on the map) and the first enclaves of housings appeared in the south-east.

**T**he apartheid policies applied from 1948 until the 1980s reinforced the segregative measures of the previous decades. We can see in red on the map, the development of the townships which served to house the significant black labour force.

### 1901-1940



### 1941-1960





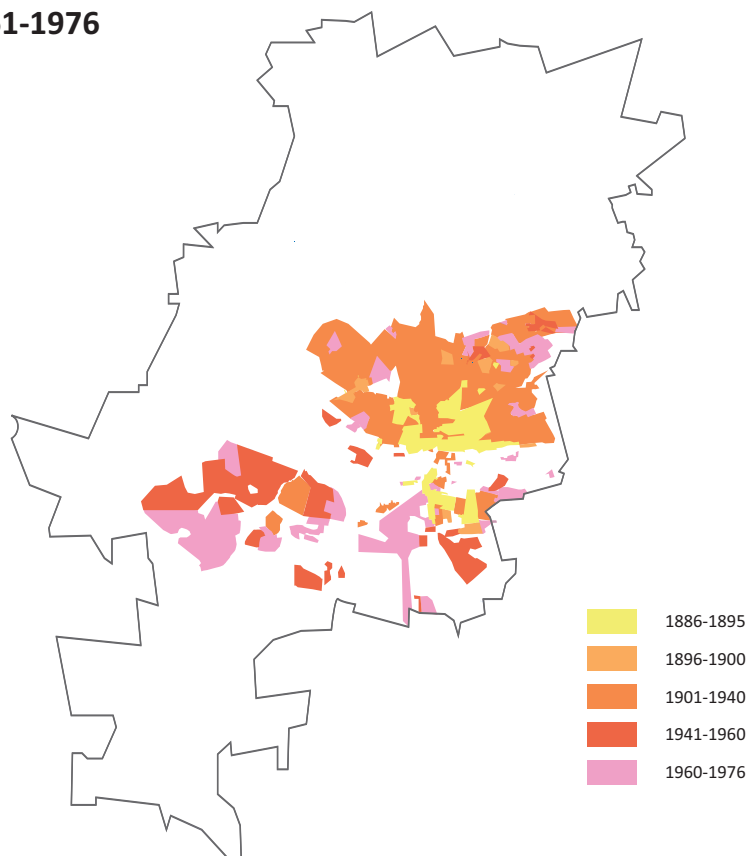
As with many cities around the world (arguably most notably, American cities) the rapid expansion of car usage had a high impact on urban morphologies and the spatial structures of the city. As such, in the 1960s, the government chose an “all-car” development model. With cars becoming essential symbols of access to freedom, affluence and prestige, urban structures were put under pressure and adapted accordingly. Long distances could be covered in a short time, resulting in the city spreading along its motorway spines.

In parallel, the dismantling of the tramway network (in use from 1954 to 1961) contributed to reducing the attractiveness of the city centre, which became increasingly difficult to access and became saturated by increased traffic. Consumers began to reject the congested centre in favour of shops more easily accessible by car in the outer suburbs.

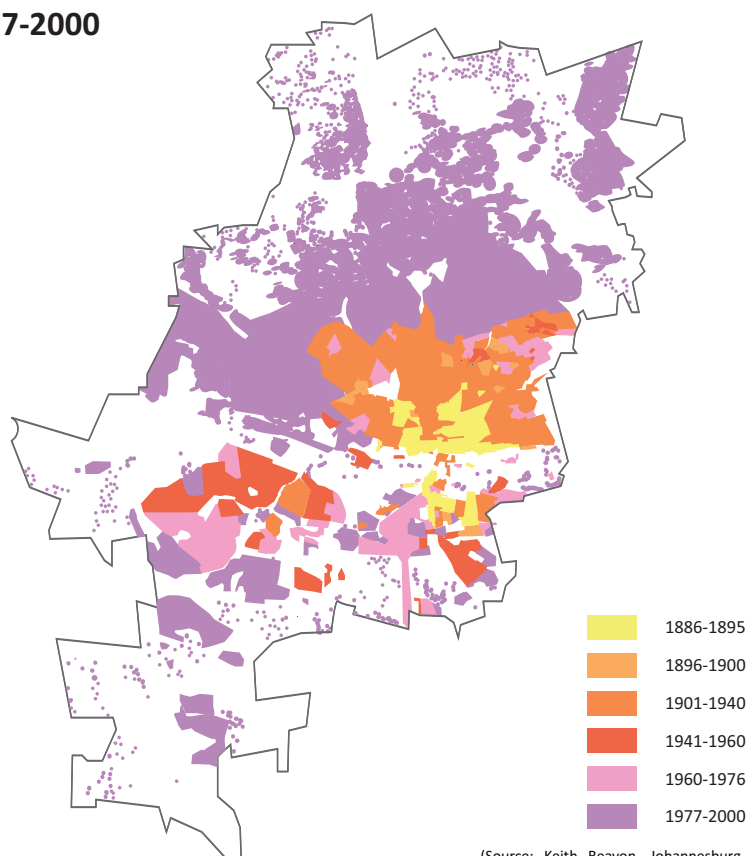
From the beginning of the 1980s, the city experienced a sprawling growth (which can be seen in purple on the map). Economic activities were not spared and ended up spreading along all major trunk roads.

Whether public or private, urbanisation in the last years pursued a similar logic, in pushing urban boundaries outward.

## 1961-1976



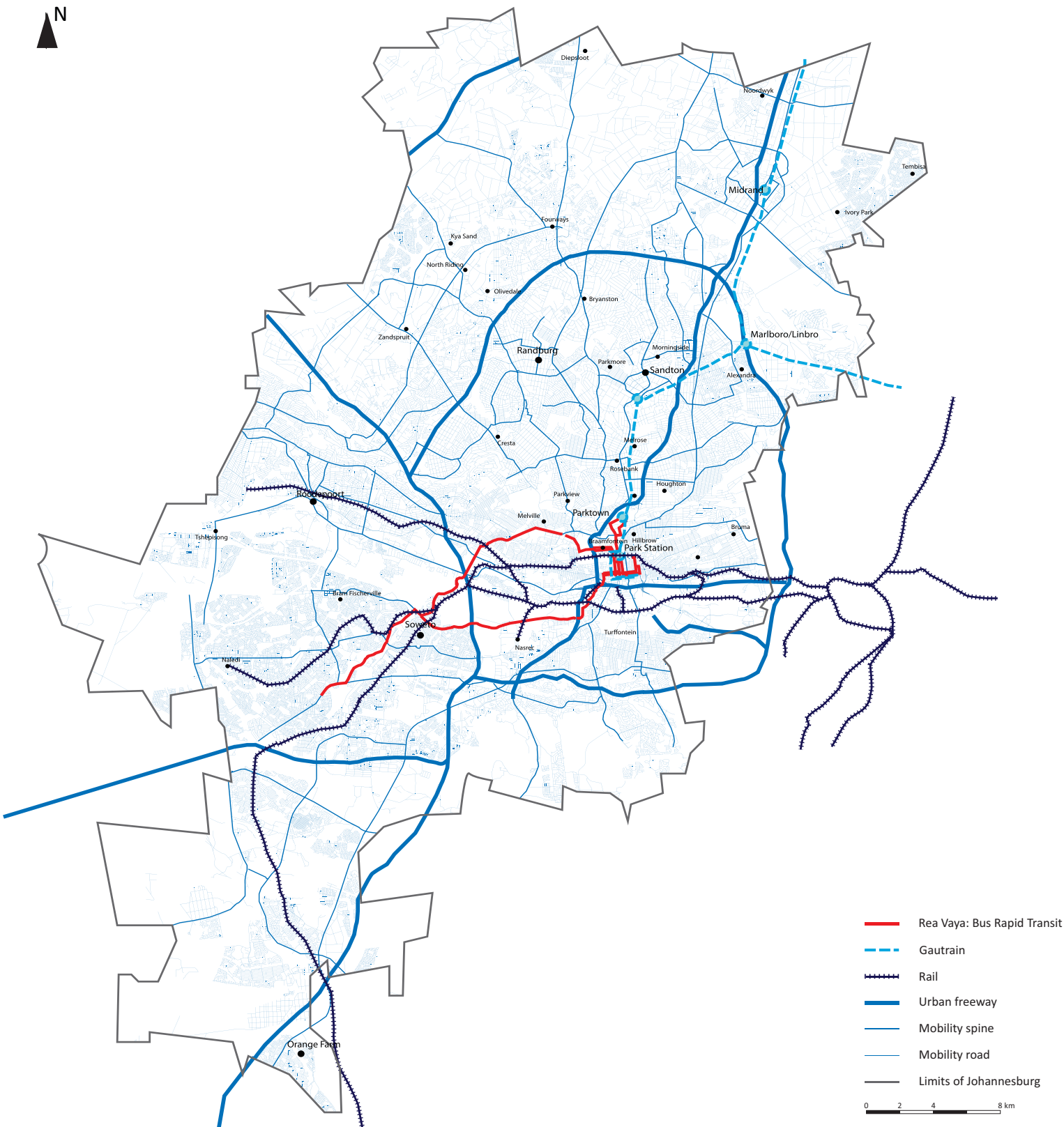
## 1977-2000



(Source: Keith Beavon, Johannesburg, the Making and the Shaping of the City.)

# 2.3 Transport Networks

## Map 8: Transport





In Johannesburg as in most South African cities, the historical lack of investment in transport infrastructures means that, today, many problems related to mobility and accessibility to urban amenities still exist.

Several generations of transport succeeded one another in Johannesburg. Initially, an effective tramway network served the CBD, complemented by rail networks for the remote suburbs of the south-east. As seen previously, the tram system was dismantled in the 1960s and the metro rail system has seen a steady decline, although with recent investments and plans for future upgrades implemented.

The spatial structure of the city was then organised around a radial urban network, emanating from the city centre and more specifically Park Station, the central train and bus station of the city. Urban development of the city took place along these development lines which linked the various attraction poles and which became progressively urbanised.

The rapid development of daily mobility had an impact first of all on the urban traffic which increased over time, but also on the distances covered which became increasingly longer.

There are 15 343 km of roads for 4.4 million inhabitants, i.e. 3.50 m of road/person. When comparing Johannesburg, which has an average density of 2 500 inhabitants/km<sup>2</sup>, with a compact city (with a density higher than 15 000 inhabitant/km<sup>2</sup>), the length of the road network, and consequently the cost, per person is multiplied by 6<sup>7</sup>.

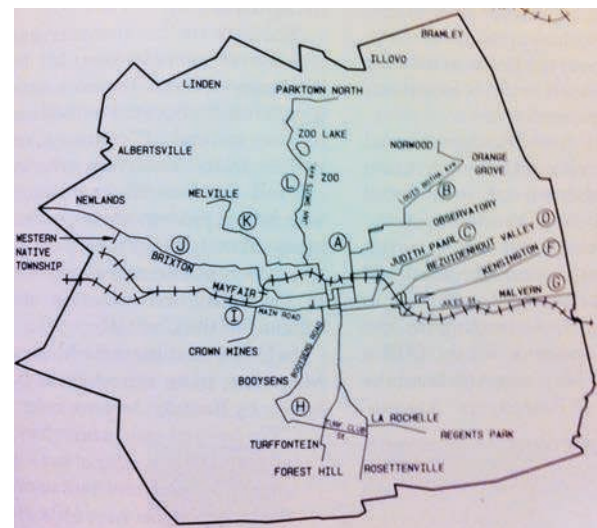
The main objectives of the new transport policy of the city, established in 2006 and revised in 2012, are to meet the current mobility needs, by creating and improving infrastructure and the service level of the network, so as to consolidate the urban development of the metropolis.

- An informal system of public transport in the form of minibus taxis has been developing over the decades, thereby filling the gap left by government policies and enabling the poorest populations to move around. Minibus taxis and their associations are seen today as important actors which the city seeks to integrate in its new transport strategy.
- The Gautrain, introduced in 2010, a regional train linking Pretoria, O.R. Tambo International Airport, and the centre of Johannesburg as well as a number of business centres along the route, including Sandton and Rosebank. The prime objective of this new train line was to relieve congestion in the Pretoria-Johannesburg agglomeration, by linking residential areas to activity and job centres. The system's target clientele

is arguably higher income commuters, as it connects mainly business centres and higher income areas of the city.

- Rea Vaya, Johannesburg's Bus Rapid Transit (BRT) system, introduced its first line in 2010 and is in the process of expanding. Its ambitious ultimate objective is to place 85% of citizens in the city at less than 500 metres from a traffic line or bus station. Today, bus lines put into service are following the existing north-south lines of the city centre towards Soweto (and soon towards Alexandra). The fragmented layout of the city and the multiplication of job centres make this a very ambitious project, both economically and functionally.
- Metrorail commuter trains were conceived to transport workers from the townships to their place of work during apartheid. They are still circulating today. As mentioned earlier, the quality of rolling stock and operations has deteriorated over time. Metrorail has established a strategic plan for Gauteng. It has recently implemented an investment programme of up to 24 billion Rand over 3 years to rehabilitate the network and integrate it into other transport modes.
- Buses in the city are managed by Metrobus, a city-owned company, and by a private company, PUCTO, which was created in 1945 to meet the demand for the public transport of black populations. The bus network links the townships to activity and job centres as well as trunk roads. This private company benefits from national subsidies.

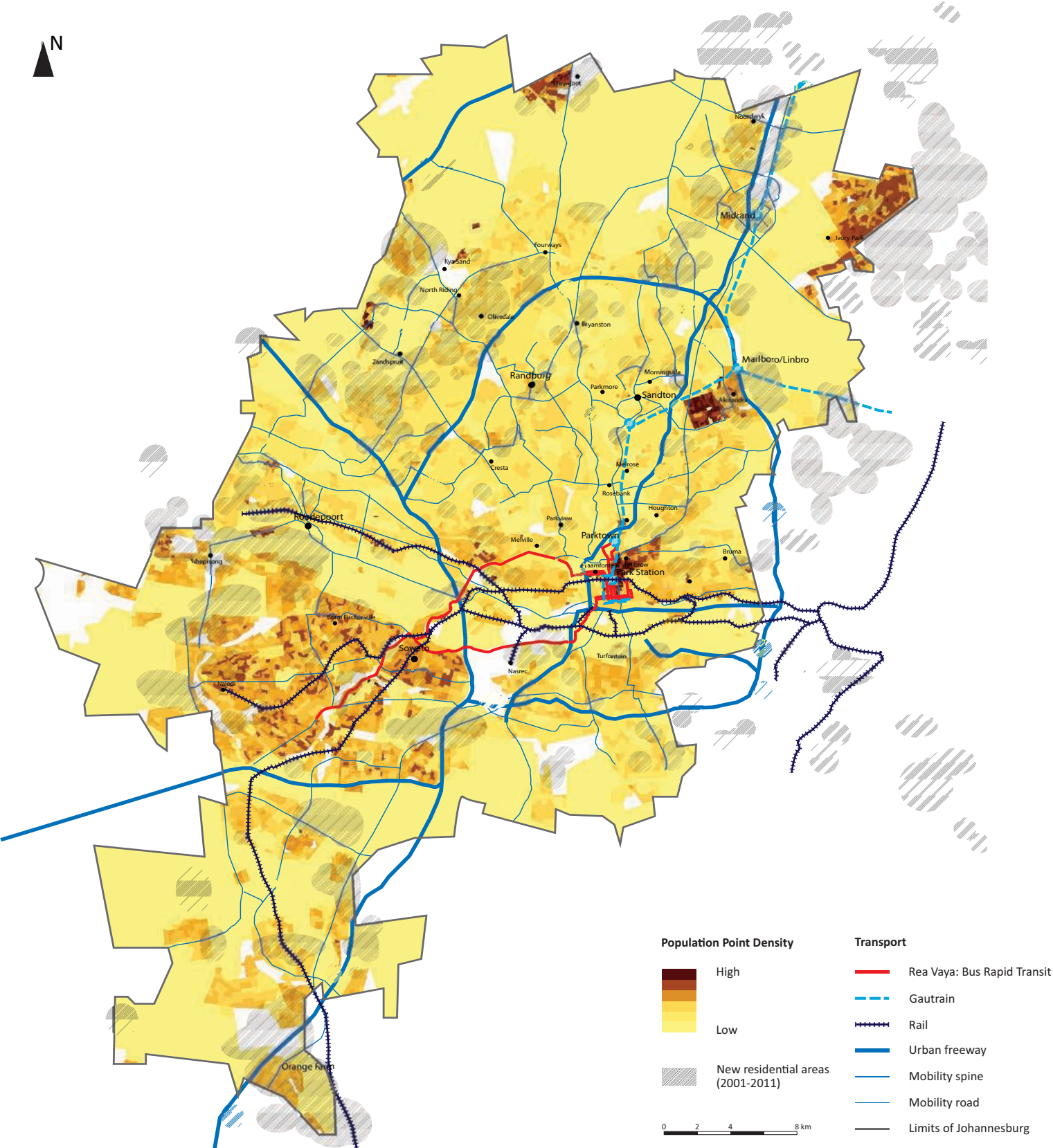
Issues concerning the coordination of timetables, lines, travelling routes and tariffs remain complex, considering the multitude of actors involved and the lack of public policy. Currently, a project for the establishment of a schedule shared by Metrobus, Rea Vaya (BRT), Gautrain and taxi operators is under way. It will ensure better connections between the various services.



Tram Network Map, Johannesburg, 1932

# 2.4 Demographics and Human Geography

## Map 9: Human Geography



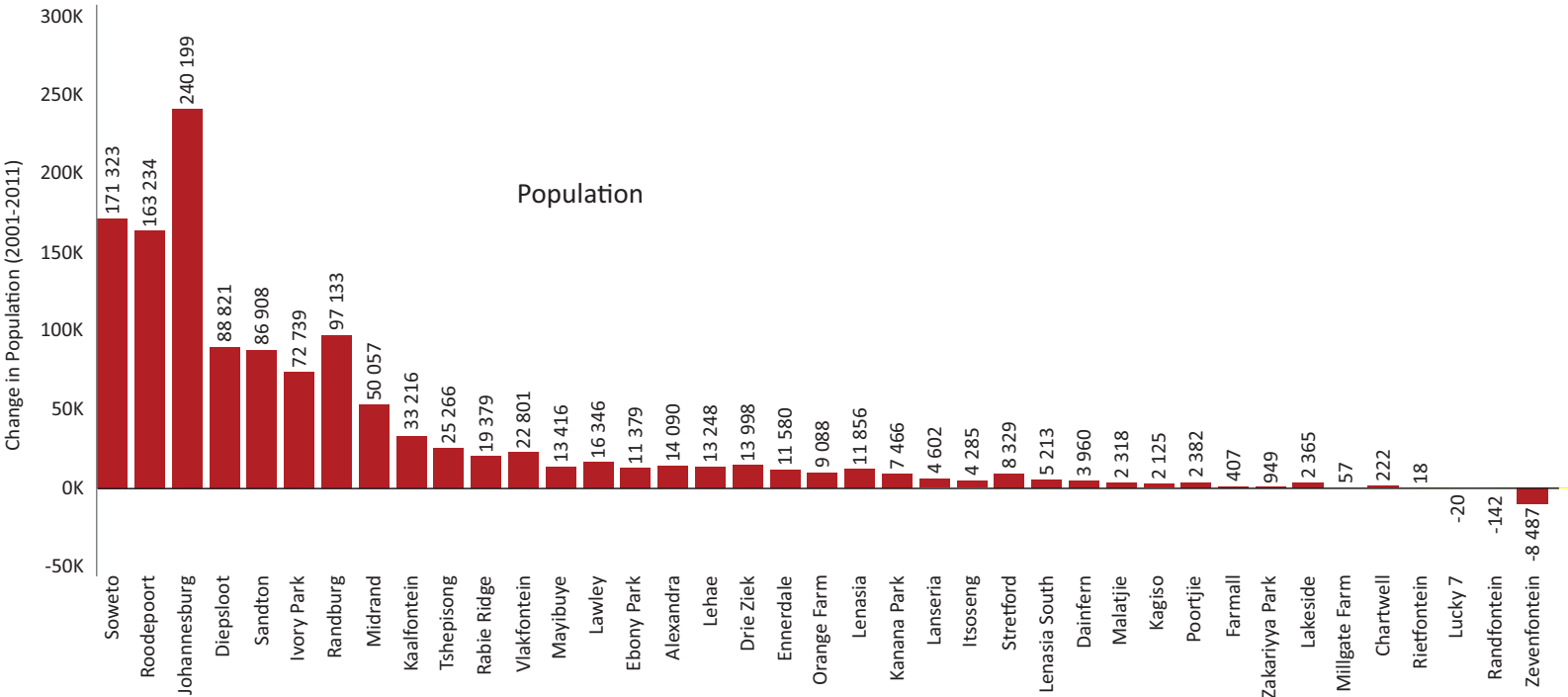
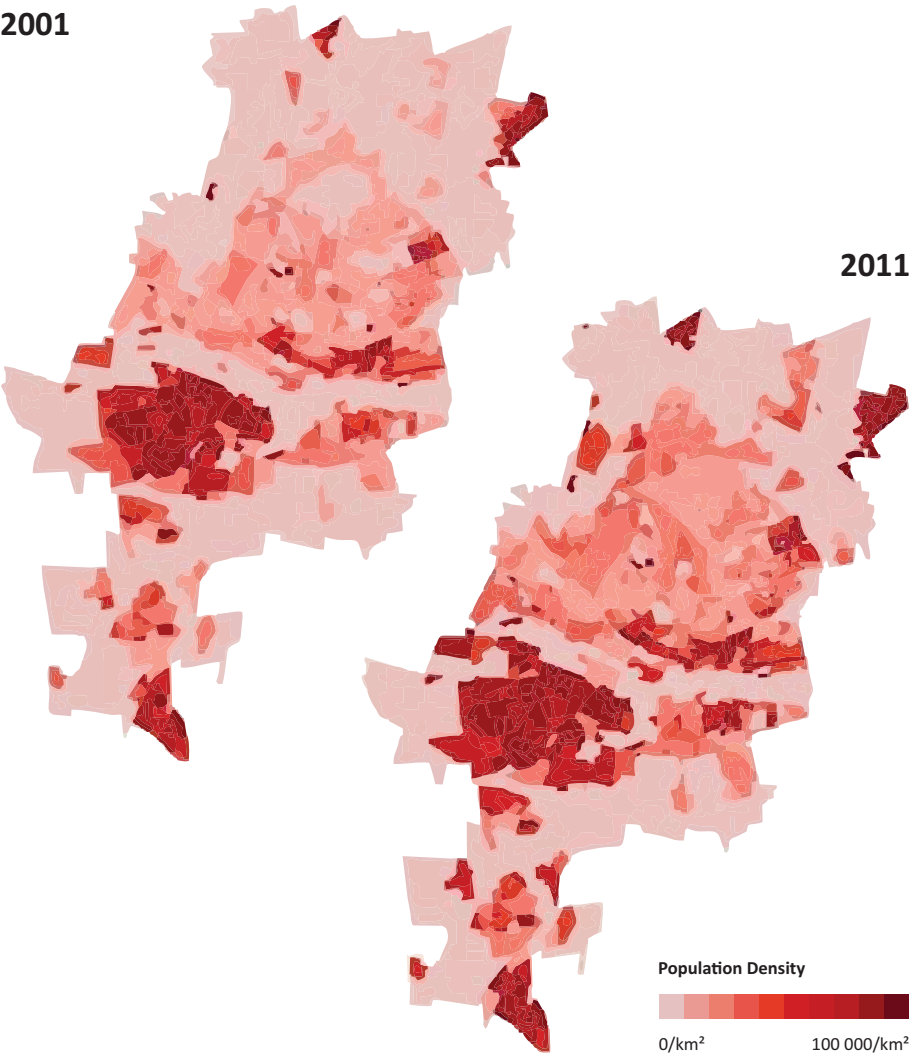
The population of Johannesburg is representative of the city's dynamism. With 2.63 million residents in 1996, it increased to 3.2 million in 2001 and reached 4.4 million in 2011, i.e. a growth of 37% between 2001 and 2011.

Johannesburg has become the main destination for migrants from rural parts of the country and international migrants. This is explained first of all by the fact that the city is the economic centre of Gauteng and the centre of the national economy. Second, it interacts closely with the two other metropolitan areas of Tshwane and Ekurhuleni and finally, compared to other main cities in South Africa, it is relatively close to Botswana, Mozambique and Zimbabwe. Despite the difficulty of enumerating the number of foreign migrants (those without papers in particular), it was estimated that they represent between 12% and 14% of the population of Johannesburg.

The increase in population reflects spatial tendencies representative of major urban trends. On the one hand, it follows the increase in jobs in economic centres which are developing in the north (i.e. Sandton, Randburg and Midrand). On the other, it is linked directly to two phenomena: the production of social housing in the outer suburbs of the metropolitan area (Diepsloot, Ivory Park and Cosmo City among others) and the multiplication of informal housing (Soweto and the city centre in particular). The map opposite shows the distribution of population density in the city. The evolution between 2001 and 2011 shows major urban changes and major areas of densification.

2001

2011



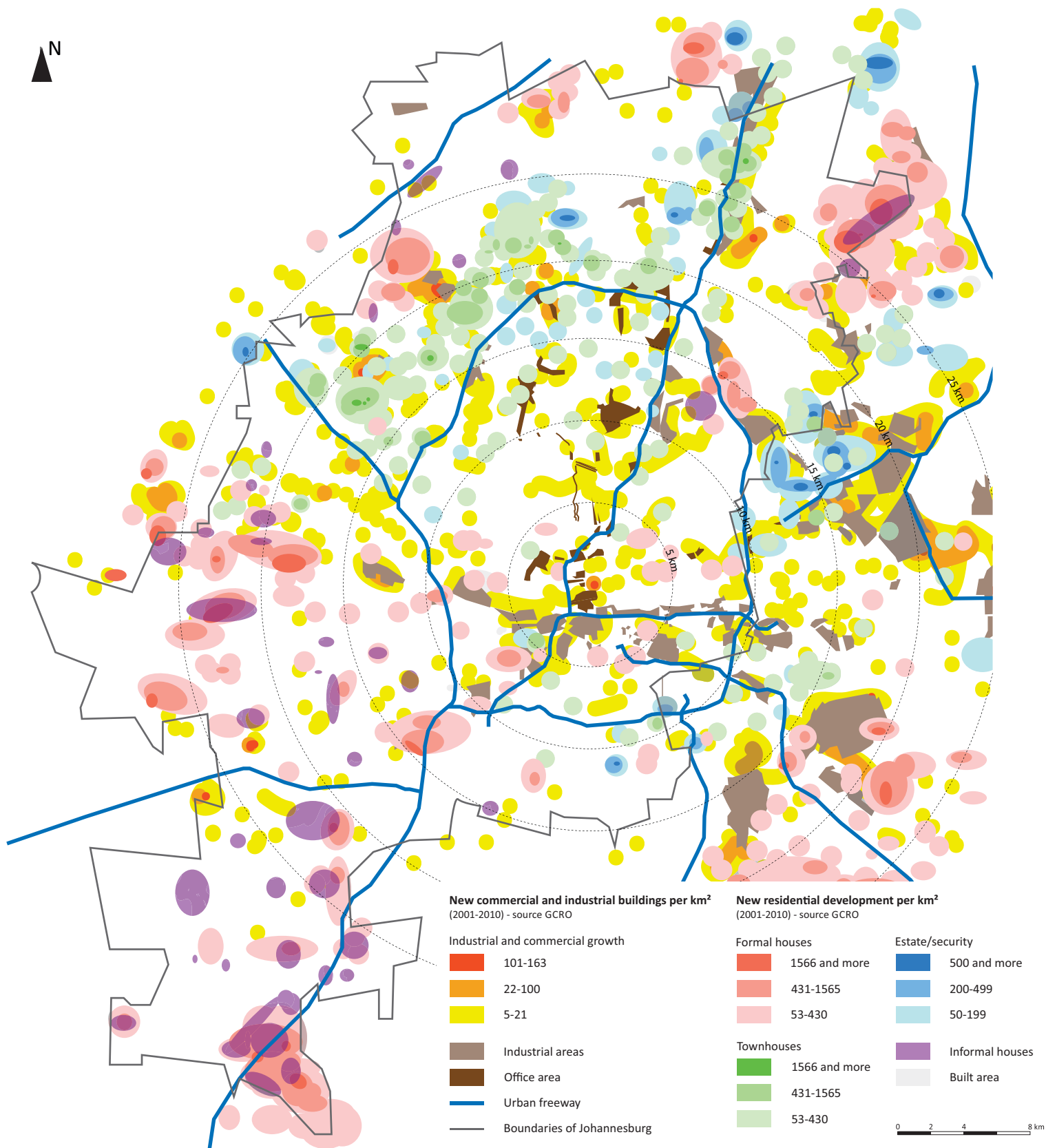




# **Town Planning and Urban Development**



# Map 10: New Urban Areas



## a. Access to Housing for All

Like all South African cities, the evolution of Johannesburg has experienced strong structural changes since the beginning of the century.

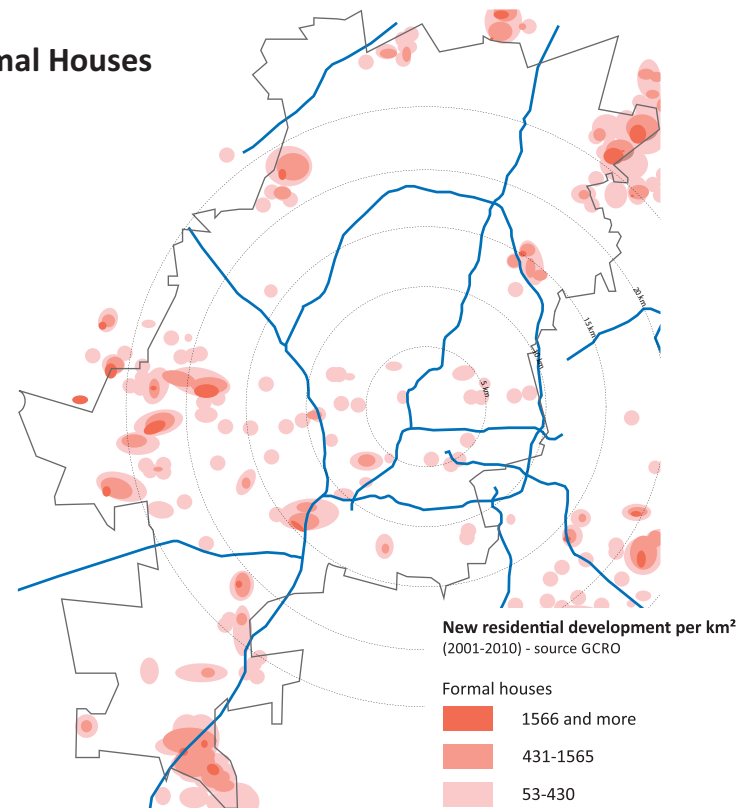
The first significant evolution was linked to government directives. Indeed, after the 1994 elections, accession to private property became the basis for post-apartheid reconstruction (Morange, 2006). Boosted by the presidential programmes stemming from the Reconstruction and Development Programme (RDP), vast social housing projects were launched in large cities with the objective of putting an end to the urban inequalities inherited from apartheid.

In Johannesburg, housing production was carried out essentially on low cost land situated largely on the outskirts of the city, in the north and the west, more than 25 km away from the city centre, or around existing townships such as Soweto and Alexandra. Today, symbolically, RDP houses acknowledge the presence of black populations in the cities, and the fact that they have the possibility of climbing the social ladder<sup>8</sup>.

Yet the continuous marginalisation of the poor to the outskirts of the city paradoxically contributes to increasing the spatial fragmentation of Johannesburg. Mass unemployment reflects failure in reaching objectives to reduce poverty and RDP inequality, in that the spatial development of the city has kept the poorest excluded from the fruits of development.

Basic services, which are supplied at the same time as the RDP houses are built, are often of bad quality, and their profitability is often questioned by the lack of creditworthiness of the populations benefitting from these new facilities, which often prevents owners from being able to pay for their standing charges or make full use of the services<sup>9</sup>.

### Formal Houses



Cosmo City, May 2014



Soweto and its extensions, June 2014



Bram Fisherville, March 2014

<sup>8</sup> Habiter un quartier RDP, Marine Suteau, EchoGéo n°13, 2010

<sup>9</sup> Sécurité, dynamiques urbaines and privatisation de l'espace à Johannesburg, Charlotte Boisteau, LaSUR 07, 2003

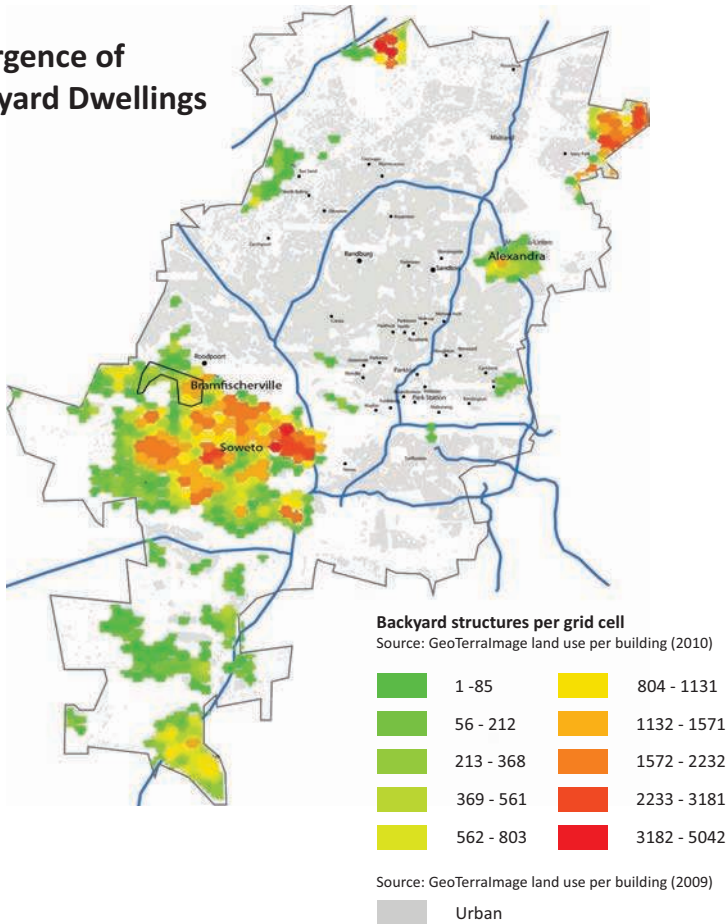


b. Between Informal Housing and RDP Houses: The Example of Bram Fischerville

Bram Fischerville is an RDP suburb that was built at the beginning of the 2000s. It harbours formal and informal housing, i.e. social houses as well as spontaneous constructions inside plots, called backyard dwellings. The emergence of these backyard dwellings in RDP suburbs is an unexpected consequence of the national South African “formal” housing policy, which gives priority to property ownership as opposed to rental housing. Backyard dwellings create a situation of cohabitation between property owners and lodgers on the same plot, although each one lives in a separate independent dwelling. This form of rental accommodates low income populations, often poor migrants, leading property owners to become “subsistence landlords” (Kumar, 1996b).

This urban phenomenon is evolving in Bram Fischerville and can be observed on a number of plots already. The map below shows areas where backyard dwellings are established in Bram Fischerville. Evolution is slow as it is linked to the owners' financial capacity to invest. The first step is generally the erection of walls or fences around the plot, followed by the extension of the original building and and/or the construction of backyard dwellings.

Emergence of  
Backyard Dwellings



Evolution of the Densification Process, Bram Fischerville, March 2014

Initial RDP Houses

2001



2008



2011



2013



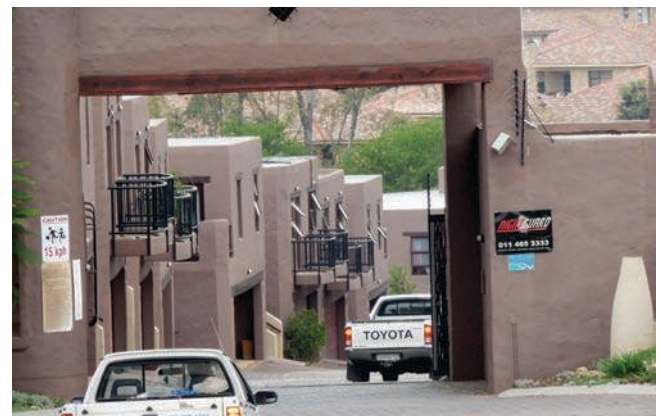
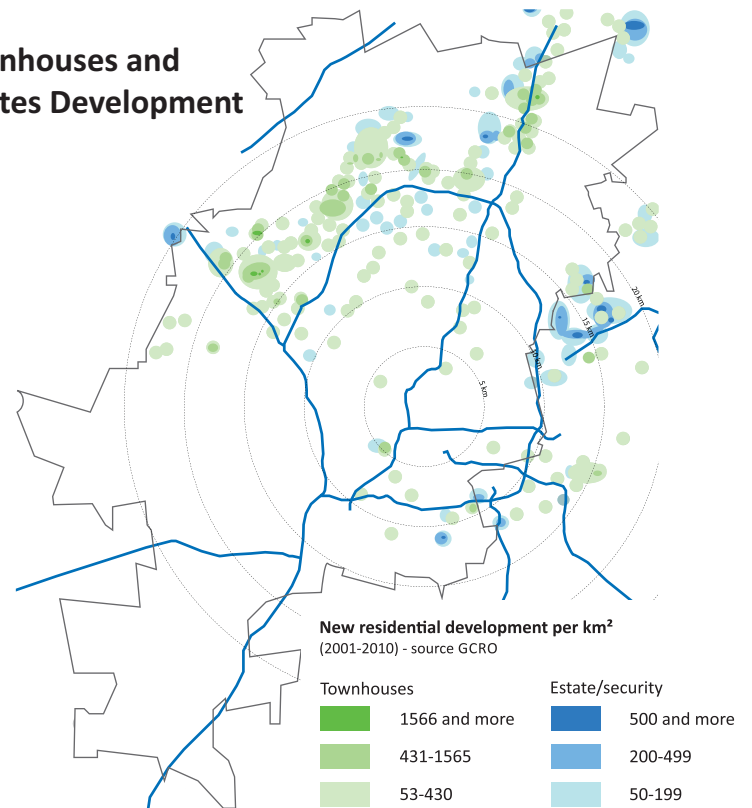
## c. When Property Rhymes with Security: The Dynamics of Building Housing for the Private Market

A second trend has also impacted strongly on the city's urban development. In accordance with the neoliberal programme established at the end of the 2000s, urban policies were modified by the privatisation movements of urban services, as well as the multiplication of closed residential complexes, commonly known as Estates<sup>10</sup> (upmarket housing intended for the very well-off) or Townhouses<sup>11</sup> (intended rather for the middle class). These are private and enclosed residences, with access under surveillance 24 hours a day by security guards who are paid by the residents. Residential confinement can be analysed as a withdrawal strategy inside a comfort zone in which social homogeneity is preserved and access by "the undesirable" is controlled or even prevented (Ballard, 2004a). The racial motivation of this trend is no longer taking place, but a phenomenon of self-exclusion by the rich is underway. Violence is used as an argument to motivate protection of all kinds, even when justifying the erection of barricades and high walls to protect the rich from social ills which are no longer racially defined, but rather on levels of wealth and advantage.

The urbanisation of gated communities is constantly developing on empty lands situated north-east of the city. These communities are entirely residential, with no functional mixing, and are disconnected from the metropolitan networks. These new urban forms are developing more and more and are bringing out existing socio-spatial gaps. Fragmented urbanisation, being built plot by plot without any global spatial policy or logic, is leaving a strong mark on the territory of the Johannesburg metropolitan area.

These different residential areas are being built on the outskirts, far from centres of activity, and with higher densities than in residential suburbs close to the city centre. This is also leaving a mark on the landscape of Johannesburg. This tendency makes territorial development projects as well as efficient public transport network development projects complex. Indeed, the fact that residents live far from their place of work reduces the efficiency of public transport systems, which has an impact on the latter's profitability and, therefore, viability.

### Townhouses and Estates Development



North Riding, April 2014

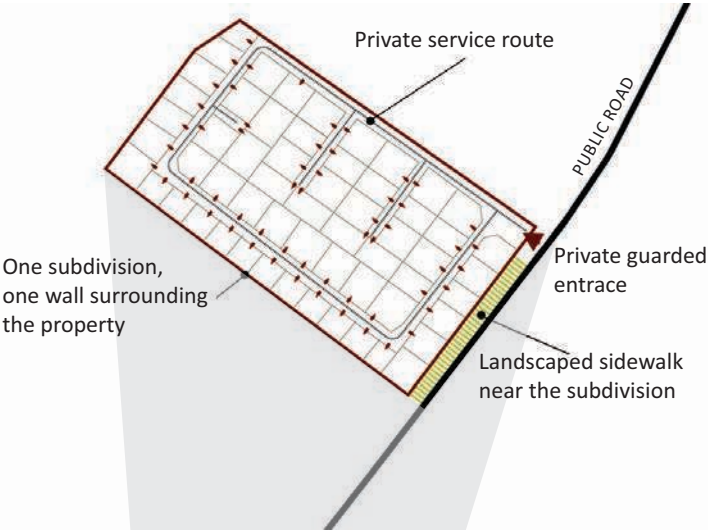
<sup>10</sup> These residences are similar to prestigious gated communities.

<sup>11</sup> Specific form of closed residential complex favouring relatively high densities, offering surveillance and security services, rarely endowed with community facilities.



## Development of Residential Areas on the Outer Suburbs: the Example of North Riding

### Typical Estate Development, North Riding, March 2014



As a suburb, North Riding is fairly representative of the impoverishment of urban structures through the multiplication of closed residential complexes. Few roads irrigate the area and these are only used as transport roads. Residences are small and some show a relative density per plot (with small semi-detached buildings on two floors).

The increase in enclosed residences is explained by the success of this type of housing with the middle class. These are indeed affordable properties, relatively dense with little or no facilities and parks. In North Riding, the urban model is much standardised and represents only a walled version of the suburb<sup>12</sup>. Yet, security is at the centre of discourses and practices: enclosed complexes have become a marketing tool. This reproduction mechanism is exacerbated to the point that enclosed residences dominate the entire residential offer. Since promoters are at the centre of the production process of these residences, they contribute to spreading this product established by them as a property concept. In North Riding, the duplication phenomenon at the level of the suburb, linked to spatial proximity, is particularly present and seems to have even become a selling point. It seems to guarantee social homogeneity and stability as well as security, and therefore seems to present assurances as regards investment potential.

<sup>12</sup> Sécurisation des quartiers and gouvernance locale, C. Bénit-Gbaffou, S. Fabiyi and E. Peyroux, Karthala, 2009

### Evolution of the Densification Process, North Riding, March 2014

2004

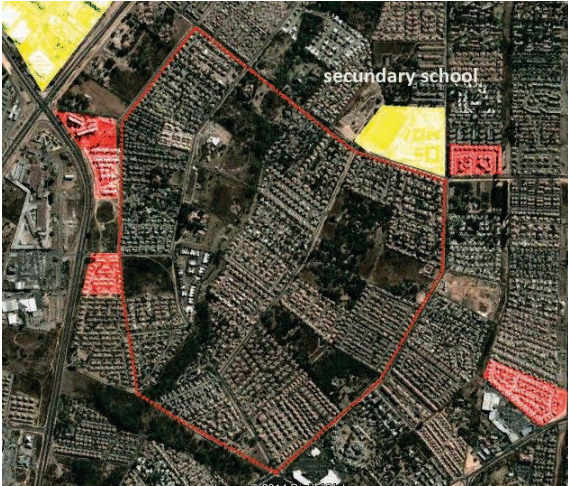


2007



Typical urbanisation carried out plot by plot

2013



Appearance of the first amenities (in yellow): schools as well as commercial and economic centres.



## Densification of Central Residential Suburbs: the Example of Houghton

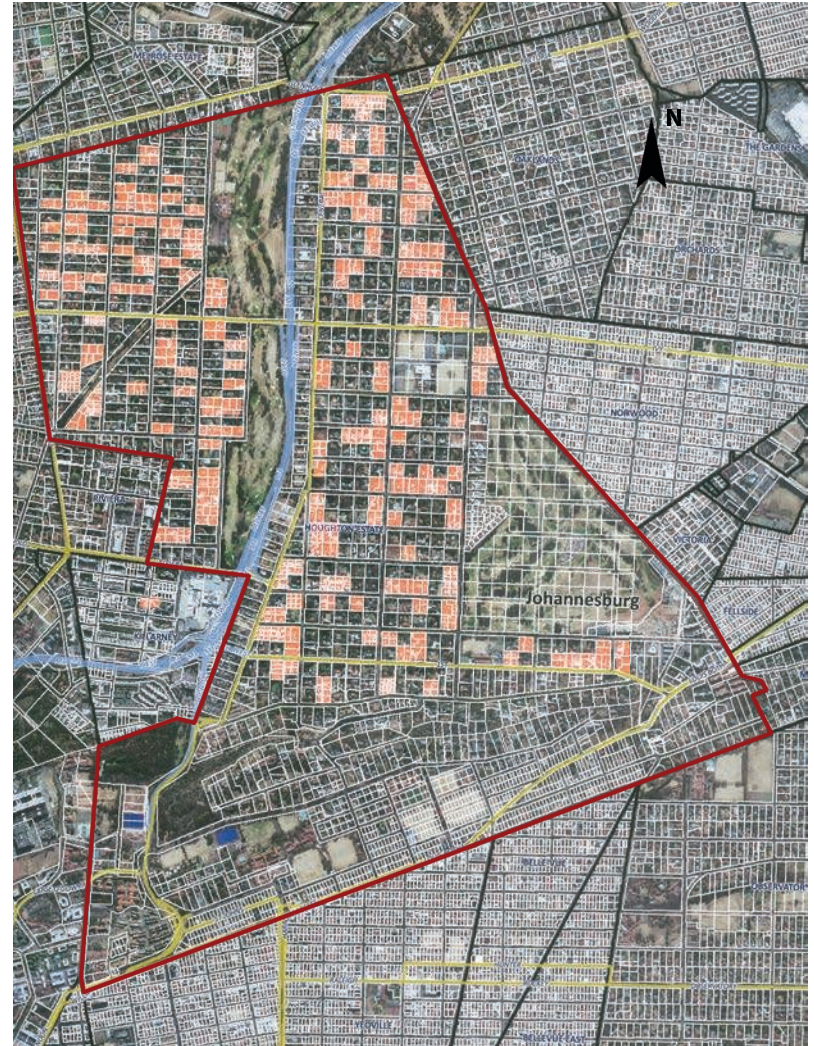
**P**lot subdivision with a view to creating housing, has been developing in historical upper income residential suburbs.

Plot division is an individual land initiative which, far from being marginal, is becoming essential as a meaningful mode of urban evolution at the city level (short of a detailed assessment, we know that the ratio of plot division in retail-site development is important). It also leads to remodelling a suburb from all angles at the local level (morphologic, landscape, demographic, sociological, technical etc.).

This method of densification in single family housing neighbourhoods is only one of the many facets through which the accumulation of uncoordinated individual choices generates an evolution of systemic functioning. Even if this method represents a cheap alternative to urban sprawl (no immediate investment in the networks, roads etc.), it appears nonetheless necessary to control and manage evolutions because the water and electricity grids are designed for initial densities, and are in some cases old and in need of maintenance.

For a few years now, Houghton has undergone many changes with the construction of housing estates on existing plots. The city sees many positive aspects in the resulting densification, but not without controversy. Indeed, these changes mean, among others, the destruction of many old houses sometimes with heritage value, the quasi-systematic felling of trees and the increase of rainwater runoff with more impermeable surfaces.

Despite the suburb's rapid development, land value and real estate prices remain solid, even if, proportionally, the value of plots has not increased as rapidly as that of plots further north (in Sandton in particular). In 2001, the average price of a house was R1 200 000; in 2006, it was R3 700 000<sup>13</sup>.



*Divided plots, Houghton, 2014*

<sup>13</sup> [http://www.joburghappenings.co.za/houghton\\_homepage.htm](http://www.joburghappenings.co.za/houghton_homepage.htm)

### Example of Plot Division Process, Houghton

2001



2004



2011





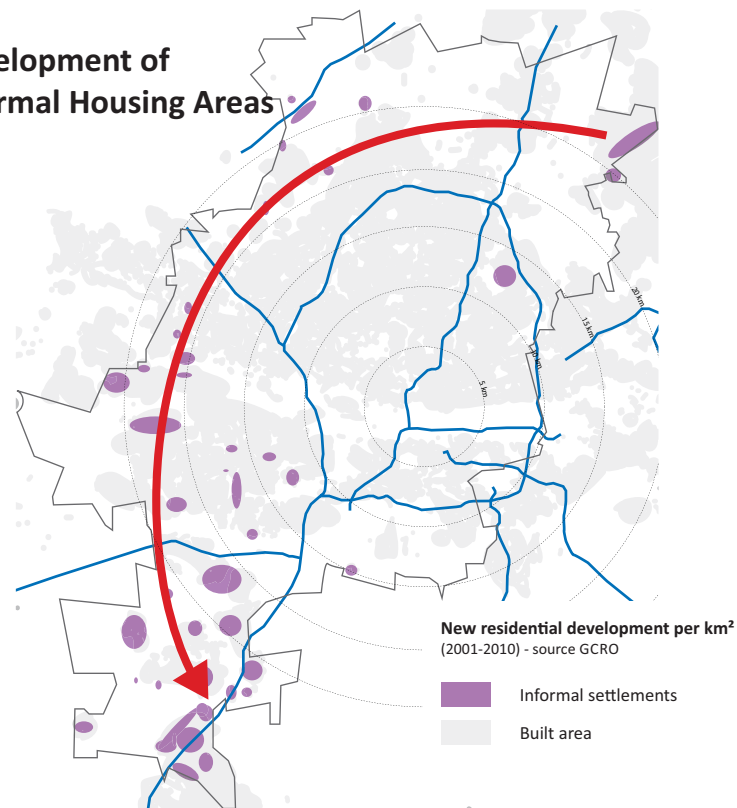
d. Informal Housing

The third trend concerns population growth via the informal sector. Despite a voluntarist housing policy emphasising the building of houses and access to property for the destitute, a large portion of the population is excluded from these processes. As a result, informal housing has taken over from the public sector. According to the 2009 census, there were over 180 informal settlements in the city, and their population has been increasing faster than the average growth rate of the city<sup>14</sup>. However, carrying out an accurate enumeration of this population remains difficult.

Informal settlements in Johannesburg are located mainly following an arch along the outer suburbs of the city, going from Ivory Park in the north-east, via Diepsloot in the north-west, to Lenasia, Protea Glen and Orange Farm in the far south.

Informal housing often borders older townships such as Alexandra or Soweto, due to the appropriation of the buffer zones.

Development of Informal Housing Areas

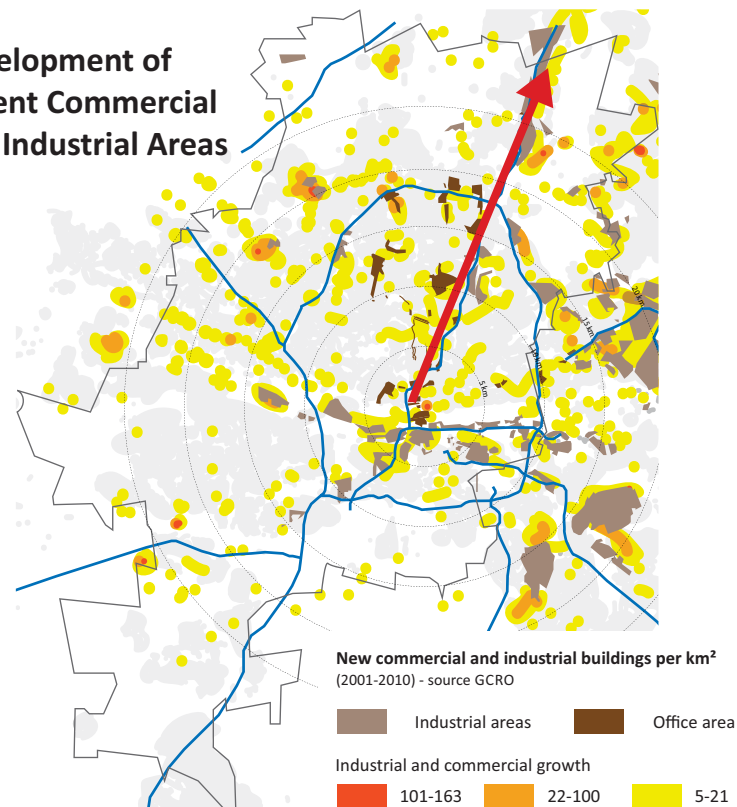


e. Commercial and Industrial Areas

Already at the end of the 1970s, the exodus of the white upper and middle classes towards the northern suburbs took place around two new centres: Sandton and Randburg. This population movement was soon to be followed by the movement of traders from the city centre towards the outskirts of the city. Part of the SMEs, offices and service providers also relocated towards the north<sup>15</sup>.

The current evolution continues to widen imbalances initiated during the previous decades between jobs and housing. Indeed, residential densification is concentrated in the north-west, and the development of activities and trading is taking place mainly along the economic corridors (particularly along the N1 towards Pretoria).

Development of Recent Commercial and Industrial Areas



<sup>14</sup> Marie Huchzermeyer, Aly Karam and Miriam Maina, University of the Witwatersrand South African Informal City Seminar, 15 November 2011.  
<sup>15</sup> Beavon, Keith S. O., (1999), op. cit., in Onana, Jean-Baptiste (ed.), op. cit., pp. 56-57

## f. Densification of the Suburbs of the City Centre: the Example of Hillbrow

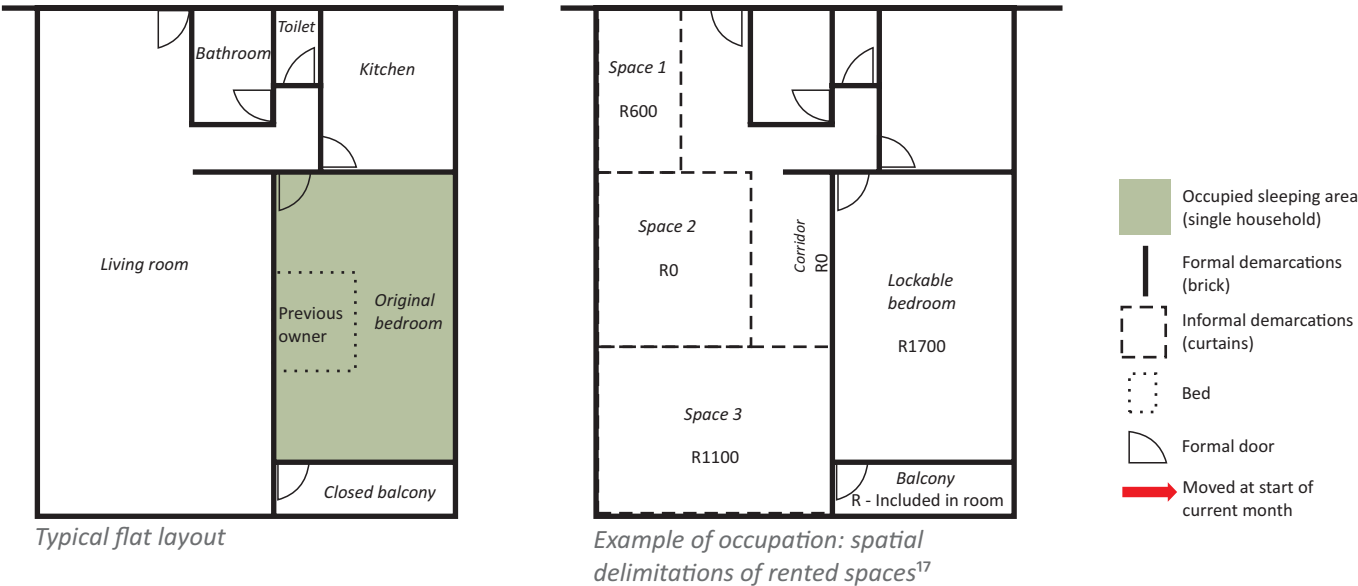
Strategies to access housing are diversified. In the city centre, they can take on a particular form of densification with much higher occupation of flats than they were initially designed for. High-density suburbs with their tall buildings situated near the city centre play an essential role in housing a large population of poor migrants in search of job opportunities<sup>16</sup>. Sub-letting, which to migrants often appears as the only financially affordable option, is organised informally. Upon looking at the Shoprite supermarket wall off the main street in Yeoville, the wall of the former post office of Hillbrow or at the foot of Ponte Tower, one can see a proliferation of advertisements for renting a balcony or a space enclosed by curtains in a dining room or even a bed to share. Every month, spaces that have become available are advertised. These are often temporary solutions for residents, waiting for their personal situations to improve or circumstances to change. The quantity of advertising suggest that this is a widely spread phenomenon in these areas.

This densification which is hardly quantifiable because of its fluid and informal nature, does not result in much external change in built form, but puts pressure on building infrastructure (water and electricity in particular) and the urban environment.



Advertisements for rooms to rent or “spaces to share” – Hillbrow

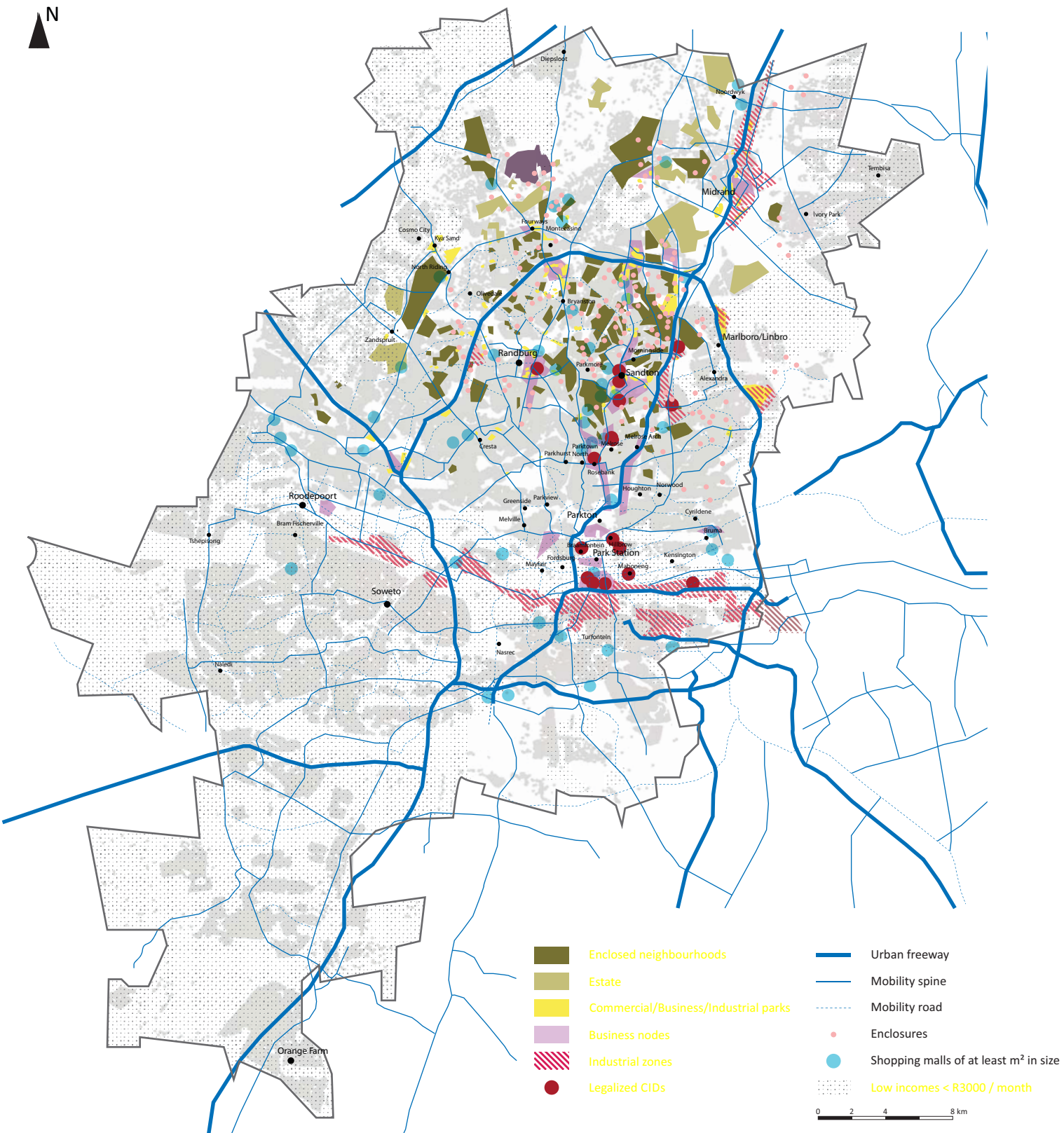
### Flat Division Principle for Rental



<sup>16</sup> A room in the city: strategies for accessing affordable accomodation, Lone Poulsen, Springer Science- Business Media, 2010

<sup>17</sup> Sharing a flat in Yeoville: Trajectories, experiences, relationships, Simon Sizwe Mayson, Master, University of the Witswatersrand, 2014

# Map 11: The Place of the Private Sector in the City Centre







The growth of the private sector has a strong impact on the urban landscape and development methods are conditioned by it: within residential areas, security issues are dealt with according to different organisations, always relying however on a privatisation principle.

As seen previously, the search for security has led the market to propose new radical urban and architectural forms. A whole new urban register has come to light, turning residences into 'fortresses' surrounded by walls, barbed wire, cameras and endowed with reinforced surveillance. This urban phenomenon has been increasing in scale, thereby increasing spatial segregation, expressing the fear of the other and a strong feeling of insecurity.

Another phenomenon, road closures, has also been developing in Johannesburg. These are mainly residential suburbs with certain access roads closed off or controlled by security guards who are recruited and remunerated by residents organised into associations. Unlike for private complexes, the streets and open spaces which were closed off remain public<sup>18</sup>. Road closures have become the prevailing security model in these suburbs.

In parallel, just like North American and European cities before that, South African cities have adopted en masse, from the 1990s onwards, the concept of Business Improvement District (BID). This was adapted into a City Improvement District (CID), initially conceived as a tool of urban regeneration reserved for city centres in decline<sup>19</sup>. CIDs are local alliances between the private sector, civil society and local authorities; they consist in taking back control of the urban environment. All the owners of the perimeter concerned pay a local surcharge to take care of the improvement of the urban services in their suburb (security, cleaning, landscape development

etc.) (Berg, 2004; Dubresson, 2008).

The map illustrates the extent to which, on the grounds that it compensates for the difficulties of the public sector to implement efficient urban renewal strategies, the private sector has spatially taken over leading sectors of the metropolitan area. The municipal priorities are to make of these spaces economic and tax catalysts for the entire metropolitan area<sup>20</sup>.

The focus has been on the creation of a successful economic environment and on the revitalisation of suburbs in decline. These policies have been focusing on the northern suburbs which are attractive because they are the wealthiest, and on the city centre. The latter appears as a first class location for the head offices of some of the largest companies, because it houses provincial and local governments as well as the main artistic, cultural and sports facilities of the city, and a high percentage of the total population of Johannesburg.

Although public-private partnerships have shown their economic efficiency, they have negative consequences on the city. Indeed, they keep reinforcing the north-south imbalances and therefore the gap between rich and poor, leaving the municipality to manage the disadvantaged suburbs suffering from a chronic lack of means for their upgrade. These suburbs are part of a cycle of depreciation, where impoverishment continues to grow and the gap to widen. In addition, CIDs, in their crusade against insecurity, drastically exclude the poor who seek employment opportunities and any form of informality (commercial among others). Today, a major challenge of the municipality of Johannesburg is to manage social issues in CIDs, as well as in the continually spreading suburbs neglected by the private sector.

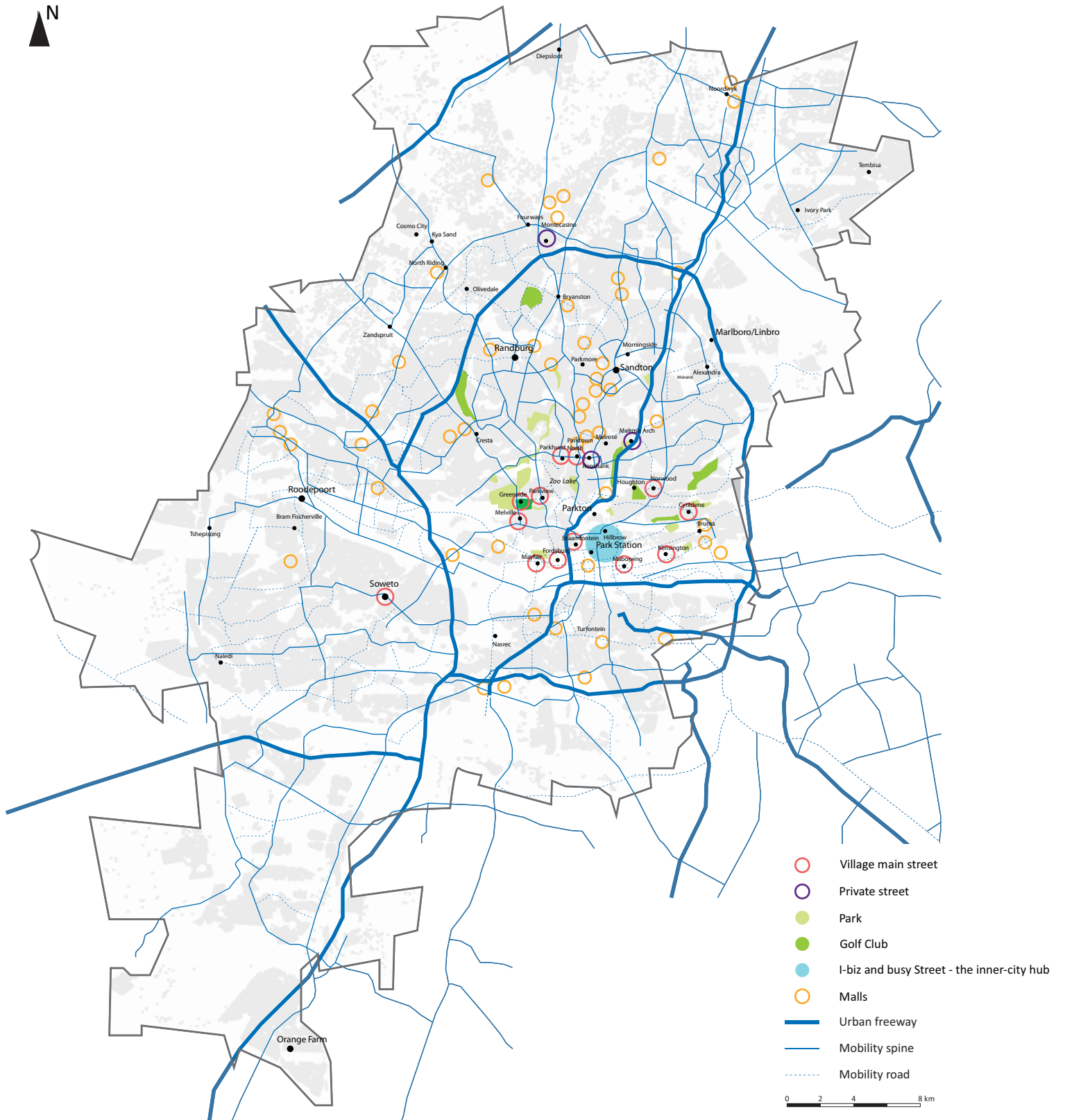
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<sup>18</sup> Sécurisation des quartiers and gouvernance locale, Claire Bénit-Gbaffou, Seyi Fabiyi and Elisabeth Peyroux, Karthala-IFAS, 2009

<sup>19</sup> Ibid.

<sup>20</sup> Ibid.

## Map 12: The New Public Spaces of the City





While democratisation has changed the way public space is perceived in South Africa, the 1990s have also been characterised by an increase in crime, leading to a decline in traditional public spaces (streets, parks and squares), and to the multiplication of residential security phenomena such as enclosures or gated communities.

In Johannesburg, these phenomena have reached such an extent that, today still, truly open public spaces are inadequate. They come in three categories:

- Few of the parks can be accessed at any time and without control. Zoo Lake appears as a symbol at the heart of the city. Its special status is a direct consequence of its history: when the grounds around the actual zoo and the park were bequeathed in 1904 by “Werner Beit & Company” (which later became Rand Mines) to the population of Johannesburg, it was on condition that it was to stay open to all residents of the city.
- Certain streets in a few historical suburbs (called Village Main Street on Map 12). This often concerns a street or part of a street where, in the middle of residential suburbs, shops have been opened on the ground floor of the buildings. These are not local shops but rather restaurants and bars. Over time, these suburbs develop a very localised and animated community life. Moreover, certain crossroads, because of the high number of people going there, have led to significant changes in the urban fabric and to the establishment of concentrations of shops.
- The city centre (Yeoville, Hillbrow etc.) is where the most significant urban roads are concentrated in terms of public-private interaction. Even if security issues have largely scarred the city centre, its general accessibility, collective appropriation and universal dimension make of it a unique

space in the city.

Public but controlled spaces have become common alternatives in Johannesburg. As a result, some parks are under surveillance, with secured and selective entrances. As an example, we can mention Atholl Park or the Botanical Garden. Certain areas, such as nature reserves, are not accessible to residents (e.g. Melville Koppies or Northcliff). Golfs courses, which are found throughout the urban network of the city, are representative of areas with reserved admission, and are only accessible (in the most part) to paying users.

Social and cultural variations of “public” and “private” spaces have emerged in Johannesburg. Certain commercial areas, which have become symbolic of these new communal spaces, testify to this. They seem to represent today a private response to the public space crisis. The depreciation of the public sphere and the progression of the feeling of insecurity, explain the partial translation of social practices towards commercial centres. As undeniably private spaces, although their access is free, they are under surveillance.

In this regard, two types of different spaces have emerged in the city:

- Territorial enclaves come under the initiative of the private sector and take on the form of closed suburbs (e.g. Melrose Arch, Montecasino or 44 Stanley Avenue). These come up as secured havens devoid of any sign of urban degradation, as observed in other suburbs. While keeping their distances from the turmoil of public spaces in the city as reflections of social, cultural and ethnic heterogeneity, these new territories live off urban liveliness and, as such, are becoming new “high places” of the metropolis.
- Commercial centres (shopping malls) with their galleries are becoming one of the main urban scenes of the strolling social ritual. They have evolved and are today considered by shoppers as the city's socialising places.

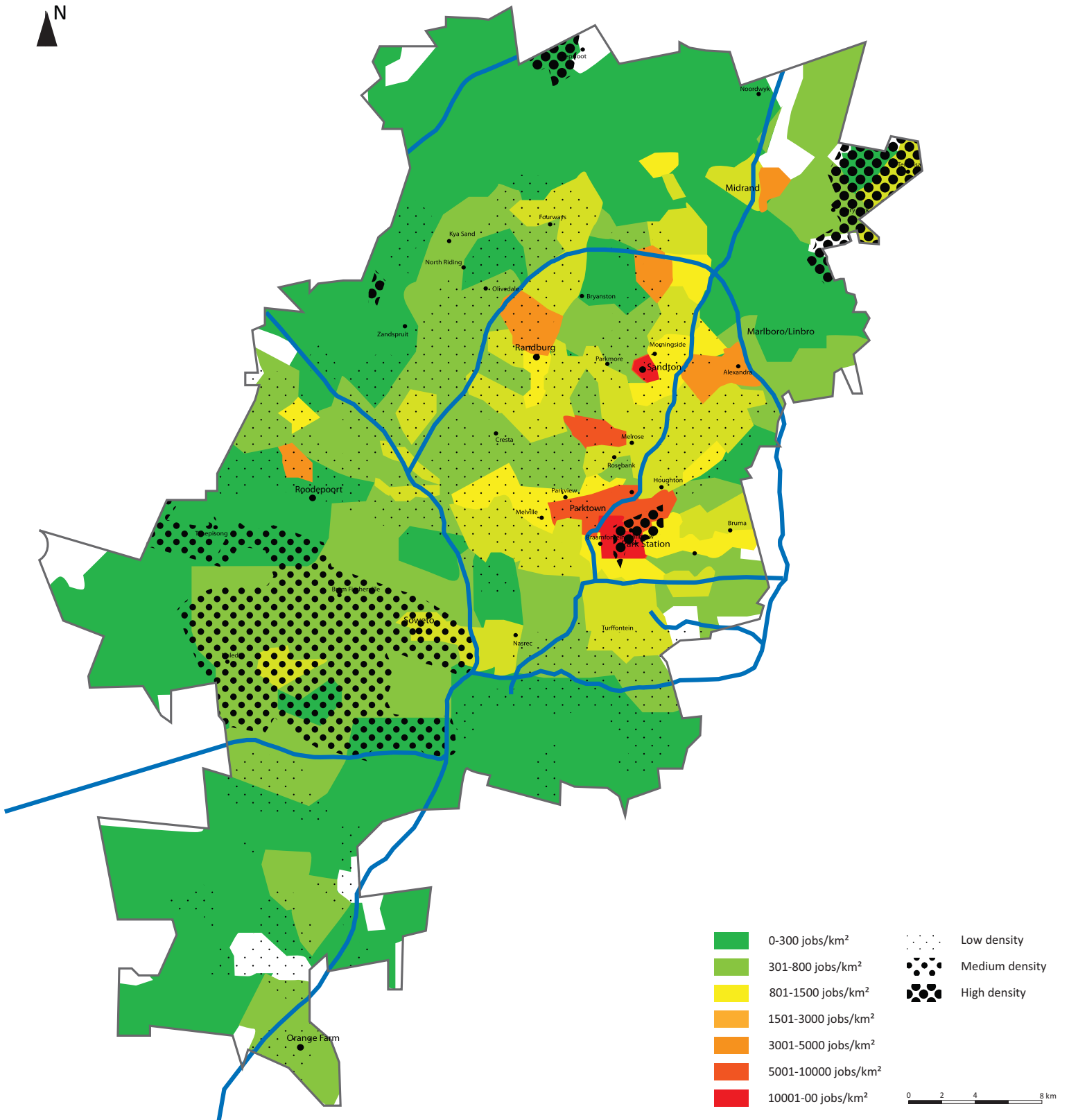




# **Urban Morphology Impasses and Paradoxes**



## Map 13: Density and Employment Distribution



In the region of Gauteng, 50% of jobs are situated in areas where density is less than 10 people per hectare. In Johannesburg, the gap between place of work and place of residence (as seen on Map n°12) is a major issue provoking a fragmentation of the market, decreasing its efficiency and, as a result, the benefits to be drawn from it by households and companies. Spatial scattering plays a counter-productive role and is extremely detrimental to the poorest households. Unlike in very large cities where the job market is a theoretical advantage for poor households compared to smaller cities, the disconnection of job areas and residential density creates a real dilemma for town planning. Urban tendencies have created a scenario where infrastructure and services are increasingly becoming unavailable for a growing number of households. Intermodal and regional integration is de facto a challenge for the first agglomeration of South Africa. Today, the need to build public transport infrastructure is vital. The long-term projections of the BRT development (see map below) are a first response, but it will not be sufficient on its own to modify the efficiency of the city, if the issue of urban forms is not the subject of large investments.

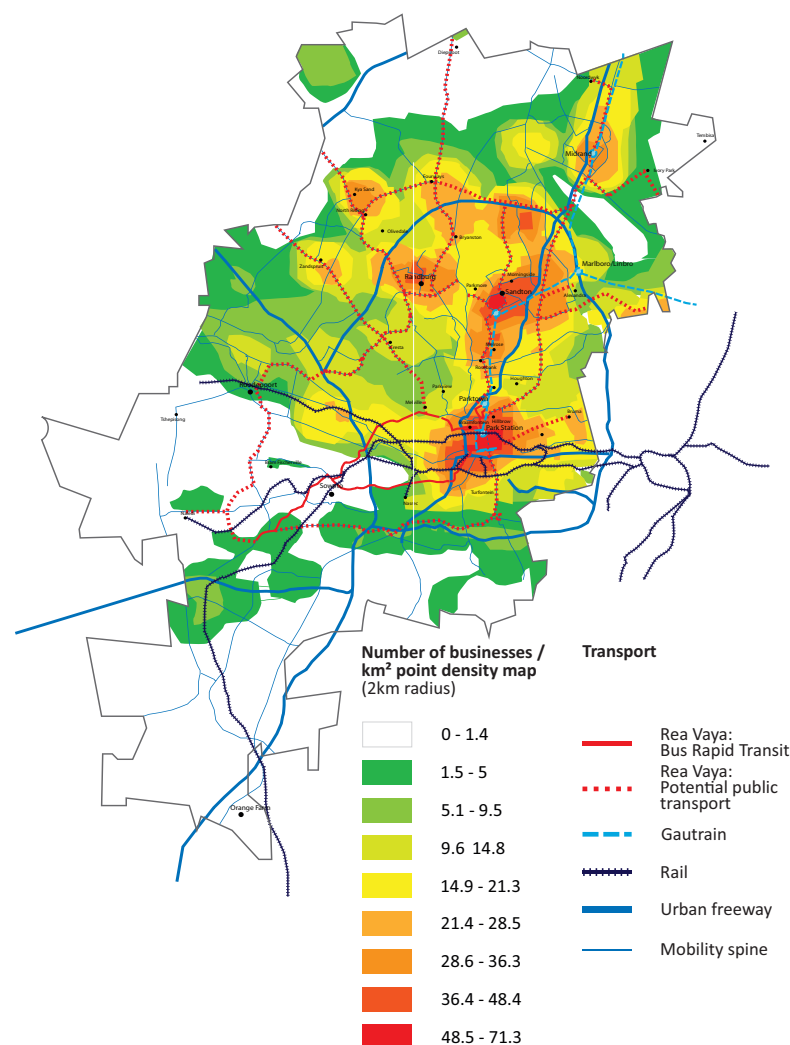
Today, in addition to social problematics, and beyond these, there are new issues linked to the search for a city which is more sustainable and consumes fewer resources.

Moreover, the poorest populations must be able to move around as far as housing possibilities are concerned, i.e. to be able to settle in the urban area of their choice, depending on the specific needs of each household. What is important is not necessarily to be close to one's place of work, but to have practical and affordable access to the rest of the city. Yet, today, access to property – a primordial issue in public policies – acts as an important brake on household mobility.

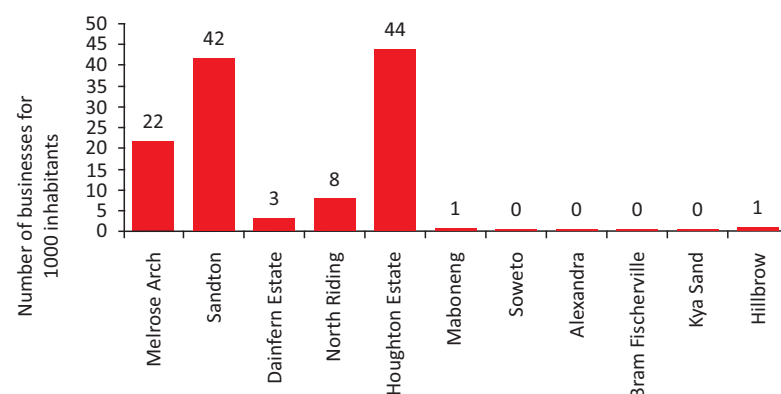
The contradiction between the national housing objectives and the tools used to fulfil them, has influenced the spatial structure by imposing the location of the built space and the intensity of the construction. In parallel, the lack of infrastructure has also contributed to spreading the space built along the highways, with private property development only taking place at an approximate distance of 1 km to 2 km of primary infrastructures<sup>21</sup>.

Business density on the map opposite, reflects the distribution of jobs: the number of businesses for 1 000 inhabitants reveals deep spatial inequalities within the city.

## Location of Businesses in the Metropolitan Area

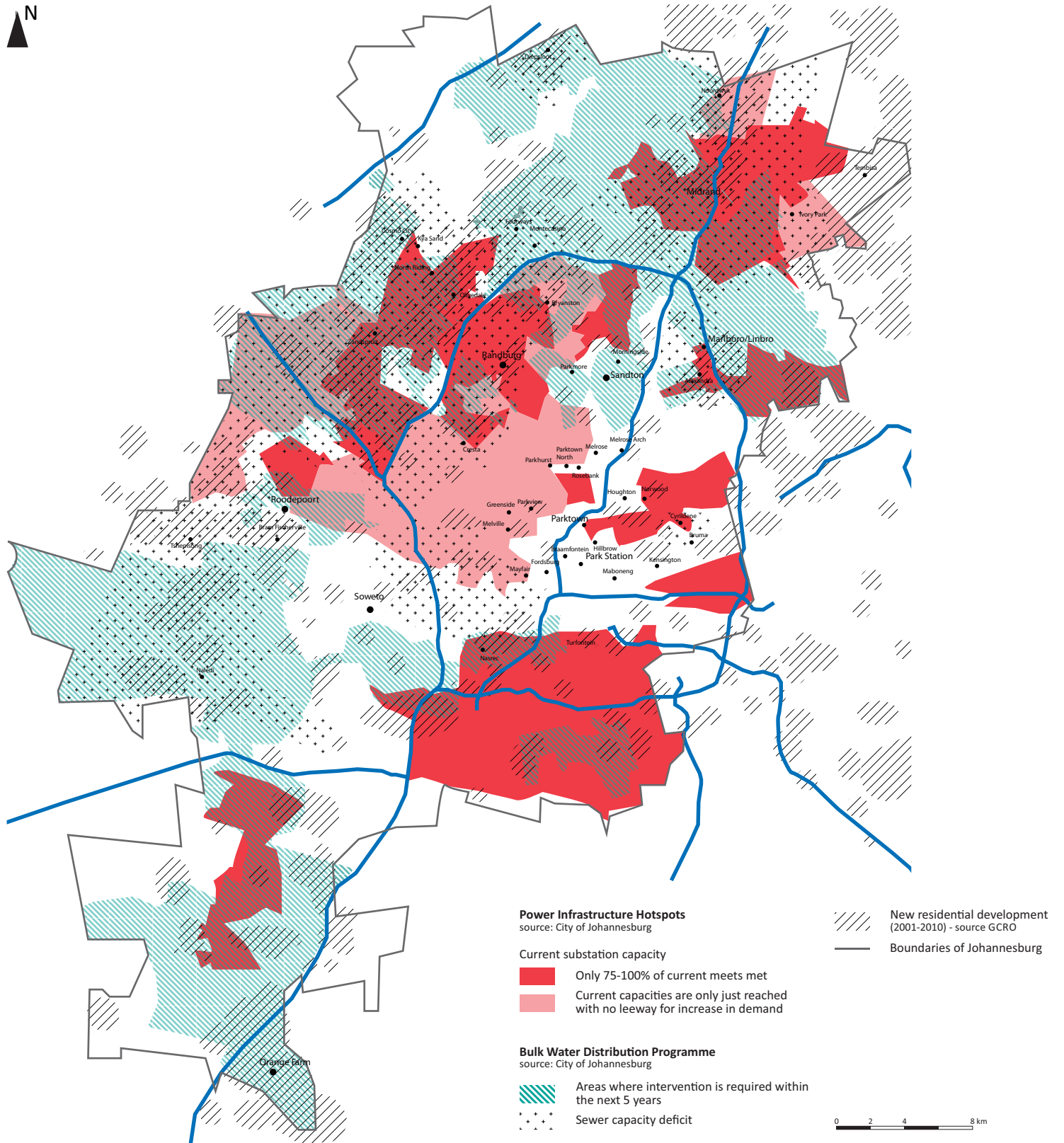


## Number of businesses per 1000 inhabitants within the ten suburbs representative of the new forms of urbanisation



<sup>21</sup> Défis posés par le développement des villes du Sud: le diagnostic spatial d'une ville, Alain Bertaud, consultant, Banque Mondiale, 2000

## Map 14: Policies Dealing with Future Grid Issues





In South Africa the right to a number of services, which includes housing and water in particular, is recognised by the Constitution. The State has to take “reasonable measures, considering the available resources” to enforce these rights. This mission aims at ensuring that all city dwellers, even and perhaps especially the less creditworthy – who are often neglected by the private sector – have access to basic urban services. Any action in this direction then comes under “general interest”, as defined by the public authorities which are the only ones with a sufficient global view and technical understanding to guarantee the rights of each citizen<sup>22</sup>.

While it was deemed that municipalities were in a better position to appreciate the needs of users, the State entrusted them with a central role in delivering basic services such as water, electricity, drainage and refuse removal. As early as 1994, the South African government made of the supply of drinking water one of the pillars of its development strategy, together with social housing, electricity and free primary healthcare.

Within the framework of its policy, Johannesburg has chosen to extend infrastructure networks in general by intending 80% of its budget for them.

First in line is electricity which is a real issue on the scale of the city. Situated in the most electricity-hungry region of South Africa, due to the high concentration of population and industries, the city faces a capacity shortage and faces periodic electricity cuts in many areas. The critical points of the city are situated mainly in sectors with high urbanisation, which makes grid issues even more glaring as new constructions develop.

Moreover, thousands of residents are connected illegally to the electricity grid, due to lack of formal connections. The price of electricity has increased significantly in the past five years. The distribution system is confronted with the multiplication of illegal connections to the grid and with meters being blocked by users, also

to avoid paying. The authorities have recently intensified the fight against consumers who do not pay, by spotting those with illegal connections and cutting their supply.

Conversely, the share of the budget allocated to rubbish removal is very low (only 2.4%), and was not actually catered for before 2013. The City-owned company responsible for refuse removal, Pikitup, works independently and levies money directly from residents.

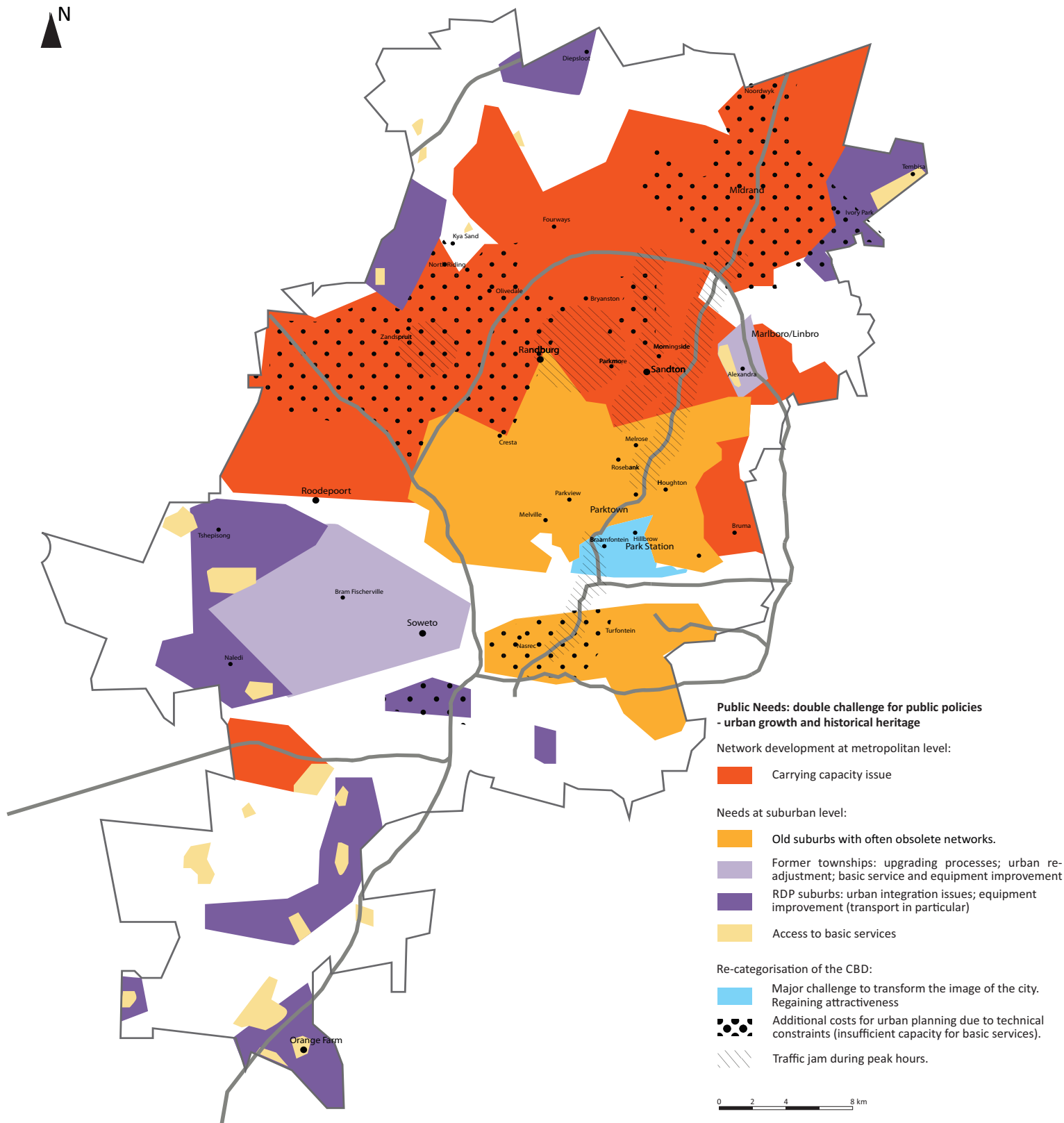
The less significant increase in the budget share allocated to water has been attracting attention, especially with the difficulties encountered in this domain. Johannesburg Water has experienced many drawbacks to its projects, due in part to non-payment from some residents. In addition, while water is an increasingly rare resource in Gauteng, its demand is increasing. It will be in short supply in the near future, which raises much concern. Areas requiring an upgrade within the next 5 years include the new urbanisation areas south of Soweto, and areas situated in an east-west belt, north of the N1. However, it seems that this projection remains largely overestimated, considering the available funds and the budget weight which funding Rea Vaya<sup>23</sup> represents. The network is getting old and is degrading; the saturation of the system no longer makes it possible for new urbanised areas to be integrated.

The management of stormwater is also a crucial problem for the city. First of all because densification reduces rainwater infiltration into soils, increasing runoff. Moreover, run-off water infiltrates the many galleries of abandoned mines and fills up with polluting and toxic elements (sulphate, heavy metals including arsenic, cadmium, etc.). If nothing is done rapidly to improve the drainage system and treat the toxic waters of abandoned mines, these could contaminate the ground water and, by overflowing, cause damage to the environment and population. The central government, which is aware of the situation, is currently using State funds to finance an emergency programme to treat the waters contained in abandoned mines, waiting to mobilise the funds required for developing a permanent solution.

<sup>22</sup> La difficile définition de la justice spatiale à Johannesburg, Claire Bénit, les annales de la recherche urbaine n°99, 2005

<sup>23</sup> According to interviews with the Johannesburg Development Agency (JDA).

# Map 15: Urban Needs: The Difficult Coordination of Public Action







The city is facing the consequences of sprawling urbanisation. It seems that understanding in detail how the different scales of governance relate to the gaps between policies and practices is crucial to analysing the capacity of the city to regulate the diverse private initiatives and to establish a planned and coherent urbanisation on the whole of the territory.

The difficult coordination of public interventions is particularly glaring considering the urban needs. Service infrastructures are experiencing difficulties as reflected in the bad service quality and insufficient servicing rates. The responsibility of these difficulties is often analysed as a failure of public management. However, one cannot leave the context aside: that of population growth first of all which, on its own, represents a formidable challenge for urban management; then that of urban sprawl, relaying capacity imperatives on the metropolitan scale.

The private sector has an enormous influence on the development of the city, imposing its morphological and spatial structures. The deployment of new urban zones takes place over territories that are increasingly remote from centres where structural problems are the heaviest for the city. The interests of the public authorities and promoters differ as soon as one takes long term temporalisation into account. Even if private contractors pay for the installation of basic services in the complexes they build, the city still has to manage in general the ensuing service charges (e.g. road networks, waste removal, water treatment management and production of electricity). Additional costs related to technical constraints also burden network prices over a large part of these territories. Moreover, the development of low density residential areas with few roads has a high impact on traffic jams, leaving the city to manage traffic and under-sized roads on the metropolitan scale.

In parallel, the city must integrate, into the metropolitan space,

dense housing areas stemming from massive national house building programmes intended for the disadvantaged populations, and located in the outer suburbs. These new problematics complicate the action of the city. Upgrading these suburbs is a challenge for Johannesburg as it is trying to eliminate deep wounds left by decades of unequal management.

Despite the importance of the funds invested in the former townships and new RDP areas, suburbs in the south are not catching up with those in the north.

During the last 20 years, public action has been neglecting existing wealthy suburbs, limiting investments to the maximum within these sectors. Yet, today, the networks of these urban areas (in light orange on the map) have aged and must be rehabilitated (networks and roads). An action plan will have to be elaborated in the near future.

Today, a research programme has been launched by the city to gradually reduce informal housing. The objective is to improve the standard of living of the poorest with multiple objectives: moving populations settled in dangerous areas (for reasons linked to the geology or liability to flooding) and formalising informal settlements.

Finally, rehabilitating the city centre is a challenge that will depend highly on strong political will, on the long term mobilisation of investments and on operations of urban reassessment, in order to attract new private investors to create assets with a growing value.

The many problematics to be taken care of by the city involve many scales and represent particularly different imperatives. Limited budgetary means are imposing a prioritisation of objectives which is becoming increasingly difficult to plan. It seems very clear that the rapid increase in urban areas will need to be controlled rapidly in order to optimise the efficiency of public investments.





# **Is Densification Synonymous with Urban Intensity?**

According to Jacques Lévy, good urbanism is measured on the basis of density and diversity. Urban intensification implies an increase in human activities in a given space; its advantages are above all linked to the proximity principle, but are only effective if urban intensification is integrated into a comprehensive approach that impacts on the various (economic, environmental and social) sectors of the city at the relevant levels.

However, intensity cannot be ordered; it exists where people meet, walk, take a pause, where one can observe high densities of daily interventions and exchanges. Urban intensity relates to the density of activities, the plurality of dwelling forms, the diversity of populations living in urban spaces, the wealth of forms through contrast and complementarity, but also the way urban space is used, its reversibility and transformation. In order to be complete and successful, urban intensification must combine:

- density of forms, infrastructures and services,
- accessibility to public transport,
- attraction of urban forms,
- quality of public spaces,
- social mixing,
- articulation and diversity of urban functions,
- functionality of open spaces.

It is also necessary to expand the notions of centrality and density with a temporal as well as cultural dimension, by focusing on the issue of social events and urban development phases. In this sense, Hillbrow and Houghton are interesting examples. Both are old suburbs, and their development over time has led to the establishment of local services and equipments in a balanced manner. Yet, their morphological differences imply significantly different functioning. Hillbrow is a place of exchange, connectivity, culture, services as well as retail trading (on the ground floor of buildings), thereby forming lasting landmarks in the metropolitan landscape. Density in this suburb leads residents to interact strongly with the urban environment. Houghton, a low-density and much landscaped suburb, in addition to housing integrates middle-sized companies, schools, leisure activities and commercial centres into the urban fabric. Yet, there are few interactions between residents, since people move around mainly by car. There is no node of urbanity per se, nor is there a link between users and centres of intensity. Town planning seeks to organise centres of activity and

their networks or intensify their functionalities and symbolics, with a view to improving the usage value of the space.

Social mixing in recently developed suburbs is generally limited. North Riding is a good example of urban sprawl, where constructions are developed, one estate after another, without any global development plan. Densification over time with construction on empty land, leaves few land opportunities for structural facilities. Based on market principles, urbanisation takes place in a very heavily segmented manner. The mono-functionality of spaces tends to sterilise urban development. Such tendencies are largely amplified by the search for security which, in parallel, leads to the generalisation of closed and enclosed spaces, with open public spaces paradoxically becoming potentially dangerous and, therefore, undesirable places. The only places of exchange and connectivity are the shopping malls that have developed rapidly, according to market trends.

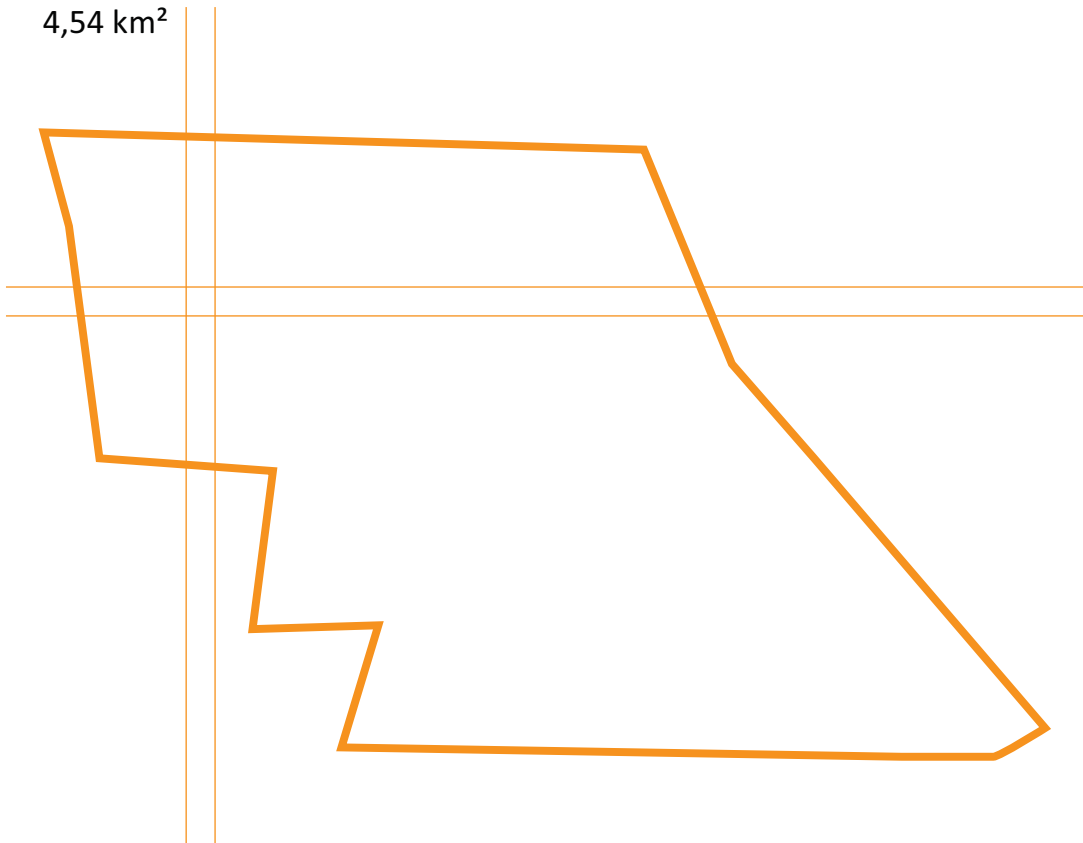
RDP housing developments are characterised by two main shortages. The first is linked to limited investment for urban development, with basic services such as schools being built late in the development process. The second is linked to the fact that the environment is not very favourable to social and economic integration for low income families. Planning implementation should provide for economic spaces leading to the settlement of local shops as well as community facilities such as churches or nurseries. The low economic attractiveness of suburbs often did not lead to the development of these centres of activities and today, residents only have access to a limited and insufficient number of jobs, shops, services and leisure facilities. Yet, the lack of mobility of residents living in these suburbs and the relative density (reinforced by informal constructions on plots), have led to the emergence of urban intensity, as revealed by the establishment of informal trading in particular.

The four suburbs under study represent great morphological diversity, generating major disparities in density. There are 1 100 inhabitants per km<sup>2</sup> in Houghton, 3 000 inhabitants per km<sup>2</sup> in North Riding, 6 360 inhabitants per km<sup>2</sup> in Bram Fischerville (excluding informal constructions) and 69 000 inhabitants per km<sup>2</sup> in Hillbrow. This disparity is represented schematically opposite: each drawn area corresponds to the surface area housing 5 000 inhabitants for each suburb.

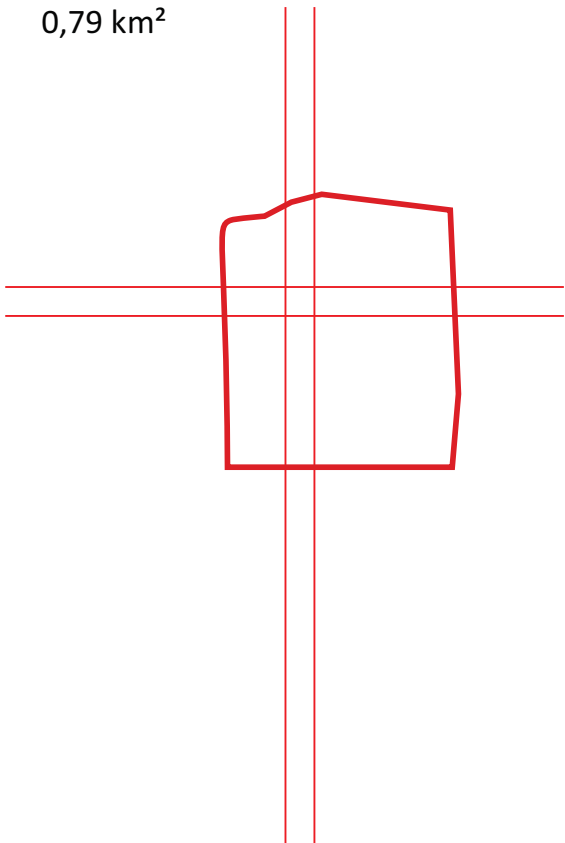


Surfaces corresponding to 5 000 people

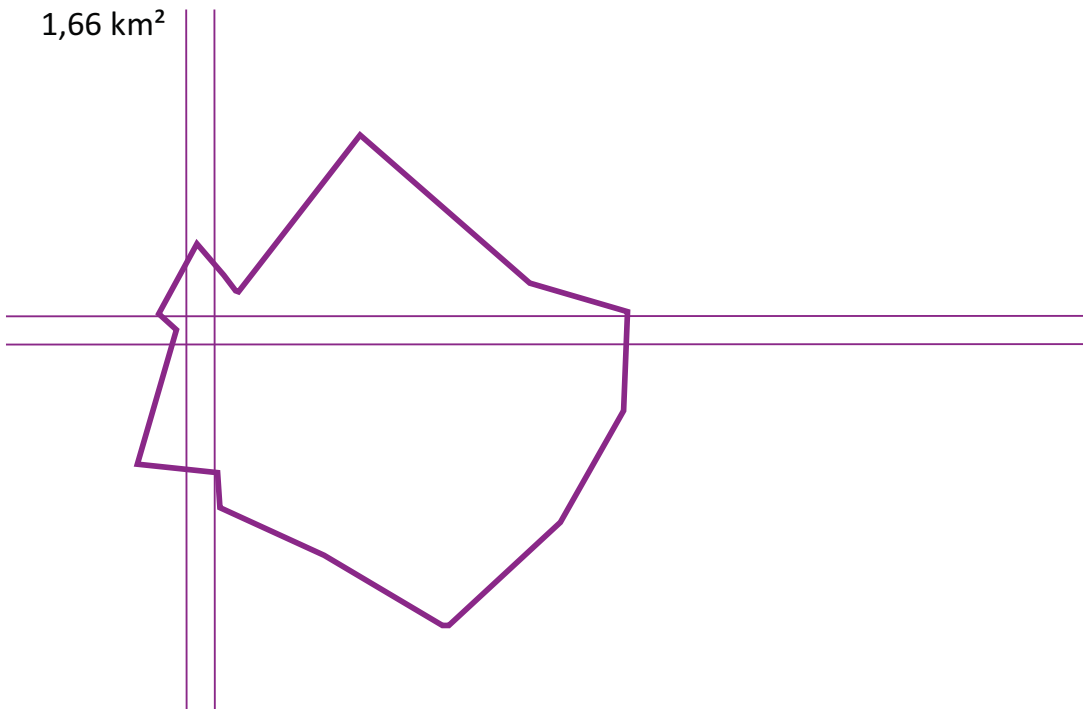
**Houghton Estate**  
4,54 km<sup>2</sup>



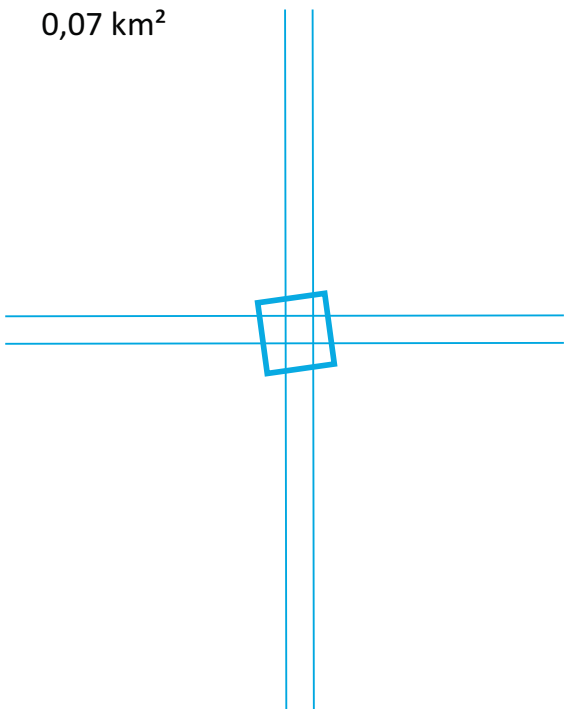
**Bram Fischerville**  
0,79 km<sup>2</sup>



**North Riding**  
1,66 km<sup>2</sup>



**Hillbrow**  
0,07 km<sup>2</sup>



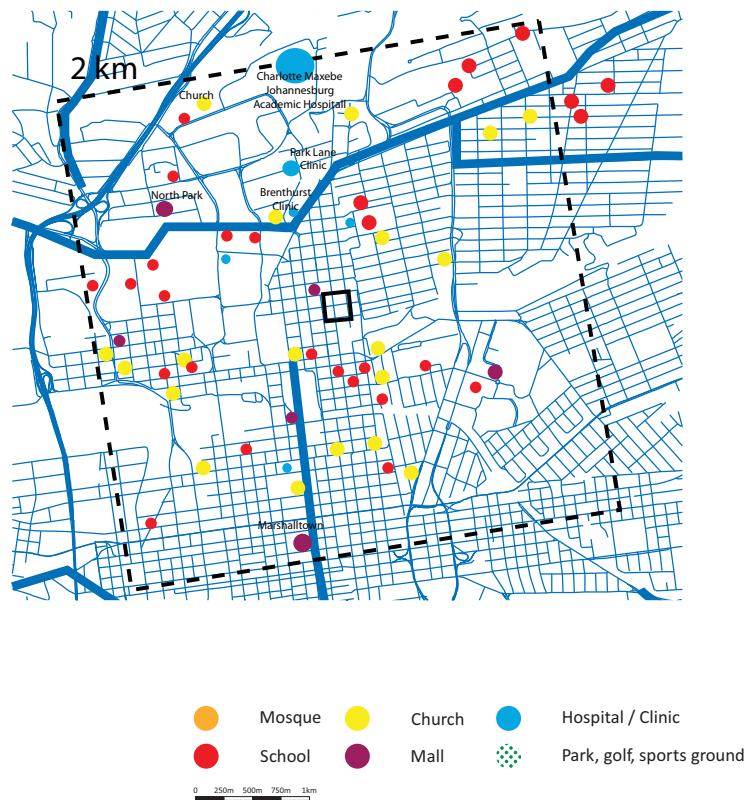


# 5.1 Economic Dynamics and Infrastructure

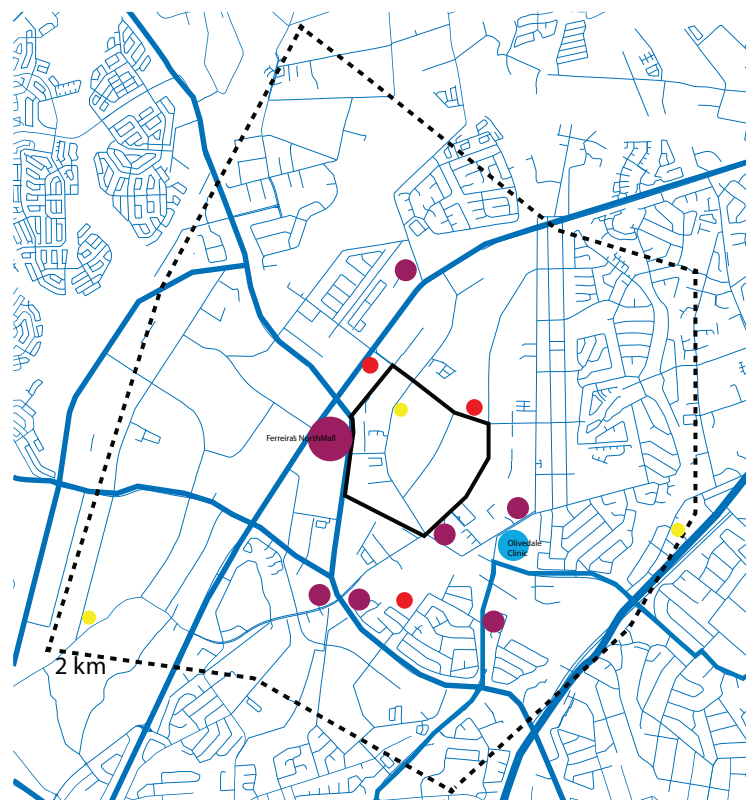
## Comparison of Four Case Studies

For each suburb, the area under study (solid black line on the maps) includes a population of 5 000 inhabitants. Each surface area is then widened by 2 km to make it easier to apprehend interactions with the direct environment. By locating public or private equipments, urban intensity can be highlighted. The relationship between scattered city, dense city and intense city is questioned in the study of these four suburbs.

### Hillbrow



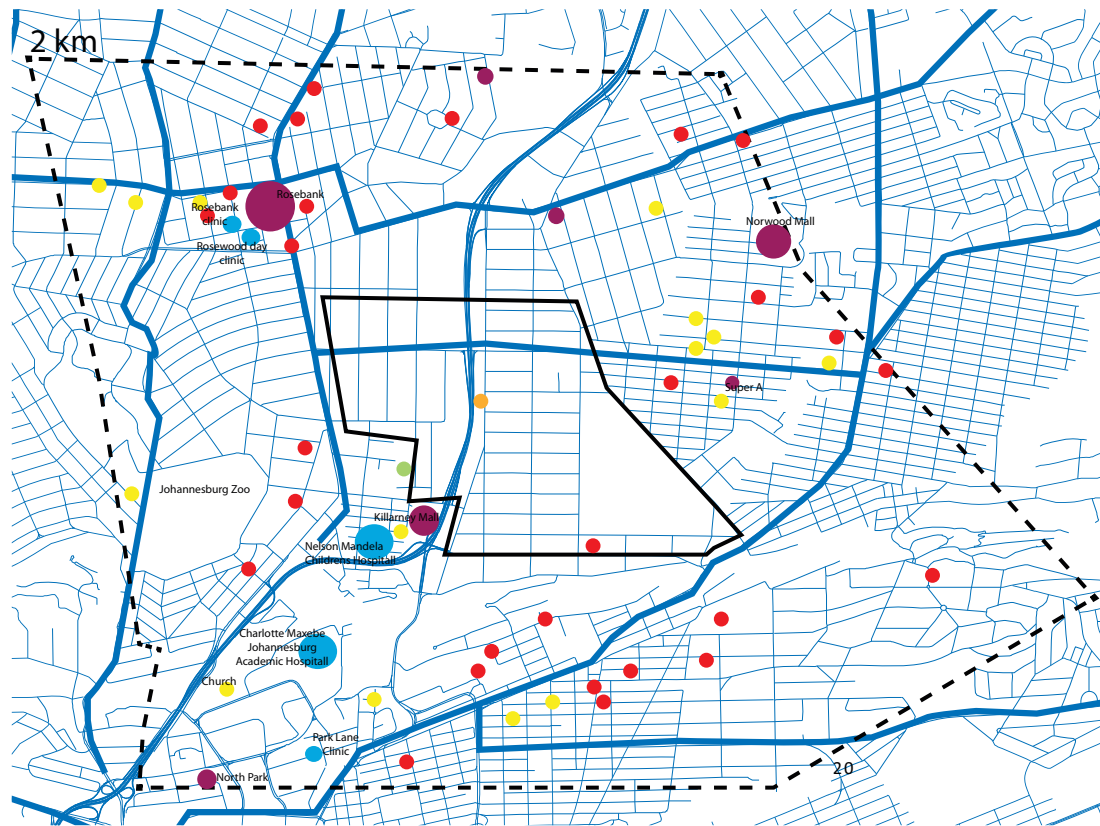
### North Riding



The reason why households choose specific residential areas to live in, constitutes one of the central problematics of the current urban economy. With Hillbrow being central, households have access to most urban amenities on foot, meaning significantly reduced travelling costs. The suburb contains many historical amenities from the city centre. It also includes structures of “modern” amenities (e.g. theatres, restaurants etc.) as well as “green” amenities, such as parks scattered over the whole sector. Due to this relatively complex structure, Hillbrow seems to meet the basic needs of its residents.

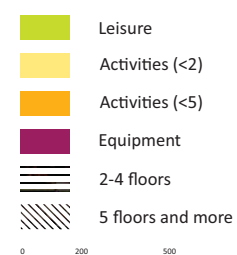
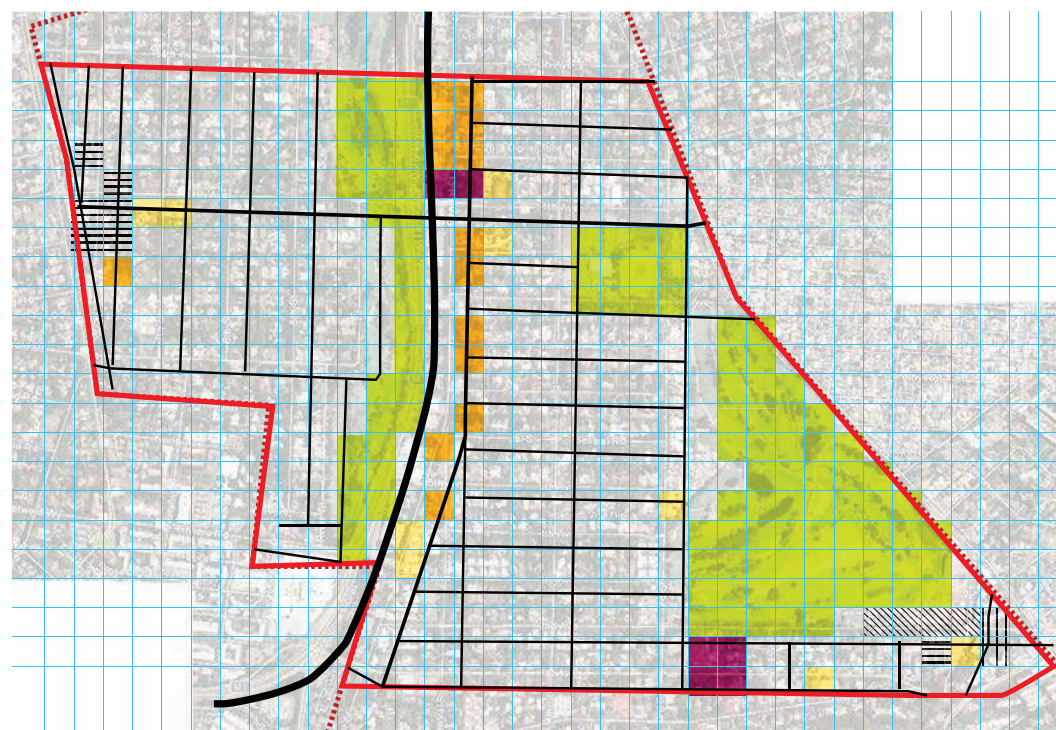
On the other hand, North Riding, a recently urbanised suburb, only has a limited number of amenities which are the result of private sector investment, such as shopping malls. Public facilities are very limited.

## Houghton Estate



Houghton Estate has a wide range of public services and, more generally, urban amenities, which constitutes a major advantage in terms of local development. This suburb benefits from proximity to the city centre, as well as many public facilities and shops. In addition, the establishment of many office premises along the highway (M1) offers a wide range of possible jobs.

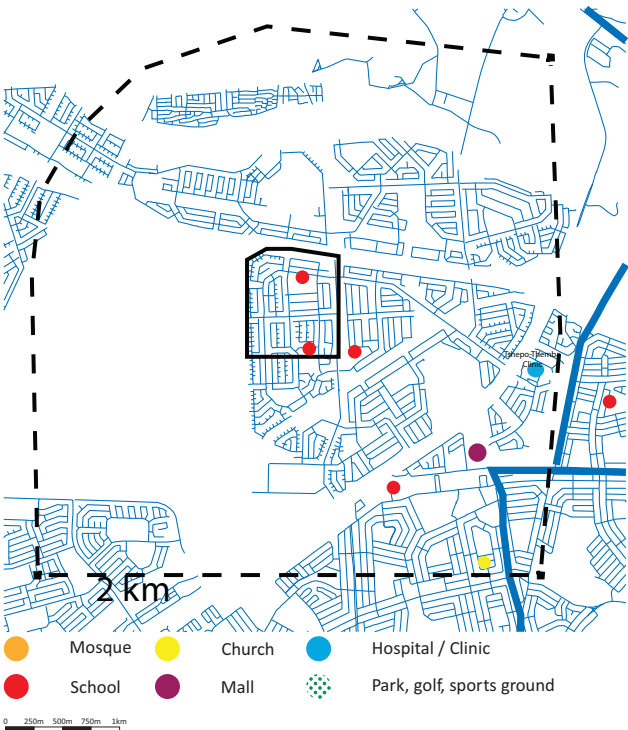
The map below shows where amenities are positioned on the sector under study.





Is Densification  
Synonymous with Urban Intensity?

Bram Fischerville

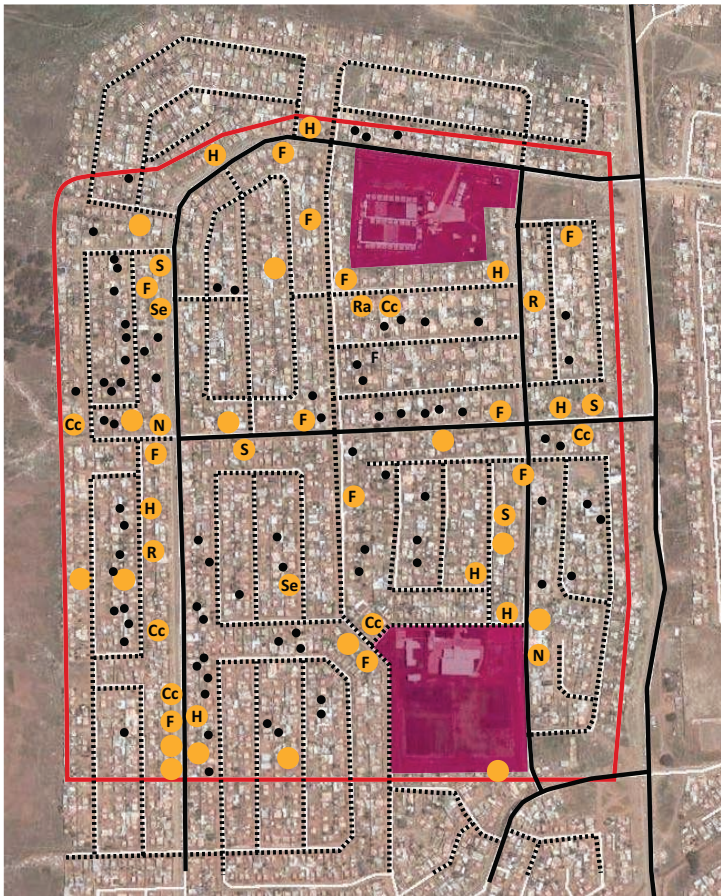


Bram Fischerville, which was built from 1998 to 2010, is characteristic of suburbs planned by the government. 19 000 houses are homes to 90 000 people. The economic activity is very limited and public investment came up only much later (paved roads, schools, parks etc.).

Yet, today, the suburb is very dynamic, progressively transforming its RDP township image into that of a classic suburb. Private investment creates a dynamic community in many domains (informal trading, entertainment etc.). The distribution of shops throughout the suburb, as a result of individual opportunities, does not create centres of activities, but enables the population to benefit from a few urban components. However, there is still a long way to go before the suburb comes out of the “dormitory town” status.

Localisation of Informal Shops and Facilities:  
Field Observation

The map opposite shows the different activities and facilities in Bram Fischerville. Accessibility (main tarred roads) is not the only criterion for the establishment of these activities which are found throughout the sector, with no apparent hierarchy.

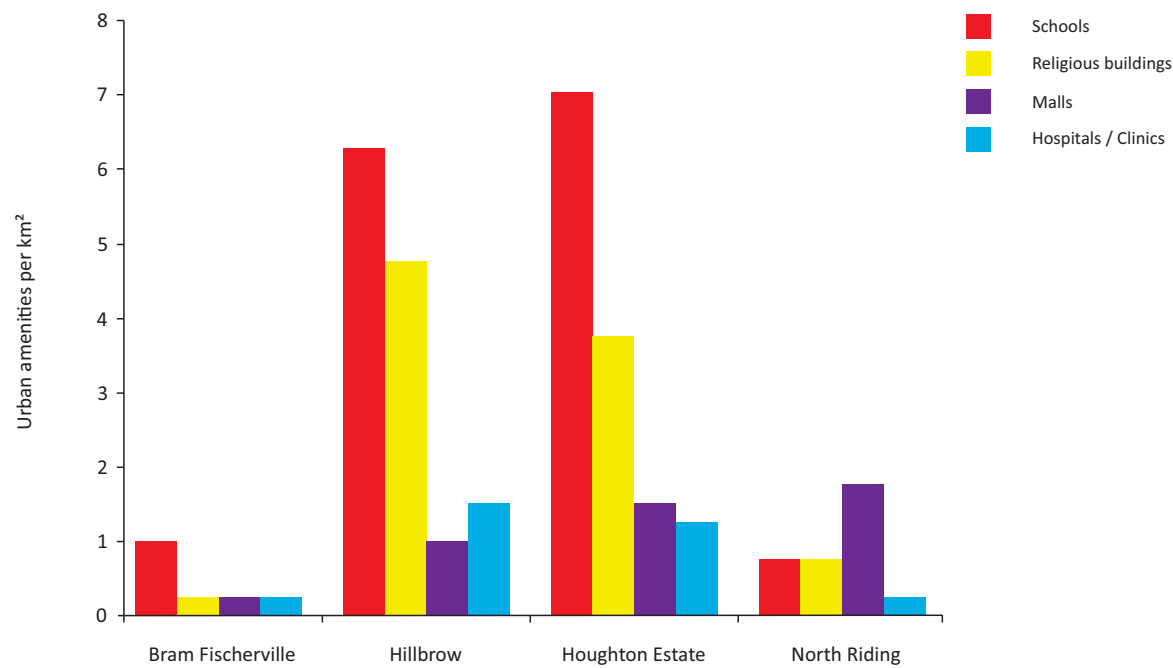




Public policies want to keep a balance between quality and quantity as far as amenities are concerned, on the metropolitan scale. The reinforcement process of the entire urban offer (housing, activities, services and elements of urban amenities as well as quality of the

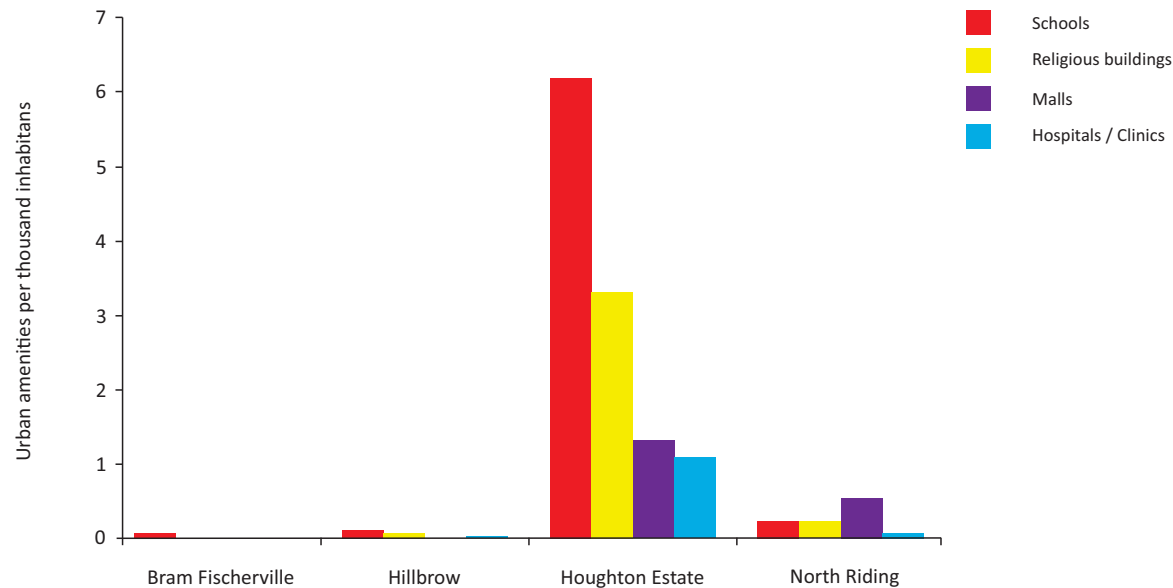
living environment) for a more diverse, animated and attractive city, does not consist in a simple quantitative increase in population and job densities. Yet, we still find today that amenity densities vary dramatically from one suburb to another.

Number of amenities / km²



When the number of amenities is worked out per 1 000 inhabitants, differences are even more marked.

Number of amenities / 1 000 inhabitants

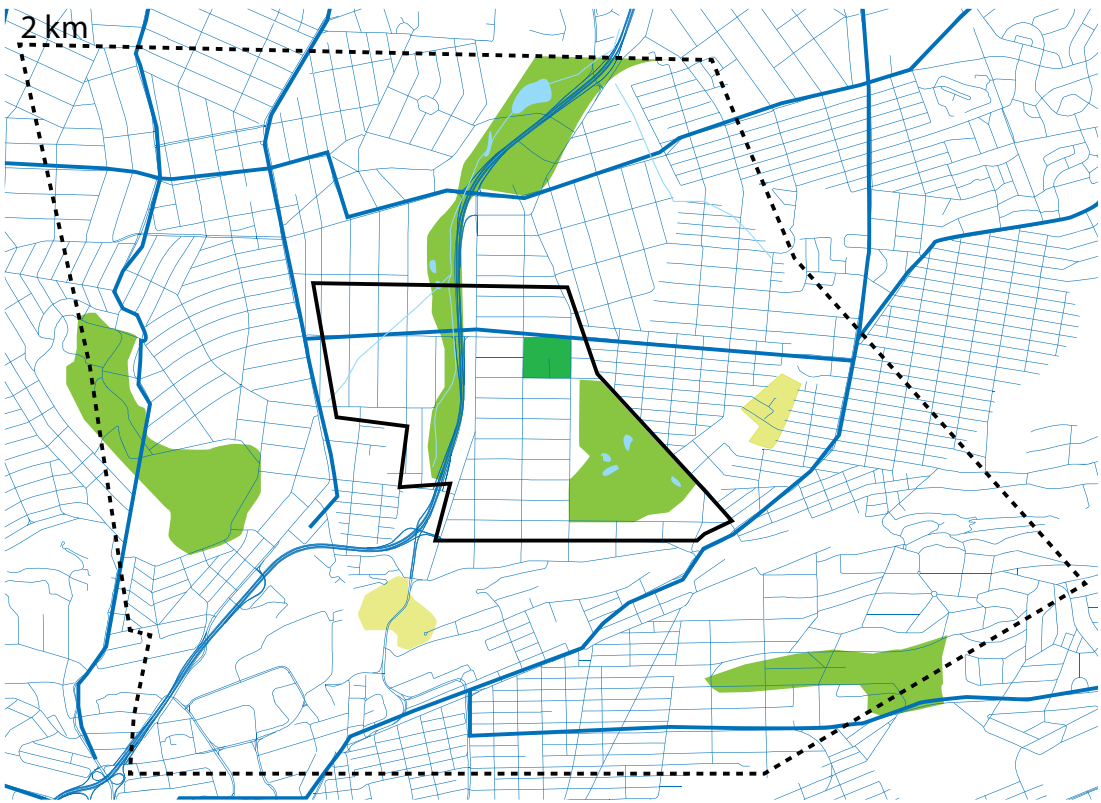


# 5.2 Landscape Infrastructure

## Comparison of Four Case Studies

In Johannesburg, open spaces crystallise the ambiguity of the city which is still marked by fragmentation and inequality. Public space is no longer part of the historical culture of the city and, despite the number of available urban gaps, the city greatly lacks public spaces. Often synonymous with danger when they are not under security, open spaces are enclosed with a view to controlling their usage. Following the patterns and segregation on which the city was built, the old suburbs situated in the north benefit from a great diversity of open spaces used for relaxation and leisure, which are nonetheless often private: vast parks, zoo, and golf courses among others.

### Houghton Estate



Houghton Estate is characteristic of the urban structuring of northern Johannesburg, which was organised around golf courses as well as relaxation and leisure parks reserved for a well-off category of population. Closed islands with sizable surface areas, these green enclaves contribute to the fragmentation of the urban fabric and to the maintenance of strong social segregation. Public parks, far from being structuring, suffer from a negative image, tarnished by acts of crime and violence and, as a result, are not much used by the local residents.

#### Natural Spaces

Private Spaces	Public Spaces
Golf	Park
Sports ground	Closed green space
	Water bodies

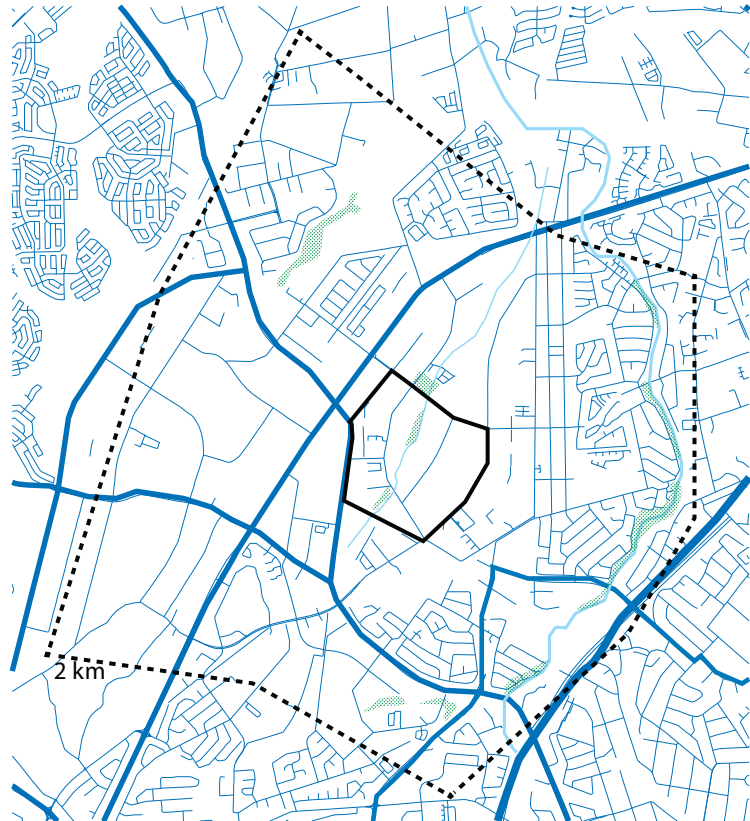


The northern suburbs, green and wooded areas landscaped and maintained with care. Photos © K. Lévy



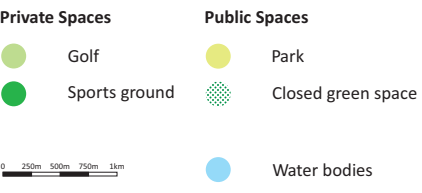


# North Riding



In parallel, the recent urbanisation of the city outskirts was carried out by whittling away natural and agricultural areas, without any preventive measures to maintain biodiversity and ecological corridors. Private contractors, with limited legal constraint, tend to consider the environment as a restriction, not an asset. The streams crossing the northern suburbs flow in the middle of areas where no building is permitted, where maintenance is the responsibility of the city. Left in a natural state, these areas allow for shifting rivers which can turn into torrents during storms. Estate walls define the limits of river banks. Inaccessible, these natural areas are not developed and are closed to residents.

## Natural Spaces

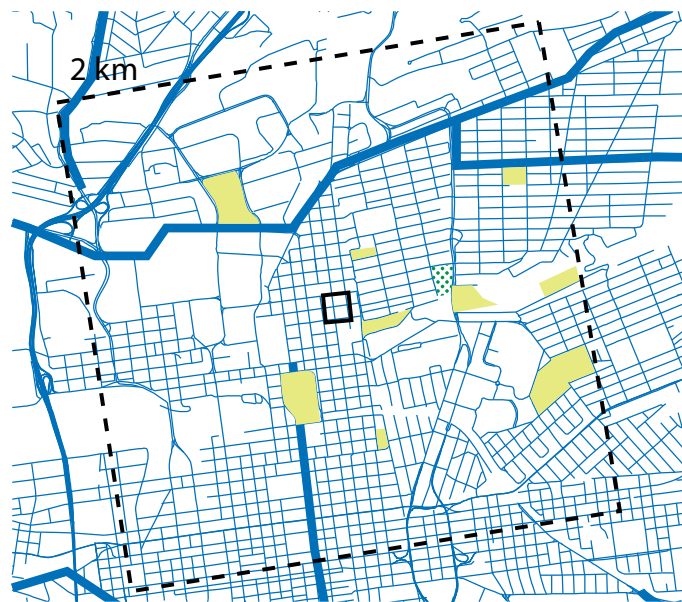


Watercourse, North Riding.



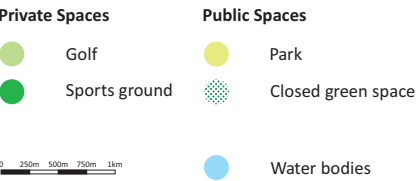
Is Densification  
Synonymous with Urban Intensity?

Hillbrow



A few parks, built from the very beginning of the suburb, are still found in the urban network of Hillbrow. Highly affected by the population of the suburb, these open spaces host sports grounds, relaxation areas and games for children. Parks are laid out in such a way as to be easily accessible to everyone. However, their size often does not match the actual urban density of the suburb.

Natural Spaces

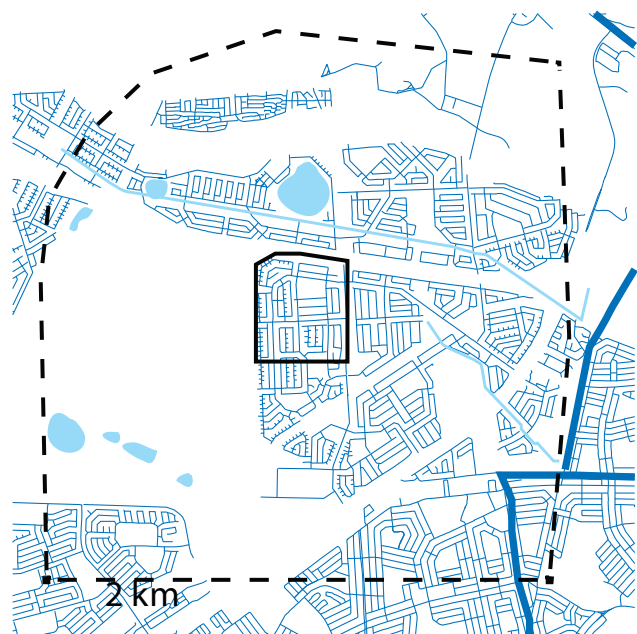


In the CBD, the suburb is urban and the constructions have completely remodelled the landscape, which no longer looks natural. Photos © K. Lévy



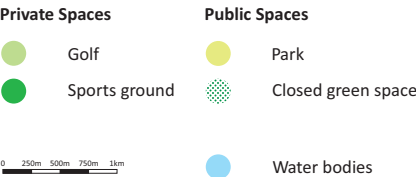


# Bram Fisherville



In Bram Fischerville, out of all the components of town planning, it was housing that prevailed. The development plan of the suburb includes 19 000 houses but no structuring open spaces. Only Extensions 12 and 13 (the eastern section of the suburb) include planned sports grounds.

## Natural Spaces



The southern suburbs with little permeable soils are relatively arid. Large water bodies characterise the landscape. Photos © K. Lévy

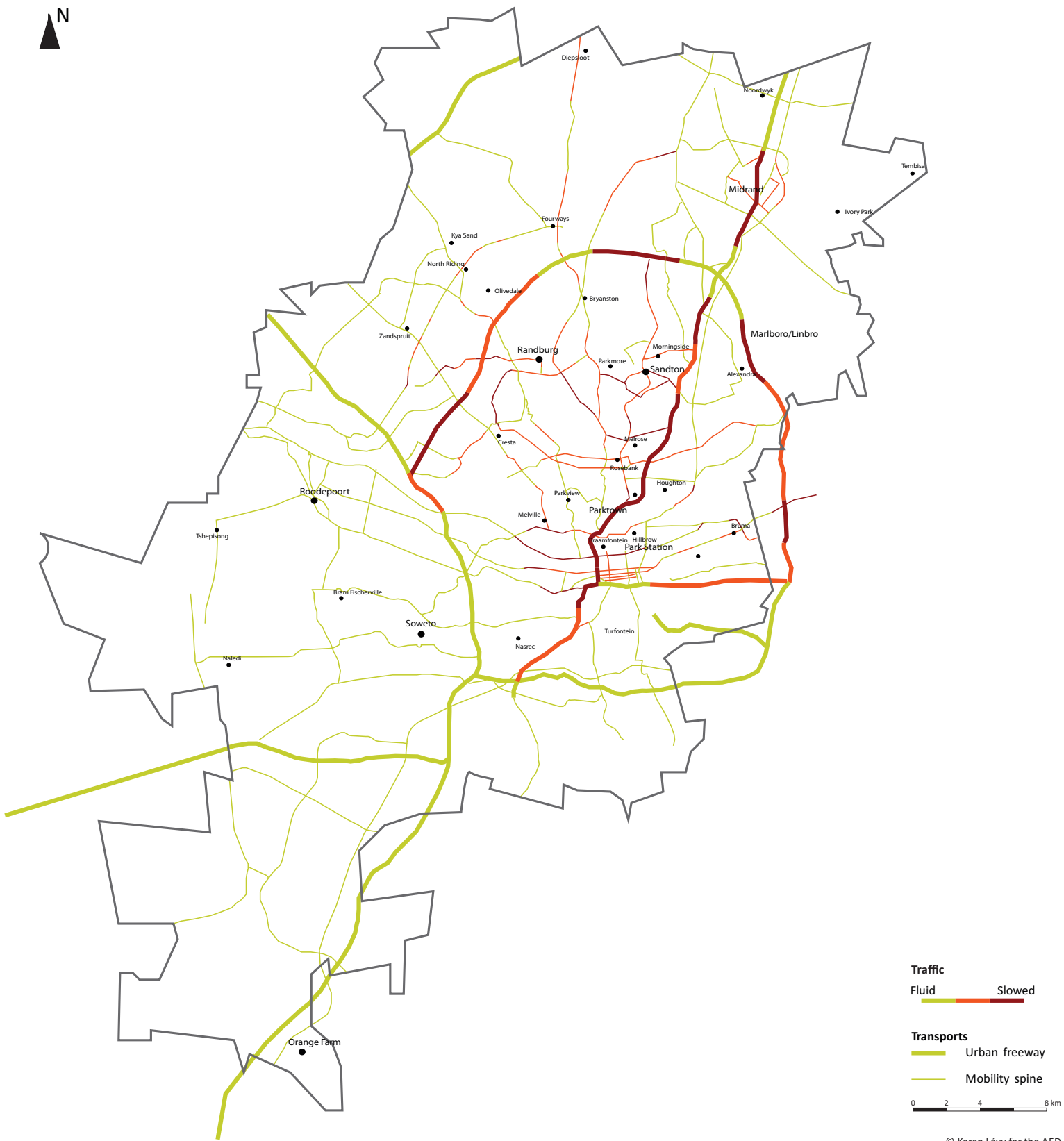




# On Mobility



Map 16: Limitations of the “All-Car” System



© Karen Lévy for the AFD



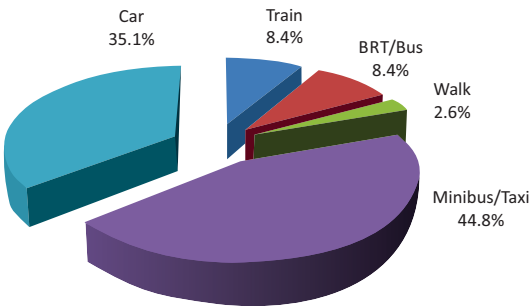
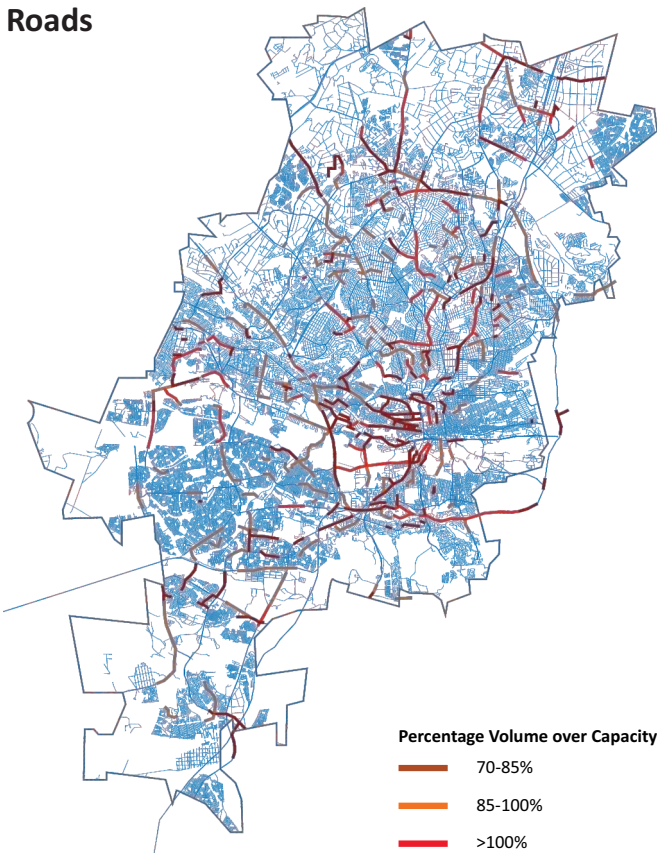
Servicing the entire area is hindered by traffic jams near economic centres. While Johannesburg has been developing since the 1960s according to a car-oriented modern paradigm, streets have become roads as a result of flow optimisation. By becoming car-focussed, streets no longer appear as places of exchange and vectors of urban integration. They have become tools of movement to users who wish to go everywhere and fast.

While this urban structure is essential to everyone and to the poorest households in particular, the latter do not have access to individual cars to move around. Indeed, infrastructure and road networks determine mobility and either favour or constrain social integration. Accessibility to the city is limited for poor populations. Their lack of means forces them to reside far from employment centres, compelling them in turn to use minibus taxis or informal transport, since the public transport is insufficient or inadapted.

Today the highway system has reached its limits with roads being too small and overused (due to the lack of public transport that does not reach the outskirts of the city), which is the cause of traffic jams at peak hours during the week. This problem cannot be solved with an increase in the number of lanes, roads or highways, but with a remodelling of urban morphology. Today, the traffic near the nerve centres of the city, accessible mainly via the highway system, is increasingly becoming a disadvantage, especially in the northern suburbs and the city centre.

Distribution by means of transport shows the extent to which cars and minibus taxis predominate (nearly 80% of movements in 2011).

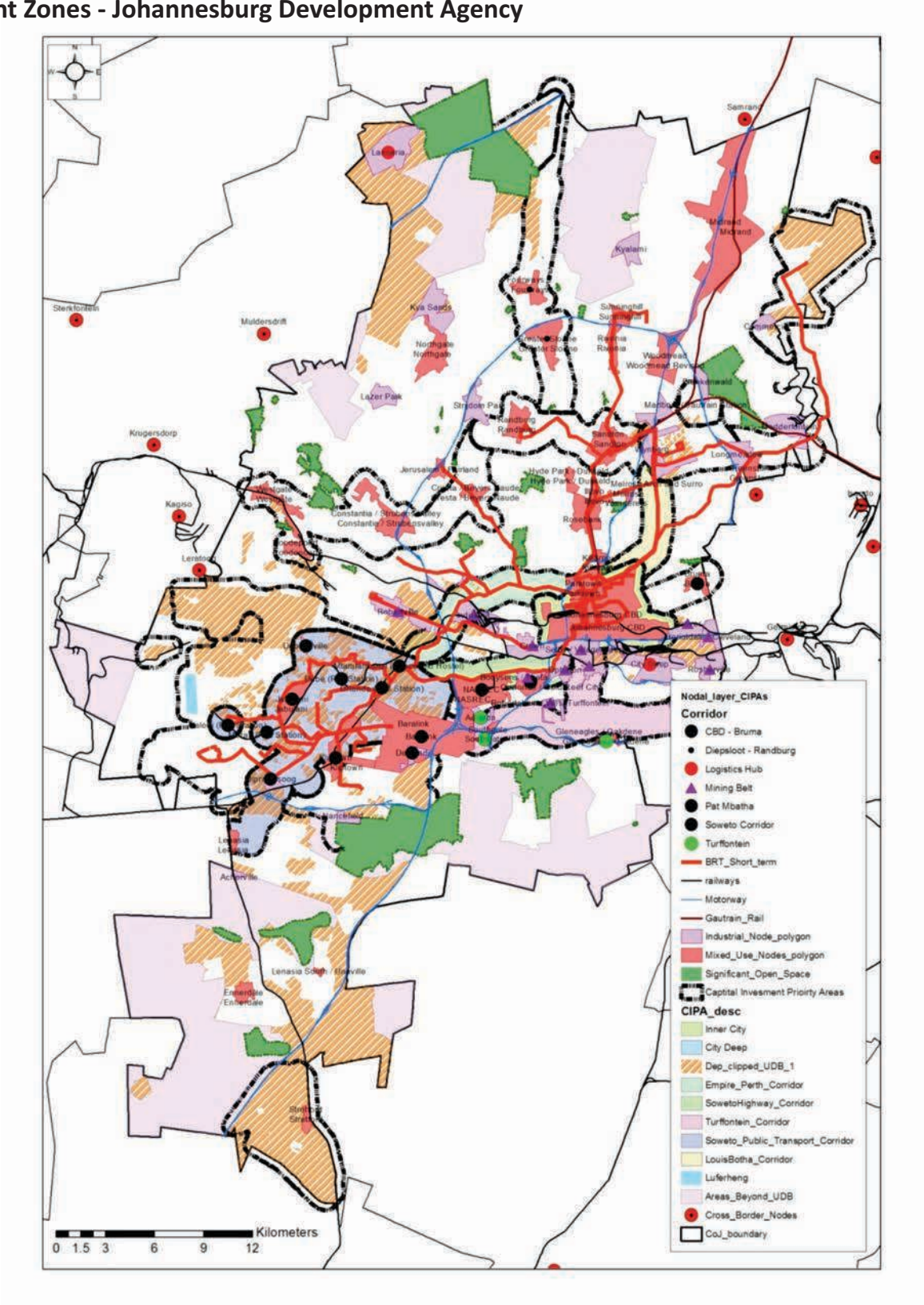
Overused Roads





# Map 17: Corridors of Freedom

Priority Investment Zones - Johannesburg Development Agency



Densification processes, through their repetitive and serial nature, high levels of closure, low accessibility and disconnection from employment areas, imply on the one hand very low efficiency in resource utilisation and high carbon intensity, and on the other high sensitivity to energy costs. The main constraint to an increase in the number of cars is economic, in that many households still do not have sufficient financial resources to organise their own mobility on the metropolitan scale. In order to make up for the limitations of previous planning systems, the objective of the city is to guarantee accessibility to the entire population, as well as better energy efficiency, with a Transit Oriented Development (TOD) strategy named Corridors of Freedom. Mobility then becomes one of the main tools of urban development and planning, but this time through the development of public transport, not cars. TOD strategies aim at giving priority to urban intensification around transport nodes and public transport stations. Morphologically, this can be displayed with concentric circles corresponding to the time it takes to travel from a station to one's home or place of work. The distance between these two nodes will then be accompanied with a progressive drop in density and facilities.

Organising the territory around new BRT stations is central to metropolitan preoccupations. However, while the first lines of these corridors of freedom have been in operation since 2010, the process is struggling to become established. Because of the lack of densification around these corridors, deterioration in urban quality is being felt, as in Empire Road, where the number of shops tends to diminish and where, despite the invested capital, the pedestrian environment has become considerably degraded where, for example, two pedestrians cannot walk next to each other in certain

sections of the pavement. Moreover, open spaces have been affected by the construction of parkings, and walls and gates often constituting the only urban facades in these corridors.

In Soweto, stations remain relatively deserted with limited developments around them.

Only the Gautrain stations, due to their economic appeal, seem to initiate a beginning of densification, as can be seen opposite in the aerial photograph of Rosebank.

This setback in the establishment of corridors of freedom is caused by:

- a lack of integration between transport and urban planning strategies;
- a lack of strictness as far as the detailed design of urban sectors is concerned;
- a lack of intermodality (no link between the different modes of transport - Gautrain, BRT, suburban train, etc.);
- difficulties of integration of the informal sector.

Today, Johannesburg seeks new alternatives to make up for these shortages, and kick-start the economic process leading to the development of efficient densification. The map opposite shows the priority investment zones of the metropolis: the corridors of freedom are to be privileged by the policy of the city which aims at transforming spatial inequality, connecting isolated urban areas, bringing people closer to employment opportunities (and other advantages offered by the city), and reducing the use of private motorised transport.



*Absence of densification around a BRT station in Soweto*



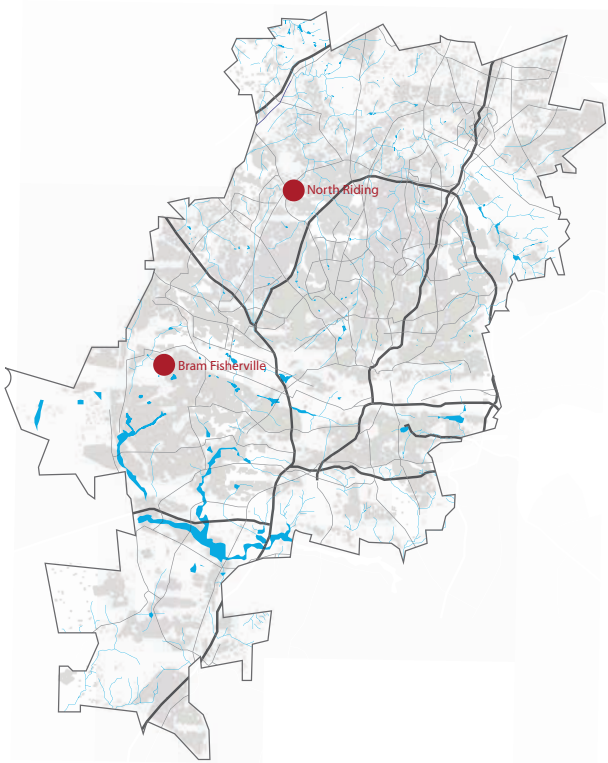
*Beginnings of Densification with Shopping Centres in Rosebank*



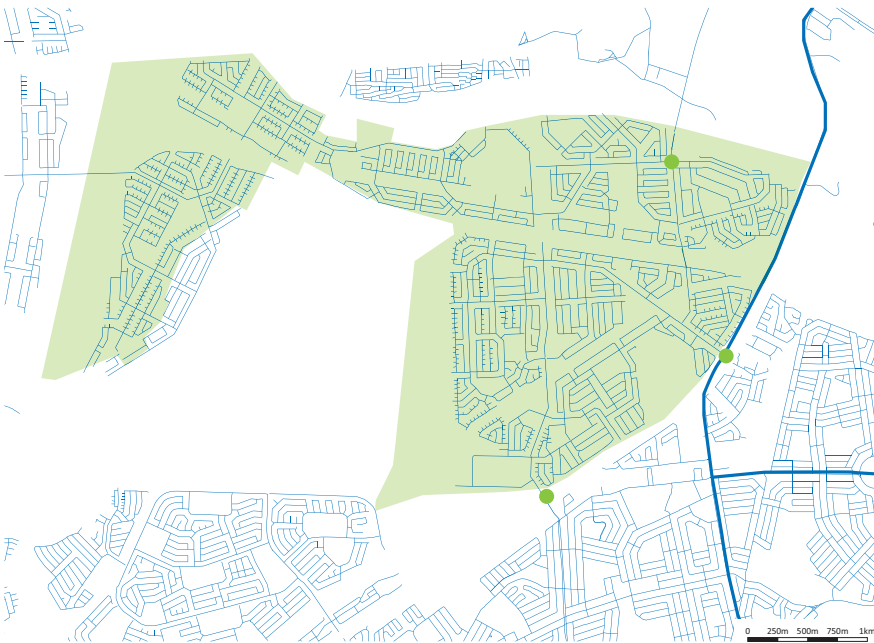
# Map 18: Access

Access to most suburbs is subject to security policies. The maps hereinafter show the different access roads to the selected suburbs and illustrate the connectivity they maintain with their close environment. Integration of these urban spaces into the city network is characteristic of suburban confinement: wealthy urban areas exclude themselves voluntarily from the urban network, leading to the generalisation of closed complexes, and from social suburbs by ensuring disconnection and control. The low number of entry points in a suburb automatically aggravates traffic jam issues.

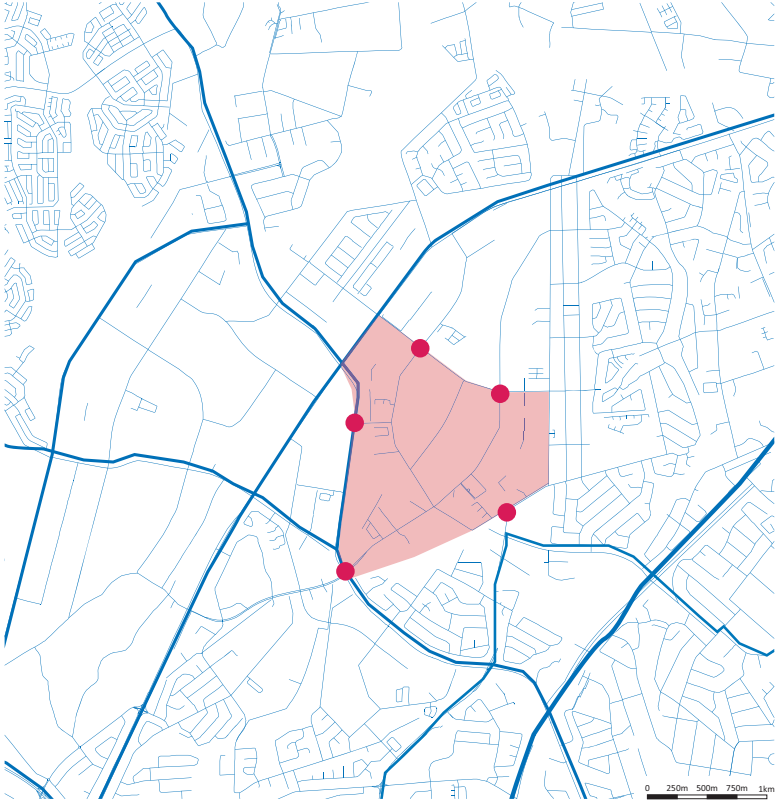
Historical suburbs are logically the best connected. Bram Fischerville on the other hand is isolated, with only three entry points and a sterile direct surrounding made up of wastelands.



Bram Fischerville



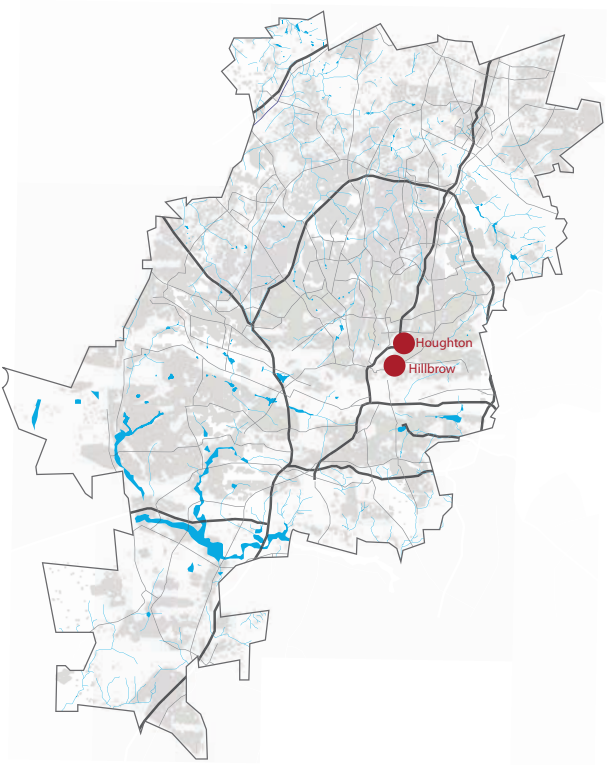
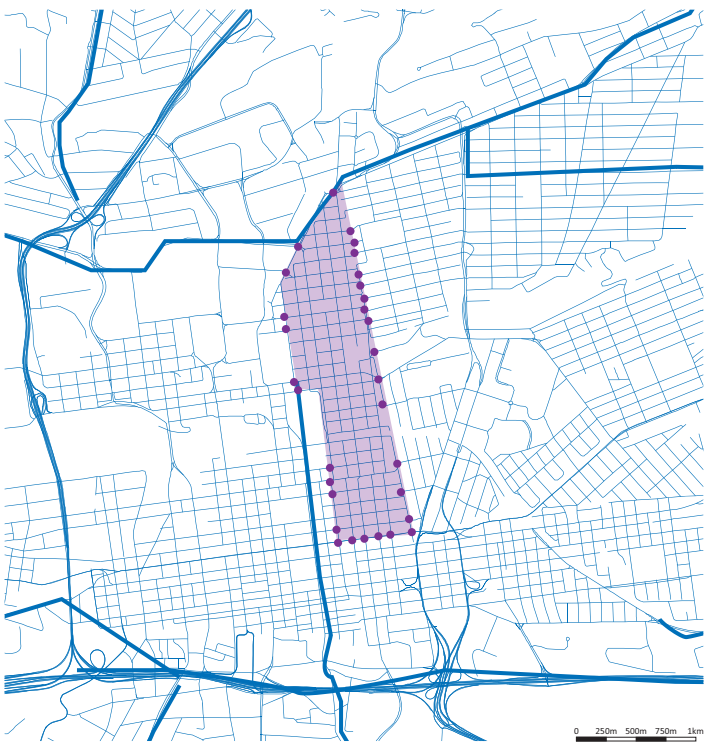
North Riding



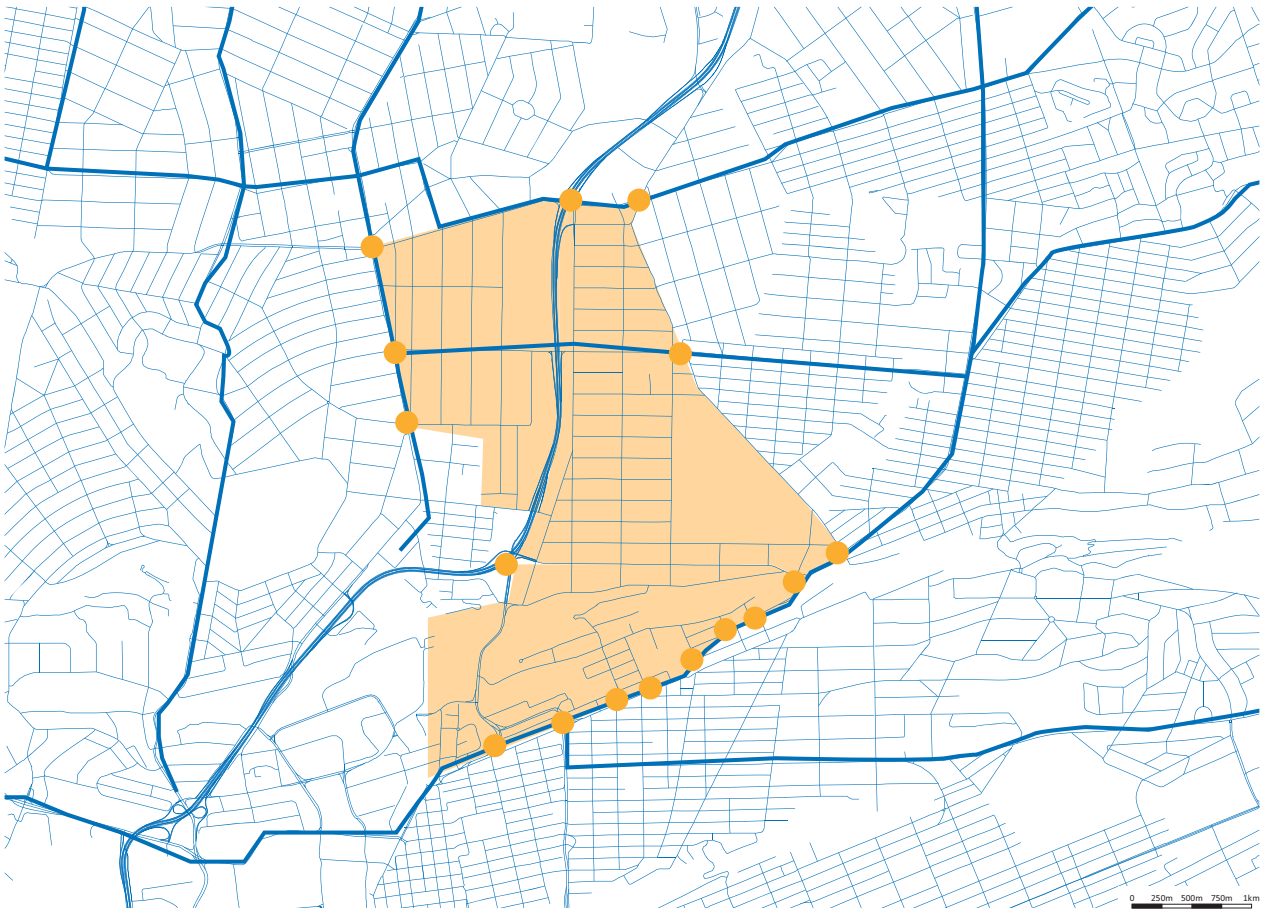




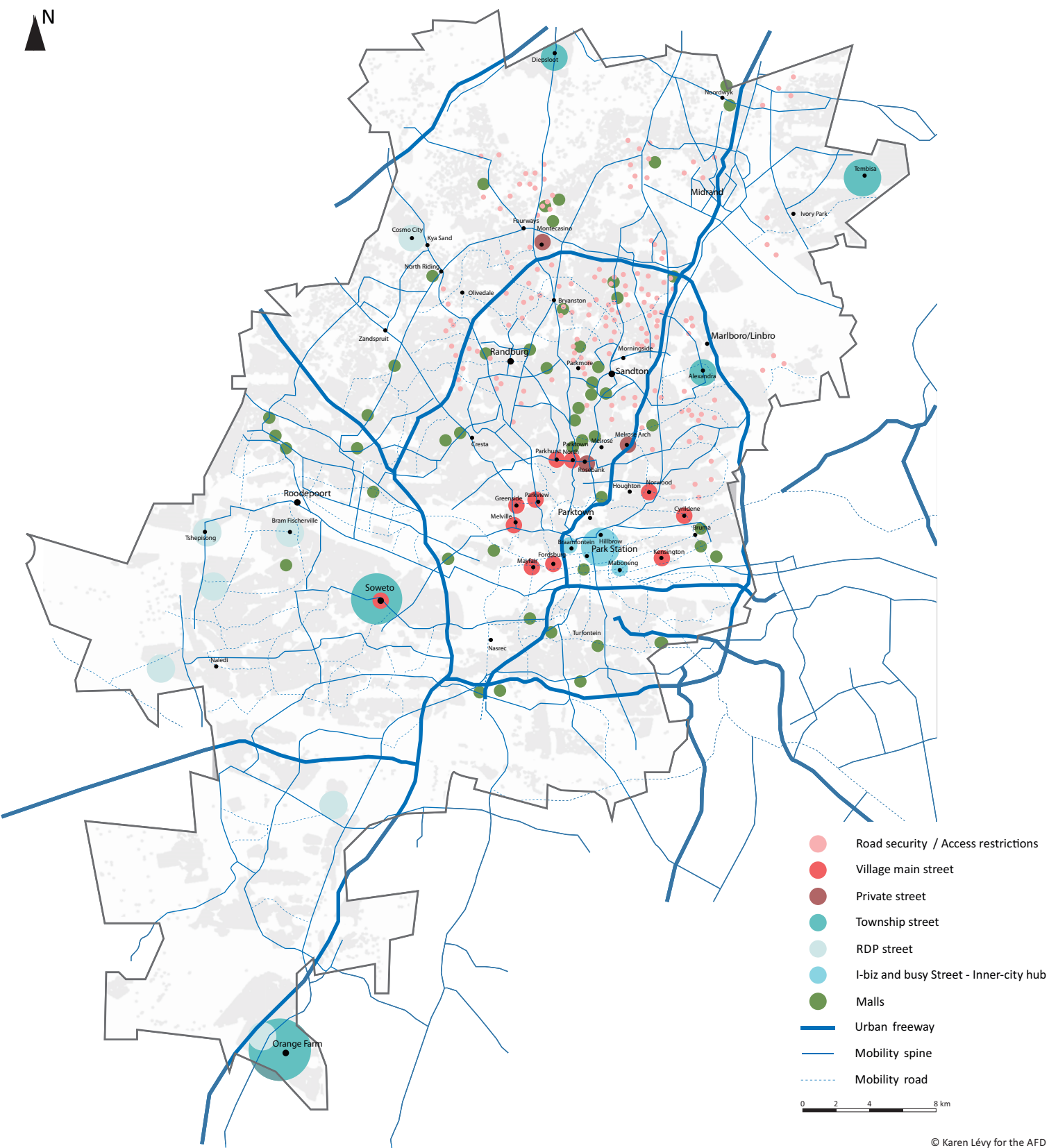
**Hillbrow**



**Houghton Estate**



# Map 19: Squares and Streets - Urban Challenge in Johannesburg





For several years now, the will to develop streets where pedestrians can move around safely, has been confronted with several challenges characteristic of South African cities:

- First of all an urban challenge: the city was developed according to the car-oriented model, marked by urban sprawl and increasingly longer travel distances, as well as a lack of developments for pedestrians;
- Then a social challenge: crime is a source of daily concern for city dwellers;
- Finally, a historical challenge: spatial segregation remains a strong social marker. The notion of collective space remains excluded from the urban vocabulary for a large part of the population.

Today, it seems that only those who cannot afford a car walk in the streets. A few private operations based on new urbanism principles, such as Melrose Arch, have integrated pedestrians into the city. However, the success of this initiative is due above all to the fact that entries are guarded and the place is considered as “secured” by users.

Suburbs managed by City Improvement Districts (CID) are more

successful thanks to the maintenance and protection of the right to public passage. Security then takes place at the entrance to individual buildings and, sometimes, as in the Maboneng Precinct, at each crossroad.

Urban developments carried out by the city have contributed to creating a feeling of belonging to the city, and to defining the character of each suburb.

Walking is no longer part of the daily practices of middle-class city dwellers: no one walks to work or to take the children to school, and even less to take a leisurely walk in the suburb. As seen previously, shopping centres have cashed in on most socialising rituals of city dwellers, and on the leisurly walks and shopping which, in the past, characterised the city centre and urban public spaces such as parks and squares. They have become meeting places for many residents of Johannesburg.

Ensuring the return of middle-class pedestrians (from the outer suburbs) in the city centre is a major challenge: where security is a condition as well as a consequence of pedestrian practices, developing pedestrian spaces can be perceived as a tool to make the city safe.

● Road security / Access restrictions



● Village main street



● Private street



● Township street



● RDP street



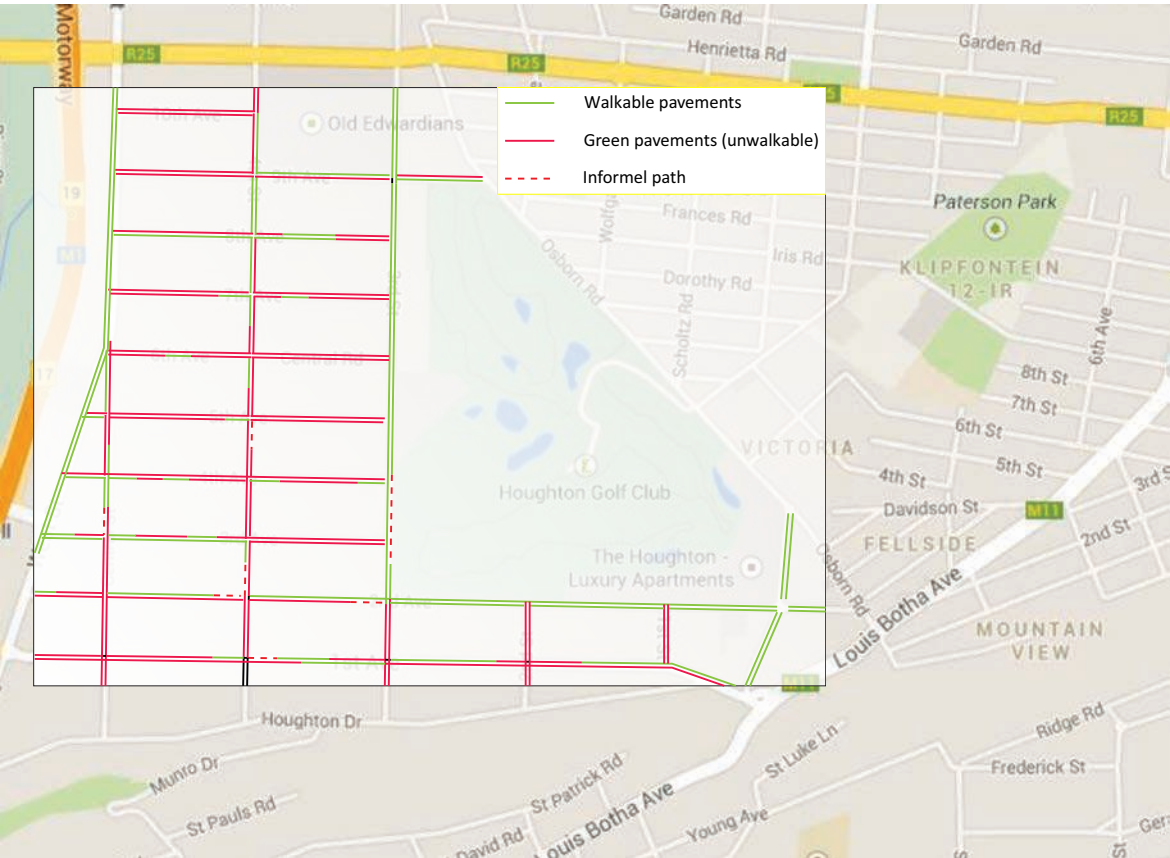
● I-biz and busy street - Inner-city



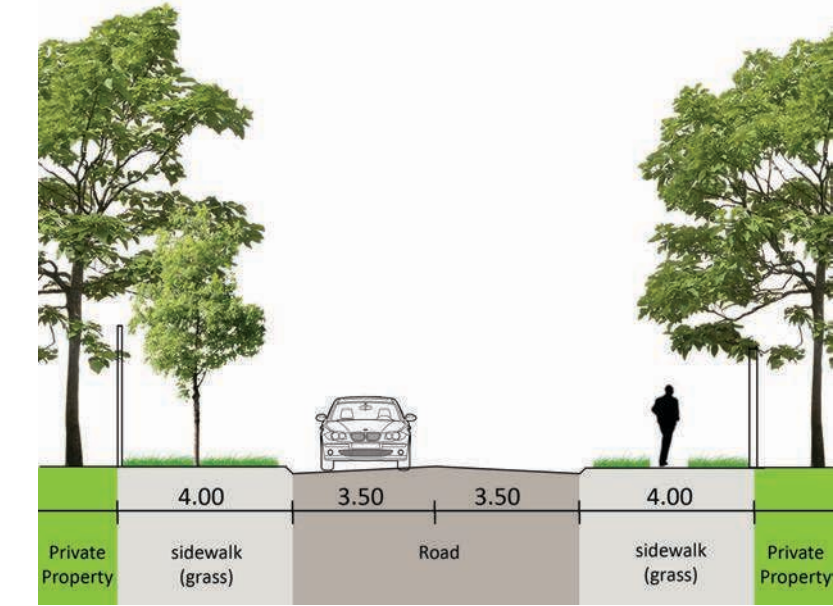


# Map 20: The Place of Pedestrians in the City

The Example of Houghton: Problematic Discontinuity of Walkways



When pavements do not serve their purpose for pedestrians...







Whether in central suburbs or on the outskirts, the place of pedestrians in Johannesburg is problematic. In Gauteng, 40% of deaths due to a road accident concern pedestrians.

While road networks are generally fully proportioned, with large pavements, pedestrian walkways are in some places very limited. Indeed, most pavements are developed by private operators who develop bordering parcels. The lack of homogeneity across entire sections of pavement makes uninterrupted walking virtually impossible. Most pavements are landscaped and are planted with lawns and vegetation. Pedestrians therefore have to walk on the actual street.

Today, it seems essential to maximise the use of existing spaces to create a clear hierarchy of road networks and to make pedestrians feel safe. Despite the importance of travelling on foot (as is the case for a population that often does not have any other means of locomotion), the city is today still largely oriented to the use of private cars. Pedestrians are seldom a priority in urban

developments and the distribution of space is not equitable, which leads to high accident rates.

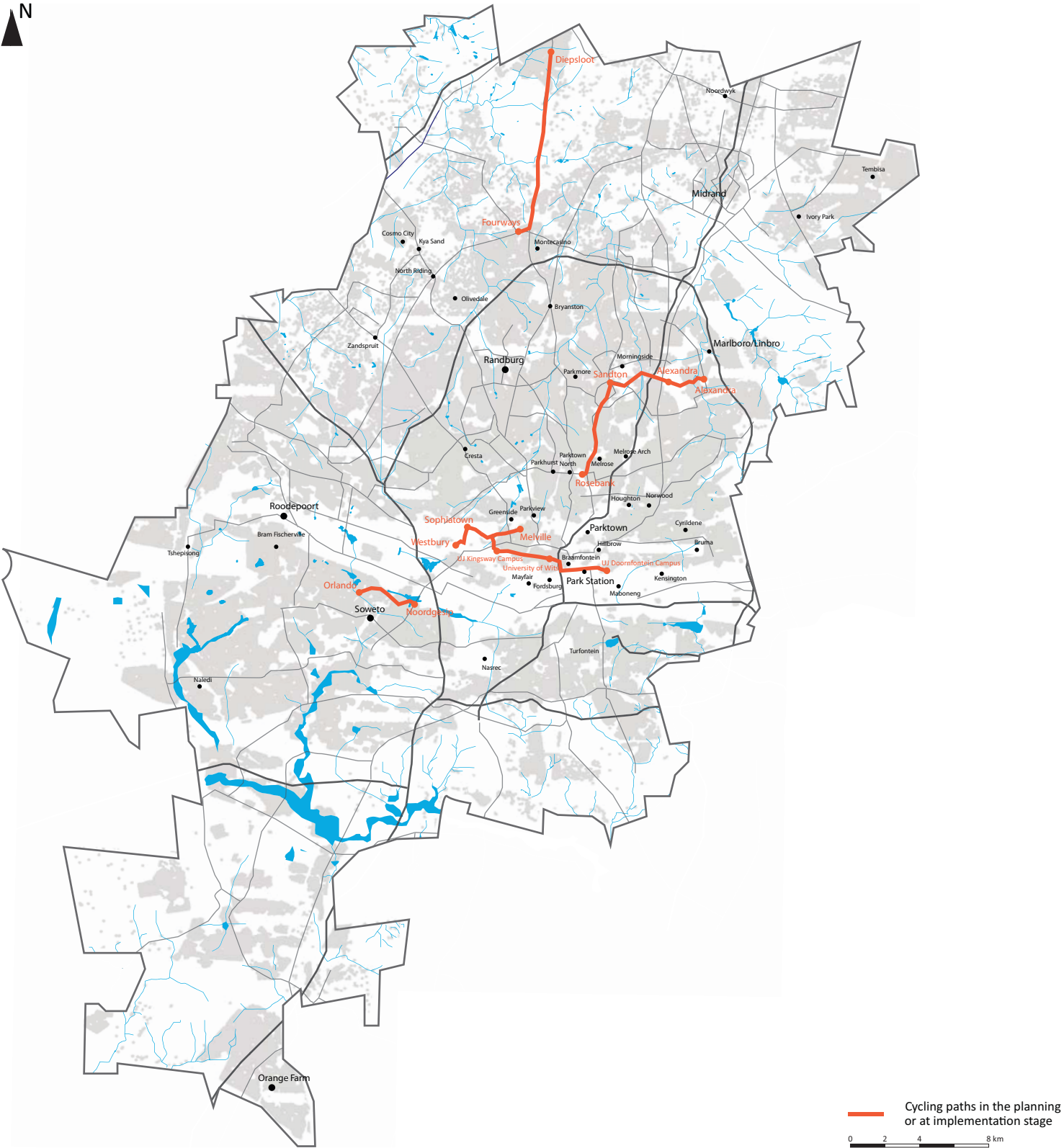
The map opposite offers a schematic illustration of the patchwork of pavements in Houghton Estate. The same phenomenon is reproduced in the recently developed suburbs on the outskirts of the city, as in North Riding. The width of the roads and the low number of intersections allows cars to drive at often excessive speeds, making usage conflicts even more problematic.

In the city centre, the issue takes on another form, but the consequences are the same: pedestrians move around with difficulty because of the priority which was given to motorised transport in the past: pedestrian crossings are not well marked and are often inexistant at crossroads; traffic lights are always to the advantage of cars, leaving pedestrians insufficient time to cross. At the same time, informal trading on the pavement not only limits the available space, but also forces pedestrians to walk on the actual street. This is the cause of high pedestrian accident rates.

### The Example of Hillbrow: Obstructed Pavements Making Walking Difficult



# Map 21: The Challenge of Bicycle Lanes





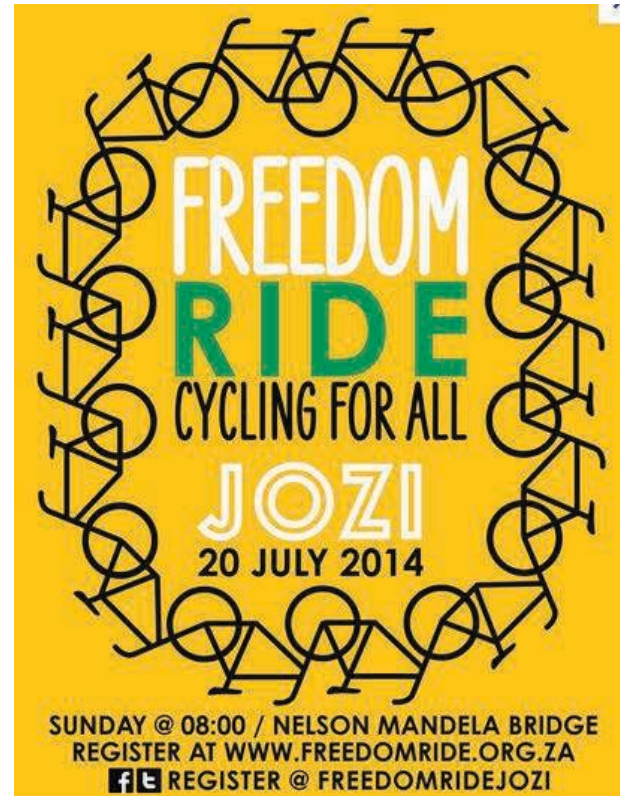
In Johannesburg, as in most cities with low density, the road network was developed only with cars in mind and most local urban services are accessible by car only. The absence of two-wheeled vehicles on the roads remains fairly unexplained (even if safety issues have a strong impact on the practice). Although the topography and morphology of the city represents significant disadvantages for cycling in town (important differences in height, long distances between centres of attraction and high car traffic among others), this alternative method of travelling could be inserted in a transport chain as a complementary means to public transport.

While the city is currently developing its public transport network, commuters should be given the opportunity to choose cycling as a travelling method, which is not the case at this stage. A real awareness is currently emerging on the importance of developing bicycle lanes so as to offer pedestrians and cyclists comfortable, continuous and legible paths. Bicycles could be made an essential link in peri-urban mobility, by favouring cycling through road-sharing and parking policies, and by offering cyclists the possibility of hopping onto public transport with their bicycles and ride or walk their first and last kilometer.

Several bicycle lanes have been planned in the city of Johannesburg with many objectives in mind:

- reducing traffic and traffic jams, in the dense urban centres in particular, such as Sandton and the city centre;
- enabling the destitute to access local employment areas. In this regard, the construction of a pedestrian-cyclist bridge is under study to link Alexandra and Sandton safely. Likewise, an ambitious project of cycling development is under study between Diepsloot and Fourways and between Soweto and Noordgesig;
- creating new uses and practices within the city: a bicycle lane, linking the different campuses of the city is under way and should develop connections between students and the members of the personnel of the universities of Johannesburg and the Witwatersrand.

Several municipal campaigns seek to change mentalities and promote cycling. This is an important challenge, as Johannesburg has a long way to go before it can project the image of a city where cyclists and pedestrians are adequately accommodated. The objective of these campaigns is to show the advantages offered by cycling, spreading information about the positive effects of cycling on people's health, the low cost of bicycle lanes for the public compared to the road network, the reduction in air pollution and the development of the city's appeal, in that cycling is a powerful factor of social and territorial cohesion.



Cycling promotion campaign, July 2014



Development of a bicycle lane in Braamfontein, June 2014







# Conclusion

Thanks to these maps, we can visualise the main features of Johannesburg as a unique city:

- The sprawl of the urban area;
- The importance of the highway and road infrastructure corresponding to car-oriented societal choices;
- The fragmentation into suburbs, at the limit of social sustainability;
- The general “enclosure” movement applicable to housing, offices and even shops, enclosing major urban functions in spaces with controlled access. The rules and practices of private security apply throughout the city;
- The unequal access to basic services.

But these maps inform us also about the very high constraints facing the city:

- A complex and fragile natural environment;
- The rapid and radical change, during the 1990s, in the right to urban space, establishing the freedom of access for all to property ownership, movement as well as economic and social activity;
- The acute perception of the need for security;
- The economic conversion of a mining and industrial city into a mainly tertiary-sector city;
- Finally, the pressure of migration from rural areas and the rest of the continent.

The urban development of the last twenty years has been characterised among other things by the uncontrolled expansion of urban areas, the progressive intensive building of houses and envelopment of agricultural and natural areas, an increase in mobility and car travelling, and the explosion of the forms of housing. All these phenomena have greatly contributed to increasing consumption in energy and greenhouse gas emissions.

Indeed, densification processes, through their repetitive and serial nature, high level of closure, low accessibility and disconnection from employment areas, imply on the one hand very low efficiency in resource utilisation and high carbon intensity, and on the other high sensitivity to energy costs.

One of the main challenges for Johannesburg is to organise processes for the densification of the metropolitan area, to channel them and use them as a lever to remodel, in the long term, the urban morphology of the metropolis. The longer the city waits, the more regressive processes are being established, leading to the amplification of spatial and social inequalities, and to the continuity of urban fragmentation.

In order to solve the extent of the challenge and to reach the status of efficient city, Johannesburg needs to transform its urban space. While there is political will from the Municipality, let us hope that the maps of 2040 will testify to it.

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