GCRO OCCASIONAL PAPER
NO. 19

Spatial trends in Gauteng

DECEMBER 2021
Authors: Richard Ballard, Christian Hamann and Ngaka Mosiane

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Acronyms and abbreviations

BRT	bus rapid transit
CAHFA	Centre for Affordable Housing Finance Africa
FLISP	Finance Linked Individual Subsidy Programme
GCRO	Gauteng City-Region Observatory
GTI	GeoTerraImage
IUDF	Integrated Urban Development Framework
MEC	Member of the Executive Council
REITs	real estate investment trusts

Preface

In late 2018, the Gauteng City-Region Observatory (GCRO) accepted an invitation from the Gauteng Provincial Government (GPG) to write a series of thematic 'end-of-term review papers'. The then GPG's term of office, which had begun with the fifth provincial elections in 2014, was set to come to an end with the sixth provincial elections in 2019. In late 2018, the 2014–2019 administration engaged in a phase of reflection. The end-of-term reviews constituted an input to this process. This GCRO Occasional Paper is a modified version of one of these end-of-term review papers and responds to the prompt of 'spatial trends'.

About the authors

Richard Ballard | https://orcid.org/0000-0001-6244-6946
Richard is a Principal Researcher at the Gauteng City-Region Observatory. He conducts research in the fields of geography and development studies, with a particular interest in urban studies. He has published on the dynamics of race and urban desegregation, gated communities, social movements, participatory processes, local democracy, cross-border migrants, urban developers, megaprojects in the human settlement sector, the middle class and development, cash transfers, governance and development, and industrial restructuring.

Christian Hamann | https://orcid.org/0000-0002-2129-8550
With a background in urban planning and human geography, Christian does research on a variety of urban geography topics, including spatial changes and development in the Gauteng City-Region as well as the socio-economic circumstances of residents. His applied geography research aims to inform urban policy development.

Ngaka Mosiane | https://orcid.org/0000-0002-5001-5601
Ngaka is a Senior Researcher at the Gauteng City-Region Observatory. His research focuses on the edges and adjoining areas of the Gauteng City-Region, exploring how the public and private spatial interventions enable and/or hinder ordinary people's livelihood initiatives and aspirations. Ngaka is also interested in informal housing – its history, current emphasis, and future directions in theory and methodology.

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Photograph by Clive Hassall

Summary

Summary

This Occasional Paper considers six spatial trends in Gauteng. Notwithstanding intentions by the state to direct spatial transformation for the better, these trends are the physical manifestation, for better or worse, of a remarkable variety of actors responding to a wide variety of opportunities, incentives and disincentives. While it might be possible to name post-apartheid urban ideals, these six trends underscore the disbursed nature of energies that are producing urban space, and the need to understand and work with these energies as we find them in directing spatial transformation.

Trend 1: From 1990 to 2000, an average of 36 km^2 was converted from non-urban land use to urban land use in Gauteng each year. From 2000 to 2010, this decreased to 22 km^2 a year, and from 2010 to 2020, it increased slightly to 25 km^2 a year (Table 2). Four-fifths of this growth of urban land cover was in the form of residential land use, most of which was formal.

Trend 2: Alongside processes that extend the amount of land being used for urban land use, there is intensifying use of existing urban land. These processes of densification have concentrated half of the province's residents on just 2% of the province's land.

Trend 3: The number of residential buildings in Gauteng increased from 2.1 million in 2001 to 3.4 million in 2016 (Figure 10). When mapped, new building growth is most prominent in townships where there has been a growth by more than 1 000 new structures per square kilometre in some places (Figure 11). One of the drivers of this growth is the ongoing increase in backyard dwellings.

Trend 4: Ongoing production of residential buildings to a large extent perpetuates the broad affordability gradient that emerged during the city-region's segregated history. Using two different types of residential morphology – gated communities (Figure 15) and government-provided human settlements (Figure 16) – we show that the production of different kinds of residential buildings, catering to divergent income levels, occurs in different parts of the city-region.

Trend 5: Although there has been some racial desegregation, particularly in residential areas once set aside for white people, the city-region continues to show socio-economic segregation. An analysis of segregation shows the way in which middle-class suburbs are racially integrated but not diversified by income (Figure 17, Figure 18). Meanwhile, townships and inner-city areas are racially homogeneous and less affluent.

Trend 6: The location of commercial and industrial buildings suggests an ongoing disjuncture between the largest residential population concentrations and many economic zones. This 'spatial mismatch' creates the need for people to commute long distances every day to work or to look for work. However, commercial and industrial buildings are also developing in and near townships.

These trends are the physical manifestation of a remarkable variety of actors responding to a wide variety of opportunities, incentives and disincentives

Photograph by Clive Hassall

Photograph by Clive Hassall

Introduction

Introduction: Causes, manifestations and implications of spatial change

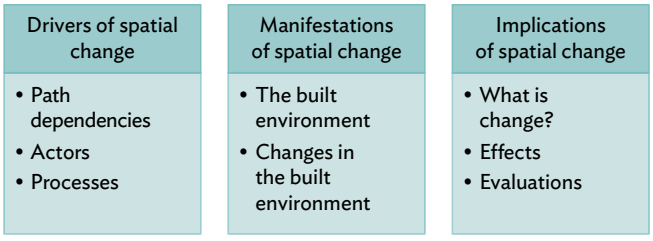
This GCRO Occasional Paper presents a set of spatial trends shaping the Gauteng City-Region. We understand spatial trends to mean directions of change of a broadly spatial or geographic nature, and we consider six spatial trends in particular.

The first trend that we examine is that each year, non-urban land in Gauteng is being converted to urban land use and there is a process of urban sprawl. The analysis shows that the rate of growth of urban land use since 2000 is less than it was in the 1990s. Second, urban land is being more intensively occupied with each passing year, resulting in higher densities over time. These increases in density are uneven, with the highest concentrations in townships and downtown areas. A third and related trend is the addition of 1.3 million residential buildings of all sizes – some with many units – between 2000 and 2016. This increasing building density is particularly pronounced in townships where backyard dwellings add significantly to the overall number of residential buildings. Fourth, the production of residential buildings is driven by a number of distinct markets and geographies, with the result that some housing markets are, in effect, segregated from one another. This perpetuates an affordability gradient for housing, and, given the income and wealth inequality of the 16 million people living in the province, functions as a spatial filter, directing people to the suburbs that they can afford, and away from places that they cannot afford. Fifth, this geography of affordability has important implications for segregation and integration: many affluent suburbs are among the most racially heterogeneous parts of the province but are socio-economically homogeneous. It also produces concentrations of low-income earners and unemployed people in and around areas with high quantities of the cheapest accommodation. Sixth, the production of commercial and industrial buildings appears, at least in part, to be contributing to the 'spatial mismatch' between where workers live and where formal-sector opportunities exist. This necessitates lengthy daily commutes to work or to look for work.

The report is structured around these six spatial trends in Gauteng. While it is undoubtedly possible to generate a longer listing of spatial trends, including, for example, infrastructure growth, changing commuting patterns and changing quantities of commercial and industrial buildings, it is nevertheless instructive to juxtapose at least these six in order to begin reflecting on spatial transformation in the province. They have the status here of descriptive accounts of the changes to the built environment that we can observe.[1] Urban theorist Henri Lefebvre (1991) refers to *perceived* space – the city that we can perceive around us and the material changes we observe. However, we begin this report by acknowledging that these manifestations of urban change in the city that we can see around us sit within analytical and evaluative interests about *spatial transformation* (Figure 1). Lefebvre argues that the material city that we can perceive (the central block of Figure 1) results from a set of immaterial social relationships that are more difficult to perceive (the left block of Figure 1). We devote the second part of this introduction to the plurality of actors and processes behind spatial change in Gauteng.

1 Much of this analysis is based on data prepared by GeoTerraImage (GTI). GTI uses remote sensing techniques to analyse Landsat satellite images. The years of comparison in this report are based on the Landsat imagery that GTI analysed. GTI created this dataset to be able to analyse land-use change over time.

Figure 1: Drivers, manifestations and implications of spatial change



And we recognise, too, that changes to the built environment have a series of important implications (the right block of Figure 1). We will not fully develop the implications of each trend but will acknowledge them in general here. One important implication is to reflect on the nature of change itself. The conversion of smallholdings into townhouses, for example, is clearly a change in and of itself and part of a trend of urban sprawl. Yet, if new townhouses are added to land adjacent to existing townhouses, then these changes reproduce existing patterns. Similarly, the addition of integrated human settlements alongside townships is not as disruptive of the existing spatial pattern as the addition of the integrated settlements alongside middle-class suburbs would be. In short, some changes to the built environment reproduce and extend existing patterns, functions and relationships while other changes transform existing patterns, functions and relationships.

A second implication of changes to the built urban environment is that they have a number of effects regarding the quality of life of residents, economic activity, the environment and the ongoing production of space. For example, although human settlements constructed on the outer edges of historical townships extend apartheid's urban form, they also provide living environments to residents who value them notwithstanding their locational limitations (Charlton, 2017).

A third implication of changes to the built environment is that we can make normative evaluations of them, for example, declaring sprawl and segregation to be undesirable trends, or density and desegregation to be desirable. Normative positions develop our notions about whether or not change is good. In our context, they inform our thinking about *spatial transformation*, or the kinds of change that overcome the harms caused by the apartheid city. Some normative positions are formed prior to an analysis of the actual effects of the built urban environment and changes to it, while others are developed in response to such analysis. Furthermore, some normative positions are formed with close attention to what material form is possible given the production of space in the city-region, while others name ideals *in the abstract*.

Drivers of change and the possibilities of directing change

> By 2050, South Africa will no longer have: poverty traps in rural areas and urban townships; workers isolated on the periphery of cities; inner cities controlled by slumlords and crime; sterile suburbs with homes surrounded by high walls and electric fences; households spending 30 percent or more of their time, energy and money on daily commuting; decaying infrastructure with power blackouts, undrinkable water, potholes and blocked sewers; violent protests; gridlocked roads and unreliable public transport; new public housing in barren urban landscapes; new private investment creating exclusive enclaves for the rich; fearful immigrant communities living in confined spaces; or rural communities dying as local production collapses. (National Planning Commission, 2012, pp. 233–234)

> In South Africa, it is the banks and other investment companies which determine the direction of development rather than the state, and they do this in ways which reinforce the class patterns of the past. (Freund, 2010, p. 294)

> Many cities around the world have been largely constructed by their residents, who build not only their own houses, but also frequently their neighborhoods. They do not necessarily do so in clandestine ways and certainly not in isolation. Throughout the process, they interact with the state and its institutions, but usually in transversal ways. While they have plans and prepare carefully each step, their actions typically escape the framing of official planning. (Caldeira, 2017, p. 3)

In the National Development Plan (National Planning Commission, 2012) quoted above, we see a desire among authorities to name the ways in which urban spaces should be configured to better serve the public interest, and to point urban development in the right direction in order to achieve those arrangements. Such aspirations are elaborated in the Integrated Urban Development Framework (IUDF) (Department of Cooperative Governance and Traditional Affairs, 2016), and various provincial and municipal integrated development plans and spatial development frameworks. These documents formulate important thinking on how urban space can be governed to produce more equitable outcomes and how the resources of plural government spheres and departments can be coordinated.

Urban configurations are not, of course, chosen from a blank slate in any urban context. Some of the path dependencies of South Africa's cities were planned by apartheid's planners, who sought to enable the conditions for the reproduction of segregation over time. In Davies' account in 1981:

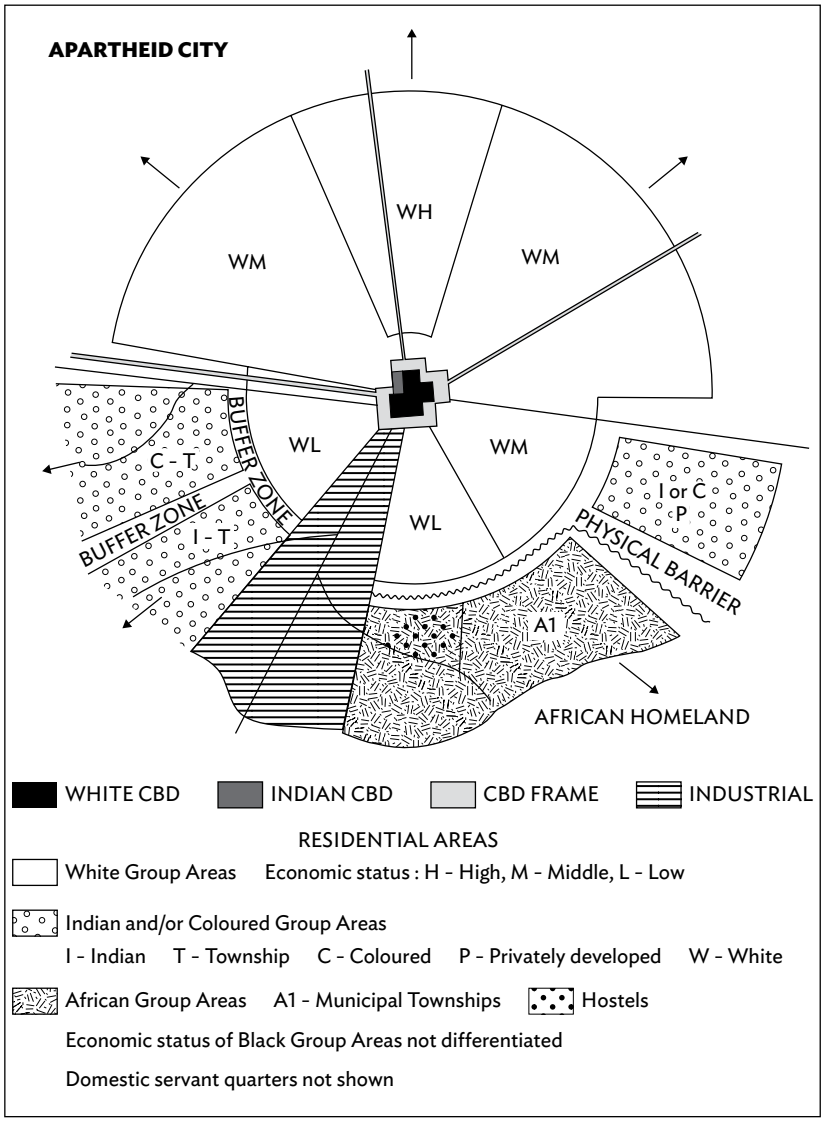
> Design criteria developed for the Apartheid City provided for a minimum number of consolidated race areas for each group. Such areas were to be large enough or to have growth hinterlands adequate to accommodate future population growth and to provide possible future devolution of local government. Race islands enclosed by areas allocated to other groups were to be avoided where possible. [...] Where possible each group was to be given direct access to work places to avoid filtering through areas set aside for other groups, and African groups were, where possible, to be accessible to major industrial work centres that could also serve as boundary zones. (Davies, 1981, p. 69)

Davies notes that apartheid segregation was not based purely on the designation of segregated areas *as such*, but on the configuration of a political economy of segregation of differentiated property markets and racially differentiated abilities to afford property, resulting not least from job reservation. Segregation would become, over time, organic and self-sustaining (Figure 2).

It is perhaps because of the capacity of white minority governments to engineer cities that we might presume the capacity of post-apartheid governments to re-engineer them according to democratic principles such as those named in the National Development Plan. The success of any such re-engineering would, however, depend not on naming a better spatial configuration but rather on transforming the political economy of spatial production and use. As the IUDF recognises, the state may be able to craft a vision of virtuous urbanism, but it cannot bring about that vision by itself because large tracts of urban space are not built by the state, nor does the state necessarily have much control over how other actors build urban space. Even where the state does directly produce new low-cost housing or integrated human settlements, such spaces are rapidly transformed by ordinary residents, acting 'transversally to official logics' (Caldeira, 2017, p. 3). The construction of backyard shacks by residents, for example, sits awkwardly within the drive to create planned human settlements to replace what many state actors consider to be undignified informal settlements. In 2015, the Gauteng Member of the Executive Council (MEC) for human settlements signalled his dismay that backyard shacks had brought slum-like conditions to Johannesburg's recently built integrated human settlement of Cosmo City. He argued that further state-sponsored human settlements would be free of backyard dwellings because there would be adequate employment for those who lived in them (Mashego, 2015; see also Rubin, 2020).

The way he *conceived* space, again to use Lefebvre's (1991) vocabulary, is far removed from the *lived* city characterised by high levels of structural unemployment and well-established practices of renting out backyard rooms. Cities are not the result only, or even primarily, of what authorities think would be best. Rather, they are the actions of millions of producers and users of the built environment, many of whom create and inhabit accommodation without seeking planning approval

Figure 2: Model of the apartheid city
SOURCE: Davies (1981)



(Karaman et al., 2020; Streule et al., 2020; Harrison and Todes, 2015; Bayat, 2010; Miraftab, 2009; Holston, 2008).

Even private-sector developers who secure planning permission can test the ability of the state to realise the vision of good urbanism that it has articulated (Herbert and Murray, 2015; Freund, 2010). A consultant at the City of Johannesburg's 2015 spatial development consultation workshops (attended by one of the authors of this report) stated that privately built edge cities did not fit the urban

logic and that some developers were not 'playing nicely'. And at a workshop in 2016, a city official argued with entry-level housing developers about the long-term sustainability of their developments on the periphery. The developer said that they had bought enough land to keep constructing according to their tried-and-tested model for at least a decade and were not going to be dissuaded from doing so by the city's concerns. Similarly, the desire to eliminate gated communities expressed in the National Development Plan and in various other forums belies the strong currents that direct developers to produce precisely this kind of urban commodity.

We can distinguish, then, between spatial transformation as an unrealised ideal (or multiple ideals) towards which champions of these visions believe we should be moving, and actually existing urban change which may or may not contribute to the realisation of these ideals. Figure 3 provides lists of the variety of actors behind urban change (part A), the variety of processes that they participate in (part B), and the variety of urban typologies and morphologies that result (part C). It is unlikely that the aims of the National Development Plan and the IUDF, important as they are, are central to the thinking and conduct of the remarkable range of state actors; regulators; land owners; financers; developers; private-sector, public-sector and individual users of spaces; tax and service payers and interest groups who shape urban space. Rather, they participate in a bewildering variety of processes, responding to particular incentives, opportunities, imperatives and constraints. Although the IUDF does examine points of leverage over city-regions, many actors producing urban space are essentially indifferent to the ideals of spatial transformation, and some contribute precisely to the kinds of urban space that the National Development Plan states we will not have by 2050.

Figure 3: Actors, processes and land-use types

A. Actors building and shaping the city-region

- National government and its various departments.
- Provincial government with its various departments.
- Local government, each with a number of departments and agencies acting within their own jurisdictions.
- State-owned enterprises and utilities.
- Regulating agencies such as the Municipal Demarcation Board and heritage associations.
- Existing owners of land and property.
- Those seeking to invest in land and property.
- Private-sector finance for urban development: banks, pension funds, real estate investment trusts (REITs).
- Developers working in various market segments (Ballard and Harrison, 2020; Butcher, 2020b; Mosselson, 2019; Goga, 2005).
- Other parts of the private sector that take up space for their activities: agriculture, industry, mining (Khanyile, 2016), retail, telecommunications, services.
- Public-sector institutions that need space for their activities: infrastructure, hospitals, schools, universities, recreation, airports.
- Users of space: residents, commuters (Trangoš et al., 2015; Wray, Götz, Culwick et al., 2014; Wray, Götz and Katumba, 2014), learners and students, workers and job seekers, hospital patients, faith-based groups, shoppers.
- Migrants to Gauteng from other provinces in South Africa or from other countries.
- Tax payers, utility payers, toll payers, bus ticket payers.
- Interest groups/collectives: city improvement districts, ratepayers' associations, body corporates (Parker and Appelbaum, 2020; Duca, 2015).

B. Processes building and shaping the city-region

- Demographic considerations: natural growth and net migration.
- Long-term economic restructuring, the increasing importance of services over manufacturing and mining (Crankshaw, 2008).
- Land occupation, informal settlements (Hamann et al., 2018).
- Hijacking and occupation of buildings (Morris, 1999).
- Informal subdivision of warehouses, apartments, houses and other structures for rental (Howe, 2020; Zack et al., 2020).
- Disinvestment in inner-city spaces and particular suburbs, resulting in deterioration (Crankshaw and White, 1995).
- Construction of backyard dwellings (Rubin and Charlton, 2020; Hamann et al., 2018).
- State-led informal settlement upgrading.
- Grassroots formalisation/investment.
- Low-cost give-away housing, Finance Linked Individual Subsidy Programme (FLISP), partially subsidised housing, social housing.
- Production of fully bonded 'affordable housing' (Butcher, 2016).
- Provision of accommodation for tertiary students (Gregory and Rogerson, 2019).
- Development of middle-class cluster accommodation (Chipkin, 2012) and lifestyle estates for more wealthy markets (Lemanski et al., 2008; Hook and Vrdoljak, 2002).
- Construction of schools, hospitals and clinics, both public and private.
- Construction of malls, shopping centres and offices.
- The creation of a new generation of mid- to high-rise residential buildings in a variety of nodes beyond historic central business districts.
- Regeneration of inner-city areas, redevelopment of inner-city buildings.
- Transport investments: highways, railways, bus rapid transit (BRT), buses, taxis, cabs and ride-hailing systems (Trangoš et al., 2015).
- Post, courier services, food delivery services, internet shopping and the logistics industry (Wray et al., 2015).
- Removal of mine dumps.
- Regulations and legal frameworks such as strategic plans (spatial development frameworks), nodal plans, detailed precinct or sectoral plans and urban-edge policies.
- State-led investments in bulk infrastructure and transport infrastructure.
- Social preferences, taste, prejudices, intolerance, 'nimbyism' (Hamann and Ballard, 2018, 2017; Hamann and Maree, 2017).
- Social problems: poverty, unemployment, crime, drugs (Siteleki and Ballard, 2016).
- Economic inequality, differential purchasing power and segregation.

C. The built urban environment that results

- Apartheid-era townships often densified with backyard dwellings and also diversified with relatively affluent sections. Townships have a large number of schools, informal and formal retail sites and some areas of industry.
- Post-apartheid low-cost housing settlements often densified with backyard dwellings and retail sites.
- Integrated human settlements (e.g. Cosmo City), catalytic projects and mega projects (Wray et al., 2015) self-consciously attempt to cater for a mix of income levels although only as high as entry-level fully bonded housing. They also try to mix economic activities and social services into human settlements.
- Apartheid-era suburbs (which might or might not be retrofitted with access control) (Lemanski et al., 2008) have various commercial and retail spaces and public and private schools.
- Post-apartheid middle-class and affluent suburbs, many of which are gated (GCRO, 2013, 2012).
- Post-apartheid entry-level suburbs, many of which are on the periphery (Butcher, 2020a, 2020b, 2016).
- Zones of industry, warehousing, services, finance-sector activity and economic clusters (Naidoo, 2019).
- Informal markets, independent shops, shopping centres and malls (Khanyile and Ballard, 2018).
- Public spaces and streets (Harber et al., 2017).
- New 'instant cities' in the form of large-scale, mixed-use settlements such as Steyn City and Waterfall City (Ballard et al., 2021; Herbert and Murray, 2015).
- New urbanist developments, which are relatively dense and mixed use such as Melrose Arch and Oxford Parks (Dirsuweit and Schattauer, 2004).
- Intensification of nodes of various kinds and sizes, such as downtown Johannesburg, Rosebank, Sandton, Menlyn, Mabopane Station (Mosiane et al., 2018).
- Investment along corridors within built-up areas, or along transport corridors linking built-up areas (e.g. Midrand).
- Farms and smallholdings, some of which are densifying and acquiring semi-urban uses.
- Nature reserves, environmentally sensitive areas (Leroy et al., 2015) and heritage sites.

Photograph by Clive Hassall

Six spatial trends in Gauteng

Six spatial trends in Gauteng

Trend 1: Growth of Gauteng's urban footprint

Built-up urban areas have covered a small but increasing portion of the province over time.[2] Whereas 7.1% of the provincial land use was urban in 1990, 11.7% of the provincial land use was urban in 2020 (Table 1).

The rate of growth of urban land has slowed down in both relative and absolute terms since 2000, although it picked up again in absolute terms from 2010. Between 1990 and 2000, an average of 36.3 km^2 of land was converted from non-urban to urban land use per year (Table 2). This amounts to an average growth rate of 2.8% a year. Between 2000 and 2010, this fell to 22.2 km^2 per year, or a growth rate of 1.3%. Between 2010 and 2020, this increased in absolute terms to an average of 25.1 km^2 of land converted to urban land use each year. However, the growth rate of 1.3% a year did not change for this period since Gauteng's urban land

Table 1: Urban land cover in Gauteng, 1990–2020
DATA SOURCE: GTI data, 2021

Year	Urban land use excl. smallholdings	% of Gauteng's total area
1990	1 309.1 km^2	7.1
2000	1 672.2 km^2	9.1
2010	1 894.2 km^2	10.3
2020	2 145.5 km^2	11.7

Table 2: Change in rates of growth before and after 2000
DATA SOURCE: GTI data, 2021

Period	Average area added each year	Average annual percentage by which Gauteng's urban land cover increased
1990–2000	36.3 km^2	2.8
2000–2010	22.2 km^2	1.3
2010–2020	25.1 km^2	1.3

2 The calculations and maps for Trend 1 are based on a narrow definition of urban land that excludes mining, smallholdings, villages and agriculture, which constituted a further 2.1% of the province's land in 2020. Smallholdings are transitional spaces insofar as many pay municipal rates and are serviced by municipal infrastructure, and many are densifying. The urban land-use classes in this section include GeoTerraImage's classification of 'Commercial', 'Industrial', 'Education', 'Healthcare Facilities', 'Institutions', 'Tourism', 'Community Services', 'Cluster Housing', 'Formal Housing', 'Informal Housing', 'Recreation & Leisure', 'Utilities', 'Transport' and 'Built-Up'. Each 'pixel' is a hexagon with an area of 0.103755 km^2; it is shaded as 'urban' if more than 30% of the area of that hexagon is urban.

was by then larger, and each additional fixed unit of land contributes a declining percentage of growth.

Figure 4, Figure 5 and Figure 6 illustrate how these processes have changed the city-region's urban footprint in 1990, 2000, 2010 and 2020. The grey shading indicates the 1990 urban land-use footprint, yellow shading shows urban land added between 1990 and 2000, green shading shows urban land added between 2000 and 2010, and red shading shows urban land added between 2010 and 2020.

Figure 4: Gauteng City-Region urban footprint, 1990–2020

DATA SOURCE: GTI data, 2021; map by Christian Hamann

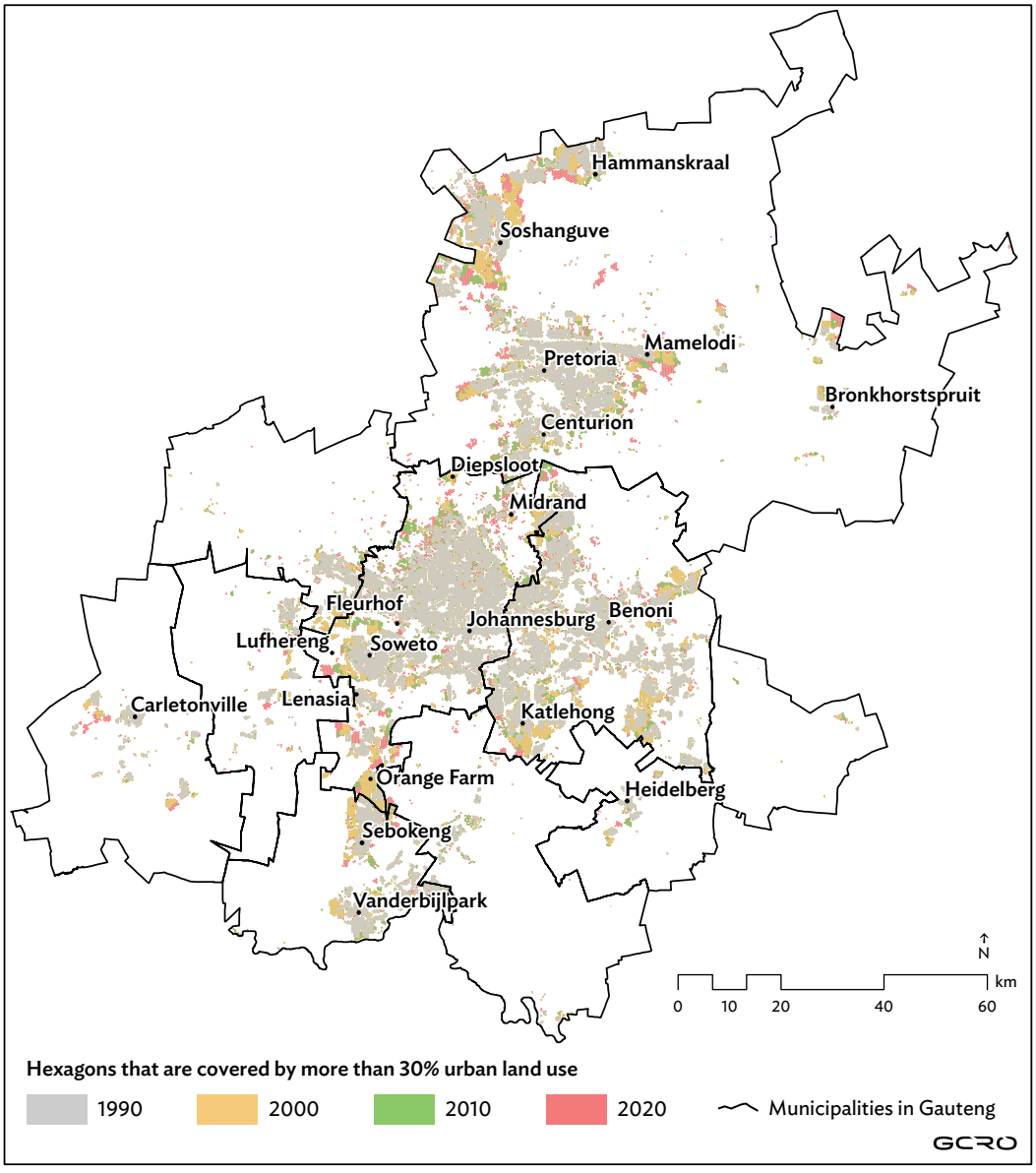
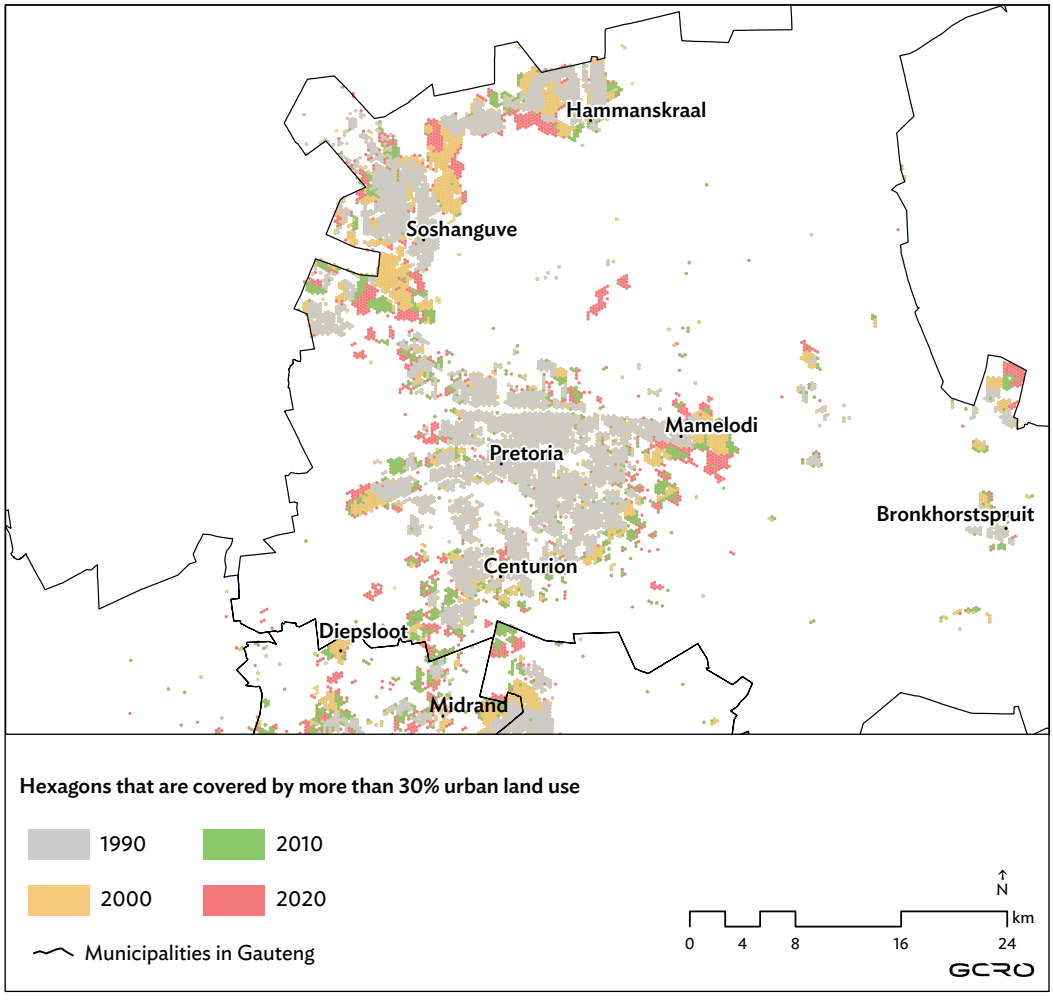


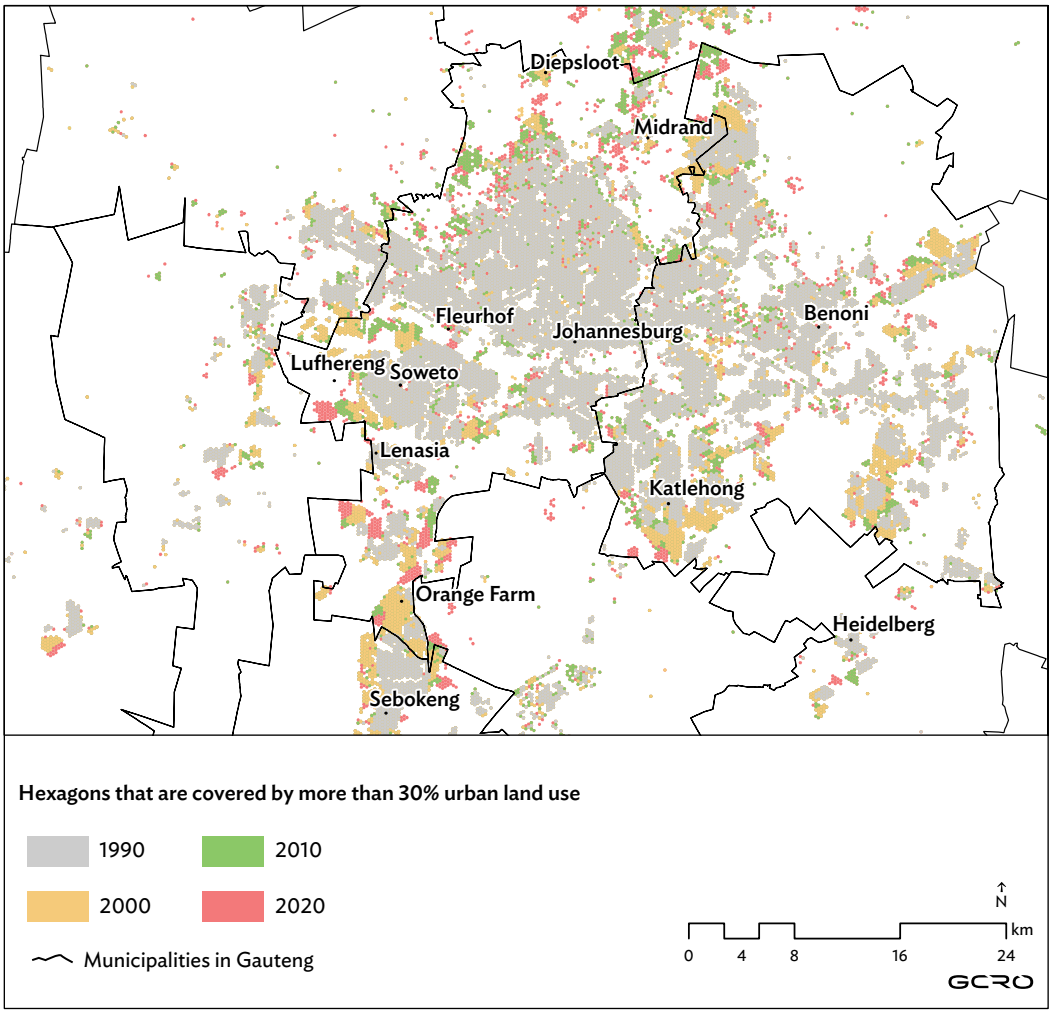
Figure 5: Urban footprint focusing on Tshwane, 1990–2020

DATA SOURCE: GTI data, 2021; map by Christian Hamann



The rate of growth of urban land has slowed down in both relative and absolute terms since 2000, although it picked up again in absolute terms from 2010

Figure 6: Urban footprint in the Johannesburg and Ekurhuleni metropolitan municipalities, 1990–2020
DATA SOURCE: GTI data, 2021; map by Christian Hamann



The category of urban in these maps is comprised of more specific subcategories, allowing us to see the kinds of land use driving urban land cover. Figure 7 indicates that the residential category is the largest contributor to Gauteng's urban land cover, and that 10% of the province's total area is covered by residential land use. This comprises all urban cover, including urban areas built before 1990. Further detail in the data is that 82% of Gauteng's residential land use is formal (excluding cluster housing), 13% is informal and 5% is in cluster housing.

Table 3 shows some analysis of urban cover added since 1990, broken down by category. The final column shows that just over 80% of Gauteng's urban sprawl

Figure 7: Land-use subcategories as a percentage of Gauteng's total urban area, 1990–2020
DATA SOURCE: GTI data, 2021

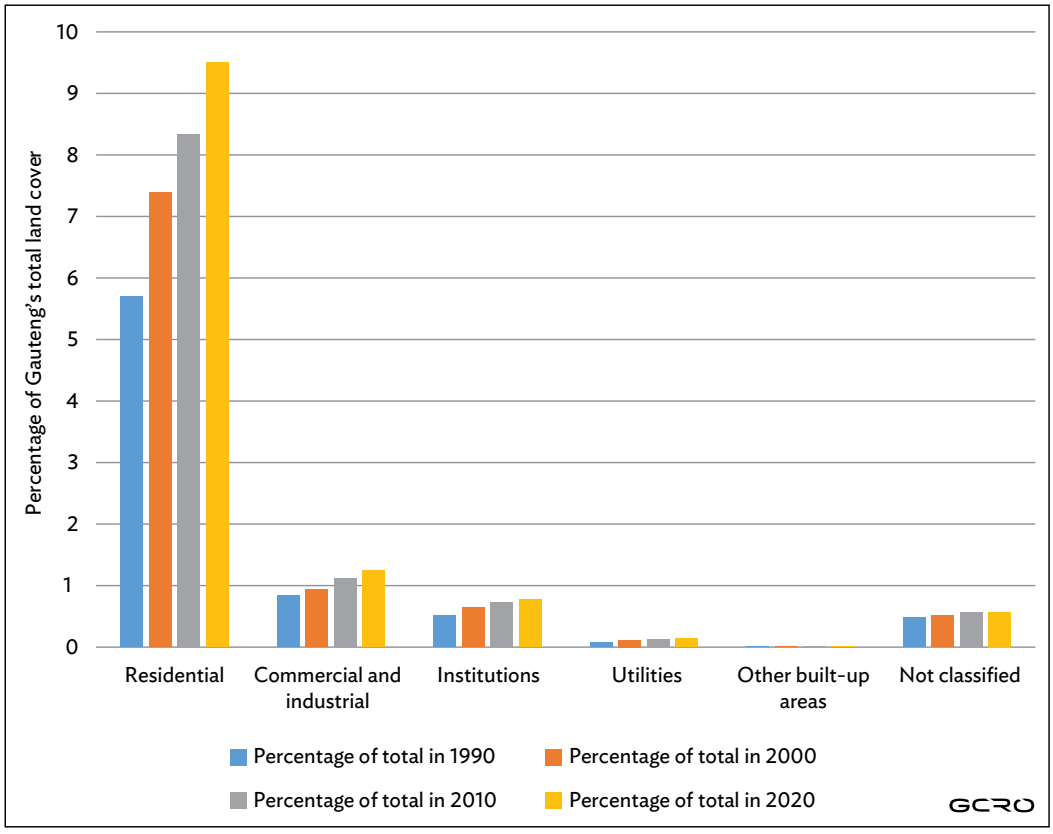


Table 3: Urban land-use subcategories measured in square kilometres, 1990–2020
DATA SOURCE: GTI data, 2021

Land-use category	Area in 1990 (km^2)	Area in 2000 (km^2)	Area in 2010 (km^2)	Area in 2020 (km^2)	Area added 1990–2020 (km^2)	Category as a percentage of area added 1990–2020
Residential	1 047	1 358	1 531	1 748	701	82
Commercial and industrial	155	173	206	230	75	9
Institutions (e.g. education, health)	94	119	134	141	47	5
Utilities	13	21	22	25	13	2
Built up	0	1	1	1	1	0
Not classified	89	94	103	105	16	2

since 1990 has been in the form of residential land use while just under 10% has resulted from commercial and industrial growth.

Contemporary growth in urban cover is shaped by a variety of constraints, opportunities and city building practices:

- The physical terrain. The eastern section of the Magaliesberg mountain range running east to west north of Pretoria is protected from urbanisation as a result of its terrain and natural value. The mining belt running east to west just south of the centre of Johannesburg remains largely uninhabitable (Bobbins and Trangoš, 2018). Recent projects such as Pennyville (Charlton, 2014) and Fleurhof are noteworthy for beginning to break down what was once intended to be a racial buffer.
- Urban-edge policies. Some municipalities and the Gauteng Provincial Government instituted urban edges in an effort to contain sprawl. In some instances growth has been contained within these boundaries, while in others the boundaries have been adjusted in order to accommodate both public- and private-sector housing (Götz et al., 2014). Katumba and Everatt (2021) argue that the Gauteng Provincial Government has not been committed to an urban-edge policy.
- Space for expansion left by apartheid planners. One provincial planner considered the human settlement project of Lufhereng to be a 'natural extension' of Soweto (Charlton, 2014, p. 186). This unwittingly reproduces apartheid's segregationist logic. As noted, apartheid planners intended for group areas to have room to expand outwards without encountering other group areas. Similarly, middle-class suburbia is expanding outwards in the north-western parts of Johannesburg through to the eastern parts of Pretoria.
- The changing structure of the economy. During the late 1990s and early 2000s, a shift towards a tertiary and service-based economy encouraged decentralisation and led to new node formation and low-density suburban sprawl (including office parks, industrial parks, residential estates and associated shopping complexes) (Crankshaw, 2008).
- Unmet and increasing demand across all income segments.
- Transport. Urban sprawl depends on residents being able to access opportunities elsewhere. This is a constraint, to be sure (Charlton, 2017); however, the constraints notwithstanding, it is also feasible for people in settlements around the city-region to travel considerable distances each day (Pieterse, 2019) (discussed further in Trend 6). Sprawl is governed by the ability of residents of outer suburbs to commute, and transport solutions emerge in response to demand for commuting.
- Opportunities for informal occupation (Mubiwa and Annegarn, 2013). Some informal settlements established at the dawn of democracy, such as Diepsloot and Orange Farm, have become major settlements in their own right. The conditions for their emergence were site specific. Informal settlement establishment was somewhat contained in the 2000s (Huchzermeyer et al., 2014), but has once again become significant, for example in Anglers, Narens Farm and Konkotela near Lenasia South.
- The effect of income level on plot size. Higher-income residential areas take up far more space per capita than lower-income residential areas. Golf estates require far more land per resident than densely populated settlements (see Trend 2).
- Land cost. Affordable housing developers are pursuing remote developments because they can deliver entry-level housing at prices that lower-salaried workers can afford there (Butcher, 2020a). The location of government-led human settlements projects can also be dictated by the price of land. Cheaper land can yield more housing but is less well located.
- New city projects. By definition, new city projects extend urban cover because they are generally built from scratch on previously non-urbanised land. These range from high-end private-sector projects (Herbert and Murray, 2015) to state-subsidised human settlement projects (Ballard and Rubin, 2017).

Trend 2: Uneven densification

Seto et al. (2011) note that urban land growth rates around the world are generally higher than population growth rates, meaning that there is de-densification when measured at the large scale of the city-region and there is a greater per capita use of land over time. In this regard, the Gauteng City-Region is an unusual case, in that population rates are growing faster than urban land use (Table 2) (Weakley and La Mantina, 2017; Götz et al., 2014). In other words, urban land at the overall urban scale is being used more intensively over time per capita. While it is certainly the case that historical settlement patterns left a great deal of land to fill in, these aggregate trends do not reveal, in themselves, the way in which there are simultaneous processes of population densification and de-densification within the city-region (Harrison et al., 2020).

Within Gauteng's urban footprint, the population is unevenly distributed. Figure 8 shows densities per square kilometre derived from population estimates that were done in 2018. It shows that much of the urban footprint has relatively low population densities. Those areas shaded blue, green and yellow/green have densities of less than 6 000 people per square kilometre. These include the vast middle-class suburbs of Johannesburg, Tshwane and Ekurhuleni. Although these show as having lower densities, they are nevertheless densifying, for example with the conversion of suburban homes into townhouse complexes (Poulson and Silverman, 2020).

Inner-city areas are among the densest places in the city-region; inner-city Johannesburg reaches 63 211 people per square kilometre. They are made dense not only through mid- to high-rise buildings in and of themselves, but also due to further processes of densification such as subletting within apartments (Zack et al., 2020; Crankshaw and White, 1995). Low-rise neighbourhoods adjacent to mid- to high-rise neighbourhoods are densified by the addition of rooms and levels to existing housing (Dörmann, 2020).

Townships, particularly more established sections, are characterised by higher densities, shaded orange, ranging from 9 001 people per square kilometre to 24 000 people per square kilometre. While downtown areas achieve high densities through multi-storey buildings, high densities in places like Alexandra, Tembisa and Diepsloot are reached with mainly single-storey settlement through small, tightly packed dwellings and the increase in backyard rooms (Rubin and Charlton, 2020). The high density of Diepsloot is particularly noteworthy given that it only came into existence in the mid-1990s (Bénit, 2002).

Transport infrastructure is an important magnet for urban development and densification. In Ekurhuleni, higher-density socio-spatial and economic developments have come to take a linear form along the N12, N17, N3 and the 'R24 Rietfontein', all connecting Germiston, Boksburg, Benoni and Daveyton to Johannesburg. Another set of Ekurhuleni's spatial densities is found along the R21/O.R. Tambo aerotropolis, towards Tshwane (Gauteng Department of Roads and Transport, 2013). Meanwhile, investments around some Gautrain stations, like Hatfield in Pretoria, are a good example of the way in which transport investments can reshape nodes. Johannesburg's plan to use its investments in the BRT system to crowd in other 'transit-oriented development' is an example of a self-conscious effort to use transport investments to reshape urban spaces to become more just (Ballard et al., 2017).

The effect of this unevenness is that one out of every two Gauteng residents lives on just 2% of the province's land (Figure 9). Higher densities are touted by many planners as a virtue as they improve the efficiency of infrastructure networks and public transport. To some extent, Gauteng's densification is positive as it uses land and infrastructure more efficiently. However, as we can see, some of the higher densities are occurring in edge settlements. To the extent that residents of such settlements commute elsewhere for work, this kind of densification means that more people make longer trips. Furthermore, infrastructure that is supporting higher densities than intended requires refurbishment and replacement – a considerable planning challenge in the city-region.

Figure 8: Population density in Gauteng, 2018

DATA SOURCE: GTI data, 2018; map by Christina Culwick Fatti, Christian Hamann and Yashena Naidoo

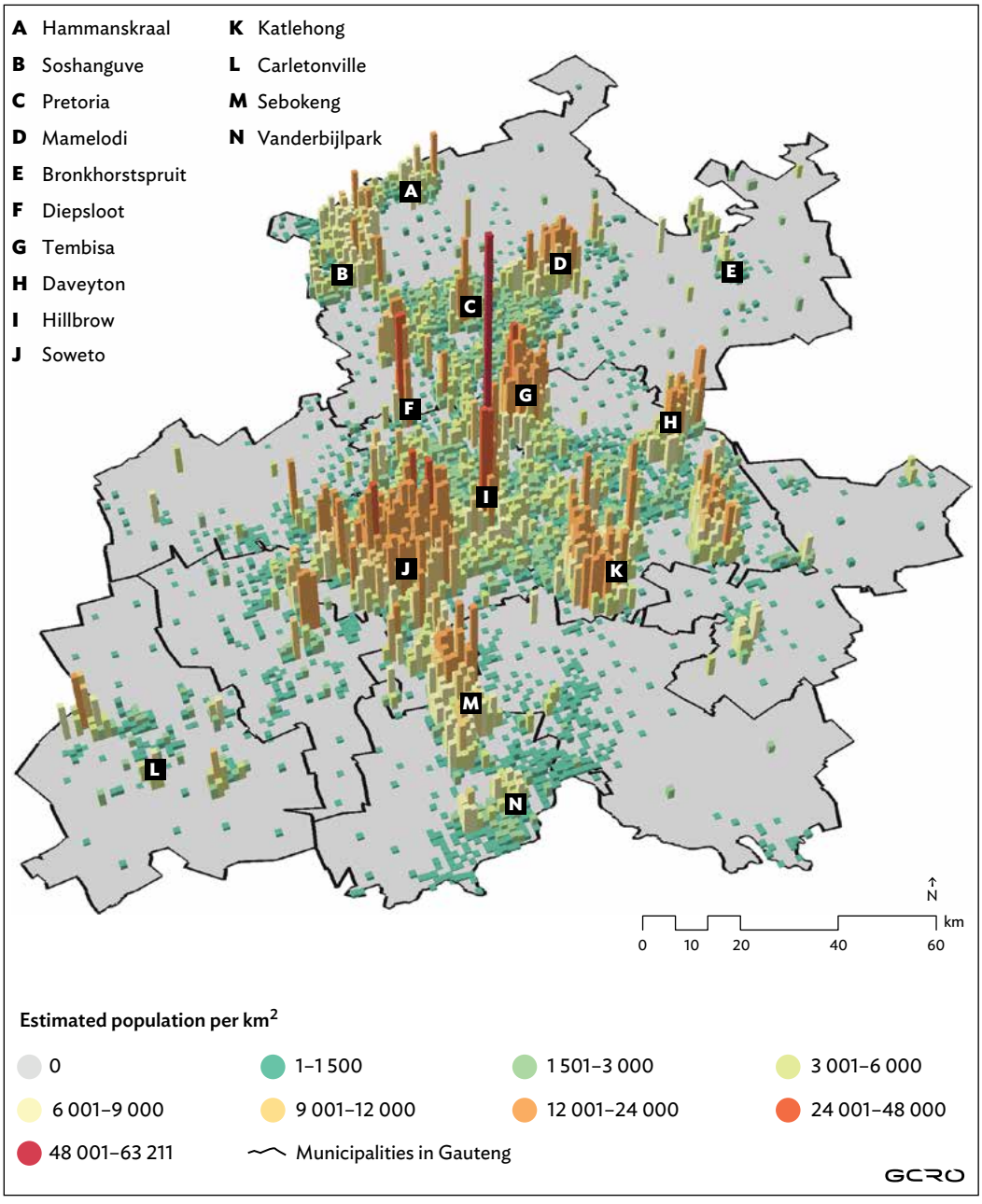
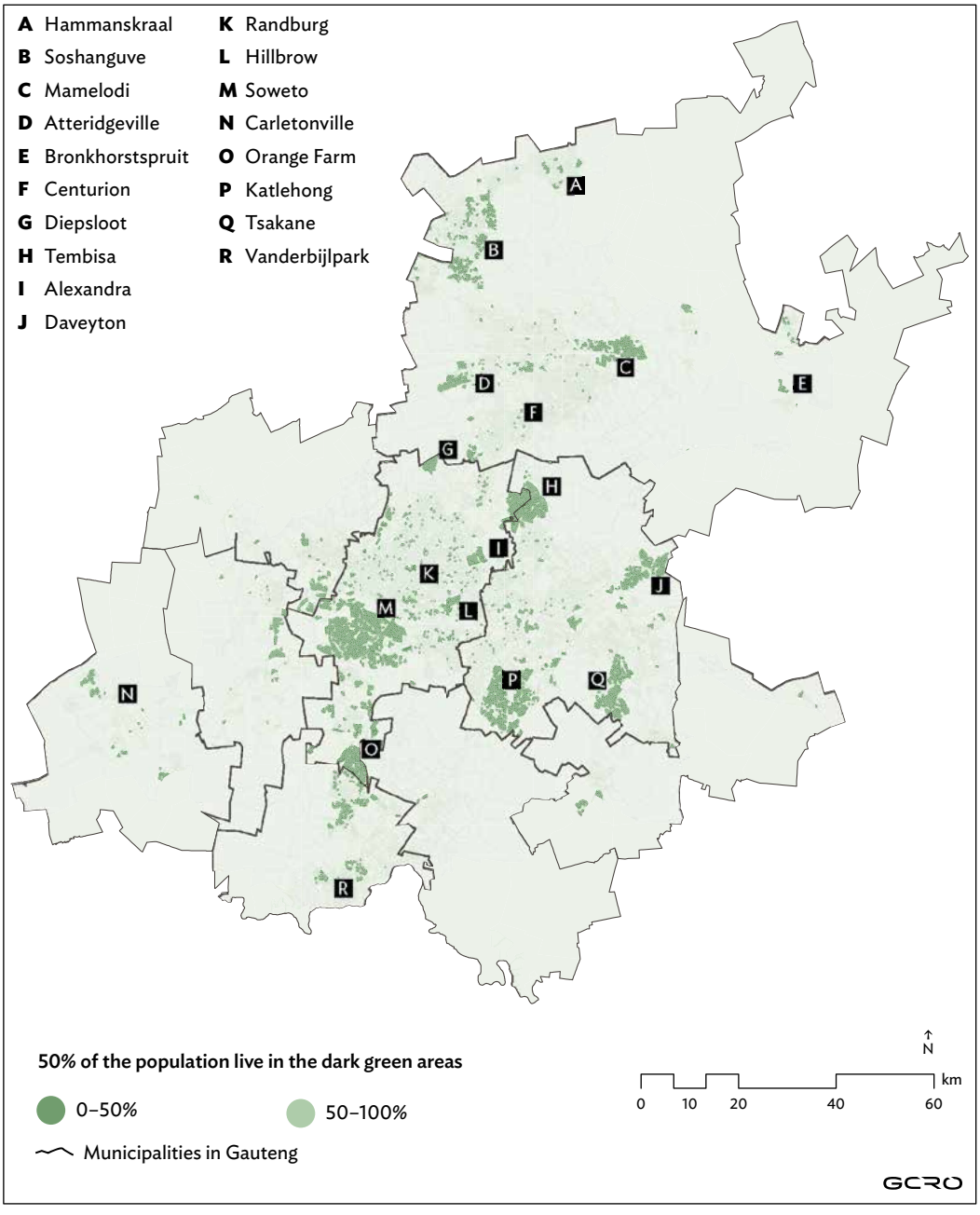


Figure 9: Half of Gauteng's population lives on just 2% of its land, 2017

DATA SOURCE: GTI data, 2017; map by Alexandra Parker and Christian Hamann



Trend 3: Residential building growth

The production of residential buildings should be contextualised through three sources of demand. First, by the end of apartheid there was an acute shortage of housing in townships, leading to the growth of backyard shacks and informal settlements (Parnell and Pirie, 1991). Second, Gauteng's population has more than doubled since democratisation, from 7.4 million people as measured at the 1996 census to 15.5 million people mid-way through 2020 (StatsSA, 2020). According to Statistics South Africa's projections (made prior to the pandemic), Gauteng's population was expected to grow by almost 7 000 people a week in 2020 (calculated from StatsSA, 2020), the majority from net migration (the excess of in-migration over net migration) and the remainder from natural growth (the excess of births over deaths). Third, demand has also been driven by the declining size of households, from 3.55 people in 1996 to 2.70 in 2016 (calculated from StatsSA, 2016, 2011). Therefore, even without any increase in population, there would be an increase in demand for housing units.

It is possible to map and quantify the production of new buildings of various kinds in Gauteng over time. GeoTerraImage classifies buildings and structures into 88 detailed land-use types – derived from satellite imagery – as varied as commercial and industrial buildings, car parks, schools and sports facilities. These land-use types can be compared across points in time. In this section, we specifically focus on eight of these land-use types that represent different kinds of residential buildings as a way of providing an indication of the construction of new buildings in Gauteng.[3]

Overall, the number of residential buildings in Gauteng increased by 60% from 2001 to 2016, from 2.1 million to 3.4 million buildings (Table 4 and Figure 10).[4] The most common form of dwelling is freehold formal houses, which increased by 38% to 1.6 million houses by 2016. By 2016, there were almost 600 000 informal housing structures (e.g. structures in informal settlements) and 800 000 backyard dwellings. This is an inversion of the situation in 2001, when there were more structures

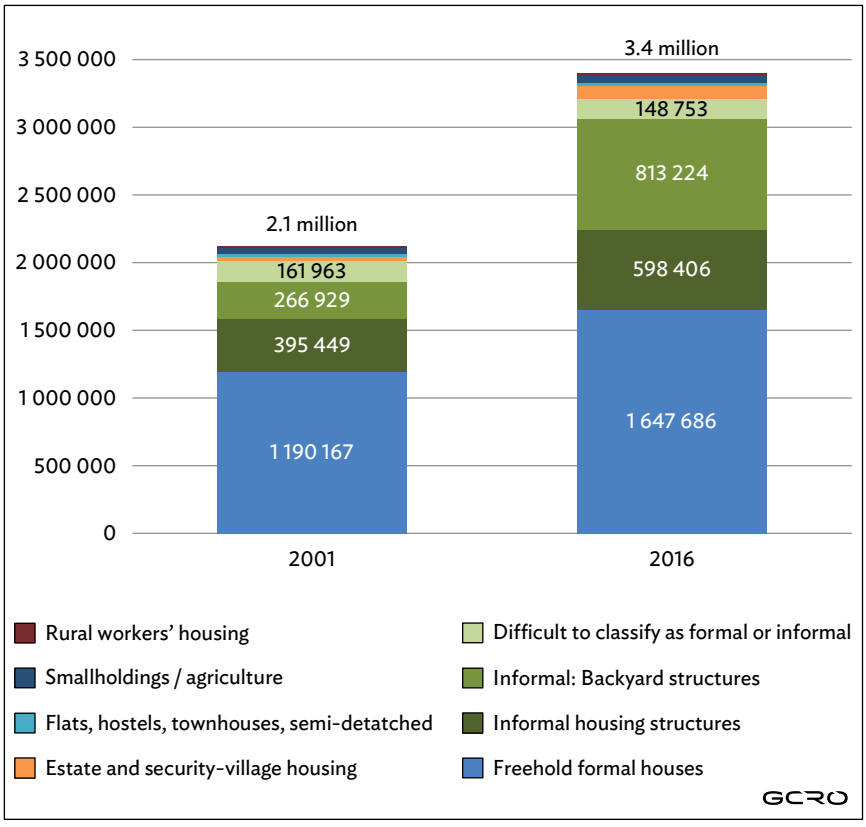
Table 4: Change in number of residential buildings (urban and non-urban), 2001–2016
DATA SOURCES: GTI data, 2016, 2001

	2001	2016	% change
Freehold formal houses	1 190 167	1 647 686	38
Informal housing structures	395 449	598 406	51
Backyard structures	266 929	813 224	205
Difficult to classify as formal or informal	161 963	148 753	-8
Estate and security-village housing	26 573	92 696	249
Flats, hostels, townhouses, semi-detached	19 848	27 245	37
Smallholdings / agriculture	42 872	47 223	10
Rural workers' housing	13 920	16 945	22
Total	2 117 721	3 392 178	60

3 See Naidoo (2019) for a similar discussion on the growth of industrial and commercial buildings.

4 Note that these calculations are based on residential buildings and not on residential units. In the case of freehold formal houses, each building would normally correspond to one unit, whereas semi-detached housing, hostels and blocks of flats contain multiple units even though they only count as one building.

Figure 10: Change in number of residential buildings, 2001–2016
DATA SOURCES: GTI data, 2016, 2001

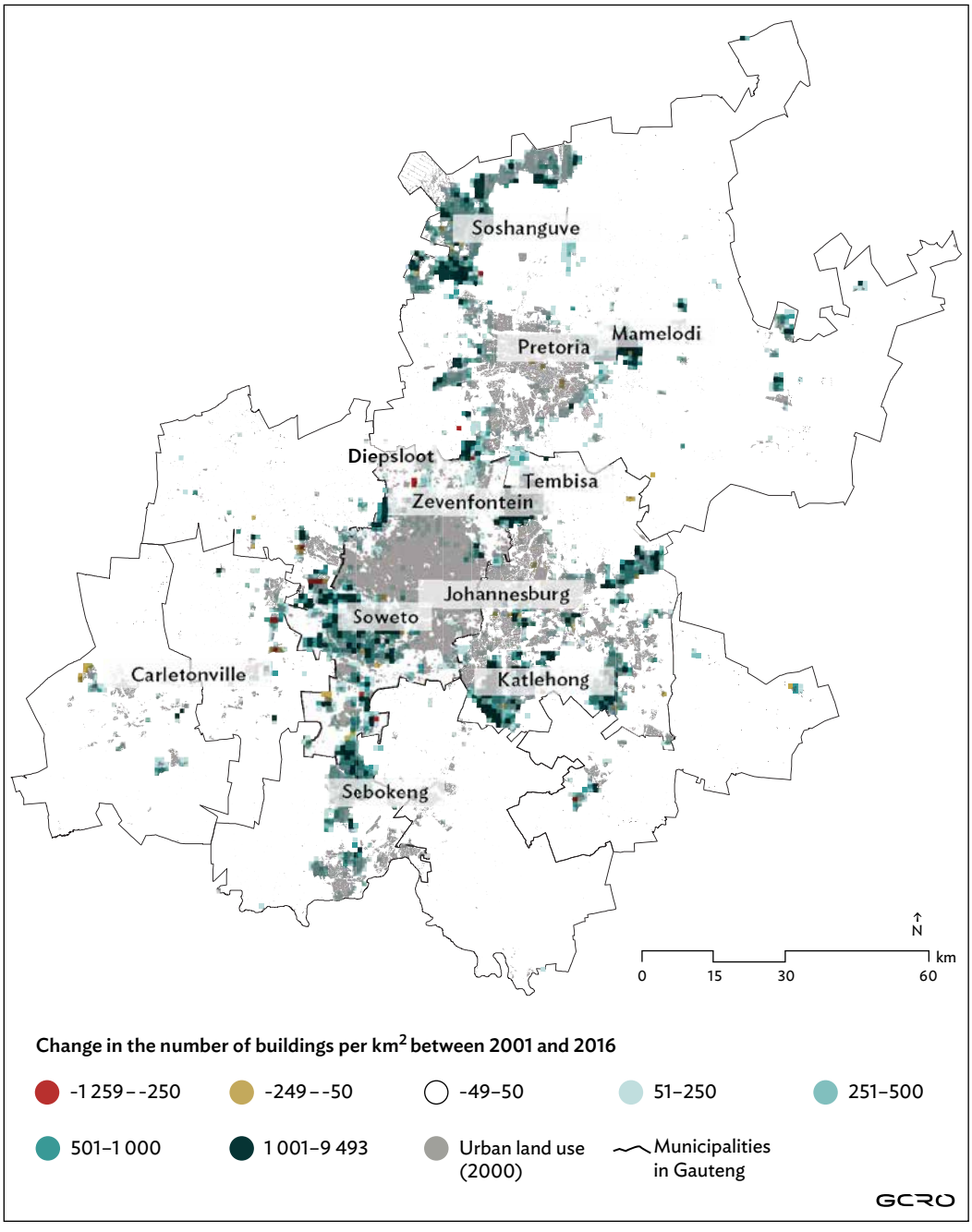


in informal settlements than there were backyard structures. This change was driven by the fact that backyard structures have increased by a higher percentage (205%) to overtake informal housing structures (which increased by 51%). Estate and security-village housing has also grown explosively, although off a much smaller base.

Figure 11 shows the change in the number of all residential buildings per square kilometre between 2001 and 2016. It underscores the fact that much of the growth in residential buildings is not expanding the urban footprint per se (Trend 1) but rather densifying existing urban space (Trend 2). The highest concentrations of increase (up to 9 493 units/km^2) were in townships such as Soshanguve, Mamelodi, Diepsloot, Tembisa, Soweto, Katlehong and Sebokeng. The increase in buildings in these township areas is largely driven by the addition of backyard dwellings, new informal settlements and some formal housing. Lower, but still significant, increases in residential buildings are also occurring in areas such as the suburbs of northern Johannesburg and Pretoria East. In these instances, increases in buildings are largely driven by new cluster housing estates and other gated developments. Some places (marked in red or yellow) saw a decline in the number of residential buildings, most likely due to formalisation, redevelopment or removal. Beyond these relatively unusual sites, the dominant patterns are of no change, or of growth in the number of residential buildings.

Figure 11: Residential growth and decline per square kilometre, 2001–2016

DATA SOURCES: GTI data, 2016, 2001; map by Christian Hamann



A significant proportion of the residential growth depicted in Figure 11 was caused by the tripling of the number of backyard dwellings from 266 929 in 2001 to 813 224 in 2016.[5] Backyard dwellings are generally constructed for renting out by the occupants of formal houses, for example by owners of 'four room' houses built under apartheid or low-cost 'RDP'[6] houses built since the end of apartheid. Some of these backyard structures are informal and others are formal. However, unlike many structures in informal settlements, backyard dwellings benefit from being close to the infrastructure provided to formal housing (electricity, water and sanitation) (Turok and Borel-Saladin, 2016).

Figure 12 shows the distribution of backyard dwellings in 2001 in pale blue, and the location of backyard dwellings that developed between 2001 and 2016 in dark blue. They are strongly associated with townships, low-cost housing projects and integrated human settlements.

By way of example, it is possible to see remarkable changes in an area such as Soshanguve. Figure 13 represents each informal dwelling as a red dot, each formal dwelling as a green dot, and each backyard dwelling as a blue dot. It shows that some informal settlements in 2001 had been formalised or partly removed by 2016 as well as the extent of the diffusion of backyard dwellings into formal dwellings.


Photograph by Clive Hassall

5 Between 2001 and 2016, a total of 1.3 million new residential units were built in Gauteng, of which 546 295 (43%) were backyard dwellings (GTI data from 2016 and 2001).

6 Reconstruction and Development Programme.

Figure 12: Backyard dwellings, 2001–2016

DATA SOURCES: GTI data, 2016, 2001; map by Christian Hamann, Thembani Mkhize and Graeme Götz

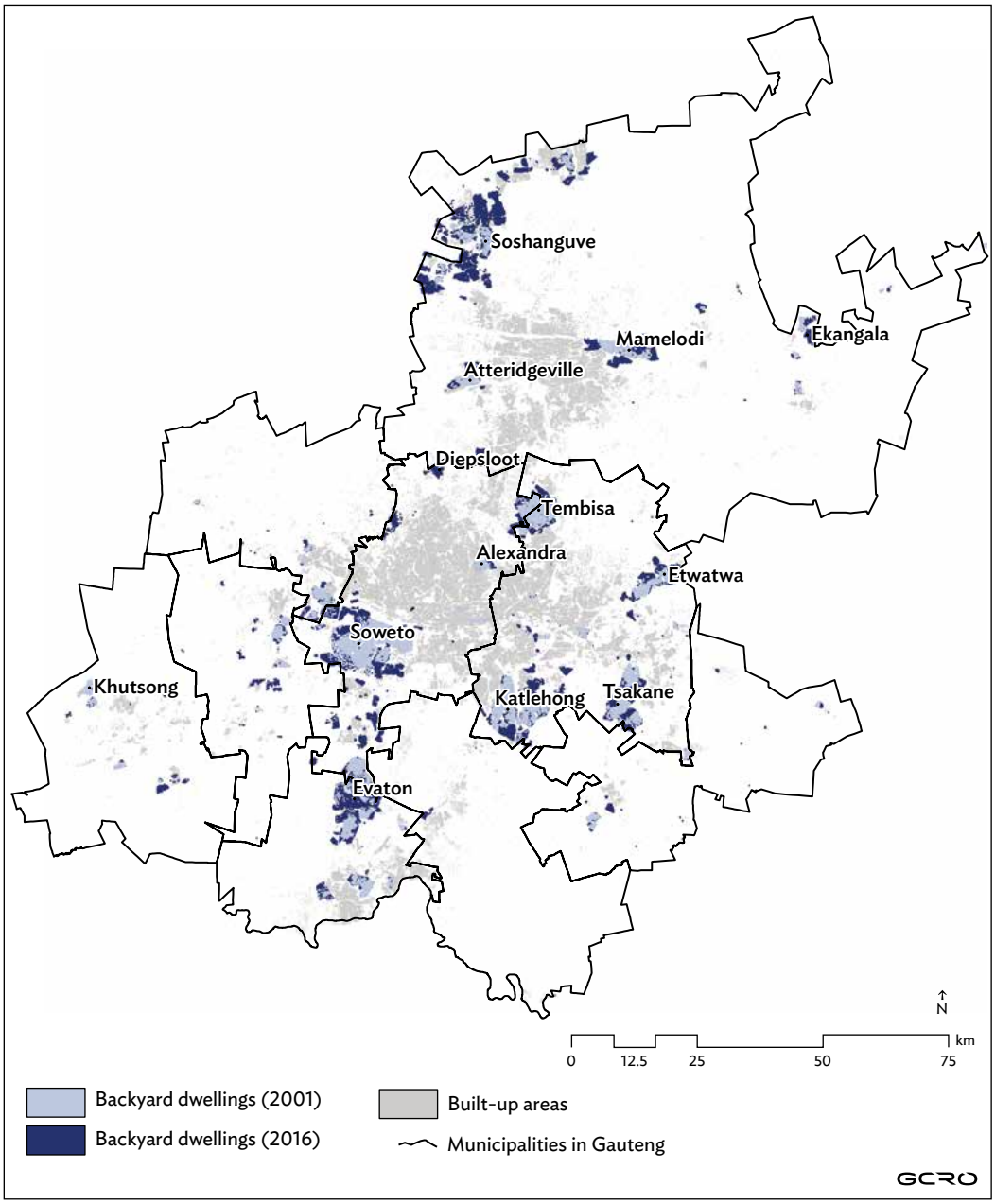
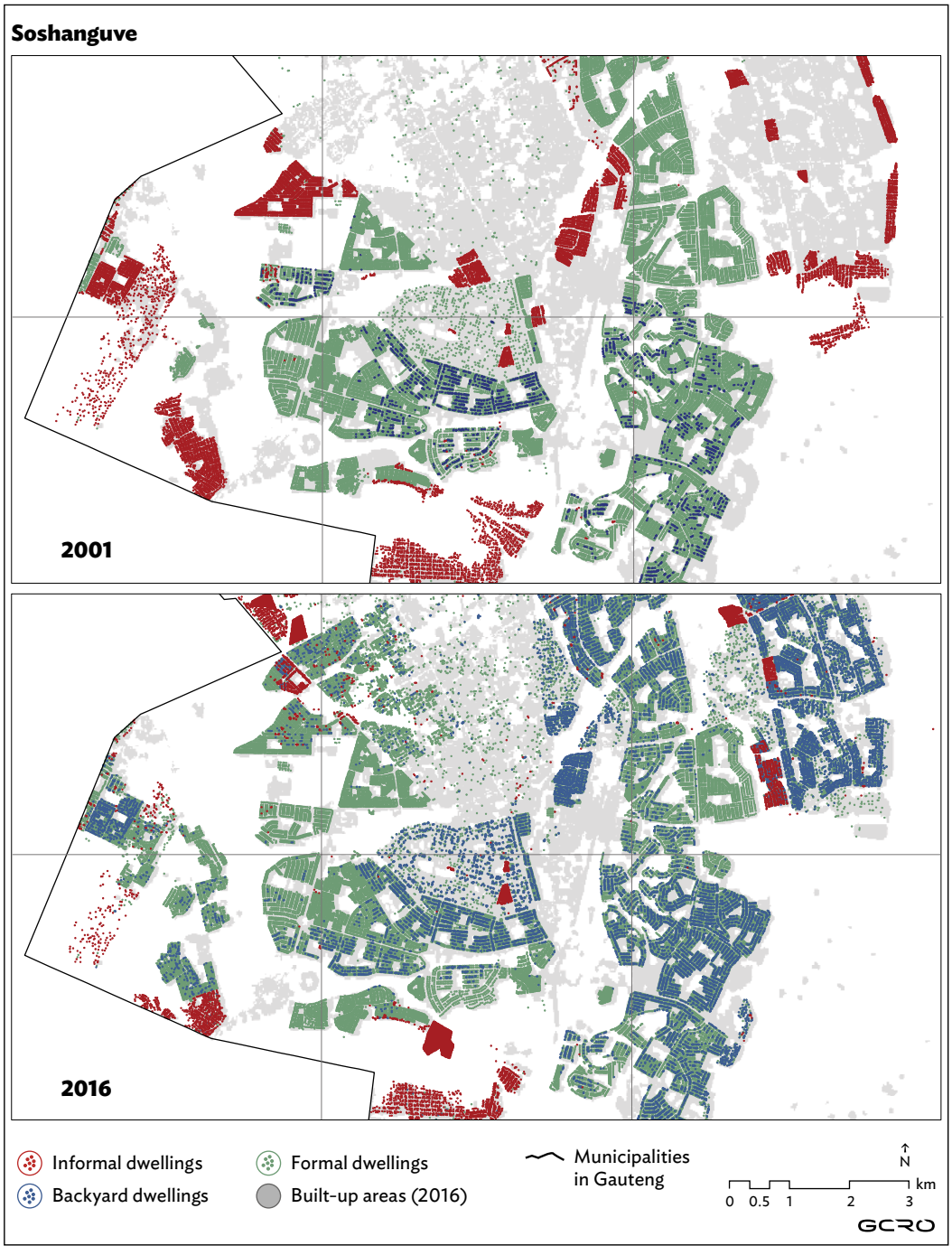


Figure 13: Backyard and other dwelling types in Soshanguve, 2001–2016

DATA SOURCES: GTI data, 2016, 2001; map by Christian Hamann, Thembani Mkhize and Graeme Götz

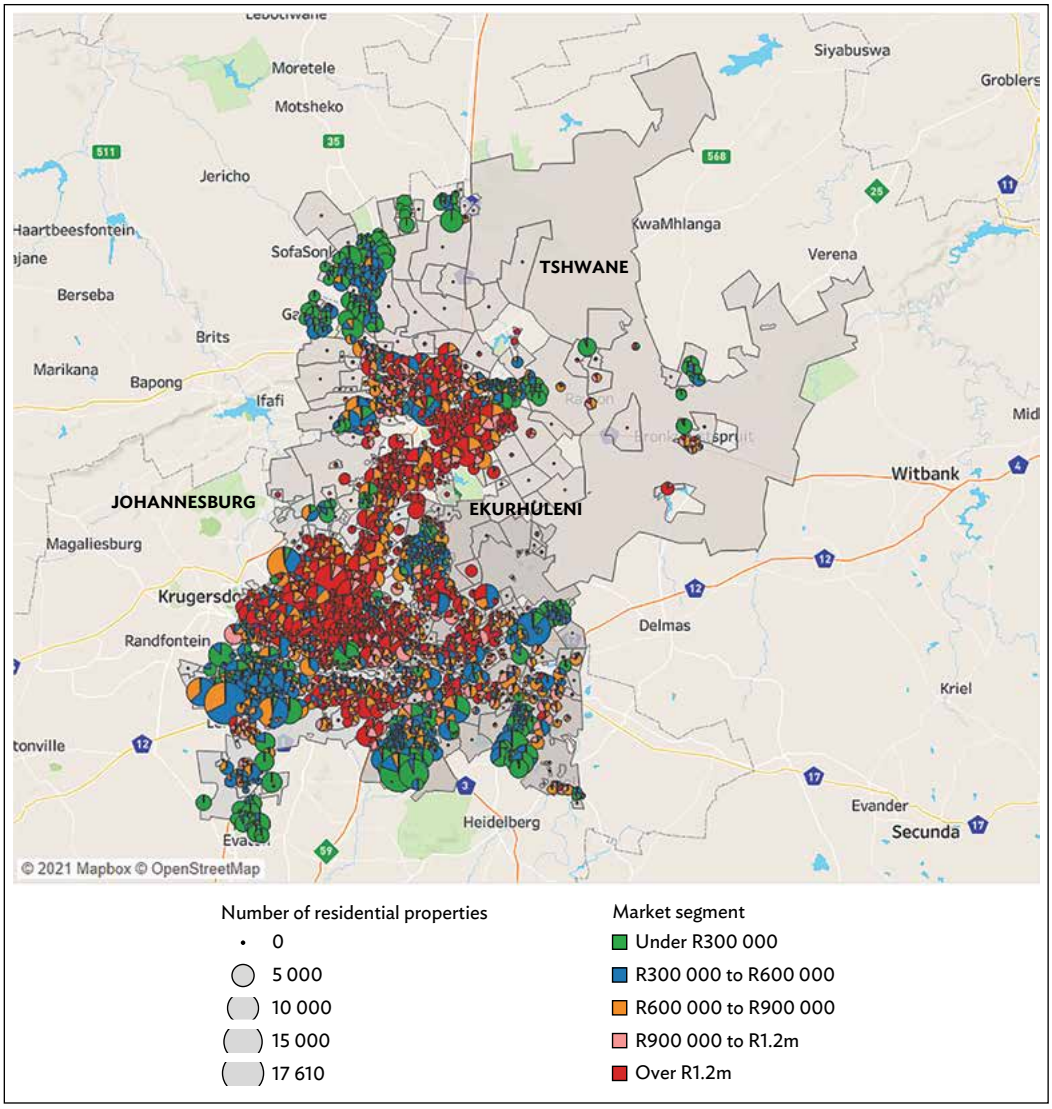


Trend 4: Gauteng's residential affordability gradient

Under the 1950 Group Areas Act, those classified as black, Indian and coloured were prevented from buying or renting property in suburbs reserved for those classified as white. Although the Group Areas Act was repealed in 1991, many of those neighbourhoods historically reserved for white people contained the more expensive properties in the city-region. Figure 14, prepared by the Centre for Affordable Housing Finance Africa (CAHFA), indicates deeds registry data in the form of a pie chart

Figure 14: Property sale values in Ekurhuleni, Johannesburg and Tshwane, 2019

DATA SOURCE: Deeds registry data supplied by Lightstone (Pty) Ltd, 2019; map by Alfred Namponya, CAHFA. Click here for an interactive version.



for each sub-place in Ekurhuleni, Johannesburg and Tshwane. The size of the pie chart represents the number of sales in 2019. Green and blue pie chart segments represent properties that sold for under R600 000. Pink and red segments represent properties that sold for over R900 000. This picture is only for formally registered property sale, and would not, for example, account for informally traded properties in informal settlements. It also does not represent formal or informal rentals. Nevertheless, it does provide an indication of the way in which once racially exclusive areas now financially exclude the working-class majority.

This pattern is not merely an effect of the stock that was built under apartheid, but also a result of the production of urban space in the post-apartheid era (Freund, 2010). We illustrate the point here through the geographic separation of two different housing markets.

First, estate and security-village buildings (Figure 15), which grew by 249% between 2001 and 2016, are concentrated particularly in middle-class, often formerly white suburbs and align to a large extent with the sub-places that had more expensive property sales (Figure 14). These products serve a range of markets from lower middle class to upper middle class and elite home buyers.

By contrast, state housing provided in low-cost housing settlements and integrated human settlements occurs alongside areas where property transactions were on the cheaper end of the spectrum – in other words, alongside or in townships and informal settlements (see Figure 16). These settlements would accommodate beneficiaries of 'give-away' housing (households that earn less than R3 500 a month) and some semi-subsidised or fully bonded housing for salaried households. Notwithstanding important exceptions such as Cosmo City, which is surrounded by gated communities, state-led housing projects tend to be far from areas where there is private-sector development of cluster homes and more affluent gated communities.

Photograph by Clive Hassall

Figure 15: Gated communities in Gauteng, 2012

DATA SOURCES: GTI data, 2016, 2012; map by Christian Hamann

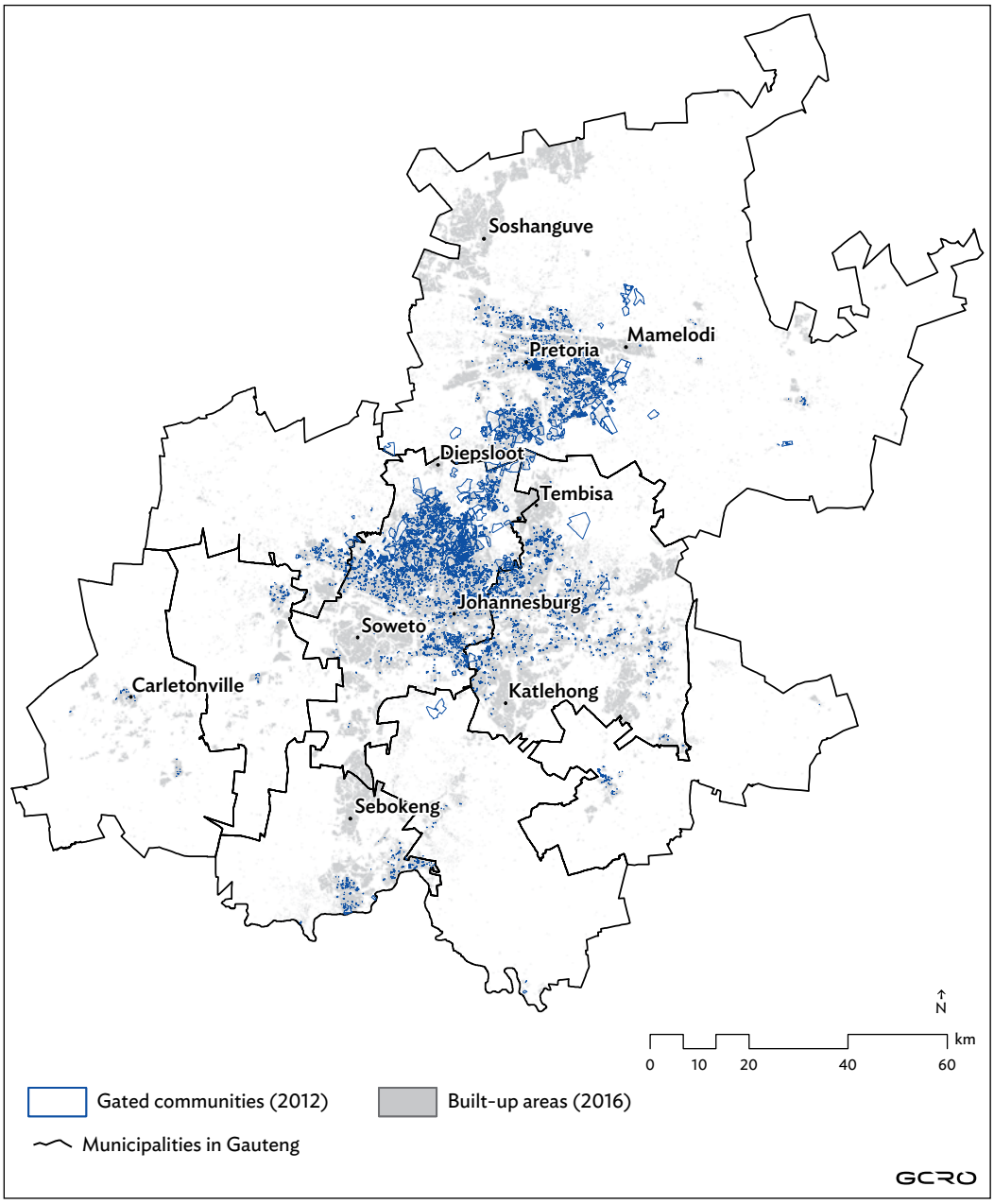
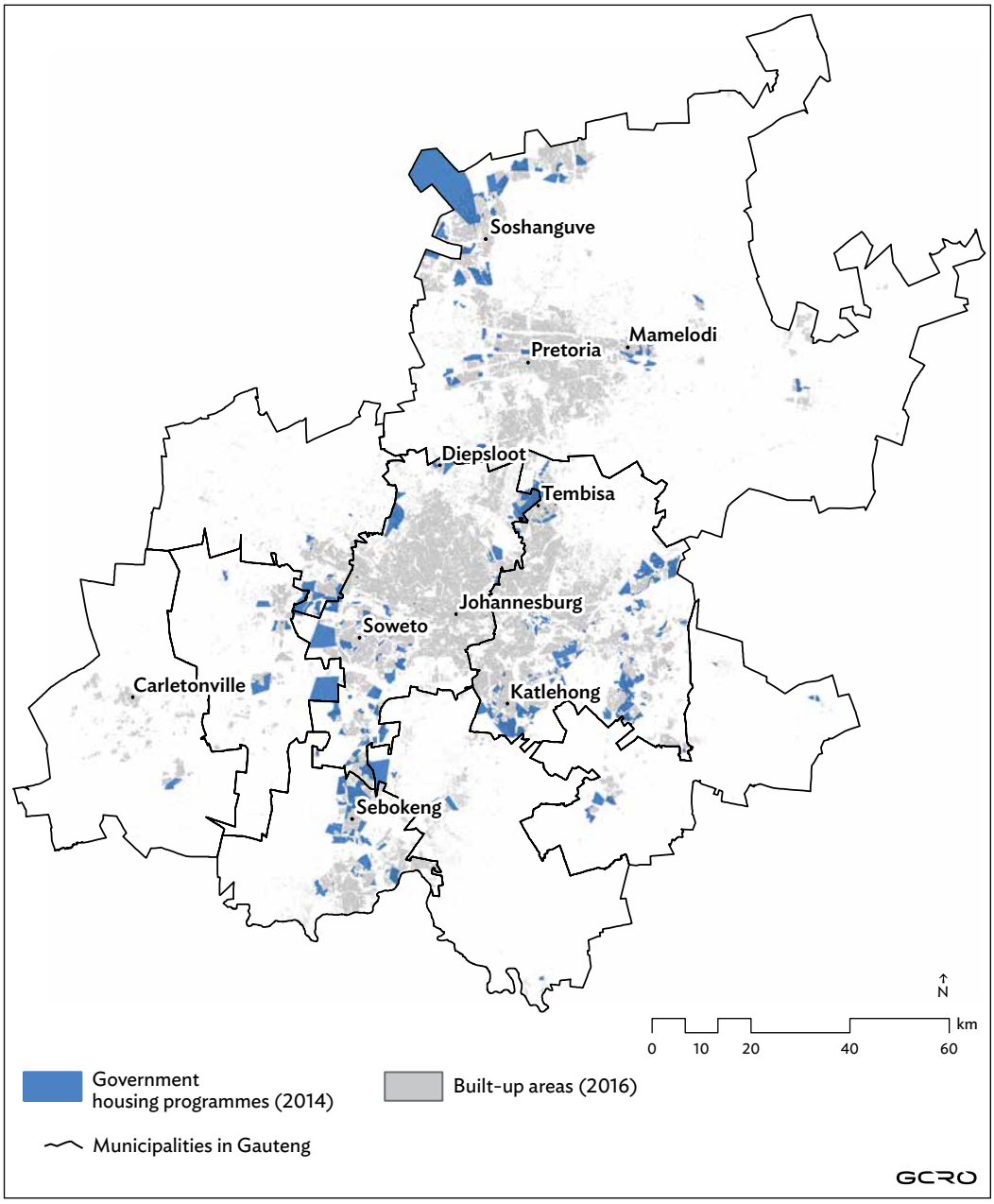


Figure 16: Government housing programmes, 2014

DATA SOURCE: Gauteng Department of Human Settlements; map by Christian Hamann



Trend 5: Socio-economic segregation

Today, some residential areas have higher degrees of integration across apartheid's racial categories than others. In this section we analyse social homogeneity or heterogeneity at ward level, with a ward being a residential area that elects one local government councillor. An average ward in the metropolitan municipalities of Gauteng contains around 15 000 people (Municipal Demarcation Board, 2020). In Figure 17, wards with dark shading have a higher mixture of different racial groups. Much of this mixing is driven by the now racially diversified middle and upper classes in South African society (Crankshaw, 2008) who can afford the more expensive properties depicted in Figure 14. However, the working-class majority does not have the financial resources to live anywhere except in townships, post-apartheid state housing or informal settlements. Since lower wealth and income categories are almost entirely black, this produces racially homogeneous spaces according to the patterns of black residential spaces established under apartheid (Ballard and Hamann, 2021).

Figure 18 shows the extent to which there is income diversity in each ward. Wards with darker shading have both rich and poor in close proximity, while lighter wards have homogeneous incomes (whether rich, poor or middle income). Here we can see that many of the areas that showed a high degree of racial integration (Figure 17) do not show much income diversity.

Some wards demonstrate the co-presence of rich and poor; for example, a ward in Zandspruit contains a gated community in one part and an informal settlement in another. Class integration might be taken as positive insofar as poorer people are not ghettoised in homogeneously poor wards, and can benefit from economic opportunities generated by their affluent neighbours (Roitman et al., 2010). However, the co-presence of rich and poor in a single ward does not signify social integration per se, and can simply reflect the shrinking scale at which segregation occurs. In the example of Zandspruit, the physical boundaries around the 'rich' settlement prevent any 'real' integration; rather, it means that segregation occurs at a sub-ward level (also see Lemanski, 2006).

The locational options of Gauteng's most economically precarious residents are exemplified in Figure 19, which shows that the highest concentrations of unemployed people are in townships.

Photograph by Clive Hassall

Figure 17: Racial diversity, 2016

DATA SOURCE: GCRO (2016); map by Christian Hamann

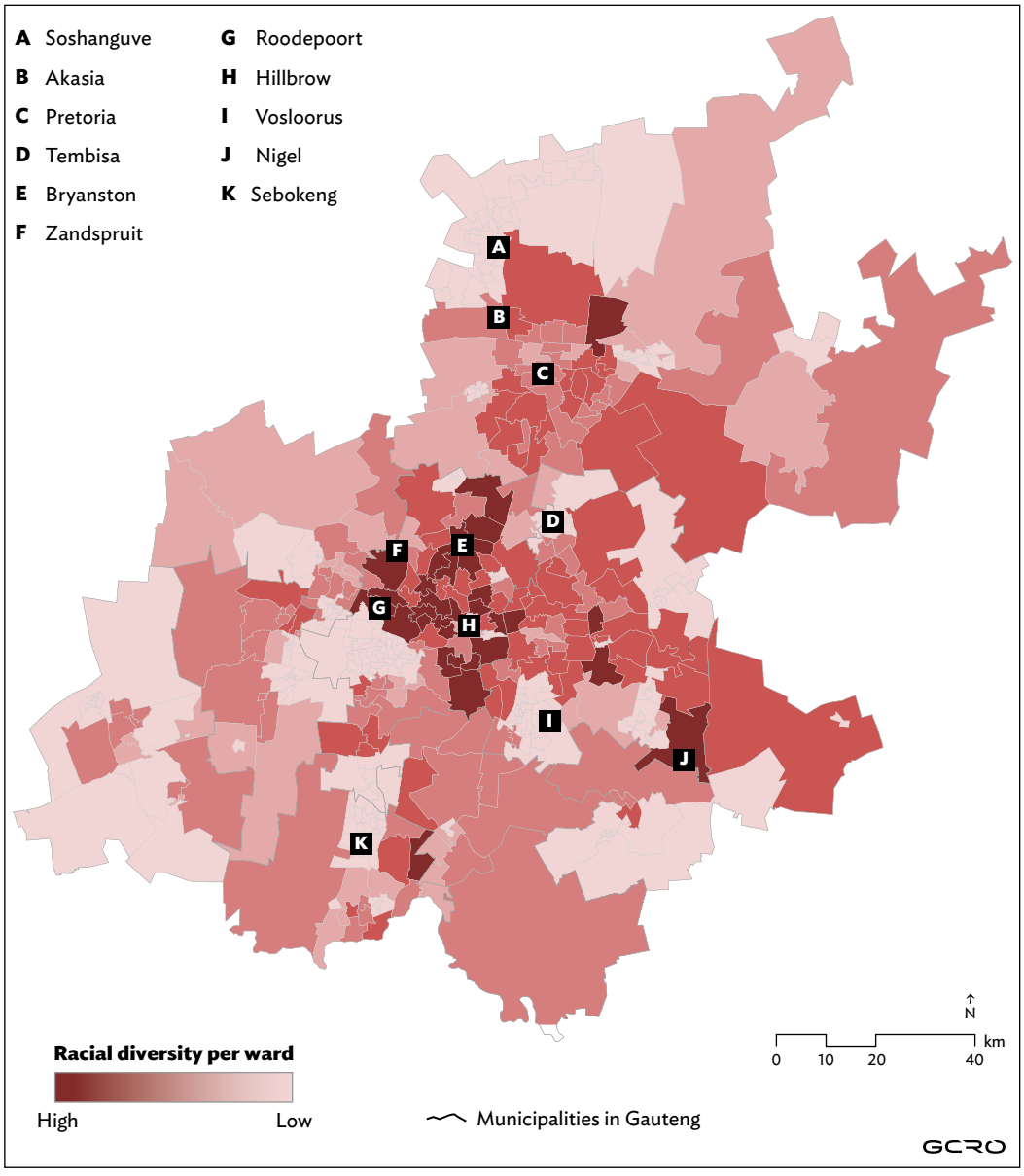


Figure 18: Income diversity, 2016

DATA SOURCE: GCRO (2016); map by Christian Hamann

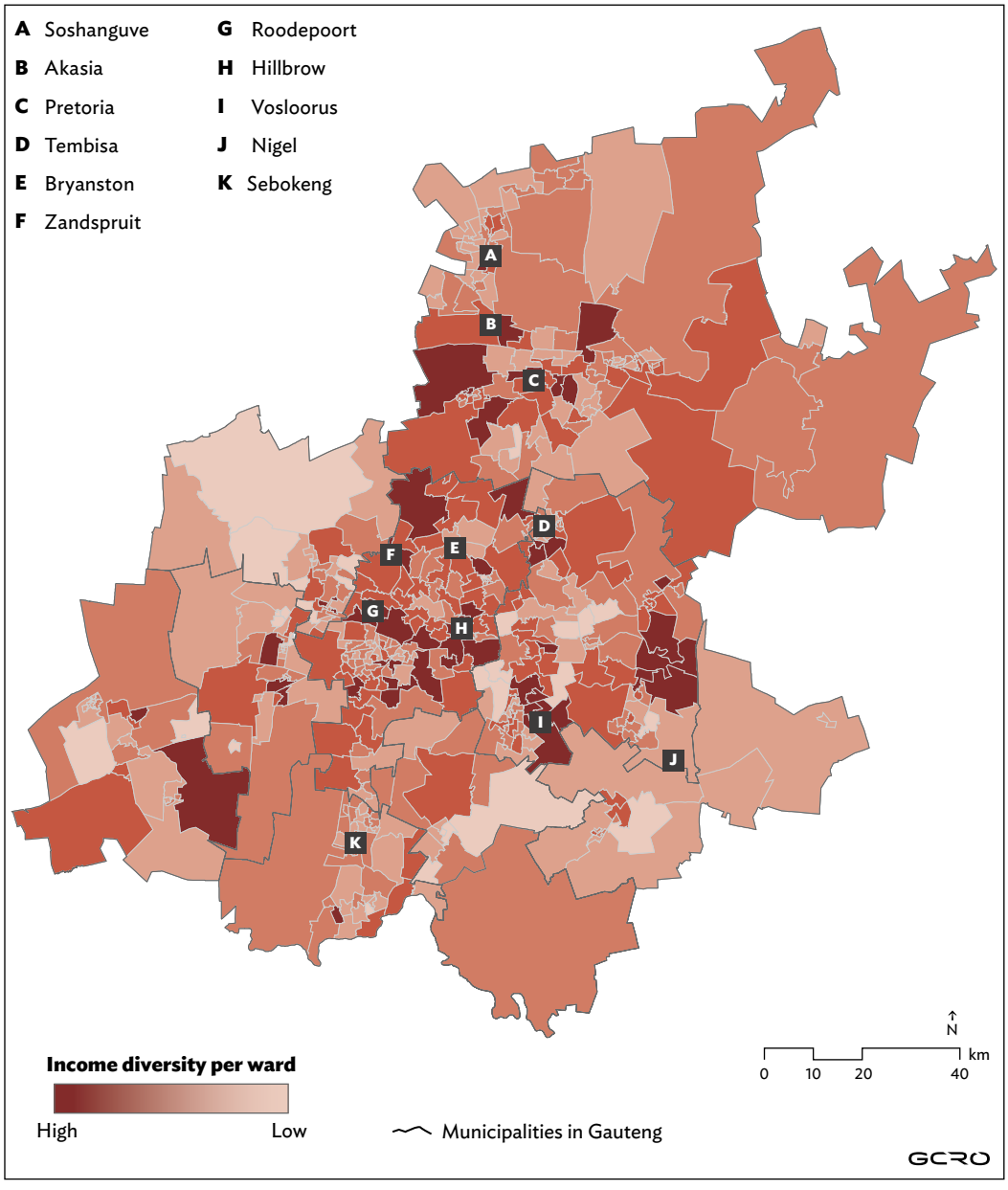
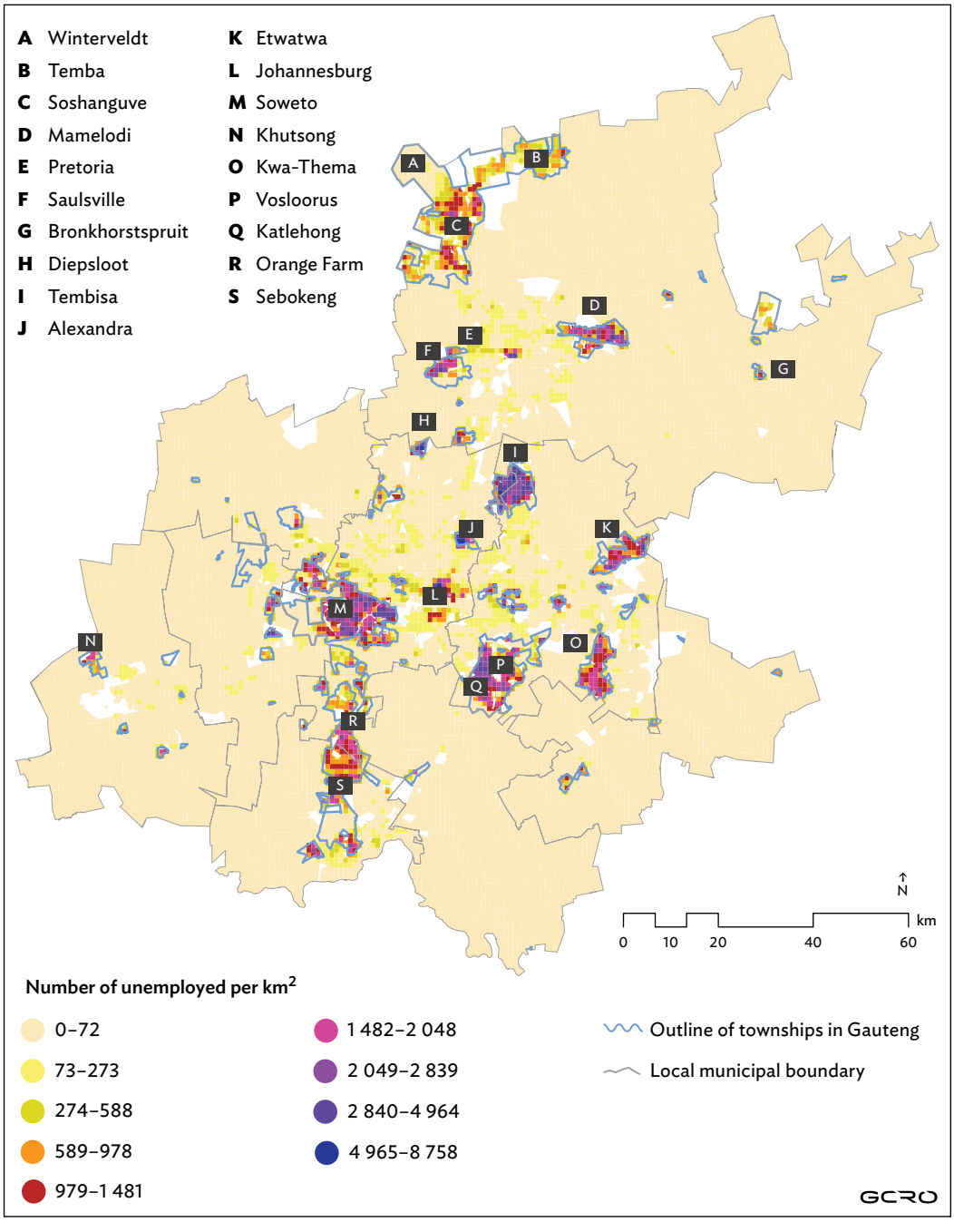


Figure 19: Density of unemployed people, 2011

DATA SOURCES: StatsSA (2011); GCRO (township outline); map by Samy Katumba



Trend 6: Spatial mismatch – moving people to jobs and jobs to people

Trends 4 and 5 show that the segregated history of the city-region created residential separation between different races and produced an ongoing property affordability gradient that underpins post-apartheid socio-economic segregation. The evolution of the city-region also produced another kind of separation: the disjuncture between dormitory spaces and economic zones where people are able to earn an income (Howe, 2021). This phenomenon is referred to as spatial mismatch (Budlender, 2016) and appears as a concern in strategic planning documents. For example, according to the City of Johannesburg's 2016 Spatial Development Framework, 62% of the formal economy of the city is located in its north-eastern quadrant, including the inner city and Sandton (City of Johannesburg, 2016). However, only 23% of the population lives in the inner-city/Sandton areas. Conversely, while 41% of the city's population lives in the Soweto/Orange Farm areas, only 13% of the city's formal economy is located there.

Where Gauteng's residents are unable to find work, or even acceptable schooling (Parker et al., 2021), within their residential suburb, many opt to undertake extended commutes (Wray, Götz, Culwick et al., 2014; Wray, Götz and Katumba, 2014). GeoTerraImage has modelled the difference between day and night populations in Gauteng. Mohulatsi (2019) analysed this data, and we reproduce a table from that analysis here (Table 5). It shows the extent to which townships lose population and economic centres gain population during the day. For example, it shows that 377 523 people leave Soweto during the day and return at night. This constitutes more than a fifth of its night-time population. By contrast, a place such as Sandton grows by 126 688 people, which is more than half of its night-time population.

Commentators observe that this kind of configuration is inefficient and imposes enormous costs on commuters and on the environment. It also

Table 5: Concentration of population at night, 2017
SOURCE: Mohulatsi (2019)

Main place	Night population	Day population	Day population subtracted from night population	Change as a % of night population
Diepsloot	139 755	98 824	-40 931	-29
Mamelodi	374 226	278 183	-96 043	-26
Khutsong	96 014	72 739	-23 275	-24
Tembisa	457 561	352 846	-104 715	-23
Soweto	1 738 966	1 361 443	-377 523	-22
Katlehong	497 499	390 817	-106 682	-21
Soshanguve	573 705	451 165	-122 540	-21
Alexandra	114 449	95 207	-19 242	-17
Orange Farm	121 815	105 029	-16 786	-14
Atteridgeville	73 821	68 826	-4 995	-7
Centurion	254 277	310 254	55 977	22
Sandton	257 635	384 323	126 688	49
Vanderbijlpark	84 128	128 019	43 891	52
Midrand	119 895	188 512	68 617	57

restricts employment prospects for those who are looking for work (Budlender, 2016). Policy-makers express an interest in bringing jobs to people, for example through township economy initiatives, or large-scale human settlement projects that would provide job opportunities internally (Ballard and Rubin, 2017). Urban developers constructing Steyn City near Diepsloot have boasted that their project has provided jobs and that workers do not have to commute far to their place of employment (Ballard et al., 2021). Pieterse (2019) argues that it is difficult to identify a remote and disconnected periphery given that there are many economic opportunities that are some distance away from conventionally defined downtown areas.

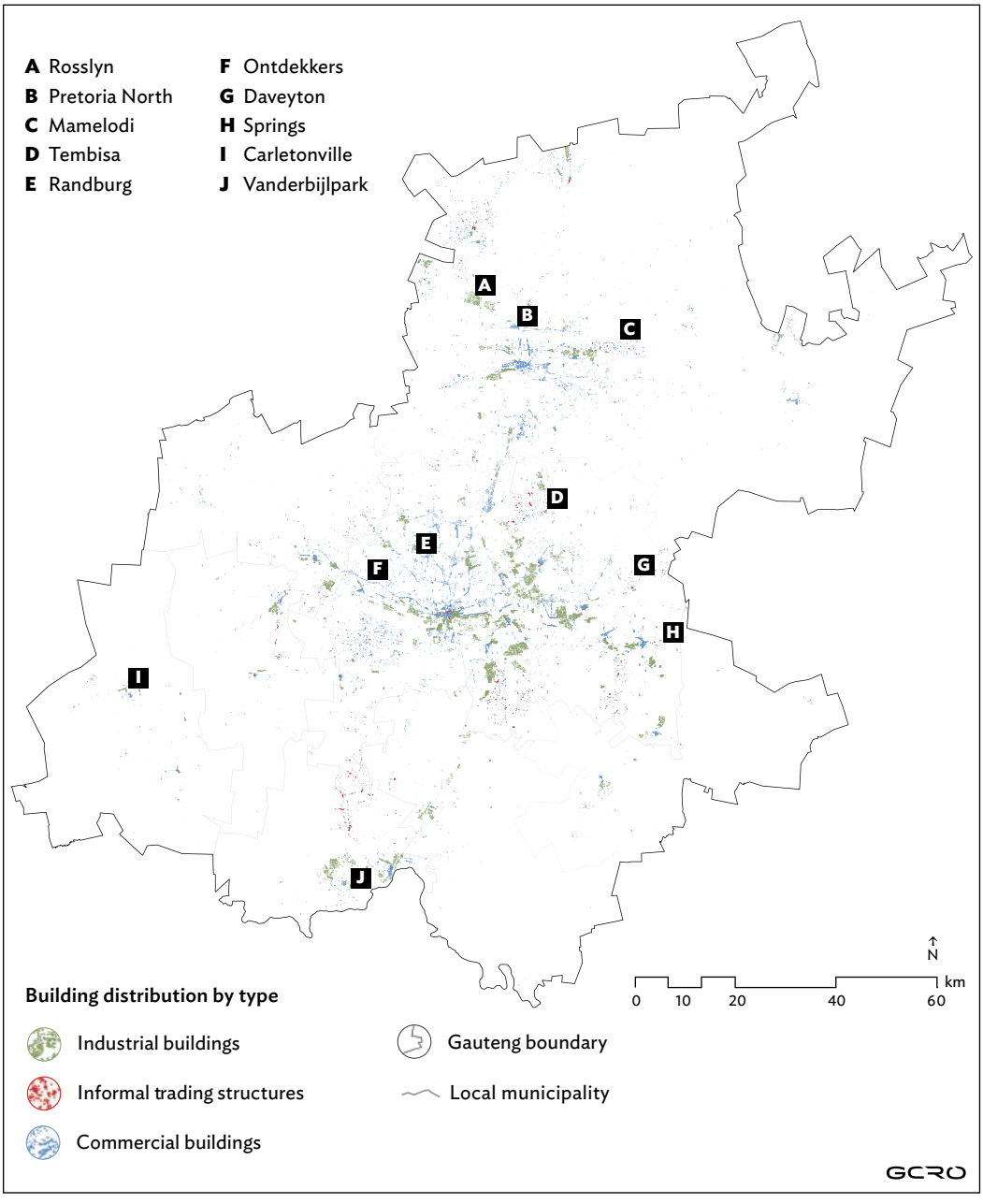
While politicians sometimes overstate their ability to bring jobs to people, it is certainly the case that some economic activity has been arriving in or near townships, as analysis by Naidoo (2019) shows. Figure 20, drawn from Naidoo (2019), reflects the geography of industrial buildings (green dots), commercial buildings (blue dots) and informal trading structures (red dots) in Gauteng. Naidoo shows that in 2001 there were 97 842 commercial and industrial buildings in the province and by 2016 there were 126 923. Comparing Figure 20 with Figure 9 confirms that many businesses are not located within the areas where the highest residential populations are concentrated. Naidoo (2019) provides more detailed maps showing new commercial and industrial buildings that were added between 2001 and 2016. The maps suggest that some new construction exacerbates spatial mismatch, although there is certainly a considerable amount of economic infrastructure that has been introduced in or near townships, where there are high concentrations of people.

The spatial mismatch is resolved every day through transport infrastructure and systems (see Trangoš et al., 2015). The introduction of the Gautrain, various BRT systems and investments to improve highways and rail systems represent ongoing efforts to achieve this goal. Commuting occurs primarily through the use of private taxis and private vehicles. Johannesburg's economic and social activities are concentrated around and within the N1, N12 and N3 ring road, extending as far west as Roodepoort (Gauteng Department of Roads and Transport, 2013). The higher-populated townships of Diepsloot, Cosmo City, Tembisa/Ivory Park, Soweto, Lenasia, Orange Farm, Sebokeng and Sharpeville are linked to the city-region cores through roads (e.g. the Golden Highway and M1) and railways.

The peripheries of Gauteng have over time become areas of high population density, characterised by substantial housing improvements as a way of expressing aspirations. The peripheries are now thought of as consolidation zones – areas where quality of life is to be supported through social and hard infrastructure investments, although not to be promoted as areas of socio-economic growth (City of Johannesburg, 2016). In this context, the Gauteng 25-Year Integrated Transport Master Plan (Gauteng Department of Roads and Transport, 2013) proposes the new link roads with wider connections in order to integrate townships such as Mamelodi, Soshanguve, Winterveld and Mabopane into the wider Gauteng core areas. Other planned transport investments are likely to further extend the city edges outwards (Gauteng Department of Roads and Transport, 2013). These include:

- The Platinum Corridor (Sandton-N4 link – the PWV 9 Freeway), which will not only connect Soshanguve, Winterveld and Mabopane to Centurion, Sandton and Fourways, but will also integrate the Johannesburg–Tshwane conurbation.
- The Lanseria growth node and Pretoria's possible ring road (PWV 9 Freeway, N14/N1 and N4), which is seen in terms of untapped corridor development and a possible Tshwane Western bypass. The mixed land-use node near Lanseria Airport will also link Midrand, Sandton and Centurion to Brits and Rustenburg through the N4 and R512/Hartbeespoort Dam.
- The new link between the N3 (south of Heidelberg Road) and the N4 Maputo Corridor (south of Roodeplaat Dam), which will bring Mamelodi and Ekurhuleni (KwaThema, Tsakane, Daveyton) into the core. The same is true for a possible 'road-to-rail transfer container depot' at Sentrarand.

Figure 20: The location of industrial and commercial buildings and informal trading structures, 2016
DATA SOURCES: GTI data, 2016, 2001; map by Yashena Naidoo



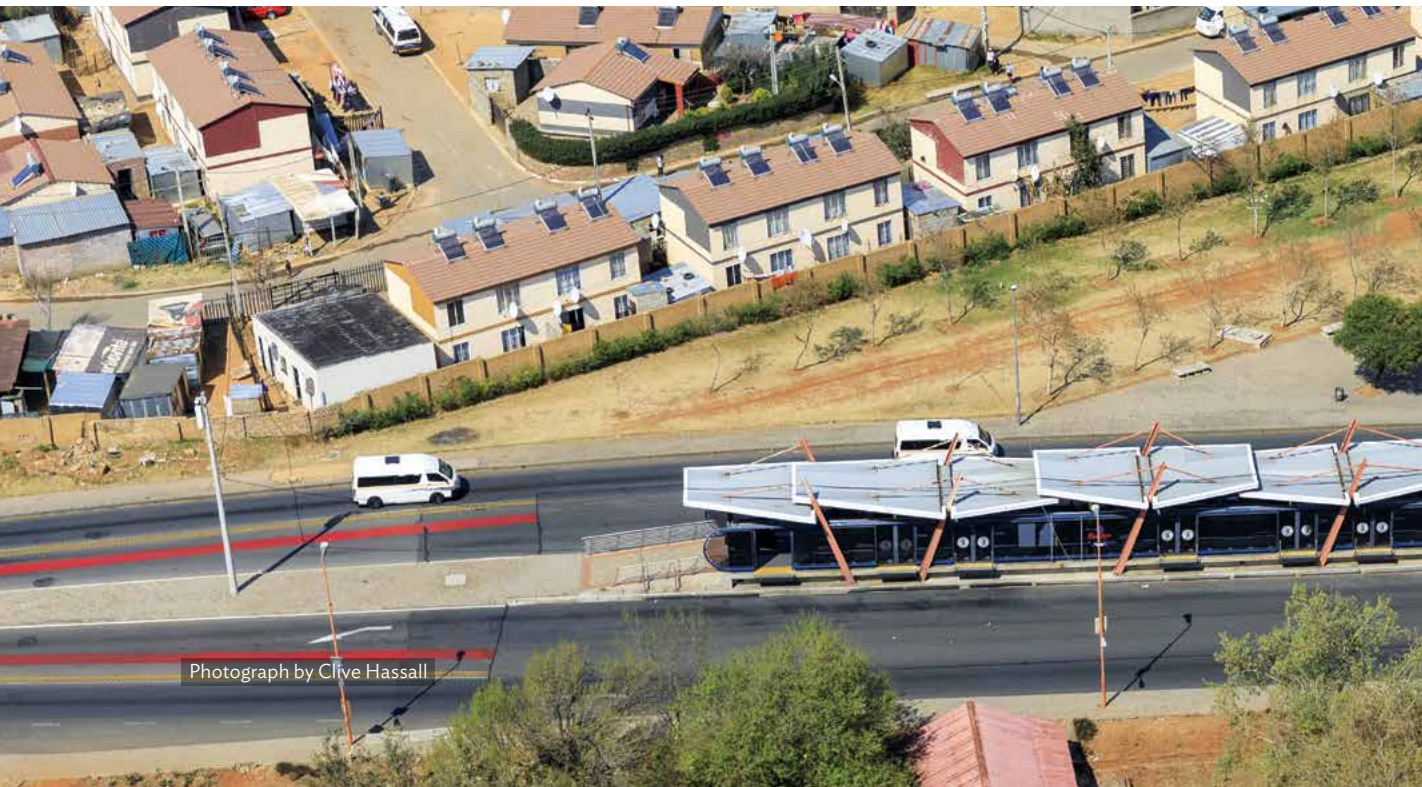
Photograph by Clive Hassall

Trends into the future

Trends into the future

Any speculation about the future of the Gauteng City-Region's spatial dynamics would do well to start with the trends that have defined the city-region over recent decades and project them forward. As Freund (2010, p. 283) notes, 'Continuity is the norm in understanding urban history with change understood as a series of accretions and as a layering of features, unless major economic shifts or revolutionary political shifts are in place.' Many of these are urban processes that are general in cities more widely. It would be reasonable to assume the ongoing conversion of non-urban land into urban land through private-sector suburban housing, state-led human settlements and informal settlements; the densification of existing urban space, particularly around transit nodes, townships and inner cities; the production of new residential buildings across the city-region dominated by detached housing, backyard dwellings and dwellings in informal settlements; an affordability gradient resembling the current distribution of expensive and cheap housing; socio-economic segregation with some racial effects given the racialised nature of inequality; and some degree of mismatch between concentrations of people and economic centres.

These trends are based on a complex ecology of actors enacting practices that respond to particular logics and incentives (Figure 3). There are some established practices and path dependencies inclining them to keep doing what they have been doing. We can ask what evidence there might be for the production of urban space by these actors accelerating, staying constant or decelerating. For example, the state continues to plan a considerable number of major 'human settlements', many of which would expand the urban fringe. The President of South Africa announced the construction of the 'Mooikloof mega residential city' east of Pretoria in October 2020, targeting the gap in the housing market with an initial



Photograph by Clive Hassall

16 000 apartments located alongside golf estates (Ndlazi, 2020). He also announced the construction of a new post-apartheid city at Lanseria for more than 350 000 people (Brothwell, 2020). These initiatives join an already long list of 29 intended large-scale human settlements that would urbanise hitherto undeveloped land (Ballard and Rubin, 2017; Charlton, 2017). Yet these grand ambitions accompany a year-on-year decrease in the quantity of subsidised housing delivered since 2006, which results from various constraints including capacity (Gardiner, 2018).

Freund (2010) mentions the possibility of unexpected developments. COVID-19 has certainly been profound in its impacts, articulating with existing structural conditions in complicated ways. For example, it has, in the medium term at least, weakened demand for office space, a sector that was already oversupplied before the pandemic. It has reduced demand for the Gautrain at a point where future phases of the project are under consideration. It increased unemployment and reduced wages, increasing demand for the most basic forms of shelter. It was also accompanied by the reduction of interest rates, increasing the ability of salary earners to purchase property. These dynamics create a complex picture for major investment decisions. Meanwhile, processes behind the informal occupation of land feature as a perennial point of discussion among government planners.

Given these six spatial trends, the ideals of post-apartheid urbanism seem laudable but sometimes far removed from many of the ways in which the built environment of Gauteng is produced and used. The spatial configurations of Gauteng result from a political economy as much as from an urban vision. It is characterised by the making and selling of urban property – anything from small backyard rooms to vast mansions, tiny tuckshops to vast malls. This built environment is spatially differentiated, and these different spaces constitute differentiated offerings for distinct markets. Spatial transformation would ultimately be possible through greater income and wealth equality, which would allow the urban majority to make use of the city at large rather than just the limited sections that they can afford. In other words, spatial justice is not only enacted through the spatiality of planning, but also through aspatial interventions in the labour market and in social policy. In the absence of greater social equality, Gauteng's spatial trends are likely to reproduce this social and spatial differentiation.

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GAUTENG CITY-REGION OBSERVATORY

6th Floor University Corner
11 Jorissen St (Cnr Jorissen and Jan Smuts)
Braamfontein
Johannesburg
Gauteng, South Africa

tel +27 11 717 7280
email info@gcro.ac.za
www.gcro.ac.za