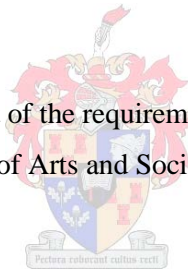# CORRIDOR DEVELOPMENT IN GAUTENG

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Dissertation presented in partial fulfilment of the requirements for the degree Master of Arts in Urban and Regional Science in the Faculty of Arts and Social Sciences at Stellenbosch University

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AUTHOR'S DECLERATION

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ABSTRACT

The development corridor concept has been regarded as an important development instrument in spatial planning and geography for many decades. Expanding literature on the theme indicates that development centres or nodes play an important role in the establishment of such corridors. Flows of goods and information between such centres are key in creating conditions that are potentially favourable for further urban development along the communication axes connecting such centres. Combined, the various nodes form a unique flexible exchange environment allowing for dynamic synergies of interactive growth that can achieve scope economies aided by fast and reliable corridors of transport and communication infrastructure. In the South African development sphere, there is strong belief that functional relationships between nodes can play a decisive role in the establishment of development corridors. This research showed that the degree to which economic activities are concentrated in the greater Gauteng region; the resulting current or emerging multinodal structural composition; and the flows of economic activities between the various nodes result in the creation of developing corridors that channel and focus economic growth between networks of cities. This confirms the importance of corridors as spatial and economic development instruments. The research concluded that corridor development in Gauteng still favours monocentrism. Johannesburg and Pretoria feature as the most dominant nodes, exerting great forces of attraction on the distribution of development and economic growth in the region. The research also suggests a degree of polycentrism whereby economic growth is channelled between networks of cities, however development potential is most favourable in areas in close proximity to primary centres and tends to be functionality driven.

ABSTRAKTE

Die ontwikkelende korridor-konsep is oor baie dekades heen as 'n belangrike instrument in ruimtelike en geografiese beplanning beskou. Uitgebreide literatuur dui aan dat nodusse 'n belangrike rol in die vasstelling van korridors speel. Die vloei van goedere en inligting tussen nodusse is uiters belangrik in die samestelling van toestande wat gunstig is vir ontwikkeling rondom kommunikasie-asse wat nodusse verbind. Die kombinasie van nodusse vorm 'n unieke vloeibare omgewing waarin medewerkende interaksie die omvang van ekonomiese groei bepaal en word ondersteun deur vinnige, betroubare vervoer- en kommunikasie-infrastruktuur. In die Suid Afrikaanse ontwikkelingskonsep, word sterk geglo dat funksionele verhoudings tussen nodusse 'n belangrike rol kan speel in die vasstelling van korridors. Die navorsing toon dat die wyse waarop ekonomiese aktiwiteite binne die Gauteng-streek versprei is; die huidige of opkommende samestelling van meervoudige nodusse; en die vloei van ekonomiese aktiwiteite tussen nodusse die skepping van korridors wat ekonomiese groei tussen netwerke van stede kanaliseer tot gevolg het. Dit bevestig die belangrikheid van korridors as ruimtelike en ekonomiese beplanningsinstrumente. Die navorsing kom ook tot die gevolgtrekking dat korridorontwikkeling in Gauteng steeds die konsep van monosentrisme aanneem met Johannesburg en Pretoria as die mees dominante nodusse, wat groot aantrekkingskragte op die verspreiding van ontwikkeling en ekonomiese groei in die streek uitoefen. Die navorsing dui ook aan dat daar tog 'n mate van polisentrisme is waardeur ekonomiese groei tussen netwerke van stede versprei word. Die mees gunstige ontwikkelingspotensiaal lê egter in gebiede wat in die nabyheid van primêre nodusse geleë is.

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ABBREVIATIONS AND ACRONYMS

GVA   Gross Value Added

UFI   Urban Function Index

CCIF   Cumulative Corridor Impact Factors

1   Introduction and background

Urban development corridors occur world-wide and are widely used as a planning instrument to regulate economic and geographical space (South Africa: 2006; 2009; 2012). Despite previous attempts to identify the fundamental properties of the concept (Pottier: 1963; Tupper: 1977; Geyer: 1988), different interpretations of the phenomenon have led to considerable differences in its application as a planning instrument. Because development corridors are the outcome of interaction between development centres, concepts such as *communication axes, development centres* and *development* are indivisibles when it comes to the identification of a corridor. The concept *development* implies economic growth and structural change, while *communication axes* between development centres serve as the conduits of economic activities along such corridors (Geyer: 1988).

In the South African context there are five urban categories with *city regions* as the most dominant. *City regions* play a significant role as the core cylinder of South Africa's economic footprint. The international connectivity and extensive hinterlands offer great opportunities for future growth and development (South Africa: 2009). Considering census data (South Africa: 2011) and Gross Value Added (GVA) data (CSIR: 2013), *city regions* accommodate 42 per cent of the national population count and 56 per cent of the national economy. The degree to which economic activities are concentrated in the country's city regions due to factors related to Krugmann's (1991) new economic geography, the resulting current or emerging polycentric structural composition of these regions, and the flows of economic activities between the nodes within and between these regions demonstrate the notion of urban agglomeration.

The corridor concept has played an important part in planning thinking in South Africa for a long time. The first reference to the use of the concept as a planning instrument can be found in the National Physical Development Plan of South Africa published four decades ago. Since then the concept has remained an important planning instrument at different levels of spatial aggregation (South Africa: 1975; 1980; 1981; 1999; 2000; 2006; 2009; 2012).

The National Department of Transport (South Africa: 1999) launched the *"Action Agenda"* to give effect to the *"strategic framework",* spelling out how the country could meet transport requirements in a sustainable way, but also expressing the view that transport is an enabling industry to meet other pressing national and social objectives. The department opted for two approaches, i.e. a *"strategic network"* consisting of densely developed nodes and inter-connecting linear corridors; and a *"supporting network"* that will feed into and distribute from the strategic network, but also connect to areas outside the core network (South Africa: 1999).

The most important piece of legislation relating to corridors is the National Land Transport Transition Act (Act No. 22 of 2000), whereas land use restructuring is governed by numerous current and former pieces of legislation. The key legislative issues in the National Land Transport Transition Act impacting on corridor development are:

1) That transportation functions must be integrated with functions in relation to land use and economic planning and the development of corridors, densification and infilling, must guide spatial planning.

2) Transport plans must be developed so as to enhance the effective functioning of cities giving priority to infilling and densification along corridors.

These plans favour investment in corridors through the promotion of nodal development, in-filling, densification and the mixing of land uses (Marrian: 2001).

Locally, *some corridors* have developed spontaneously over extended periods of time in most of the major metropolitan areas of the country. Well-known examples of such corridors include:

1) Main and Durban Roads in Cape Town;

2) Main Reef Road, Ontdekkers Road, Beyers Naudé Drive, Oxford Drive, Jan Smuts Avenue, Louis Botha Avenue; Heidelberg Road; and Rivonia Road in Johannesburg, Ekurhuleni and West Rand;

3) Umbilo and Berea Roads in Durban; and

4) Francis Baard, Paul Kruger and Michell Streets, Van der Hoff Avenue and Steve Biko and Johan Heyns Roads in Pretoria.

As far as *"planned corridors"* are concerned, well-known examples of such corridors include:

1) Whetton-Lansdowne corridor in Cape Town;

2) Mabopane-Centurion corridor in Pretoria;

3) Germiston-Daveyton corridor in Eastern Gauteng; and

4) Khulani corridor and Korsten-Kwazkhele-Motherwell corridor in Port Elizabeth.

These corridors not only provide goods and services to passing traffic, but also act as attractors of spatial activities in the broader metropolitan area in which they are located (Green et al.: 1996). Indications are that these corridors are regarded as *development axes* – linear developments without particular spatial economic significance. What emerged from the assessments and critiques of these corridors is the need for broader supporting metropolitan strategies, as well as a greater awareness of agglomeration economies (Cameron: 1998; Lamont: 1999; Oranje: 1999; and Fensham: 1998).

The most recent example supporting multinodality would be the four major corridors extending from the Port of Walvis Bay – the Trans Kalahari, the Trans Caprivi, the Trans Cunene and the Trans Oranje, each corridor providing locational freedom towards the changing economy of communities. However, individually, each corridor favours a monocentric model, i.e. corridors extending between the two principal cities such as the one between Walvis Bay and Johannesburg (Brundige et al.: 2011). These examples supplement a strategy that strengthens the national economy by creating economic development corridors.

The National Spatial Development Perspective (South Africa: 2006) highlights corridors as main elements in the spatial development of cities within South Africa. According to the Gauteng Spatial Development Framework (South Africa: 2011) as an outflow of this perspective, cities are structured into patterns with uneven development intensities, varying concentrations of activities and a diverse mix of uses. Given the spatial and physical complexity of cities, a series of morphological urban structure elements play an important role in their economic development, such as:

1) The urban corridor consisting of a combination of structuring elements which are geographically defined as a linear axis linking two or more nodes.

2) Nodes, with a hierarchy from primary to secondary and tertiary, mostly located at the intersection of movement routes, which give the all-important access that is required for spatial development and growth. In essence, nodes are intense concentrations of activities, containing a mixture of uses such as retail, office, entertainment, community facilities and even residential.

However, spatial development perspectives ranging from national to local levels do not provide any suitable evidence on what forces result in the creation of urban corridors, or the state of development, vibrancy, or effectiveness of the corridors as development instruments.

The aim of this paper is to determine the existence and measure the relative vitality of corridors in the greater Gauteng region. The paper will first define the concept of the development corridor and discuss its properties before measuring its strength in Gauteng.

1.1   Research questions

The outcome of the paper is based on the following research questions:

1) Which communication corridors in Gauteng represent development corridors?
2) How can the existence and strength of development corridors in Gauteng be measured?
3) Do the measures selected to quantify the outcome of development forces be considered suitable methods of displaying evolving corridors?
4) Does multinodality as appose to the monocentric urban agglomeration provide a more realistic model of network cities?
5) Do current classifications of urban categories based on hierarchies allow for the establishing of a network of cities?

1.2   Research objectives

The objectives of this paper are as follows:

1) To provide a brief literature review on the concept of corridor development, focussing on theories relating to urban agglomerations as the outcome of a combination of competitive advantages, agglomeration economies, endogenous development and externalities.

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2) To find a measure to quantify the outcome of the development forces referred to in the first objective.

3) To measure the relative strength of communication axes within the greater Gauteng region.

4) To display the evolving corridors in the network of cities in the greater Gauteng region.

1.3   Hypothesis

The outcome of the paper is subjected to the following hypothesis:

1) Larger urban areas such as the City of Johannesburg; Tshwane and Ekurhuleni attract people, ideas and commodities more than smaller urban areas. This results in the creation of developing corridors that channel and focus economic growth between networks of cities confirming the importance of corridors as spatial and economic development instruments within the greater Gauteng region.

2   The development corridor

2.1   Definition of a corridor

The *urban corridor* concept has been regarded as an important development instrument in planning and geography literature for many decades, especially in German and French literature. Expanding on pioneering work that was done in the field by Hurd (1924), Christaller (1933) and Lösch (1954), Perroux (1955) and Pottier (1963) were the first to study the concept in great detail, and subsequently followed by Friedmann (1966), Berry (1969), Doxiadis (1969), Papaioannou (1969), Bähr (1976), Koch (1976), Tuppen (1977) and Geyer (1987; 1988). This is therefore a settled theory. These studies all stressed the importance of *urban centres* or *nodes* in the establishment of corridors, whether these centres are industrial, service or mixed commercial nodes within cities forming inner-city corridors or towns or cities forming regional urban corridors. However, there are indications that there is still confusion as to what constitutes *corridors* and *development corridors*; the former simply referring to historical accidents – linear developments without particular spatial economic significance – and the latter to *development axes* in which specific significance is attached to the vibrancy and interdependency of the nodes that led to the establishment of the corridor. Matters that contribute towards this confusion are *functional* and *locational* relationships in relation to *dependency* and *interactions* rather than the achievement of development due to proximity.

A corridor originates from a communication axis which expresses the forces of development which resulted from interactions between centres leading to the manifestation of urban development and form. Von Papp (1976) refers to the *development axis* as the concentration of communication infrastructure along a communication axis. Botham (1983) refers to the *communication axis* as the nodal line along which socio-economic interaction is generated. Combining communication infrastructure and the establishment of urban development in the vicinity of such infrastructure

constitute what can be regarded as a corridor (Geyer: 1988). The Council for Scientific and Industrial Research (CSIR) defines the concept as a linear mixed land use element of urban structure which occurs on a series of transportation routes working together (CSIR: 1999). As a planning mechanism, the development axis ideally lends itself to the linear concentration of development within or between cities (Geyer: 1988).

An axis which expresses linear forces of development results from flows of goods, services and information between main or dominant centres leading to the manifestation of linear urban development along the communication axis connecting such centres. According to Haggett (1983), the flow of trade and exchange along axes is the distinctive feature that allowed urbanisation to emerge. Basically two types of economic flows can be distinguished; transport flows and communication flows – transport involving the physical movement of something while communication expanding the concept to the multidimensional sharing of information. The former refers to the 'traditional' conception of the phenomenon (Gottmann: 1961; Boudeville: 1974), the latter to the richer 'recent' conception of network flows within networks of cities (Friedmann: 1966; Doxiadis: 1970; Castelles: 1996; Graham and Marvin: 1996; Taylor: 2009). It is clear that transport systems form an essential feature of an economic landscape of cities. As early as 1850 did Köhl create a series of branching networks that served settlements in city regions. His ideas were taken up by Christaller to explain the development of systems of cities. Both Köhl and Christaller identified two important features relating to transport networks: firstly, that transport networks are hierarchic in that they consist of a few major feeders and many tributary feeders; and secondly, that a transport network has a branching structure that relates to flows. In essence a transport link to a regional network should affect the relative accessibility of all the cities connected to it. This places emphasis on the notion of development resulting from interactions between dominant centres. According to Haggett (1983), transport networks consist of two important elements: nodes and links. Nodes are the intersection points denoting location, size and forces of interaction. Depending on scale, nodes can represent cities, street intersections or even a cluster of land uses such as shopping malls, services or industries in a city. Links are connections denoting location, length, size and capacity. According to Batten (1994), network cities evolve when two or more independent cities, complementary in function, strive to cooperate and achieve significant scope economies aided by fast and reliable corridors of transport and communication infrastructure.

The functional relationship between centres or nodes could play a more decisive role in the establishment of a corridor than the distance between the nodes or the demand threshold of each node. This could result in urban configurations taking the form of a corridor. A typical example would be the Johannesburg-Pretoria corridor that evolved along the N1 motorway between the two primary cities. Voyer (1997) conducted a study on emerging high-technology industrial clusters focusing on Brazil, India, Malaysia and South Africa. He viewed the emergence of high-technology clusters as part of corridor creation due to their location tendencies. The focus of the study was based on the formation of industrial clusters (technopoles) – Centurion and Midrand – along the corridor between the two

principal cities. Hohenberg and Lees (1985), on the other hand, link the concept of nodality to a network of settlements within which trade occurs between cities consisting of centres, nodes, junctions and relays. Combined, the various nodes within a network of cities form a unique flexible exchange environment. Urban partners can benefit from these dynamic synergies of interactive growth and can achieve scope economies aided by fast and reliable corridors of transport and communication infrastructure (Batten: 1994). Typical examples are Randstad, Holland and the corridors between Singapore and Malaysia. The focus was based on modern urban agglomerations consisting of an intricate web of cities whose functional and locational relationships provided holistic competitive advantages over monocentric rivals (Pacione: 2009).

In the South African context there are strong indications that functional relationships between nodes do play a decisive role in the establishment of development corridors. According to the Cape Town Spatial Development Framework (South Africa: 2012), development corridors are seen as broad linear areas of high-density urban development centred around activities and development routes and is characterised by dynamic, mutually supporting relationships between land uses and movement systems. This concentration of high-density urban development improves access to opportunities offering a means to integrate communities with service provision, economic and social needs. Such development corridors are usually characterised by a combination of strip and nodal development. Strip development generally compromises mixed uses (commercial, industrial and residential) and are located along portions of development corridors, while nodes are characterised by the clustering of activities at points of maximum accessibility.

2.2   Attributes of a corridor

According to Hurd (1924) and reiterated by Whebell (1969), urban corridors are very persistent and are one of the most basic geometric urban systems in urban development. Geyer (1988) distinguishes three major fundamental attributes in relation to corridors: They must have a vibrant development node at both ends of a communication axis linking the two centres; They must be mutually dependent in order to support the flow of economic activities along the axis; and Interaction between the centres must create the potential for further development along the communication axes between the two centres. A corridor is basically a confirmation of the complex process of interaction, be it social, economic, or administrative, between two primary development centres, which tend to augment the urban development process in each centre as well as in secondary centres on the communication axis in-between (Gottmann: 1961).

Pottier (1963) was the first to extensively study the origin and development of corridors as a phenomenon in economic and physical space. During the initial stages of development, a communication route serves merely as a transport link between two or more development centres. However, over a period of time, more and more infrastructure is established along the route and in the process, the original single-purpose transport route changes into a multi-purpose communication axis.

The communication axis, as a nodal line in economic space, serves as an artery that facilitates the creation of agglomeration economies, especially of economies of scale. The increase in the possible creation of economies of scale lead to the concentration of commercial and industrial activities, which in turn leads to the creation of locational agglomeration economies (Ohlin: 1933; Hoover: 1937). Geyer (1988) distinguishes between a number of fundamental properties: Morphological; evolutionary; spatial; dynamic; functional; and content.

In the South African context, c*ity regions* represent the core cylinder of national agglomeration economies. When combined, they support polycentrism with corridors extending between them – Gauteng (City of Johannesburg; Tshwane and Ekurhuleni), Cape Town, eThekwini and Nelson Mandela Bay. However, individually, each *core city* favours a monocentric model.

3   Corridors, urban form and their development forces

It is clear that corridors require vibrant functionally interdependent nodes that generate high levels of business interaction along communication axes between them to function properly. Issues that are therefore important in understanding the forces that bring about such vibrant development corridors are agglomeration economies, accessibility and urban multinodality.

3.1   Agglomeration economies

The clustering of economic activities at interdependent nodes provides advantages for creativity, learning and innovation, thereby building dynamic competitive advantages. The view of cities as places dominated by either distressed communities, declining industries or decaying physical structures has been turned on its head with new emphasis on cities as the main engines of economic growth (SACN: 2011). Agglomeration describes the benefits that businesses obtain by locating near each other and relates to the idea of economies of scale and effects. The processes contributing to the development and growth of cities are considered in the types of economies that are formed, their sources, network linkages and the advantages they bring (Howitt: 2004; McCann: 2004).

The clustering of businesses may be the result of particular development strategies resulting in the accumulation of information and the flow of new and innovative ideas among them for the achievement of increasing returns to scale. Increasing returns to scale are internal to a business and allow for the establishment of more of the same businesses outside the region (Isard: 1956). Economies of scale external to a business are the result of spatial proximity and form part of agglomeration economies, the other elements of agglomeration economies being localisation and urban economies (Ohlin: 1933; Hoover: 1937; Isard: 1956). Agglomeration economies are external to a business but internal to a region and exist when production costs are reduced due to the spatial clustering of economic activities (Parr: 2002). This clustering attracts other businesses to take advantage of these economies causing sustained processes of cumulative causation of growth in

particular areas within national space. This process is one of the underlying principles of sustained core city growth (Krugman: 1991; Fujita and Thisse: 1996; Mayer: 1996; Nafziger: 2006).

According to Howitt (2004), Mayer (1996), McCann (2004) and Nafziger (2006), the main type of economy considered as agglomeration economies are localisation economies – the source of scale economies and the driver of urbanisation economies (Marshall: 1920; Hoover: 1937; Isard: 1956). There are three sources of localisation economies:

1) The emergence of labour workforce pooling. Large populations of skilled labourers enter a region exchanging knowledge, ideas, and information. The more businesses there are in a region, the greater the competition is to obtain workers and *vice versa*.

2) The access to specialised goods and services provided. The access to specialised goods and services is known as intermediate inputs and provides increasing returns to scale due to the proximity to available sources needed for production.

3) Technological spillovers resulting in the diffusion of ideas or adoption of ideas. New innovations of technology increase risk while the clustering of businesses reduces uncertainty in the use of new technology.

3.2 Accessibility

Graham and Dender (2010) refer to agglomeration as the scale of localisation accessibility. According to them, accessibility can either be the direct continuity within built-up areas or can be a direct continuity between main urban areas linked by transportation links or major roads emphasising the notion of a network. The *network* concept emphasises the complex and strong relationships that exist between different urban areas due to the clustering of economic activities. Moreover, networks are associated with economies of scale and synergy, therefore not surprisingly, the network concept has become part of the standard vocabulary of planners and policymakers (Meijers: 2004).

Following Friedmann (1972), Rosenburg (2014) refers to accessibility as the modified law of gravitation, taking into account the population size of places, distances apart and their size of economies. According to Rosenburg (2014), larger places attract more people, ideas and commodities than smaller places, resulting in different degrees of attraction between places. Friedmann (1972) refers to gravitational properties as the magnitude of interaction between two development centres resulting in the creation of a development axis derived from the sizes of the economies of the two centres relative to the distance separating them. According to Haggett (1983), accessibility highlights the balance between an urban system and the transport network that links them.

3.3   Urban nodes and corridor development

Multinodality – the outcome of agglomeration economies – is often associated with the notion of synergy. The assumption is that individual cities in collections of proximity relate to each other in a synergetic way, making the whole network of cities more than the sum of its parts (Meijers: 2004). Emphasis is placed on synergy and can be expressed as the rise in performance of a network through efficient and effective interactions. Capello and Rietveld (1998) analysed the concept of synergy at the micro-, meso- and macro levels and arrived at two distinct meanings: Synergy could refer to positive results when two or more cities cooperate, or it could refer to externalities caused by individual cities voluntarily and non-voluntarily forming part of a group of cities.

Although interest in multinodality has grown rapidly, literature on the concept is still limited and therefore a diversity of related concepts is linked to it. Terms that are often used include: multicore city regions; network cities; or city networks, which are largely synonymous with the polycentric city concept (Bailey and Turok: 2001). Polycentric cities have coalesced in functional and morphological terms into larger and more dispersed urban systems. Polycentric cities are often defined as collections of independent cities located in close proximity and well connected through infrastructure (Kloosterman and Lambregts: 2001). This explains the emerging belief that polycentric cities are becoming the most important spatial level of territorial competition and in addition, are believed to be the next stage in the evolution of urban space.

Graham and Dender (2010) refer to urban agglomeration as a good thing in so far as it generates positive externalities. Urban agglomerations provide greater diversity, creativity and more locational freedom, making network cities a more relevant model towards urban economic growth. This accentuates the relevancy of the development corridor concept as a potentially versatile development instrument.

4   Network cities within the greater Gauteng region

In the South African context, urban evolution resulted in nested patterns of higher and lower-order centres. The latter allowed for the delimitation of functional areas in national space, based on economic catchment areas of higher order centres, which in turn determined the outcomes of agglomeration economies in the form of *city regions*. The resulting current or emerging polycentric structural composition of *city regions*, and the flows of economic activities between the nodes confirm the notion of urban agglomeration whose functional and locational relationships will provide greater diversity, creativity and more freedom for growth and development. This is confirmed by research conducted in the United States of America, Canada, France and locally, suggesting that the area in which corridors are to be developed must show a pre-existence of strong economic growth. Corridor development does not necessarily create economic strength, but rather channels and focuses existing or potential economic growth (Marrian: 2001).

In this research, the urban function index (UFI) and the city typology of the CSIR were used to establish a network of cities within the greater Gauteng region. This typology was subsequently used to measure economic agglomeration, i.e. the relative strength of commercial and industrial clustering as a means of determining the potential strength of development corridors within the greater Gauteng region.

The purpose of the UFI of Statistics South Africa (Stats SA) is twofold: first, to determine the economic weight of urban settlements relative to one another, and second, to distinguish between the sizes of the commercial, service and industrial components of urban economies. One of the potential uses of the UFI is to determine the relative economic dominance of cities in an urban network as was done in the CSIR's urban classification and in the South African National Development Plan for 2030.

The settlement typology was conceived to describe the role and character of the different settlement types, and to illustrate the relationships and flows between the different spaces as well as the relationships between urban centres and their hinterlands and the broader global economy. The variables used for classification include concentration or population density, settlement size, UFI and the relations between places using accessibility measures. Flows and linkages between settlements played an important role in both the classification and definition of settlement areas. Five categories of cities were identified. In declining order they include: City regions; Cities; Regional service centres; Service and local and niche towns; and Rural settlements. Table 1 shows the degree to which city regions dominate lower-order city categories in the country.

Table 1: Population and GVA count of different settlement types in South Africa

Settlement type	Population count		GVA	
	Total	%	Total	%
City regions	21 856 192	42.24%	1 185 948	56.87%
Cities	3 876 064	7.49%	178 276	8.55%
Regional service centres	7 313 276	14.13%	229 690	11.01%
Service and Local and niche towns	7 024 698	13.58%	204 636	9.81%
High density/Dense and sparse rural settlements	11 675 848	22.56%	286 784	13.75%
Total	51 746 078		2 085 334	

Source: Council for Scientific and Industrial Research, 2013

The degrees of dominance of different city categories in the Gauteng urban system are given in Tables 2, 3 and 4.

Table 2: Cities showing potential for a well-established formal economy within the Gauteng city region

Places	UFI	Municipality	Population count
Rustenburg	8.32	NW373	549 575
Klerksdorp-Orkney-Stilfontein-Vaal	9.02	NW403	398 686
Total			**948 261**

Source: Statistics South Africa, 2011

Table 3: Cities or towns located in or close to the periphery of the Gauteng city region

Places	UFI	Municipality	Population count
Vanderbijlpark	7.30	GT421	721 671
Vereeniging	7.83		
Total			**721 671**

Source: Statistics South Africa, 2011

Table 4: Population counts of city categories in the Gauteng city region

Places	UFI	Municipality	Population count
Alberton	17.91	EKU	3 178 457
Benoni	6.33		
Boksburg	20.90		
Germiston	38.49		
Kempton Park	11.97		
Springs	7.49		
Brakpan	3.39		
Tembisa	2.12		
Krugersdorp	16.65	GT481	362 420
Johannesburg	81.96	JHB	4 434 832
Lenasia	6.17		
Midrand	11.30		
Roodepoort	28.21		
Sandton & Randburg	94.51		
Soweto	8.41		
Centurion	15.54	TSH	2 921 478
Mamelodi	51.70		
Pretoria	27.23		
Total			**10 897 187**

Source: Statistics South Africa, 2011

5   Daily and weekly urban system of Gauteng

Using the *daily* and *weekly urban system* concept which was advanced by Geyer et al. (2012) and Geyer and Geyer (2014) in a South African context recently, travelling distances of towns and cities from core city centres were used to functionally distinguish between towns and cities within the Gauteng city region. The purpose was to quantify the relationships and flows between different settlements within the region and to distinguish between nodes within the daily and weekly commuting areas of the core cities. The daily urban system includes all settlements located within one

hour's travel time from one of the metropolitan city centres and are generally regarded as satellite towns of a lower order. The weekly urban system, on the other hand, includes all settlements (higher and lower order) located between one and two hours' travel time from one of the metropolitan areas. For the purpose of the research, only intermediate towns/cities were included in the analysis.

According to Friedmann (1966), there is a direct relationship between the interaction between cities and the distance separating them. In simplistic terms, the locality of a settlement in relation to a dominating core city would co-determine its level of interaction with the core city. Daily urban systems therefore are based on a one-hour travel time from the city centres which makes daily commuting possible for work or other economic or social purposes between the two urban settlements. The same applies to the weekly urban system which consists of nodes between one and two hours' travelling time from core city centres. Taking into account the variables of functional typologies and urban systems, the following cities can be classified as networks of cities within the g*reater Gauteng region* (see Table 5 and Figure 1).

Table 5: Networks of cities within the greater Gauteng region

Dominant urban system	Weekly urban system	Daily urban system
Alberton	Bela-Bela	Atteridgeville
Benoni	Klerksdorp/Stilfontein/Orkney	Brits
Boksburg	Middelburg	Bronkhorstspruit
Brakpan	Parys	Carletonville/Fochville
Centurion	Potchefstroom	Delmas
Edenvale	Rustenburg	Devon
Germinston	Secunda	Ga-Rankuwa
Johannesburg	Ventersdorp	Heidelberg
Kempton Park	Witbank	Mabopane
Krugersdorp		Nigel
Mamelodi		Randfontein
Midrand		Sasolburg
Pretoria		Shoshanguve
Roodepoort		Springs
Sandton/Randburg		Temba
Soweto/Lenasia		Vanderbijlpark
Tembisa		Vereeniging
		Westonaria

Figure 1: Nodes within the core city and its daily and weekly urban systems
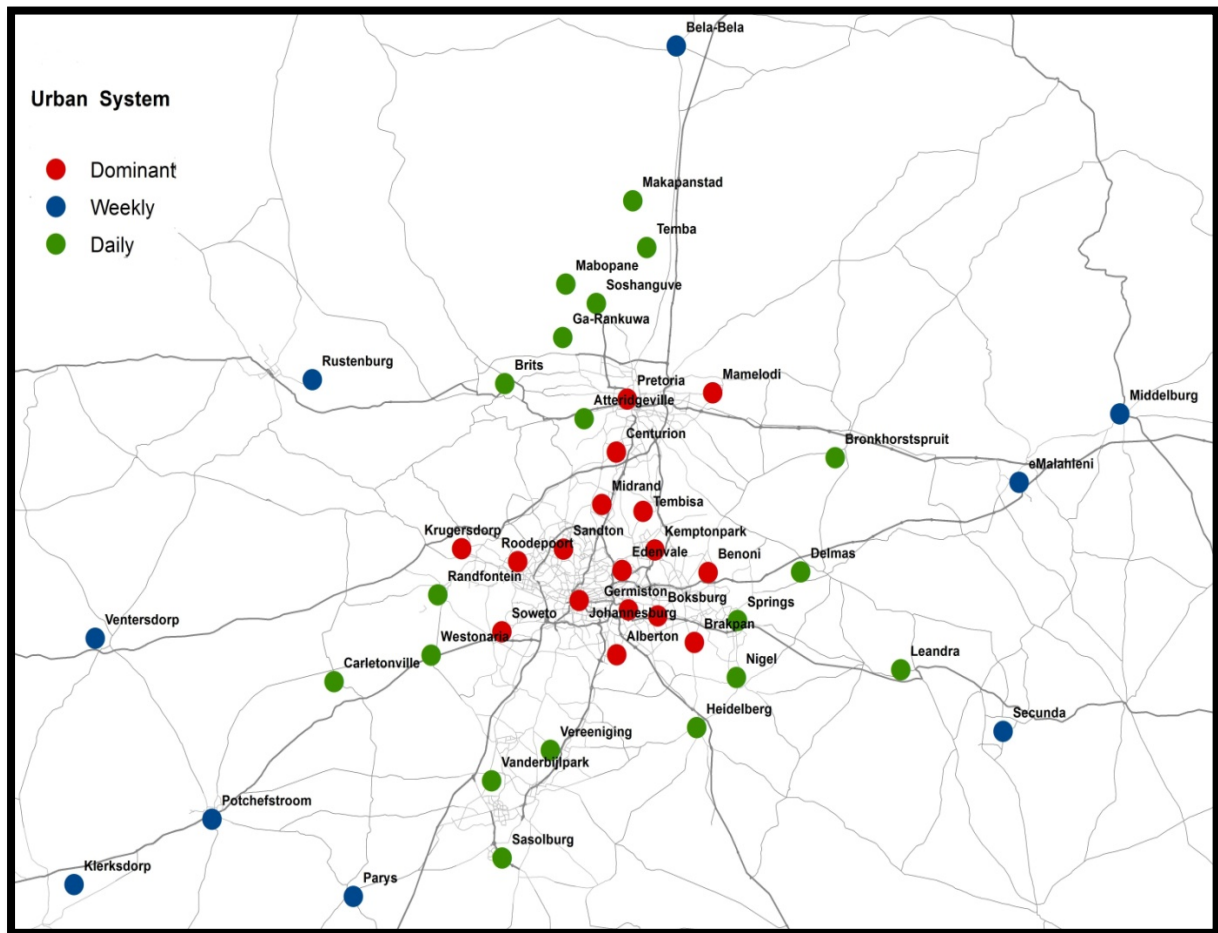
6   Economic output index of nodes

The focus of the section was to establish the degree of economic attraction exerted by nodes based on the economic output index (EOI) of each city within the city region. Economic output refers to the total value of all goods and services produced in an economy, and are primarily used to determine whether an economy is growing or to compare the relative economic output between cities.

The EOI is calculated as follows:

$$EOIi = \left(\frac{PEi}{PTi}\right) / \left(\frac{PEg}{PTg}\right) x \left(\frac{GVAi}{GVAg}\right)$$

EOIi   = Economic output of city, i, (i=1…n)

PEi   = Economic active population of city, i

PTi   = Total population of city, i

PEg   = Economic active population of all the cities in the region

PTg   = Total population of all the cities in the region

$GVAi$ = GVA of city, i

$GVAg$ = GVA of all cities in the region

The outcome established the economic output levels of cities relative to one another. The EOIs of cities in the research are used as z-values in the compilation of a three-dimensional graphic construction of the economic spaces in which these corridors operate. Table 6 and Figure 2 illustrate the agglomeration of economic activities within the *greater Gauteng region.*

Table 6: EOIs of nodes within the greater Gauteng region

Dominant urban system	GVA	Economic active	Total Population	Economic output	Weekly urban system	GVA	Economic active	Total Population	Economic output	Daily urban system	GVA	Economic active	Total Population	Economic output
Alberton	23 971	254 451	800 937	0.31	Potchefstroom	6 161	45 831	149 670	0.07	Carletonville/Fochville	6 586	63 690	190 251	0.09
Boksburg	16 684	113 676	287 832	0.27	Klerksdorp/Stilfontein/Orkney	11 799	95 274	351 756	0.13	Heidelberg	2 842	22 584	71 661	0.04
Germiston	17 295	118 734	274 260	0.30	Ventersdorp	745	4 632	22 074	0.01	Nigel	3 699	14 019	40 641	0.05
Kempton Park	17 521	87 129	171 573	0.36	Parys	2 240	12 267	62 787	0.02	Delmas	1 865	17 748	62 760	0.02
Johannesburg	97 638	402 279	957 438	1.67	Witbank	21 456	108 705	304 332	0.31	Bronkhorstspruit	4 847	28 305	94 353	0.06
Midrand	8 607	50 895	87 390	0.20	Bela-Bela	1 904	12 477	45 000	0.02	Temba	2 464	60 762	262 188	0.02
Roodepoort	24 128	181 242	390 105	0.46	Rustenburg	26 313	180 630	479 286	0.40	Mabopane	7 203	79 245	344 820	0.07
Sandton/Randburg	41 139	374 241	753 435	0.83	Middelburg	9 490	63 606	168 846	0.15	Ga-Rankuwa	3 705	26 166	90 948	0.04
Centurion	24 624	234 675	472 125	0.50	Secunda	16 166	69 114	189 639	0.24	Brits	14 302	36 729	92 832	0.23
Pretoria	92 281	464 205	1 062 021	1.64						Atteridgeville	2 037	19 692	64 425	0.03
Mamelodi	11 468	117 441	334 578	0.16						Springs	9 968	74 097	225 348	0.13
Krugersdorp	16 343	107 046	284 553	0.25						Westonaria	3 178	33 099	95 487	0.04
Soweto/Lenasia	38 775	464 412	1 573 920	0.47						Randfontein	5 659	62 694	192 825	0.07
Tembisa	12 465	279 021	793 857	0.18						Shoshanguve	12 849	112 776	405 318	0.15
Edenvale	12 607	26 445	49 293	0.28						Devon	2 842	9 846	43 155	0.03
Benoni	14 850	153 756	468 753	0.20						Sasolburg	6 171	36 360	115 194	0.07
Brakpan	5 130	102 465	352 224	0.06						Vereeniging	4 276	74 178	207 507	0.06
										Vanderbijlpark	21 798	203 490	786 651	0.23
Total	**475 526**	**3 532 113**	**9 114 294**		**Total**	**96 274**	**592 536**	**1 773 390**		**Total**	**94 493**	**771 990**	**2 599 713**	

Source: Council for Scientific and Industrial Research, 2013 and Statistics South Africa, 2011

Figure 2: Economic space represented by the nodes within the larger Gauteng region, 2011
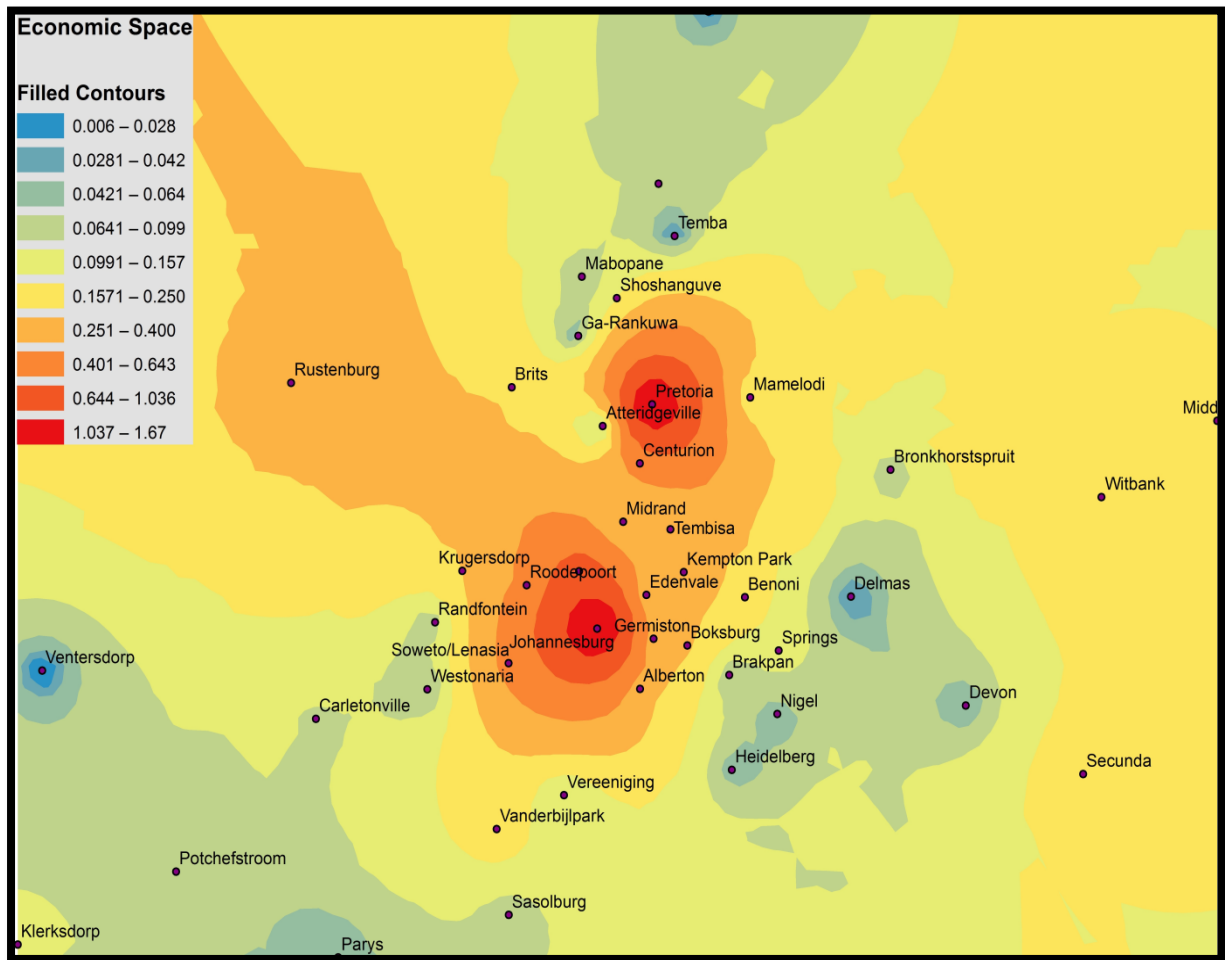
From Table 6 and Figure 2, the following conclusions were drawn:

1) Johannesburg (1.67) and Pretoria (1.64) have the most dominant scales of economies, exerting great forces of attraction that impact on the distribution of development along the axes with larger centres such as Sandton/Randburg (0.83); Alberton (0.31); Kempton Park (0.36); Roodepoort (0.46); Centurion (0.50); Soweto/Lenasia (0.47); Witbank (0.31); Rustenburg (0.40) and Germiston (0.30).

2) Centres that developed to such an extent that they also compare favourably as strong economic centres include Boksburg (0.27); Secunda (0.24); Midrand (0.20); Krugersdorp (0.25); Edenvale (0.28); Benoni (0.20); Brits (0.23) and Vanderbijlpark (0.23).

7   Relative strength between the networks of cities within the greater Gauteng region

The previous section determined the agglomeration of economic activities, illustrating potential corridors based on the distribution of economies. However, consideration should also be given to the relative strength between these cities to obtain a more refined classification of axes. For the purpose of the research, a modified law of gravitation was considered because it takes into account the EOIs of

two places in relation to the actual distance between them. The outcome determined the relative strength between the cities when considering that larger places (higher order) attract people, ideas, and commodities more than smaller places (lower order).

The relative strength of the corridor is calculated as follows:

$CP_{12} = (EOI1 \times EOI2)/D$

CP_{12} = *Corridor potential between cities, 1 and 2*

EOI_1 = *Economic output of city, 1*

EOI_2 = *Economic output of city 2*

D = *Distance between cities, 1 and 2*

The relative strength is converted into Cumulative Corridor Impact Factors (CCIF). The outcome is to determine the potential vitality of corridors within the greater Gauteng region, based on the attraction levels.

The CCIF is calculated as follows:

$MC = (SC1 + SC2 + \dots SCn)$

MC = *Main corridor, (1…n)*

SC_1 = *Section corridor 1 of main corridor*

SC_2 = *Section corridor 2 of main corridor*

Table 7: The relative strength between these cities with the highest economic output

PLACES	Johannesburg	Pretoria	Sandton/Randburg	Alberton	Kempton Park	Roodepoort	Centurion	Soweto/Lenasia	Witbank	Rustenburg	Secunda	Boksburg	Germiston	Midrand	Krugersdorp	Edenvale	Vanderbijlpark	Benoni	Brits	Mamelodi	Bronkhorstspruit	Vereeniging	Sasolburg	Nigel	Carletonville/Fochville	Potchefstroom	Klerksdorp/Stilfontein/Orkney	Tembisa	Devon (Leandra)	Delmas	Springs	Westonaria	Brakpan
Johannesburg	0	0.490	0.920	0.470	0.250	0.370	0.190	0.300	0.040	0.040	0.030	0.160	0.360	0.130	0.120	0.330	0.050	0.110	0.040	0.030	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.070	0.010	0.010	0.010	0.010	0.030
Pretoria	56	0	0.300	0.080	0.130	0.110	0.550	0.090	0.050	0.060	0.020	0.070	0.080	0.110	0.060	0.090	0.030	0.050	0.070	0.090	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.080	0.010	0.010	0.010	0.010	0.010
Sandton/Randburg	15	46	0	0.090	0.140	0.120	0.130	0.100	0.020	0.020	0.010	0.070	0.090	0.100	0.050	0.150	0.020	0.050	0.020	0.020	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.040	0.010	0.010	0.010	0.010	0.010
Alberton	11	63	30	0	0.040	0.040	0.030	0.050	0.010	0.010	0.010	0.040	0.120	0.020	0.020	0.050	0.010	0.020	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Kempton Park	24	46	21	27	0	0.030	0.040	0.030	0.010	0.010	0.010	0.060	0.050	0.040	0.010	0.080	0.010	0.040	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Roodepoort	21	69	33	34	54	0	0.040	0.200	0.010	0.020	0.020	0.040	0.020	0.040	0.080	0.030	0.010	0.020	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Centurion	44	15	33	51	43	55	0	0.030	0.010	0.010	0.010	0.020	0.030	0.060	0.020	0.040	0.010	0.020	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Soweto/Lenasia	26	83	40	30	55	11	70	0	0.010	0.010	0.010	0.020	0.040	0.020	0.050	0.030	0.020	0.020	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.020	0.010
Witbank	137	112	146	140	127	162	123	168	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Rustenburg	169	114	133	142	171	103	144	116	230	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Secunda	133	164	149	126	128	158	169	154	83	288	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Boksburg	29	60	33	22	15	54	56	50	117	184	116	0	0.070	0.010	0.010	0.010	0.050	0.010	0.080	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.020	0.010	0.010	0.010	0.010	0.010
Germiston	14	60	27	8	21	32	47	39	129	173	122	11	0	0.020	0.020	0.080	0.010	0.030	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.020	0.010	0.010	0.010	0.010	0.010
Midrand	26	31	16	34	18	38	18	52	139	144	153	37	31	0	0.010	0.030	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.030	0.010	0.010	0.010	0.010	0.010
Krugersdorp	35	67	39	48	65	14	54	26	175	89	171	68	46	49	0	0.010	0.010	0.030	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.030	0.010	0.010	0.010	0.010
Edenvale	14	49	16	17	13	44	36	45	128	161	137	14	10	18	55	0	0.010	0.030	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.030	0.010	0.010	0.010	0.010
Vanderbijlpark	71	127	85	63	91	76	114	69	204	159	189	86	74	96	81	81	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Benoni	30	63	36	32	19	54	60	60	109	188	110	7	21	42	78	20	96	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.020
Brits	91	53	81	99	109	81	82	98	168	68	237	123	96	66	75	85	150	126	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Mamelodi	82	28	72	89	66	94	39	107	95	138	165	80	87	56	92	75	153	67	76	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Bronkhorstspruit	94	58	101	98	73	123	69	137	56	175	128	82	94	86	121	85	161	67	113	40	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Vereeniging	63	115	82	51	79	83	102	79	192	159	177	74	62	84	96	69	11	84	150	140	149	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Sasolburg	82	136	96	72	100	87	124	80	214	170	199	95	84	106	92	90	16	105	160	161	170	21	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Nigel	58	88	74	51	53	83	94	79	119	213	94	40	46	76	96	60	89	34	141	91	84	79	99	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Carletonville/Fochville	77	126	90	81	106	67	113	55	219	98	204	101	89	107	57	95	80	111	123	150	180	79	89	136	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Potchefstroom	120	181	134	124	149	110	169	98	262	150	247	144	132	151	105	139	88	154	181	206	236	90	89	179	64	0	0.010	0.010	0.010	0.010	0.010	0.010	0.010
Klerksdorp/Stilfontein/Orkney	167	229	181	171	196	103	216	145	310	169	295	191	179	198	152	186	136	201	228	253	283	137	137	226	112	47	0	0.010	0.010	0.010	0.010	0.010	0.010
Tembisa	41	36	30	36	16	52	26	64	122	161	136	32	33	13	63	20	100	26	99	56	67	88	109	60	114	158	205	0	0.010	0.010	0.010	0.010	0.010
Devon (Leandra)	101	114	115	93	98	126	139	121	82	236	40	83	89	119	139	103	157	77	175	117	84	147	167	61	172	216	263	97	0	0.010	0.010	0.010	0.010
Delmas	71	73	78	74	61	96	73	102	78	195	83	50	62	84	120	61	138	43	133	76	43	126	147	46	152	196	243	56	43	0	0.010	0.010	0.010
Springs	48	84	56	33	39	65	80	61	112	208	97	19	30	62	79	40	97	12	146	76	78	85	106	20	112	155	202	56	64	33	0	0.010	0.010
Westonaria	52	114	66	58	82	37	101	31	195	110	181	77	66	83	31	72	56	87	107	139	169	55	67	106	31	74	121	90	149	129	96	0	0.010
Brakpan	38	73	46	30	29	62	70	58	111	198	102	14	26	52	75	29	94	8	136	74	76	82	103	27	108	152	199	46	70	70	9	85	0

Level of attraction

Distance

Table 8: Cumulative Corridor Impact Factors (CCIF) of main corridors in Gauteng

Main Coorridor	Corridor sections	CCIF	Strenght
Johannesburg-Pretoria	JO-SA	1.83	Very strong
	SA-MI	1.34	Very strong
	MI-CE	1.28	Very strong
	CE-PR	1.45	Very strong
Johannesburg-Pretoria	JO-ED	1.14	Very strong
	ED-KE	1.01	Very strong
	KE-TE	0.82	Strong
	TE-PR	0.79	Strong
Johannesburg-Krugersdorp	JO-RO	0.49	Medium
	RO-KR	0.20	Medium
Johannesburg-Benoni	JO-GE	0.63	Strong
	GE-BO	0.37	Medium
	BO-BE	0.22	Medium
Johannesburg-Kempton Park	JO-ED	0.58	Medium
	ED-KE	0.33	Medium
Johannesburg-Sasolburg	JO-AL	0.54	Medium
	AL-VE	0.11	Medium
	VE-VA	0.10	Medium
	VA-SAS	0.04	Weak
Johannesburg-Sasolburg	JO-SO	0.37	Medium
	SO-VE	0.11	Medium
	VE-VA	0.11	Medium
	VA-SAS	0.04	Weak
Johannesburg-Klerksdorp/Stilfontin/Orkney	JO-SO	0.34	Medium
	SO-WE	0.08	Weak
	WE-CA	0.09	Weak
	CA-PO	0.08	Weak
	PO-KL	0.05	Weak
Johannesburg-Secunda	JO-GE	0.60	Strong
	GE-BO	0.35	Medium
	BO-BR	0.16	Medium
	BR-SP	0.14	Medium
	SP-LE	0.12	Medium
	LE-SE	0.08	Weak
Johannesburg-Witbank	JO-GE	0.52	Medium
	GE-BE	0.21	Medium
	BE-DE	0.09	Weak
	DE-WI	0.07	Weak
Pretoria-Witbank	PR-MA	0.15	Medium
	MA-BR	0.08	Weak
	BR-WI	0.07	Weak
Pretoria-Rustenburg	PR-BRT	0.13	Medium
	BRT-RU	0.07	Weak

Table 8 shows the different corridor sections favouring attraction levels associated with corridor development. Figure 3 shows the potential vitality of corridors within the greater Gauteng region. Evident from the figure are the following axes:

1) Very strong primary axis between Johannesburg; Sandton/Randburg; Midrand; Centurion and Pretoria.

2) Very strong to strong primary axis between Johannesburg; Edenvale; Kempton Park; Tembisa and Pretoria.

3) Strong secondary axis between Johannesburg; Roodepoort and Krugersdorp.

4) Strong secondary axis between Johannesburg; Germiston; Boksburg and Benoni.

5) Strong secondary axis between Johannesburg; Alberton; Vereeniging; Vanderbijlpark and Sasolburg.

6) Strong secondary axis between Johannesburg; Soweto; Vereeniging; Vanderbijlpark and Sasolburg.

7) Strong secondary axis between Johannesburg; Germiston; Boksburg; Brakpan; Springs; Leandra and Secunda.

8) Strong secondary axis between Johannesburg; Germiston and Benoni.

The figure also shows the following axes as potential corridor development:

1) Axis between Pretoria and Mamelodi.

2) Axis between Pretoria and Brits.

Figure 3: CCIF of main corridors in Gauteng
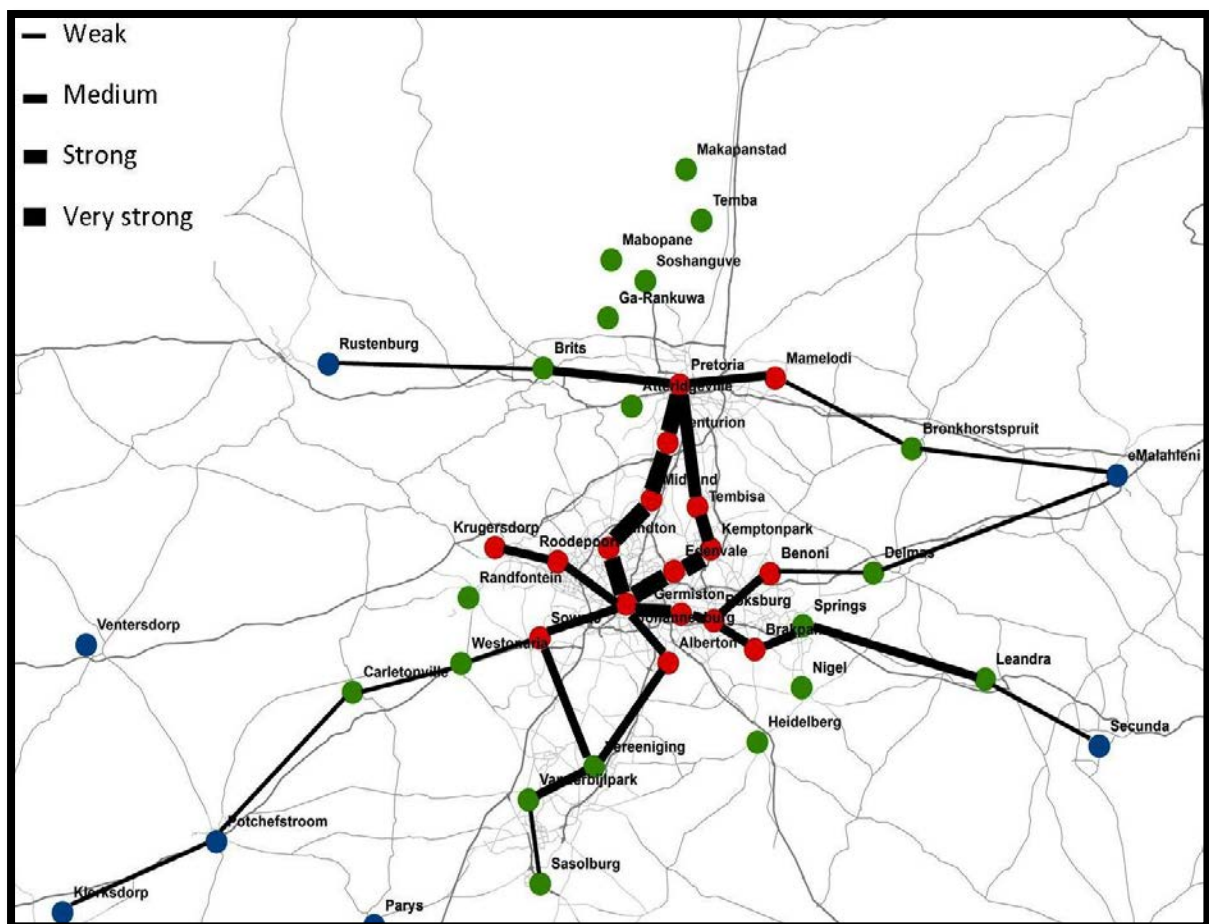
8 Industrial and commercial land use clusters as an outcome of corridor development within the greater Gauteng region

In the previous sections it was established which cities in relation to their economic output and relative strength compare favourably in establishing potential corridor vitality. This section deals with the actual spatial properties considering industrial and commercial land use data, with the focus on cluster values. The strongest concentration of industrial and commercial land uses are found at the cities of

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Johannesburg and Pretoria. This confirms the notion that Johannesburg and Pretoria have the most dominant scales of economies with strong attractions towards the other centres. Figure 4 shows how Johannesburg and Pretoria as primary nodes exert great forces of attraction that impact on the distribution of development along the axes with other larger centres.

Figure 4: Industrial and commercial land use clusters in relation to Johannesburg and Pretoria as the primary nodes
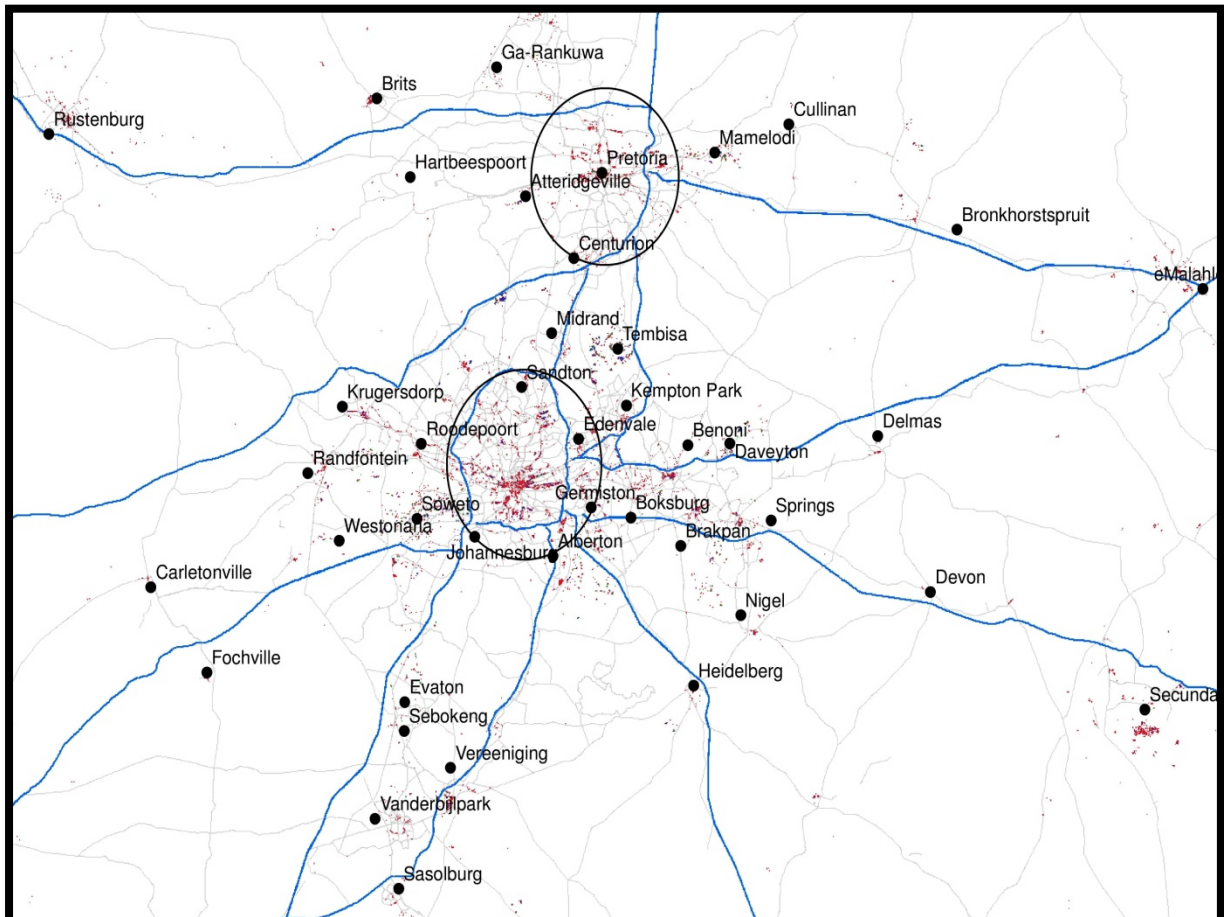
Source: GeoTerraImage, 2011

9   Conclusion

In the South African context, urban evolution resulted in nested patterns of higher and lower-order centres. The latter allowed for the subdivision of the country into functional areas based on economic catchment areas of higher order centres, which in turn determined agglomeration economies known as *city regions*. According to the National Spatial Development Perspective, corridors are highlighted as a main element in the spatial development of cities within South Africa. However, except for pioneering empirical work in the 1980s in which the spatial dimensions of development corridors in South Africa were quantified (Geyer: 1986; 1988; Geyer and Steyn: 1989), most work on development corridors since then has been descriptive. There is no evidence of any empirical research in which the vitality of development corridors has been determined. This became the objective of this study.

The research concluded that the concept of network cities operating within urban agglomerations provides opportunities for diversity, creativity and greater freedom in locational choice. The development corridor seems to be a potentially versatile development instrument within such a spatial urban framework. It channels and focuses economic growth and thereby creates new opportunities for economic agglomeration and growth which has not existed previously. The following conclusions were drawn from the research:

First, functional and locational relationships in relation to proximity result in very strong attraction levels in urban systems and are associated with the linear expansion and channelling of development potential along communication corridors linking cities within networks of cities. Such dynamic urban network constructions are associated with high economic output and close nodal proximity. This confirms Friedmann's (1966) finding of a positive relationship between the economic weights of cities and the distances separating them. Empirical results show that weakening corridor formation in Gauteng is associated with increasing distances of primary centres from one another. Strong primary nodes that are located within 15 km resulted in strong corridors; medium corridor formation between centres within 25–35 km from one another; and weak corridor formation of nodes further apart.

In summary, according to the research, the following forces were identified as important elements in the development of corridors:

1) The economic output of a city in relation to the region, establishing agglomeration of economies.
2) Strength between the cities in relation to economic size, establishing synergies of interactive growth.
3) The distance between cities in relation to their strength, establishing the potential of corridor development.

The above elements show the degree to which economic activities are concentrated in the greater Gauteng region and the resulting current or emerging multinodal structural composition. In this regard, the research showed that Johannesburg (1.67) and Pretoria (1.64) are the most dominant economies, exerting great forces of attraction resulting in the flows of economic activities between various nodes.

Although the research identified certain forces that compare favourably in establishing potential corridor vitality, the research also took into account the spatial properties in relation to corridor development. The research showed that in most cases, economic output and relative strengths do overlap with the current spatial properties, such as that Johannesburg and Pretoria are the most dominant nodes impacting on the distribution of development.

In summary, the research concludes that corridor development in Gauteng still favours monocentrism, considering Johannesburg and Pretoria as the most dominant nodes exerting great forces of attraction towards larger centres impacting on the distribution of development and economic growth. However, the research does suggest a certain degree of polycentrism whereby economic growth is channelled between networks of cities, however limited to close proximity and functionality only. In conclusion,

as mentioned by Nicholson (2003), cities are largely interdependent, which by itself is not enough to support economic growth. However, the principles of clustering linked by strong transportation networks support the notion of more freedom in the restructuring of space-economy among cities.

10   References

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