

A unified spatial framework
for the evaluation and
enhancement of economic
potential and efficiency in
Cape Town

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ABSTRACT

This dissertation is a comprehensive investigation into the changing morphological and functional structure of the city of Cape Town.

Within this it seeks to understand what the economic drivers behind this changing urban form are and what effects this has on Cape Town's economic growth potential, efficiency and resource usage in its management of urban growth. Based on a vast review of economic theories into the changing economic sectoral demands of the city and the locational patterns of activity these engender, the inherent economic potential of differing urban forms and the resource efficiency in management of these forms the conclusion is drawn that currently cities across the globe are facing increasing dispersion and deconcentration of economic activity as they grow. This is despite the resolute finding that higher increased levels of economic agglomeration and concentration within urban areas offers a far higher potential for economic growth, innovation, efficiency and decreased expenditure in management of the urban form.

The analysis of Cape Town's morphological and functional structure found that historically Cape Town was monocentric in both of these structural forms. Subsequently however rampant dispersal of economic activity which was shown to be driven by a structurally rigid low density stratified distribution of population has led to the incremental entrenchment of a low economic land intensity concentration outside of the historic CBD in a typical polycentric form. This it is shown represents a economically and resource use inefficient form of the city, which inevitably will stagnate future economic and metropolitan performance. It was further established that functionally, Cape Town still retains a strong monocentric structure however this too seems to be dissipating.

Based on these findings of Cape Town's current structural inefficiencies and future projections, the dissertation reviews the current spatial development framework prepared by the Cape Town Municipality. The findings of this critique indicate a long term structure plan which does not adequately address the inefficiencies identified in the analysis section. It further finds conflicting rationalities in the approach to long term spatial planning that will not likely promote a more economically efficient urban structure. Based on these critiques the dissertation of recommendations on how urban planning can better promote an increasingly efficient and rational economically approach to the urban structure of Cape Town, thereby answering the primary question set out at the beginning of through dissertation.

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CHAPTER 1: INTRODUCTION

1.1 Introduction to Dissertation

The necessity for increasingly effective spatial organisation of urban centres is, in the twenty first century, becoming an exponentially more paramount role of the state in the face of drastic urbanisation rates and changing global economic flows. This is requisite in order to achieve the desired ambitions of a territory, whether these be promoting economic growth, redistribution, social equity or environmental sustainability, the comprehension and guidance of spatial urban structure is an unequivocal component of these. The urban malaise is commonly characterised by sprawl, fracturing, marginalisation and accessibility obstacles, shortages of adequate land for use, eschewed bid-rent curves, inequality, varying spatial transactional costs (McCann, 2008) and intra-territorial competition. These are significantly engendered through the conflicting demands of the population, business and the state for the limited resources of space, capital, land and development capacity that are available within a territorial market (Erasmus et al., 2008). As Heikkila (2000:79) states, “The cumulative effect of all such land use decisions by all property owners is the resultant pattern of land uses that define urban structure” and although these processes are all irreversibly interlinked, the holistic comprehension and thus successful intervention in urban structuring cannot be achieved without the understanding of its foundational components. This being said, the intervention towards the justifiable correction of these is largely a responsibility of urban planning. According to McDonald & McMillen(2011), this requires the unification of the three basic pillars of urban shaping: the locational decisions of households, economic activity and the firms that comprise this, and policies of governmental bodies, the cognisance of which is paramount in order to effectively plan for any desired urban form.

These morphological urban forms are however changing at an unprecedented rate as urban management struggles to contain the pressures of rampant urbanisation, real time shifting economic conditions and sectoral demands as economic globalisation pervades the very fabric of urban structure, inflated capital maintenance costs as land consumption increases and resource availability decreases, and the mounting political pressures that every section of society exerts on the planners of tomorrow’s cities.

Often in this malaise of change and regulative bureaucracy, required to manage the daily demands of the ever growing urban conurbation, spatial planning, such is the case of the

Cape Town spatial development framework, loses sight of the fundamental responsibilities which should inform these daily processes. Such guidance must be provided by a comprehensive unitary framework for the elements which construct morphological structure of a city which, through the functional relationships of these, determine the economic efficiency and sustainability of a city. Without such a framework cities and their morphological structure are powerless to the vagaries imposed by growth and competing demands for land use which without overarching rational guidance, commonly resulting in vastly inefficient urban forms.

The resultant morphological urban forms, usually the unforeseen consequence of sectoral policies implemented without spatial concerns, range from the historical monocentric city model to variations of the increasingly common polycentric arrangements and even beyond polycentric forms of dispersed activity. Within these morphological structures there are further a plethora of typical functional models which delineate the interactions of the elements of city in specific pattern. Together the morphological and functional structure city vastly influence the current efficiency and economic potential of a city and the significantly reduce the range of future urban policy options for a city due to the path dependency of urban structures which typically evolve over the long term time horizon and only in a limited number of directions (Bertaud, 2003).

Resultant of the precipice on which the city and urban planning find itself has led to recognition for the need of a greater focus and understanding of Cape Town’s structural underpinnings is recognised in the Cape Town spatial development framework, the primary spatial policy document for the city, which states, “the City must adopt an integrated approach to land use planning, economic development and transport operations. It must align public transport with a logical spatial structure, which is supportive of land use intensification and a concentration of economic and employment generating land uses” (CoCT, 2012:27).

This recognition by the City of Cape Town authorities stems from the evolution of the spatial structure of Cape Town which has resulted in several obstacles to the competitiveness of the area, and inherent inefficiencies of a “sprawling and low-density multi-nodal city characterised by strong spatial fragmentation” which is “not conducive to inter-firm networks and urbanisation economies and generates a spatial mismatch between employment and housing locations in the context of the limited transport available and the lack of information about job vacancies” (OECD, 2008:16). This urban form is further associated with greater capital costs related to amenity provisions, the extension of road, water and sewer lines, and storm water drainage systems as well as the on-going management of such systems.

1.2 The Research Question

It is these inefficiencies from which the primary research question of this dissertation stems:

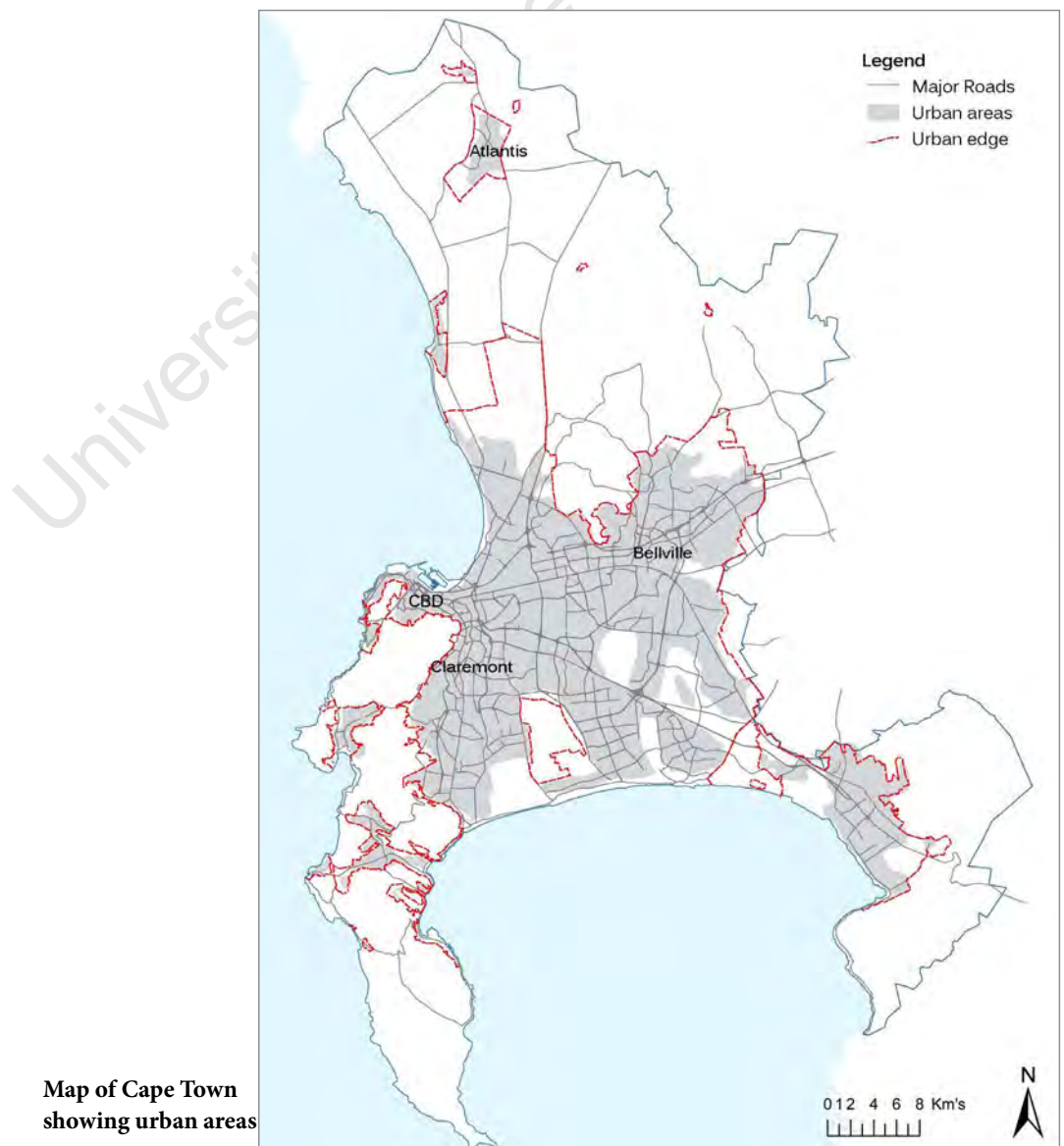
How can urban planning better promote an increasingly efficient and rational economically centred approach to the urban structure of Cape Town?

To broach this question, it must be acknowledged from the outset that there are a plethora of variables which, in aggregate, construct the urban structure of Cape Town, and there are furthermore several divisible ways in which the efficient performance of such can be gauged. Therefore in determining the criteria of efficiency, against which Cape Town can be assessed and thereby enhanced, this document uses the three primary criteria which Dewar et. al (1990) argue is the most vital, as seen below:

“In assessing the performance of any urban area, there are three criteria which, above all others are important. Their significance is heightened in developing societies, characterised as

they frequently are, by poverty, unemployment and inequality. The first is the need to maximise efficiency of resource use in the management of cities. The second is the ability of the urban system to generate economic opportunities for people. The third is the degree to which the structure and form of the city promote easy accessibility to those opportunities for its inhabitants (Dewar et. al, 1990:106).”

This framework for evaluation of city structure then raises a number of sub-questions which seek to assess how resource efficiency in management, generating economic opportunity and accessibility may be both gauged, in order to determine their performance in Cape Town, and how they may be improved upon, through spatial planning of urban morphological and functional structure. These questions are then asked throughout this document, from the viewpoint of contemporary literature on the topics (Ch. 2), to the analysis of these criteria in Cape Town (Ch. 3) and their application in the Cape Town SDF and subsequently how the answers to these questions should inform urban planning in Cape Town to increase the performance of these variables (Ch. 4), thereby answering the primary question of this dissertation.

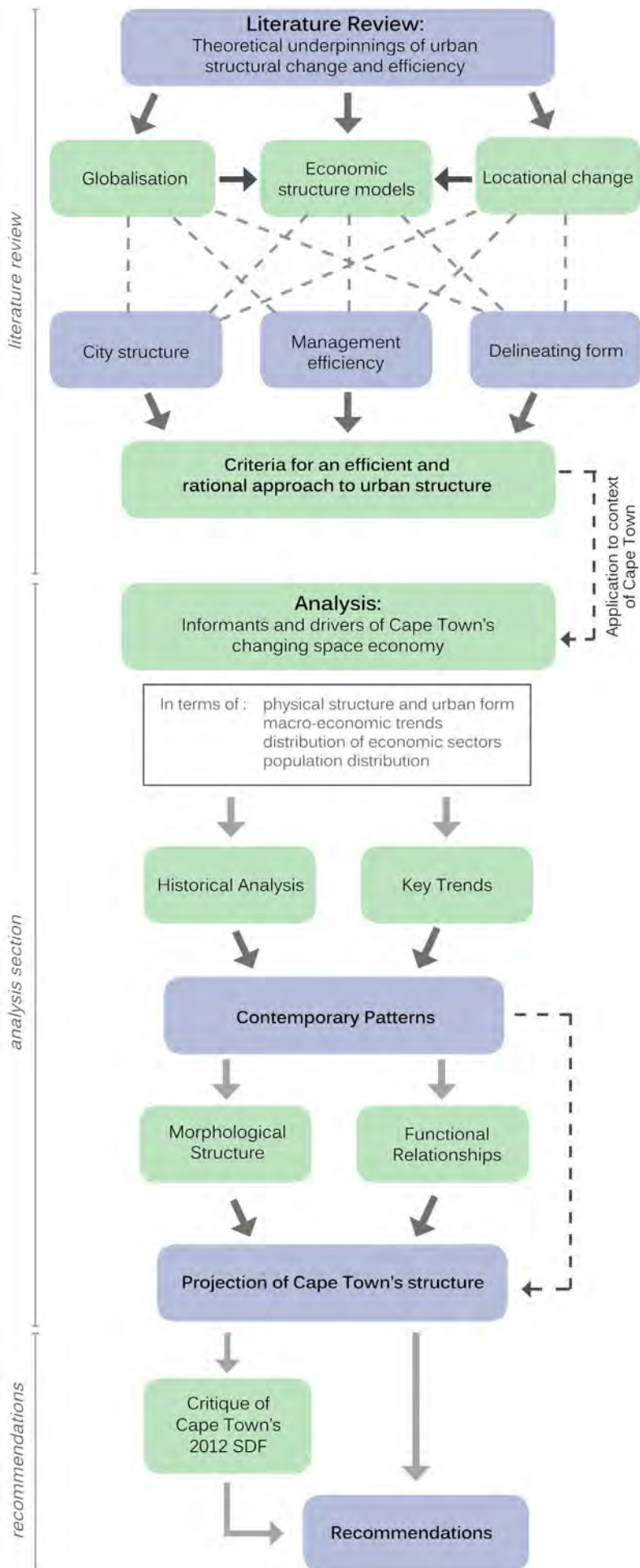


1.3 Structure of Dissertation

In order to answer the questions set out, this document is divided into three further chapters from here, which each approach a differing insights to varying questions but together in composite bring the document to a conclusion on establishing an answer to the primary question of this dissertation.

Firstly the literature review (chapter 2) will seek to investigate the theoretical motifs of structural change and the effects these have on the economic efficiency of the city. This will be engaged with through distinct drivers of change and the inherent ramifications they have on the city and its economy. The first section seeks to review the contemporary theories around the interplay of rapid economic globalisation and the engendered global economic trends of these, and then subsequently these processes will be related the forces exerted on cities through shifting economic sectoral demands of globalisation trends. The second section of chapter 2 drops down in scale to examine the hypothetical economic models of city structure which provide insight into how structure changes and what morphological forms these take. It then examines in light of these models what forces, at the metropolitan level, alter the locational demands of the space economy and residential population and consequently how these changes and the structure they construct influence economic potential and efficiency in the city. The third section of chapter 2 seeks to engage with how the theoretical economic models of city structure relate to the broad empirical evidence of changing city structures. Subsequently the chapter further offers a review of prevailing thoughts on how these empirical structure changes have influenced the financial efficiency of metropolitan management. The chapter then closes by investigating how contemporary urban geographers and economists empirically identify the various urban structures, which relates the theories substantiated in this chapter to the following chapter on metropolitan form of Cape Town.

Chapter 3 is an analysis of the shifting morphological and functional structure of Cape Town. This is accomplished in three sections beginning with a primarily qualitative historical analysis which leads up to a quantitative benchmark of structure set in 1996 which allows the subsequent sections to measure change of structure against. Subsequently the contemporary trends of structural change are analysed by examining qualitative data to gauge such changes between the benchmark, which acts a control, and the emerging contemporary form of Cape Town. Lastly the contemporary morphologi-



cal and functional structures of Cape Town are delineated and analysed in order to gauge for inefficiencies in the urban form. In the conduction of this analysis, each section is further divided by the analysis of the individual elements which construct the form of Cape Town. These are the structural form of infrastructure services, the space economy deconstructed into tertiary, industrial and retail sectors and the residential population spatial structure. Furthermore, throughout the analysis, the theoretical understanding of drivers of change, efficiency of structure and economic trends that were established in chapter 2, are related to the various elements of structure, over the chronological period of observation.

Chapter 4 addresses the question of how the contemporary spatial planning approach, manifested through the spatial development framework (SDF), is currently managing urban form and what strategies it is promoting towards a future form. This is juxtaposed against both the findings of the analysis in the previous chapter and the theoretical motifs of the literature review to gauge the current objectives and strategies. The subsequent section of chapter 4 proposes a number of recommendations for urban planning and the spatial structure of Cape Town generally and the SDF more specifically. This brings the dissertation to a conclusion and summation of the document which at the confluence of the various sections answers the question of how urban planning can better promote an increasingly efficient and rational economically centred approach to the structure of Cape Town.

Validity of Research Methods

The data employed in this section is sourced from a number of government agencies as they are generally not linked in fields under any particular study. As such the data was not uniformly presented across variables and minor manipulation in certain datasets was required to create a compatible database for modelling. Furthermore datasets are not chronologically aligned and will be indicated throughout when the data was obtained. That being said, the most recent data which was obtainable in each case has been used and serves as a proxy in certain models as a current reflection of activity. All data used was verified to as far an extent as was possible, however it is not beyond the realm of possibility that the data employed may contain some inaccuracies. Due to the scale of the research area, personal collection of data, for any of the employed variables, would not have been possible.

The construction of density distribution profile of city structure and modelling its future projections has patent limitations. This includes reflecting true reality due to limited data and computational complexity. Furthermore, within the employed framework, despite distance and density being spatial measures, it is still only a two dimensional reflection of city structure and qualitative supplementation is required to balance this. However there are inherent benefits to this form of analysis in that it is a systematic approach, where resulted can be repeated and validated and the model can be refined. This contrasts to prediction and evaluation systems based qualitative or 'soft' data.

CHAPTER 2: LITERATURE REVIEW

This literature review is an investigation of the theoretical fields which together comprise the body of knowledge on urban structuring. It systematically seeks to review the drivers of change in spatial economies of cities and understand how this impacts upon economic efficiency and growth potential as well as resource use in the management of these structures.

In the case of the former the locational choices that firms undertake and the resultant patterns of urban formation which they tend to be resultant of and in parallel, how contemporary efforts within urban planning's understanding of the urban space economy have been responding to these market forces, in order to promote economic growth and limit the externalities that these formations engender will be explored. It is possible to analyse these drivers and decisions within the entire spectrum of scale, from global trade patterns and financial flows to regional locational arrangements to the spatial configuration of these at the local metropolitan scale. However these scalar flows are interlinked with the local scale being nested within the regional and international flows. As such in order to comprehensively understand the local drivers of economic growth and location choice in Cape Town this document will forward a theoretical framework which analyses these from the shifting systems of globalisation and its ramifications on broad locational decisions down to how these are constructed at the local level with an emphasis on the form of developing cities.

Within this framework then, there are three almost distinct, although inextricably interlinked, bodies of literature which require investigation, which shall be divided into two separate sections. The first body of literature is the review of knowledge which delves in to the shifting global patterns of sectoral demand and the evidence of this at the metropolitan level. This will be a top down approach of reviewing the literature, from the drivers of economic globalisation and how these forces are shifting the structural economy of cities globally and hence the impacts this has on urban location of economic activities in this changing metropolitan economic composition.

The second body of literature is the comprehension of the major theoretical debates in locational choice for formal urban economic activity and how these drive particular urban forms and how these emergent forms effect economic efficiency and growth potential. This requires covering a vast theoretical tradition and as such selectivity in the review had to inevitably be undertaken but still represents a fair profile of the body of knowledge.

As the focus of this literature review is inevitably on the subsequent form of urban economic agglomeration and its

counterpart of dispersion, which construct the patterns of economic activity in a city, the review of locational economics is constructed around the theoretically modelling which is based on the spatial economic models that describe city structure. These range from the early models of the monocentric city structure, to the increasingly complex models which reflect the emergence of varying arrangements of multiple economic nodes in the urban space-economy and models of economic activity spatial dispersion in the uniform city.

Subsequently the literature on locational patterns and the indicative theories of urban structural change shall be related to the more qualitative versions of how cities have been changing in this regard, as well how coupled with external trends these may be changing in the future. A review of how these emerging structures have been empirically shown to alter the efficiency of resource use in the management of urban growth shall further be provided.

Lastly a review on the literature which seeks to delineate urban space economy structure in an empirical manner shall be undertaken so as to inform the following section on the analysis of Cape Town's spatial economy structure.

The review of these outlined bodies of literature seeks to explore the major debates that exist within each field and where the major shifts in theory pertaining to their subjects have occurred, so as to provide insight into the most topical issues relevant to this dissertation.

2.1 GLOBALISATION

While globalisation has been said to create the “borderless world” (Kenichi Ohmae, 1989) where state barriers to population movement, information, trade and finance have become far more permeable towards end of the 20th and beginning of the 21st centuries than ever before, the forces of globalisation have also simultaneously resulted in a shifting role of specific locality as the sites of global economic competition and capital attraction (Porter, 2000). This has become increasingly prominent as the traditional economic controls and incentives of the nation-state have become less relevant as neo-liberal policy agendas pervade the global norm. However this is an overly obtuse simplification of the factors involved within globalisation which is not a singular process but a web of multiple complex processes which interact with each other. Generally in the literature on globalisation it is acceded that broadly there are three strands of change which have embedded the continual process of globalisation, these are economic, cultural and political globalisation. Economic globalisation is the process where national economies are becoming absorbed into a single economy through the “internationalization of production and transnational capital flows” (Heywood, 2007:145), to this extent it is linked to capitalist and neo-liberal market structures where the removal of trade barriers, encouraging foreign direct investment and freeing of exchange rates promote economic globalisation (Perkins et al., 2006). Cultural Globalization on the other hand is the phenomenon increased mobility of information, commodities and communication, where exchanges can now be performed with such relative ease that it tends to “flatten out cultural differences between nations and regions” (Heywood, 2007:145). Political globalization is characterised by the increasing influence of international organisations that impose transnational influence and exercise jurisdiction in an international area which commonly affects regions across the globe (Heywood, 2007). The culmination of these forces is an intricate network of interactions through which society is increasingly morphed and determined by actions that occur elsewhere on the globe.

The interconnected nature of the global economy predicates that analysis of the local level must incur a review at the wider scale as local economies are increasingly dependent upon and effected by global economic change. This is largely a result of economic globalisation which has meant that commodities, capital, technology and other inputs of production are increasingly liquid and hence can be sourced efficiently in global markets. A broad view from one epistemological view on these trends of global economic transition is that such increased mobility of production leads to increased alternatives of production and supply as well an increasingly pluralistic global economic structure, through increased competition and hence the relative demise of entrenched spatialised monopolistic centres and the dispersion of economic of economic activity to multiple locations of specialisation (Hotz-Hart, 2000). However

despite the emergence of new economic agglomeration at the global scale competitive success in the global market has yet to become widely and evenly dispersed at all, with certain nations, regions and the cities within these containing far more competitive firms than others even relative to neighbouring locations (Porter, 2000).

Under this assertion it is argued instead that economic globalisation is an incipient long-term process which overarchingly, is tending towards increasing levels of functional integration amongst different national economies, but critically it is also inextricably anchored in a global network of global-city regions (Scott, 2000).

Global economic trends

Within the nexus of globalisation, certain economic trends tend to pervade across the globe and have large repercussions on local economies and consequently spatial impacts on urban form. The broadest stages of nation economic development have been a long recurring and widely accepted trend in global economics whereby national economies gradually shift from an agriculturally dominated economy towards an industrial production dominated economy, known as industrialisation, and then from industrial to a service sector dominated economy with the transition commonly referred to as post-industrialisation (Soubotina & Sheram, 2009). The relationship at a domestic scale between these sectors employment capacity over the long run within this framework is shown in figure 2.1.1. At this simple level of analysis the impact on city structure is self evident in that as industrialisation, and consequently decreasing share of agricultural economic activity, so urbanisation rates increase along with the migration of economic activity into the patterns of urban agglomeration. As will be seen throughout this review, the subsequent shift from industrial to a service sector based economy. These trends have been shown to be applicable to most growing economies and explained, albeit simplified, by the structural changes in domestic consumer demand and the relative labour productivity of the three main economic sectors. Within the structural metamorphosis of these economic changes however there are noticeable variances throughout history, which are determinate of the rate of change and locational specificity, which are predicated upon a number of factors, most notably technical progress. That is, when countries productive capacity progresses technically the total factor production increases in both primary and non-primary sectors, however this progress is more rapid in the latter. The result of this is that the differential, over the long run, in productivity increases and efficiency of resource use, or factors of production, accrues more positively to the more advanced sectors (Echevarria & Hajzler, 2003). This increasing differential results in comparative advantage of higher order economic sectors for more technically progressive countries, which in the long run is more competitive than relative factor endowments which has been a large contributor to the entrenched patterns of global economic inequality.

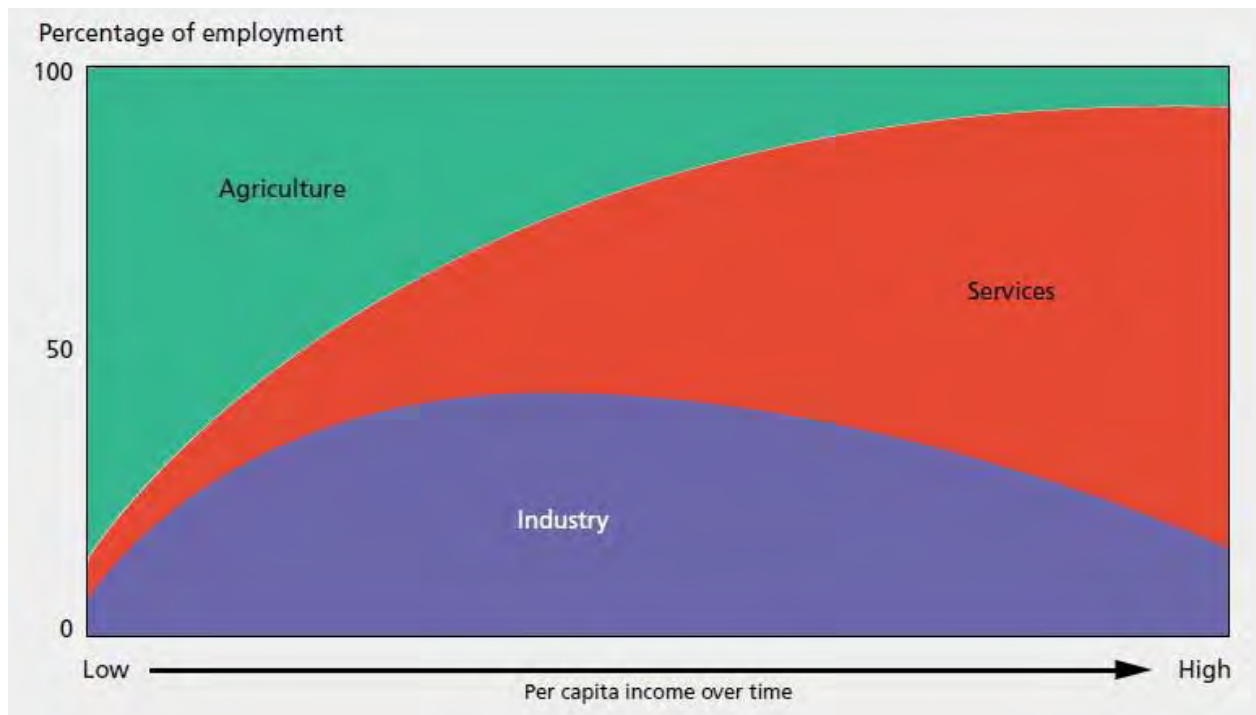


Figure 2.1.1

Despite this, within Development Economics literature there are two predominant and juxtaposed views about the wider economic impacts of these transitions. In the Neoclassical economic view it is posited that the sectoral composition is largely a relatively insignificant consequence of economic growth and on the other end development economists largely originating from the World Bank argue that such growth is in fact brought about by the changes in sectoral composition of national economies (Echevarria, 1971). This debate around economic structure and its bearing on growth is as old as modern economics itself, with the oft cited 'father of modern economics', Adam Smith, (1776) having argued two and half centuries ago that structural features were strongly related to the level of economic development while, his temporal and equivalent, Ricardo (1817) argued that the changing composition of the productive system was a requisite for economic growth (Soubbotina & Sheram, 2009).

This debate around the direction of causality between economic sectoral composition change and economic growth is significant as at the national, regional and local scales public policy makers continually strive to promote certain types of economic activities within their relevant jurisdictions by employing a wide array of tools, from marketing to economic incentives. Yet although the direction of causation may not be entirely established, evidence shows that even if sectoral change may not drive growth, specific sectoral composition can through the establishment of scale of economies which contribute to competitive advantage at all scales of production and economic production, hence leading to economic gain.

The rate of change in technical progression therefore has large impacts upon global sectoral change and in the last few decades

the rate has been monumental as the figurative economic epoch of globalisation took root. Such of the most notable contemporary trends is the worldwide decline in the manufacturing sector especially in terms of employment figures. Between 1995 and 2005 it is estimated that global manufacturing employment declined by over 12 percent, with the shift being evident in both developing and developed countries (Kim & Short, 2008:38). Table 2.1.2 shows this global decline as well as demonstrating the changing distributions of sectoral output between 'developed' and 'developing' economies. Despite there being a global downturn in manufacturing employment, the industrialized cities of the Global North have been most dramatically affected as manufacturing firms seek relatively cheaper labour with lower barriers to entry in developing countries. Simultaneously with this decline in global manufacturing urban centres, particularly of newly industrialized nations, have seen a strong tendency of economic growth in the service sector. These are not entirely new trends with the emergence largely being driven through economic globalisation in trade liberalisation, increasing industrial automation and vast improvements in communications technology over the last few decades.

Changing Capital Flows

This 'evolution' of economic activity has historically entrenched the dominance of specific local economies through the race for scales of economy and thereby comparative advantage in those industries which are not geographically resource dependant. However these same trends, accompanied by the changing structural economic paradigm, brought through the momentum of globalisation, have in recent decades driven the unparalleled growth of a number of previously languishing

Group	1960-1972	1973-1985	1986-2008
<i>World</i>			
Agriculture	5.67	4.41	3.93
Industry	32.98	31.86	29.45
Services	61.39	63.73	66.63
<i>Advanced Economies</i>			
Agriculture	3.50	2.43	1.90
Industry	33.60	32.11	28.11
Services	62.90	65.46	66.63
<i>Emerging Market Economies</i>			
Agriculture	21.59	15.72	11.78
Industry	27.93	29.74	34.19
Services	50.48	54.54	54.03
<i>Other developing economies</i>			
Agriculture	28.96	20.97	19.93
Industry	29.91	33.90	32.12
Services	44.61	45.13	48.47

Source: Brookings Institution, *Emerging Markets*, p. 37.

Table 2.1.2

economies, most notably the emergence of the East Asian manufacturing powerhouse economies. This rapid growth has been fuelled by the swift structural transformation of these economies into the industrial centre of the globe, permitted by the mobility of production through financial fluidity, decreased trade barriers and relatively lower transportation costs (Memedovic & Lapadre, 2010). This shift is furthermore evidenced in the surge of foreign direct investment (FDI) across the globe from multinational corporations (MNC's) originating from the historic economic hegemony. These flows of FDI have grown far faster than either trade or income globally over the last 20 years, indicating the changing trends of investment and growth (Shatz & Venable, 2000). And just as these countries economic performance improves so the urban centres have begun to evidence growth as regional finance centres and a growing provision of tertiary service sector activities, which will drive the continuum of the economic cycle as these activities surpass those of industrial production for total factor production efficiency over the long run.

Although the quantifiable facts are undeniable, FDI is increasing and so is the dispersion of economic growth, there is in fact deep disagreement on the transformative influence globalisation is having on the geography of the world economy (Dicken, 2000). One the on hand there is the view that the global economy is trending towards the 'borderless world'

of Ohmae(1989) where advancements, particularly technological have promoted the liberalisation of capital and trade which has reduced the traditional necessities of location. On the opposite end of the spectrum, however contemporary economic geographers contest this view of the de-territorialisation of the global space economy. It is argued instead that place and geography are still fundamentally shaping the ways in which firms are produced and how they behave (Dicken, 2000). In this regard the empirical evidence has suggested that the organisational structure of transnational corporations are predominantly still embedded in the context of their origins, thereby showing that capital has not become truly fluid and to an extent the entrenched global patterns of economic activity are still relatively constrained (Dicken, 2000).

Despite this empirical evidence of foreign direct investment stream surges have resulted in a marked change in global public institutions economic behaviour. The source of FDI as a means of economic growth, whether or not full global capital mobility exists, has driven unprecedented levels, in the last three decades, of competitive bidding by states and between the cities within them, for the limited share of internationally mobile capital. Most states offer fiscal incentives for inward investment however cities tend to incorporate promoting 'product variation' for capital attraction by constructing a marketing platform of the strategic nature of the regions particular location, the relative

attractiveness of the local business environment, the quality of labour, transport networks and so on. In this regard economic efficiency of a city, and strong economic identities that are related to these, can arguably be a platform for increasing marginal competitiveness in the global investment market. Conversely levels of FDI and the sectors in which these promote potentially may alter the space economy of a city. In this regard it is commonly argued that national economies have become networks of metropolitan economies that act on the global stage and that these must be leveraged to attain metropolitan and thereby national economic growth. It further means that cities and their respective local authorities must independently from the state foster an environment conducive to investment attraction. However differing cities, have varying potential contributions or niche sectors in which they may gain comparative advantage, for example the differences between New York as a global financial hub or Shenzhen as one of the outsourced manufacturing bases of the global economy.

Placing the City in the Global Economy

This requires the understanding of what particular metropolitan nodes represent in the global economy and how this contributes to a particular cities economic structure as well as its future prospects. Quite simply, cities and their economies are attributed particular functions and roles in the global economy nexus, depending on how effectively it positions itself within this nexus. The classification of cities in this regard, within the global hierarchy, have been promoted by a number of different frameworks notably by Friedman (1986). Although these frameworks may emphasise different characteristics to explain the global urban hierarchy, they all attempt to reflect on what level a city exerts its presence in the global system, from economic gravitas to political power. Along with these theoretical debates a large number of quantifiable ranking systems to determine hierarchy of metropolitans in the globalised complex have been developed. In general however they will all show a similar trend of so called 'global-cities' at the top of the rankings which include the financial and political capitals of the world such as New York, London, Shanghai and others. On the other end of the scale will be the cities which are not even amongst the primary nodes for their region, or display low levels of economic power. Inevitably South Africas major metropolitan areas, Johannesburg, Cape Town and Durban tend to lie in the mid-range of these scales, with Johannesburg on occasion being considered top tier due to its place as the financial capital of Africa. Cape Town is in the view of this paper, at least in terms of economic functionality best represented by the Globalisation and World Cities Research (GaWC) which places the metropolitan as a Beta structure in the global economy as it is a "city which links moderate economic regions into the world economy" (GaWC, 2012). This places it amongst a list of secondary economies belonging

to nations of rather formidable economic presence. Although being of secondary status its role as a gateway to a moderate economic region has an impact on its sectoral distribution of economic activity, which invariably effects city structure.

Economic Opportunities for the City in Globalisation

Regardless of a cities particular structural economic flaws and poor international competitiveness, these geostrategic changes, discussed above, have been perceived as a singular historic opportunity to reposition cities within this global nexus. This is largely due to that in the current phase of globalisation, changes in technology and policy are leading to vertical disintegration of production in many industries and the structural change in the globalising economy is increasingly related to functional and spatial fragmentation of production and consumption and their reintegration through trade (Memedevich & Lapadre, 2010). This means that consequently, trade in intermediate goods has grown faster than that in final goods which opens up new niche markets for cities to capitalise on if they can gain a comparative advantage. This however requires the cooperation of local actors and institutions in mediating, contesting and shaping the particular products of economic changes in particular sites (Sorensen, 2003). Furthermore as the patterns of horizontal specialisation in final goods are supplanted by patterns of vertical specialisation, 'kaleidoscopic' comparative advantages come to the fore, which have become more penetrable and volatile (Memedevich & Lapadre, 2010).

In this sense the speeding up of natural economic progression as discussed before where developed countries become increasingly tertiary based economies, so developing countries are offered a new gap in the market, where metropolitan cities are the basing points for these inroads. With this shifting pattern of economic growth changes in the space economy of cities in a number of ways but at the level of interplay between globalisation, national economies and the cities the most notable trend is that as economies grow from low to high income, production becomes more concentrated spatially (WDR, 2009). This makes cities, especially in developing countries, like South Africa, the crucial catalysts and incubators for economic growth.

2.2 LOCATIONAL ECONOMICS AND CITY STRUCTURE IN HYPOTHETICAL ECONOMIC MODELLING

This section aims to review the body of economics literature on locational patterns of economic activity and the effects these have on the morphological structure of the space economy. Within this it aims to understand what the driving forces behind locational change are in order to better understand the intricacies of urban space economy change and the inherent efficiencies and conversely inefficiencies inherent to these structures.

The tradition of locational economics, which may be simply understood as the study of what goods or services are produced, by which firms, in what locations and why they display this behaviour is a school of study which has long existed as a subsidiary subject of Economics. Although previous work had been accomplished the man credited with the initial establishment of classical locational theory, the locational theorist equivalent of Adam Smith, was Von Thunen whom published "The Isolated State" in 1826 which is consensually accredited for developing the first credible theory of spatial economics and Economic geography and was to become the basis of classical locational theory. Since the early conceptual foundations offered by Von Thunen, locational theory has progressed through a plethora of theoretical approaches and philosophies of thought, which have provided numerous insights into spatial economics of firms, a vast field which cannot be exhaustively explored in the confines of this dissertation. Instead this chapter will seek to extrapolate the major advances in the field and offer a critique of their application to spatial planning.

Location theory seeks to explain the distribution of activities in space, the aim being to identify the factors that influence the location of individual activities, the allocation of different portions of territory among different types of production, the dividing of a spatial market among producers, and the functional distribution of activities in space. These various phenomena are analyzed by removing any geographical feature that might explain the territorial concentration of activities, so that location choices are interpreted by considering only the great economic forces that drive location processes: transportation costs, which diffuse activities in space, and agglomeration economies, which instead cause activities to concentrate. By balancing these two opposing forces, these models are able to account for the existence of agglomerations of economic activities even on the hypothesis of perfectly uniform space (Capello, 2011).

A number of academics offer exhaustive reviews on this expansive field of research, with as many frameworks for classi-

fication of the varying interrogative endeavours into locational economics, however the independent view of this document is that in the field of locational theory there are three general questions which theorists attempt to address all of which are relevant to this research. The first question is framed at the microeconomic level of the firm and seeks to understand the trade-offs that the rational actor firm face in location choice and how the weighting of these factors influence where such a firm, depending on its *modus operandi* will locate. The second field of interrogation which the science seeks to query is at the broader macro-urban scale in order to understand the spatial patterns which emerge from the aggregate locational choices of firms in the city. The third avenue of investigation is at the meso-scale, in that it seeks to explain the centrifugal and centripetal economic forces which drive economic dispersion or agglomeration respectively in the urban setting by analysing the market forces of positive and negative externalities resulting from proximity of establishment, thereby having a feedback loop relationship with both the firms locational decisions and the emerging patterns of economic activity in the city. Collectively these three lines of investigation, as will be shown, provide insights into the reasons why economic activity in the intra-urban setting have typically arranged in fundamentally similar ways globally, the forces which have been and continue to drive change in these formations as well as suggesting what intervention in these patterns should address in terms of economic efficiency.

Von Thunen

Von Thunen (1826) as previously mentioned laid the ground work for ensuing theories in locational structure. Therefore, despite its simplicity and age it still holds relevance to the modern interpretations of how economic forces compete to form the landscape of the space economy.

His model of land use proposed that a spatial distribution of alternative agricultural activities can be determined by accounting for transport costs to the city centre, which were assumed to be a linear translation of distance, and land costs in terms of locational rent and profit. What he put forward was that the gain from producing on equal potential land decreases as the distance from the city centre, being the marketplace, increases. This resulted in the illustration that farmers had to find equilibrium between land cost, transportation costs and profit to maximise economic potential. The result was the emerging pattern of concentric rings expanding outwards from the city centre which delineated land value in terms of transportation costs and hence demand levels for land and therefore the rent price.

Despite the severe simplification of this model, the incorporation of transportation costs being introduced to microeconomic models was revolutionary. Perhaps the greatest insight of the time was the influence that land rent would tend to increase as one located closer to the city centre, which would

be determinate of the activity which took place which will theoretically result a defined spatial distribution of alternative production activities.

It also formalised the economic principle that higher market prices for a good will allow for higher rental payments, which consequently encourage larger areas of land to come under cultivation, thereby producing larger output quantities (McCann & Sheppard 2003:651). This same principle would eventually be applied to the model of the monocentric city, the base model for most contemporary urban economic theories and through simple analogy explains the distribution of modern sectoral land consumption patterns in cities according to their productive capacity per unit area.



Weber

Subsequent to Von Thunen's submission, most historical perspectives tend to skip a hundred years, or at least brush over, till the mid-20th century where a fresh wave of developments in locational theory reinvigorated the science, generally beginning with Alfred Weber. What Von Thunen did for agricultural spatial distribution Alfred Weber proposed in terms of the more complex industrial sector location. His work on what is termed the least cost model is different from Von Thunen's isolated state, as the name suggests, because it was based on industrial firms seeking to minimise costs as opposed to maximising profit. The logic behind the least cost model was that industry would be located where its costs would be lowest in terms of four factors namely, raw materials, transportation, labour and agglomeration economies of scale (Weber, 1929). Despite the inclusion of these factors the model was predominated by the reduction of transport costs as the determinant of location but it was far more technical than previous attempts as it also took into account the difference between raw material transport to the factory and transport costs of final products to the market (McCann & Sheppard, 2003).

Weber proposed that industry could be separated into what he termed weight gaining, which are market oriented industry, and weight loss industries which are raw material oriented. The assertion meant that, based on his modelling, producers would be differentiated on optimal location depending on if they were

relatively more raw material dependant or market dependant, with location occurring relatively closer to their respective critical dependency. Examples of weight gaining industries such as textiles, baking or tech-assembly would seek to locate nearer to urban markets and weight losing industries such as paper industries or mining reciprocity industry would locate nearer to the source of raw material.

This theoretical assumption provides one of the earliest rationales around why, in modern metropolitan areas cities witness dispersion of economic activity from the historical cores of economic activity, firstly in order to locate near either the market, which would be the residential populace and secondly to minimise costs by seeking lower rent land on the urban periphery which was supported by Von Thunen's work. It also shows that transport costs play a large role in where economic activity is situated in that lower aggregate unit costs for transport will mean that firms will be less incentivised to locate near either the raw materials of production or the market, thereby substituting capital in the form of equal transport costs for cheaper land that is further from these high demand locations.

Further work by Weber introduced the idea of labour costs and agglomeration economies causing distortion in the model, meaning that an industry could be persuaded to adjust its optimal location choice if a point of lower labour costs could offset transport costs ultimately increasing total profit (Healey & Ilbery, 1991). Likewise Weber noticed that industrial firms tend to locate agglomerate and that at sufficient levels of agglomeration the unit price for production would decrease for all firms. Therefore he postured that agglomeration economies were another factor which weighed on the decision process of the firm for optimum location and the reduction in production through agglomeration economies can outweigh relatively higher labour and transport.

These revelations at the time began then to indicate the tensions that exist between the advantages of agglomerative economic locational patterns through scales of economy and the division of labour against the dispersive factors of the negative externalities created by such patterns. It further represented the idea that the integration of labour of the space economy was a critical contributor towards spatial economic efficiency.

Walter Isard and the General Theory of Rent

Von Thunen's idea of alternative agricultural activity production activities was adapted and added to by much of Isard's (1956) work on pioneering the field of regional development and search for a general theory on location and the space economy (Isard, 1956). He proposed the theory of rent, which had been explicitly formulated only for agriculture, and was extended to the urban case.

Earlier studies usually assumed, by simple analogy to agricultural rent theory, that rents and transport costs were complements, whereas he made it increasingly clear that the relationship was more complex, involving variations in size of site, tastes, income, profits, and other costs.

This realisation influenced the understanding of location and density of residences and firms, and the equilibrium structure of land values and land uses in urban areas greatly, even if just to show that the interrelationships of these variables were far more complex than previously assumed (Clark, 2000).

Bid-Rent Function and the Monocentric City Model

Nearly a century and a half subsequent to the Von Thünen concentric model, Alonso took this concept as well as the principles of Weber and applied it to the intra-urban sphere, which inevitably would lead to a new offshoot of locational theory and economics, namely the school of 'urban economics'. The result of this was the development of the bid-rent function and the establishment of the monocentric city model (Alonso, 1964), which even now is the standard urban spatial model in urban economics (McDonald & McMillen, 2011). The bid-rent function, which would predicate the assumptions of the monocentric city, was extended on the von Thünen model to urban land uses but required out of necessity, considerable modification to apply to residential, commercial and industrial land uses. Although this model was quickly enhanced by Muth (1969) and Mills (1972) which was to become the Muth-Mills model and came to incorporate production, transportation and housing into the model, it was not until Fujita (1989) that these functions were fully unified into a single framework. Although each of these made a substantial contribution to the model individually, it shall be considered as one framework in this section for the sake of relative simplicity.

The bid-rent function by Alonso describes, through quantitative modelling, as the name eludes the relationship between rent price and distance from the CBD. Through this relationship it describes the varying prices which a firm would willing to pay for land rent at differing distances from the CBD in order to achieve a requisite level of profit. As with Von Thünen's model the distance from the core, in his model represented by the city and in Alonso's the CBD, dictates the hypothetical rent price, where residential preference drives up the demand for locations nearest the CBD. The bid price is said to be hypothetical as it does not reflect actual monetary value but rather that, "if the price of land were such, the individual would be satisfied to a given degree" (Alonso, 1964:59). The demand for proximity to the CBD is driven by both access to the market or export hubs for produce and given that labour costs, as well as capital are unchanged by location then transportation costs become the variable in production and profit. The bid-rent function then directly shows the "maximum amount of land that a firm

can pay and still have a given level of profit" (McDonald & McMillen, 2011:86).

Although this is the simple rationale of the bid-rent function, which is economically intuitive as the firm seeks to minimise its profits under assumptions of fixed costs besides transport, however to a large extent the ramifications of this are far more apparent when the bid-rent function is adjusted to accommodate substitution in production. The addition of production substitution creates a more realistic model as previously it was assumed that a firm would produce the same output regardless of location given the same unit area of land for production, although the firm would face differential rent prices. What substitution does is allow the cognisance of the firm's ability to alter the level of inputs which can substitute for land and result in the same level of output. This realisation creates the platform for incorporation of the fact that a firm may increase labour and capital to replace land and vice versa, which is the process in urban areas that accounts for increasing heights of buildings to maximise the capacity of available land. Under the substitution function, firms which face relatively higher land rent costs would therefore increasingly substitute land for other inputs to achieve a desired output resulting in a higher output to unit of land where land rent is higher, hence the CBD typically being the area of highest buildings in an urban conurbation (McDonald & McMillen, 2011).

This enhanced relationship of the linear bid-rent function has the impact that the bid-rent function becomes a curve as the combination of capital and land become interchangeable to achieve the same level of profit. This relationship and by proxy the curve becomes steeper as a firm is increasingly able to substitute capital for land.

Another important aspect of this modification is the revelation that as land rent rises closer to the market gateway (CBD or transport hub) firms are incentivised to substitute away from land and towards capital and towards capital while conversely as land rent falls accordingly with distance from the centre firms increasingly substitute toward land and away from capital. This inevitably results in the typical pattern of dense CBD's in the centre of cities and the low density urban sprawl that characterises urban edges. As with most static equilibrium functions of supply and demand in economics the bid rent function can be shifted by a number of factors, the most significant of which is transport costs. It is argued that as transport costs decreases the bid rent function becomes 'flatter' (McDonald & McMillen, 2011). This means that firms across the board become increasingly indifferent to their location in the city as a direct consequence of reduced transportation costs.

The final caveat of the bid-rent function and its application in urban economics is its ability to model the bid-rent curve for differing sectors in the cities, which all display heterogeneous land demands. Although this could be applied to a variance of subsectors in the city, this paper will just briefly explore the

three major non-residential bid-rent functions in the urban sphere, this model is commonly referred to as the three sector model of the land market. The variance across sectors in their bid-rent function can be explained by the particular needs of such sectors and what is profitable in production. The tertiary service sector typically has the highest bid-rent for central locations in the CBD and relatively low bid-rent for land located outside the CBD. This can largely be attributed to need for personal contact with suppliers, customers, government agencies and others which are easily accessible in a central location as well as having the highest profit productivity per unit area of the three sectors. The secondary manufacturing sector tends to have a wider array of bid-rents within the sector as certain small scale production can locate in the CBD and benefits from the agglomerative externalities that are present, an example of this could be high end clothing production which requires direct access to customers.

On the other hand a number of manufacturers seek to locate in the central business district but cannot compete with their bid-rent and therefore locate on the fringe of the CBD. Other types of light industry have little requirement for direct access to the CBD and therefore bid in industrial areas located out of the CBD around urban areas. Rather proximity to appropriate transport or labour force may take preference for these manufacturers. Finally heavy industry typically is more preferential to transport requirements than central location, requiring appropriate water, rail or highway which can service heavy-duty transportation needs. The result of this variation in the bid-rent of manufacturing is a function which is flatter than that of the tertiary sector and covers a wider range of location in the urban realm preferentially but locates only where its bids can compete. The final sector in this model is that of residential, which covers the entire spectrum of the urban model as preference vary so widely however it is assumed that both secondary and tertiary non-residential sectors have a higher bid-rent to locate relatively more centrally so although preference may be wide ranging residential development tends to be located on the fringe of the city where its bid may compete. The edge of the city is considered to be where agriculture outbids residential demand. Figure 2.2.2 displays the relationship between these sectors, indicating their particular bid-rent function and how they overlap for location but differ on bid offered resulting in the distribution of land use in the model.

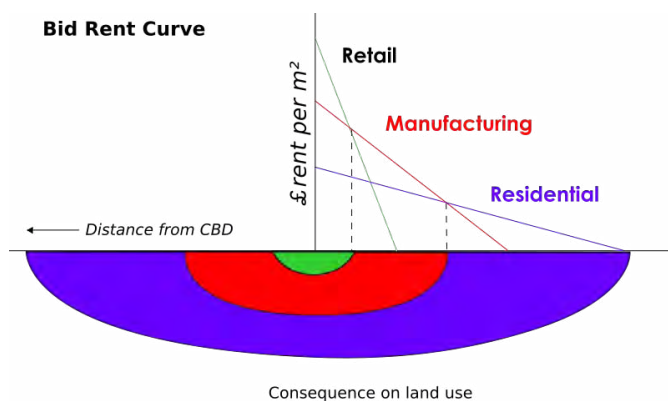


Figure 2.2.2 Three sector land-use model in Monocentric City

The bid-rent function and the three sector land use model was then applied by Alonso as the founding theoretical function of the monocentric city model. In this model of the urban city region proposes a structure where the Central Business District (CBD) is located centrally in a city that revolves around it. All employment is assumed to be located in the CBD and the surrounds are purely residential, with the city ending where agriculture out bids residential for land allocation. As with the three sector model land rent tends to decline monotonically with distance from the city centre however it further predicts that housing rent, household density, and housing density all decline monotonically with distance from the CBD. A rise in income or a fall in marginal transport cost causes the household and housing density functions to flatten, whereas a rise in agricultural rent or in population causes them to steepen (Anas et al, 1997). In this model all land-use decisions are based entirely on trade-offs between demand for space and recognition of commuting costs by residential private interest and the need for commuting is exogenous in the model, so no agglomerative effects are present (Anas et al, 1997). These agglomerative effects are to a large extent what further research in field would cover as shall be shown. Although the model is largely an analysis of urban residential economic choices and their impact on spatial structure, which is not the foci of this review the model according to McDonald & McMillen (2011:103) is “still the most important model in urban economics”, even despite its limitations of broad assumptions and zero externalities. Besides being a building block for future urban economic models it is argued that the model is effective for the explanatory concept of the broad population decentralization trend which has been a recurring feature of most cities globally (Mills & Tan, 1980).

The Polycentric Urban Form

The simplicity and functionality of the monocentric city model has over time been eroded as the weakness of relying on a model which did not reflect the empirical realities of pervading city structures were realised. This can be seen by the lagging chronological induction of the various divergent models from the monocentric city to the arguments of empirically substantiated observations of changing city employment to increasingly dispersed locations (Clark, 2000). Beyond the imitative quality of the models the monocentric model was increasingly criticized for failing to explain endogenous growth of job centres in a city. The realisation that, even in a monocentrically oriented urban space economy, agglomeration is not exogenous but depends on other determinants of urban form, which demanded increasingly complex economic modelling approaches to explain the economic fabric of cities (Anas et al, 1997).

So the induction of the polycentric urban structure model came about in a number of varying approaches. However whereas the monocentric model was continually enhanced through modelling improvements, it was always based upon the original models of Alonso(1964) and Ruth-Mills(1969; 1972), contrarily the polycentric model, although conceptu-

ally based on a common loose structural arrangement, sought more to explain the forces of dispersion and agglomeration which drive the polycentric model. Before these forces and the theories belying them are covered it is critical to first explain the base model of polycentricism in a form comparable to the monocentric model.

Structuring of the Simple Polycentric City Model

The simplest way to explain the changing function is through the adaptation of the three-sector monocentric model to that of a polycentric city under the application of Alonso's (1964) bid-rent function. As cities grew larger, and so the curve of the bid-rent function flatter, coupled with technological advances, increasing dispersive forces began to drive economic activity out of the historical monocentrically oriented CBD.

What subsequently occurs is the spatial competition, not unlike in the monocentric model, for market sites of strategic accessibility in the suburban nodes. This in turn drives up the bid rent gradient to form peaks in the bid-rent function. This can be seen in the top level of figure 2.4.6. These peaks in the bid rent function, as with the three sector land use model discussed above, form discernible patterns of land use where commercial service

sectors tend to outbid that of manufacturing, and residential land use has the lowest general bid-rent thereby occurring only where the distance to the sub centre for housing outweighs the distance from its centre for manufacturing. These peaks in the bid-rent function gradient represent what are commonly known as economic or employment sub-centres within the metropolitan region. Once again, as with the monocentric city model, a heightened bid-rent gradient can be equated to higher land-use intensity, or in the case of residential usage population density. The latter can be seen in the subsequent effects of bid-rent gradients in figure 2.4.6. As with the monocentric city, population density and land use intensity decreases as distance from the centre increases, however in the polycentric model the emergence of peaks in density occur instead of an inverse linear relationship. When the bid-rent function is delineated into a simple three sector land use model a similar pattern, to that of the monocentric CBD, emerges at the economic sub-centres within the model. However whereas in the monocentric model these are central and surrounded by a residential ring, in the polycentric model the economic sub-centres are likened to islands in a sea residential land use. To reiterate these models are hypothetical and would occur in this form only within a perfect spatial market with zero distortions, whether through land-use zoning, transaction costs, geography or others, a characteristic which no city in the globe has.

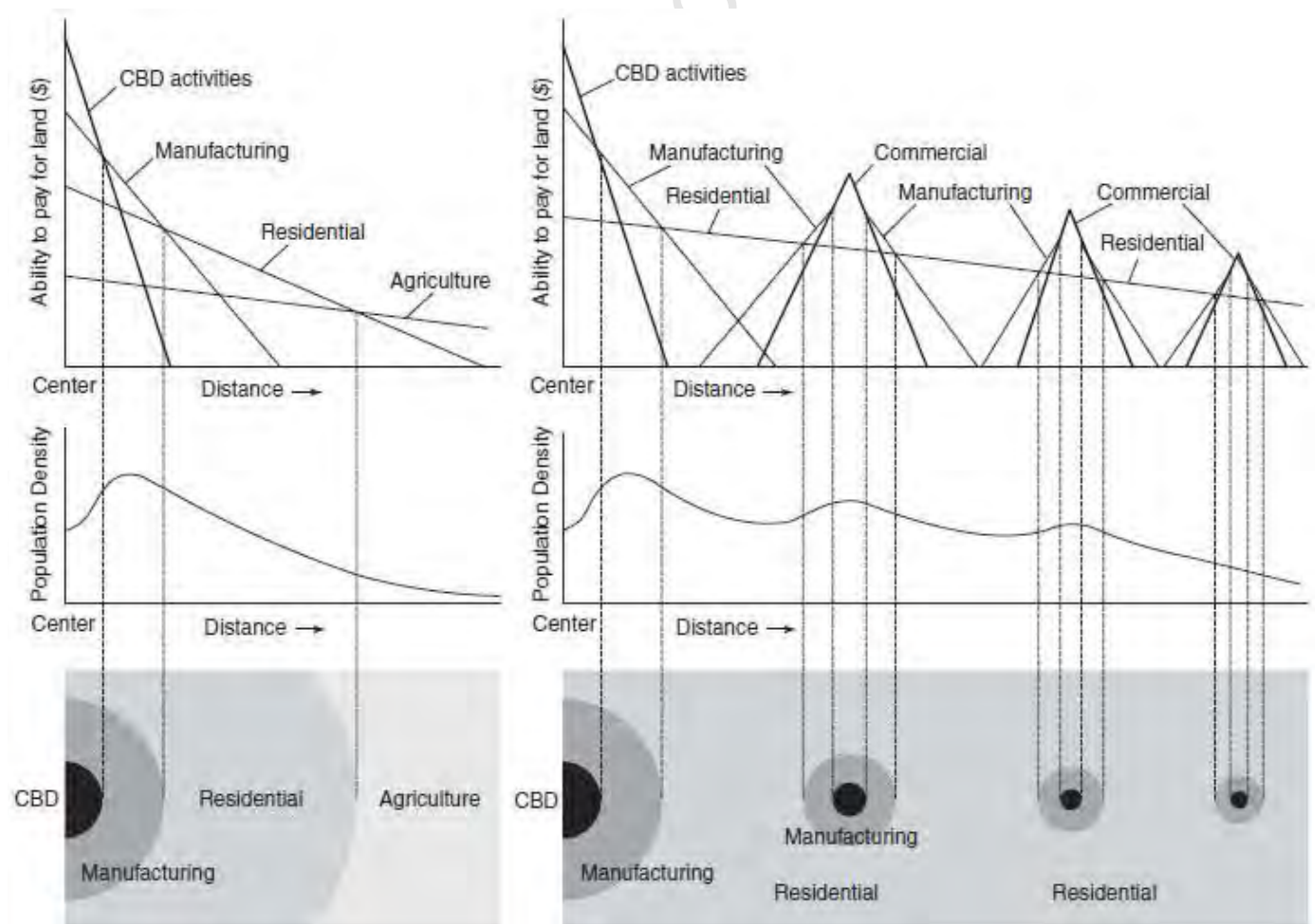


Figure 2.2.3 Comparison of Hypothetical Monocentric and Polycentric Urban Structures (Clark, 2000:144)

The emergence of the polycentric city model in reality is ultimately due to the tensions between agglomerative and dispersive forces in the space economy. Whereas in the monocentric model the agglomerative forces clearly outweigh the dispersive forces resulting in a singular agglomerative pattern which is defined by sectors solely due to differing bid rent functions. However in a polycentric spatial distribution dispersive forces have out balanced the benefits agglomerative as negative externalities arise due to unmitigated high negative externalities of density. This can result in a wide array of differing morphological polycentric structures of a city, with ranging levels of economic activity concentration depending on the trade-offs between centripetal and centrifugal forces of location. There is even a point where dispersive forces pervade the city to such an extent that the morphological structure of the space economy is considered beyond polycentric as the aggregate deconcentration of economic activity reflects very little in terms of density pockets to define a node.

However given that it has been substantiated that there are very large intrinsic benefits to agglomerative patterns of economic activity and high level economic density the most important note to make about the polycentric city is a decline in absolute economic efficiency due to decrease in such endogenous benefits.

Therefore the most critical understanding necessary for urban planning in spatial structuring of the city is to understand the forces that drive economic activity agglomeration and conversely those that disincentivise such patterns of location and ultimately what decide the morphological structure of the space economy within a city.

Many of the agglomerative and dispersive forces economic activity have already been comprehensively covered by the works of Von Thunen to Alonso, however there are several, more contemporary, additions to the understanding of these that validate review and help explain the emergence of the polycentric city.

Anas & Kim(1996) argue that a polycentric model of agglomeration can be based on the assumption that production and residential uses can occur everywhere in an initially featureless space but become interdependent by the consumption- related travel decisions of consumers and the interindustry linkages among firms. Consumers value access not only to jobs but also to shopping centres and producers value access to other producers, to labour, and to customers. The location of production and, hence, of jobs is endogenous as is the location of residences and, hence, of labour.

It has also been shown that to economize on the costs of delivering to customers, firms and their labourer's agglomerate together to form economic centres. How many such centres emerge is determined by the level of unit transport costs as per the original works of Von Thunen and Weber, which leads

to the supposition that under higher transport costs, there are more centres, and under lower transport costs, there is just one center (Anas et al, 1996).

Core-Periphery Model

Just as urban economics employs the monocentric city model as its base for theoretical analysis so new economic geography has come to depend on the theoretical underpinnings of the core periphery and periphery model as envisioned by Krugman (1991). What this model essentially seeks to explain is how the interaction between increasing returns and transport costs might lead to the emergence of a particular geographic structure of production (Krugman, 2004). This model is largely an adaptation of the home-market effect (Pred, 1966; Krugman, 1980) which argues that where a larger market exists (under the assumption of only two markets) and the production of some goods are subject to increasing returns to scale it would be most efficient to concentrate the production of these goods in only one market due to returns to scale, and due to transport costs it would be most efficient to produce these in the economy of the larger market (as supplying would require lower transport costs) and export to the smaller market. If the model then factors in mobile labour it is shown that labour is likely to move from the smaller market to the larger due to employment incentives, and this will also increase size of the larger market both in relative and absolute terms. This means that growth would be self-reinforcing and the result is that a small asymmetry between locations can create a wide gulf in development. At the same time however if not all resources are mobile it would then make sense to disperse production and thus the interaction of centripetal and centrifugal forces of the spatial economy compete to determine optimum location and growth.

The model further suggests three basic principles of location and the growth (Krugman, 2004). The first is that the backward linkages required to create the home market effect, which are the incentives for firms to locate in the larger market, must be supplemented by the forward linkages of workers being incentivised to locate near the producers of consumer goods which will drive agglomeration patterns. The second principle is that agglomeration will not automatically always occur and is instead dependant on the forces of forward and backward linkages being necessarily stronger than the centrifugal force of immobile primary resources as well the counterbalance effects such as changes in transportation costs, economies of scale, and the value of those resources which are mobile. Finally it is shown through the model that there are differing conditions under which a core periphery can arise, where a balance of industry in two regions is sustainable, and those under which it must arise, where one market will rise to dominance over the periphery (Krugman, 2004).

Although this model is directed towards explaining the comparative growth of regions, its principles, as they are based

on micro decisions can intuitively be applied to two competing cities in a country or even two nodes in a metropolitan area (Anas et al, 1997).

Producers of final goods have an incentive to locate where they have the largest market, which is where the downstream industry is and producers of final products have an incentive to locate where their suppliers are, which is where the upstream industry is located- vertical structure of production.

Fujita (1993), commonly considered alongside Krugman as the other co-contributor to the founding of the new economic geography movement, offers a somewhat different approach to the modelling of analysis of the problems posed in this branch of spatial theory. This approach is initially based on the von Thünen isolated state model however whereas the model was originally assumed to exist qualitatively Fujita(1993) assigned it an equilibrium function to explain the backwards and forwards linkages of the spatial economy which support the existence of the central city. Within this framework it induced that if the population of this central city increased to such an extent that the hinterland becomes sufficiently distant from the city centre that it would begin to make economic sense for some manufacturing to establish a secondary node or city centre on the periphery around which a new urban population will begin to establish and that process is continual resulting in urban conurbations and new cities (Krugman, 2004).

Knowledge Spill Over and Innovation

A number of theories have also highlighted the inherent advantages to co-locative high density economic clustering through the endogenous sharing of information and heightened competition on driving innovation and thereby economic growth. However within the debate on innovation through spill over effects different theorists have advocated either industry localisation (Marshall, 1890), specific manufacturing specialisation (Porter, 1990) and a mixture of industries (Jacobs, 1970) as the defining variable for this engine of growth.

Despite all of these arguments long holding credit, a seminal empirical evaluation by Glaeser et al (1992), revealed that important knowledge spillovers might occur between rather than within industries, consistent with the theories of Jacobs. It further indicated that in a cross section of city-industries, industries grow slower in cities in which they are more heavily overrepresented and furthermore that industries grow faster in cities in which firms in those industries are smaller than the national average size of firms in that industry.

2.3 PHYSICAL CITY STRUCTURE

The relevance of the changes in locational theoretical foci in terms of city structure, from that of the monocentric to increasingly complex polycentric and dispersive models is reflected and explained by a qualitative analysis of contemporary city structure trends that pervade the metropolitan areas of the globe. Although the economic models reviewed in the previous section are relatable to the evolutionary structures of non-residential location in metropolitan areas, they are limited in that mathematical modelling and theoretical posturing commonly exist in a vacuum which cannot perfectly replicate the complexities of actual cities. Despite this, those models provide vast insight into the mechanisms which drive the changes in the structural economic patterns of cities, yet without coalescing them to observed trends they are limited as tools for urban planning. Therefore this section shall attempt to relate the literature of locational economics and city structure to a more qualitative and empirically supported review of how and why these structures are changing, or alternatively why they persist. In doing so it shall also draw some further conclusions about the efficiency of varying patterns and provide insights into how urban planning has and could be addressing them.

Incongruities of realities and modelling

The first crucial discrepancy between the city structure models already reviewed and the observable changes in city structure, that should be noted, is the cognisance of temporal factors in change. Whereas an economic model of endogenous agglomeration growth or dispersion of the space economy in the city makes no reference to quantifiable time or rate of change, it is clearly observable that these changes have historically been a creeping incremental movement. However in the last few decades change in structure, driven by changes in both residential and non-residential locational behaviour have started to become increasingly rapid as shall be shown.

The second patent incongruence between hypothetical economic modelling of urban structures and analysis of prevailing structures in reality is evident in the significance of scale. In even the most spatially based economic modelling, observable scale is always a function of relative distance and invariably a scale of micro, meso or macro urban landscape which is again a concept of space only grounded in relatively. Clearly on the other hand an analysis of any metropolitan spatial structure requites physical analysis of a definable scale and distance. However this being said, one advantage of relative scale economic models are their malleability to a specific metropolitan area which is advantageous but at the same time the concept of structure is highly scale-dependent in that a system which may be polycentric at one scale may be monocentric when examined at another scale (Taylor et al., 2008).

The evolution from monocentric to dispersive structure

Likewise with the temporal ordering of the reviewed economic models, pre-industrialisation cities tended to begin by displaying a strong monocentric (although of course never perfectly monocentric in the Alonso model theoretical sense) structure of economic activity distribution within large, relatively for the time, cities. These were also typically based around a geographically strategic point for transport, such as a port, river, or on a major railroad. However since industrialisation and the proliferation of the personal motor vehicle, location bids and transport costs began to change and so the locational patterns of economic activity slowly began shift. However the monocentric character of cities persisted well into the 20th century, because producers who located outside the core, thanks to the truck and telephone, were still bound to the central harbours and rail terminals. Although the private motor-vehicle expanded the residential threshold of the monocentric city, it reinforced the monocentric orientation of export industries, as improved labour access to the centre and higher relative land values in the suburbs kept most export industries from suburbanizing. Through this monocentricity persisted in most cities until the widespread use of the interurban truck, along with the construction of urban freeway systems and the establishment of suburban rail terminals, began to concretely alter the urban space economy. As was indicated by the early efforts of polycentric modelling, monocentricity has weakened over time because of changes in technology, particularly, faster and cheaper transportation, which makes it possible for commuters to live farther from their jobs in the CBD and communications, which allow modifications to firms organisational behaviour such as promoting back-office operations to move out of the CBD into peripheral areas of lower bid-rent and nearer labour markets.

Furthermore as cities residential patterns have shown dispersal so those sectors which favour market orientation, as differentiated by Weber(1929) as weight gaining industries, have sought to disperse from the central business district into suburban areas. The acceleration of these decentralisation of economic activity in urban areas began in earnest in the 1960's according to Coffey & Shearmur(1996) as several major waves of dispersive locational waves began. This was first noticeable within those industries which are extremely weight gaining, consumer and personal services, which began to disperse to more suburban oriented locations out of the traditional CBD. Following these initial trends of dispersion, a perceptible growth in manufacturing dispersal from the traditional confines of the CBD periphery as established in the classical monocentric city model and its three-sector bid rent function. Subsequently the next discernible phase of dispersal from the traditional city centre was driven by a large scale organisational restructuring of firms which saw the 'back-office' functions of cities to decouple from the CBD, seeking lower bid-rent areas and labour accessibility

as digital communications progressed allowing the separation of functions at an intra-urban scale. The more recent trends of dispersive location patterns of firms, and arguably the most critical symptomatic evidence of threshold centrifugal forces overcoming agglomerative economies, is the relocation of high order and front-office functions (Coffey & Shearmur, 1996).

This final wave of firm relocation is significant in terms of city structure for several reasons. Firstly, as these high-order service functions typically represent the highest bidders in the monocentric bid-rent function, the centre of the centre in other words, it at the least represents a symbolic triumph of reduced transport costs and technological efficiency boosts to outweigh the agglomerative benefits of the traditional monocentric model, or at its height it signifies the end of the functional monocentric economic model altogether. Furthermore as these economic activities are pertain to the highest levels of productivity, with income generated per capita as the proxy measure, it also induces the highest flight of productivity per capita from the CBD, having a number of consequences for the city. To borrow a term from environmental systems thought it represents the crossing of the monocentric cities 'resilience threshold', a point from which the system no longer can function in its original form. It also represents the true transmission to a non-monocentric city structure and the induction of more complex forms of polycentrism or homogeneity in the space economy.

According to Anas et al (1997) cities' economic growth patterns have been displaying a trend of dispersion of the traditional

city centre for many decades however in relatively recent time, in the temporal scale of urban structures, the process of decentralization has shown a marked shift towards taking on a more polycentric form, with concentrated employment centres making a distinct mark on both employment and population distributions. This is resultant of the afore mentioned dispersion of economic activity which when collocating outside of the CBD have become increasingly large and diversified, and have developed agglomeration economies of a sufficient force to attract the types of activities heretofore found uniquely in the CBD. These urban sub-centres are increasingly in direct competition with the CBD as centres of high-order economic functions and have profoundly modified the physical and economic structure of most metropolitan areas. (Coffey & Shearmur, 1996). Simultaneously however rampant dispersion of economic activity is occurring unabated peripheral to these centres, moving many urban centres to a structure beyond what could be considered polycentric. This distinction between a polycentric spatial economy form and its contiguous dispersed space economy however is not always unambiguous as predominantly even sprawl is not entirely homogenous. In most cases the employment of statistical analysis can identify a number of irregularities in the distribution of economic activity in even the most seemingly homogenous urban masses and their respective spatial economy (Anas et al, 1997).

This has resulted in vast number of differing forms of polycentrism to emerge. Bertaud identifies the four most common physical models that prevail contemporarily, shown in figure 2.3.1.

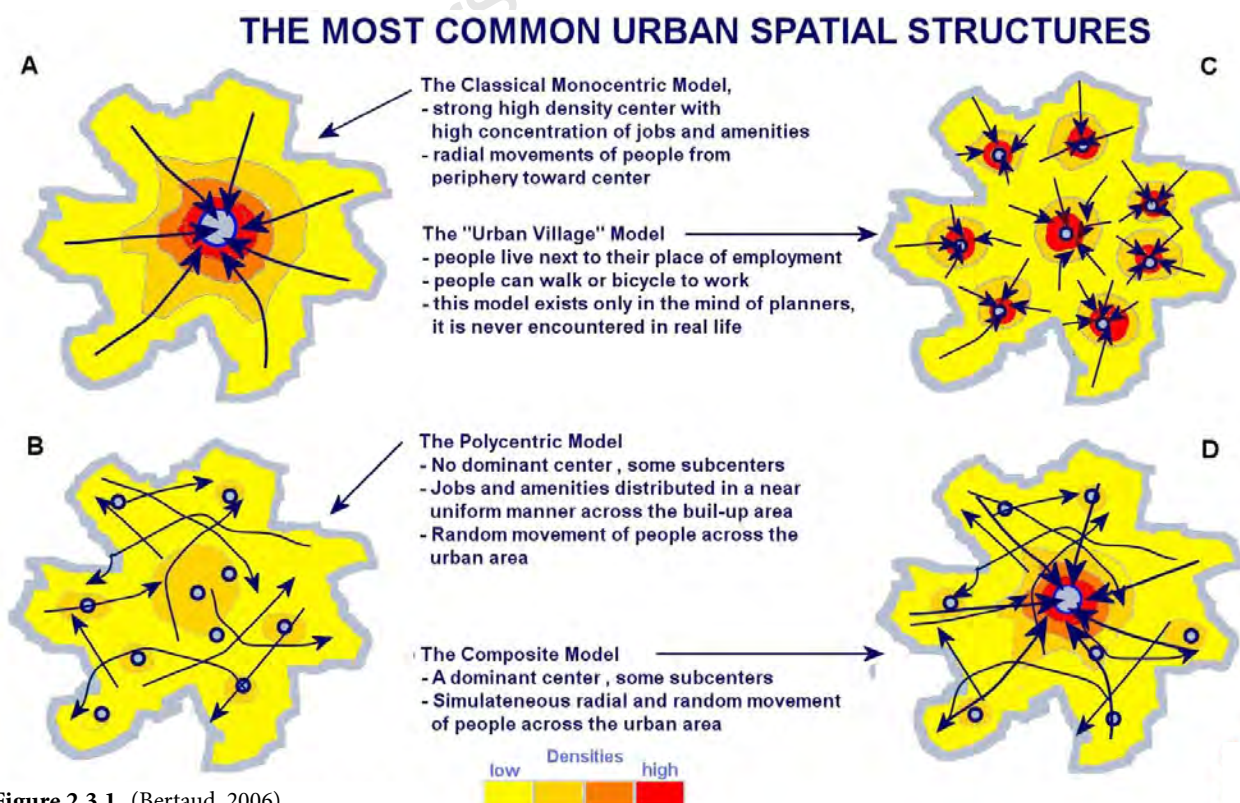


Figure 2.3.1 (Bertaud, 2006)

Immobility and Inefficiency in the Isolated Sub-centre

Urban sub-centres have displayed in a number of instances a large level of rigidity, whereby despite shifts in labour or market locations or efficiency in particular modes of transport or even the physical designation of transport infrastructure relocating away from a particular sub-centre, density of economic activity and demand for space in such a centre remains stable. This it is argued is due to agglomeration economies outweighing the shifting gravity of what would be dispersive forces in this case, such as poor market orientation or relatively higher transport costs. Although this could be argued to present a positive scenario in that clearly strong agglomerative economies exist in such a sub-centre, it also indicates a non-optimal location in terms of economic efficiency which could be potentially improved through alternative location or alternatively reorienting the dispersive gravity towards the sub-centre by realigning transport infrastructure or residential structure with the sub-centre.

There is an alternative market explanation though that could in some cases explain the persistent inefficiency of these isolated sub centres. It is possible that, in context dependant scenarios, that opportunity costs do not outweigh the opportunity benefits of endogenous relocation due to market distortionary factors. These could include inappropriate zoning alternatives or lack of available land due to artificial planning constructs such as an urban edge relative to a more efficient location for structural arrangement.

2.4 FISCAL EFFICIENCY AND CITY SPACE ECONOMY STRUCTURE

Along with the changing prevailing structures in metropolitan spatial economic distribution, so to have the models for local metropolitan governance seen a structural shift and the role of spatial planning within this paradigm. Where cities must now promote economic development and the slightest marginal advantage may drive success, in the face of unprecedented levels of urbanisation financial austerity with regard to economic efficiency has become a priority in management of cities. In this regard, urban planning and the delivery of its mandate in service, transport and structural provisions, has increasingly been promoting cost efficiency. Therefore structure has a large role to play in restricting the costs associated with urban growth. Most commonly this relationship is argued in terms of residential distribution as it is the largest consumer of land capital and thus residential sprawl as opposed to a compact urban form of residence is equated to be far more costly, for the state, in the former mostly in terms of service extensions.

A number of research endeavours however have analysed the impacts that varying spatial distribution patterns of economic activity have upon the fiscal efficiency of governance. According to (Juntunen et al, 2012) whom conducted a survey of many of these research findings conflicting results have been found however on aggregate the evidence shows resolutely that a compact form of development for non-residential development is in fact less draining on local public finances in terms of cost of service. This is increasingly pertinent as in many cities the decreased costs of servicing non-residential segments of the city, coupled with the higher rates of fiscal return to the state from these land uses, means that often these economic nodes of the city provide the surplus revenue to finance the deficit of residential service provision. This is particularly noticeable in cities where spatial redistributive policies are a policy priority.

Beyond this a detailed study discussed by Juntunen et al(2012:719)also shows that public capital and operating costs for close-in, compact development are lower than they were for fringe, scattered, linear and satellite development. What this particular study shows is that levels of densification versus dispersion are not the only factors deriving fiscal efficiency but the spatial arrangements of these discontinuous sub centre agglomerative patterns have financial implications for the metropolitan area as a whole. In terms of the locational patterns discussed under the economic city structure models discussed this evidence would argue that the monocentric city model would be the most fiscally efficient structure and on the other end of the scale the dispersed homogenous model would be the least efficient. In the middle of this scale are the varying formations polycentric city models of employment sub-centres. Although this seems to be in line with intuitive logic in that spatial scale of economies in bulk service delivery favour increasingly dense agglomeration, a study by Ladd(1992) argues that there are also inevitable diseconomies of scale in fiscal efficiency relating to level of agglomeration. In the same way that certain firms may benefit from densifying agglomerative location up until a threshold where diseconomies will supersede the agglomerative benefits, so too does this principle apply to fiscal efficiency from the view of the state. Evidence presented by Ladd(1992) indicates that instead the agglomerative scales of economy in terms of fiscal costs is shown to have a U-shaped average cost curve. Under this assumption a polycentric city structure that displays high levels of density within its economic sub-centres and low levels of dispersion may in fact be a more cost efficient city structure than the purely densified model of the monocentric city.

2.5 IDENTIFYING CITY STRUCTURE

All three general versions of city economic structure (mono, poly and dispersed) can be classified by the identification of economic centres, or lack thereof. The complexity of this iden-

tification of economic agglomeration can have a vast range in statistical analysis depending on the factors measured and the relationships which are intended to be evaluated. In this regard no standard evaluation exists for the differentiation of the urban economic landscape and a wide array of differing techniques exists. Typically employment centres in this regard are identified broadly as places that exceed a threshold employment density and a threshold employment level (Anderson & Bogart, 2007). However the thresholds and techniques for delineating these intra-urban nodes vary and furthermore, importantly so do the types, scale and availability of data. Due to these inconsistencies, unfortunately comparisons between metropolitan areas have been highly limited due to both a lack of consistent and comparable data and a plethora of methods and thresholds employed in the identification of economic centres (Coffey & Shearmur, 1996). The variations in these not only make direct comparison difficult but also can render intrinsically differing results on the number, scope, function and hierarchy of centres and sub-centres within a metropolitan area. In a survey of the major research undertakings to identify economic centres, at the time, Coffey & Shearmur (2007) identify six of the most common techniques. These are:

1. Employment thresholds
2. Local peaks in a smoothed density gradient
3. Employment Density Combined With Total Employment Threshold
4. Ratio of total employment to residents
5. Ratio of Total Employment to Resident Workers Combined with Total Employment Threshold
6. Analysis of Origin-Destination Flows.

Through these various analytical techniques and the designated threshold of variables differ to produce a different range and scale of centres, however each has its own set of advantages and disadvantages and the choice of usage is largely a determinant of scale and type of data available. Despite the statistical differences of these techniques all of the above can be calibrated to discern differing levels of economic agglomeration or alternatively show the effects of dispersive forces on the spatial economy.

Beyond the variable techniques of measurement, a standard for the designation of particular spatial patterns under the polycentric rubric also suffers from a lack of ambiguity. As with characterising an economic centre, the sub-centres of a polycentric city structure can be simply described as a spatial node with significantly larger employment density than nearby locations and that has a substantial effect on the overall employment density function of the city (McMillen, 2001). Whereas in an economic model these are perfectly identifiable, the incongruities of irredeemably complex reality with mathematical modelling in many cases results in need for intuitive comprehension coupled with data analysis to understand the relationship of polycentrism in a particular city. Put more simply, mathematical computation alone cannot effectively

identify relational patterns in a non-hypothetical polycentric city, especially without perfect information, and therefore a framework for cognisant evaluation of these structures is vital. However when characterising the larger nexus of sub-nodes within an urban conurbation and both their independent, as well as relational characteristics within the metropolitan system, the delineation of polycentrism and its multiple models becomes far more difficult. In this context Burger & Meijers (2012:3559) go state that, “polycentricity definitely ranks among those key terms that are employed loosely and in a variety of ways and this inevitably leads to imprecision and a loss of meaning”. They (Burgers & Meijers, 2012) go on to argue that this is largely due to the two analytically distinct and divergent approaches that pervade the research on polycentrism in urban areas. The first is a morphological approach which centres on the comprehension of nodal features within the prevailing structure, as already discussed and the other is a functional approach which focusses on the relational aspects between these nodes and investigates the connectivity of them (Burger & Meijers, 2012).

Vasanen(2012:3629-3633) provides a rich chronological synthesis of the of the emerging approaches to quantifying and categorising the functional, as opposed to morphological, role of polycentrism within metropolitan areas. This research is relatively new with a number of very recent approaches emerging within the functionary school of polycentrism research (Burger & Meijers, 2012). Below is a brief synopsis of the major frameworks for polycentric functional evaluation as described far more in depth in Vasanen (2012) as well as Burger et al. (2012).

Functional Polycentrism

- Van der Laan et al (1998)- categorised functionality according to whether the commuting flows in the regions were directed from the suburbs to central city or vice versa.
- POLYNET project analysed functionality in terms of business network connection and information flows which are generated by advanced producer services.
- Green (2000) emphasised, in his formal method of defining functional polycentricity, that a functionally polycentric network is not solidified to physical location but that the functional linkages within a morphologically polycentric system can change over time, while the physical attributes remain constant. He measured functional polycentricity in terms of network density- a ratio of the actual flows versus the total potential flows of a structure.
- Another approach to understanding functional polycentrism was given by the gravity model employed by de Goeie et al (2010) as well as van Oort et al(2010). In this model the relationship between the subcentres of a polycentric city are explained through their size and the distance between

each other, similar to Newton's law of universal gravitation. In a fully functional polycentric system, the interaction between the nodes should be solely determined by the gravity model and no signs of hierarchy should be evident.

- Burger et al. (2011) introduced the primacy index, a measure of the ratio of commuting flows or employment between the central city and the rest of the city-region. They furthermore built on van der Laan's (1998) work by assessing the level of functional polycentricity according to the degree of commuting and exchange commuting.
- Burger & Meijers (2012) used the rank-size distribution of nodality scores (i.e. the absolute importance of the centre) to assess the degree of morphological polycentricity and, likewise, the rank-size distribution of the centrality scores (i.e. the importance of the centre related to its surrounding) to measure the degree of functional polycentricity. Their indicator for polycentricity is a log-linear regression line of the rank-size distribution where a flat slope indicates a polycentric urban region.
- Vasanen (2012)... measuring functional polycentricity has been introduced where the degree of polycentricity is measured through the connectivity of the urban centres to the rest of the polycentric urban system.

Therefore in summary it can be established that:

1. Delineating specific nodes and their boundaries can be fuzzy work due to the lack of a standard for such evaluation across the board, therefore data can be manipulated to alter the findings significantly. (Morphological approach)
2. Research into understanding the functional relationship between nodes is still developmental and also lacks a standardised framework for evaluation. Therefore comparisons between differing cities are at times limited.
3. With these two current limitations, polycentric form and its more dilute counterpart of dispersion are thinly separated at the margin but unambiguously differentiated at the extreme.

2.6 LITERATURE REVIEW CONCLUSION

This literature review has covered a vast spectrum of theoretical debates and bodies of knowledge in order to understand, firstly the drivers of spatial change in contemporary cities, with a focus on the space economy, secondly to understand the urban forms that are emergent from these, and lastly to convey the inherent economic and resource usage inefficiencies that are inherent to these differing forms.

Due to the comprehensive nature of this, there are certain findings from the literature which are more prominent than others in the application to the analysis of Cape Town and therefore a quick summary of such points is necessary in order to lead on to the next chapter.

It was shown initially that economic globalisation has been exerting sectoral composition changes in the global economy which would ultimately alter the spatial economy landscape of any city which is a competitor in the global market. It was further revealed that there is a strong theoretical tension between structuralism debates on the need for economic sectoral composition change in order to generate growth in local economies. Perhaps most critically is that the rate of sectoral change globally has been changing at an increasing rate.

The subsequent section on locational economics critically demonstrated that these sectoral compositions have large ramifications on the morphological structure of the space economy and hence the land use patterns that define a city. Most importantly it highlighted the constant tension between agglomerative and dispersive forces in both shaping the space economy thereby engendering a construct of morphological city structure and defining the economic potential of a city. Through the varying incentives of economic activity agglomeration it was evident that there is far more to gain in economic growth potential through dense high intensity land uses of economic activity than there is through dispersed location patterns. However despite this, it is a recurring motif that these dispersive forces are becoming stronger as cities become larger which is a deconcentration of the effects of agglomeration on economic growth, due to the negative externalities created by high density economic activity as was shown in the subsequent section.

This is where urban planning has a large role in fostering economic growth within a city, by reducing the externalities which lead to dispersion and ultimately deconcentration of economic activity. It also inherently supports the view that the more polycentric a city is the relatively more deconcentrated economic activity which hampers efficiency and growth. These include the minimisation of land market distortions, decreasing the unit costs of transport, providing a unified labour pool and countering negative externalities through co-locative incentives.

A further critical insight was that a mixture of industries in close proximity, as per Jacobs (1970) theory, resulted in the highest economic growth potential in a city. This further provides a role for urban planning in promoting, through land use tools the mixing of industries at high concentration levels.

Once again the value of economic concentration over dispersion was shown to be the more efficient urban form in the review of resource usage in the management of cities and growth patterns.

Although together these branches of locational science have a very long history which has generated a monumental number of rich theories into the locational criteria and emerging structures of economic activity and its plethora of sub-sectors, a tradition of economics which this literature review could only ever partially cover, the science has still been largely unable to come to a consensus of most of the debates that have dominated it nor generate concrete answers for policy intervention. McDonald & McMillen (2011:483) in their substantive endeavour to encapsulate urban economics note in conclusion that, "in brief, what we think we know at the moment is that an industry in an urban area will grow more rapidly if it produces a product that is in demand, is competitive, is already of some size in the urban area (and was of some size in the past), is located in a larger urban area (but not too large), and is surrounded by a diverse collection of industries (maybe)."

However despite the lack of comprehensive concrete answers, it can be clearly stated given the findings that cities must promote a dense spatial economy by reducing the inherent negative externalities and that the sectoral composition of these dense nodes should be a balanced mixture of sectors in order to realise a city's full economic potential. Simultaneously this form will provide authorities with much needed financial alleviation through a more rational and efficient urban structure.

Given that the emergence of polycentric cities are attributed to the dispersion of economic activity from the monocentric core, thereby promoting deconcentration of activity intensity it can be further stated conclusively that the further entrenched a city becomes towards polycentrism the less economically efficient it will be on aggregate.

CHAPTER 3: ANALYSIS

3.1 PURPOSE

This section seeks to spatially analyse the patterns which construct the morphological and functional structure of the City of Cape Town. In order to shape the future structure of Cape Town, a comprehensive understanding of current morphological and functional attributes of the city are critical. However, in order to make assumptions about the drivers of this contemporary form, and how these variables will assert force on the potential future structure of the city, questions about the historical structure and drivers must be asked. This creates a platform for benchmarking structure on a temporal range and thereby assessing the current magnitude of drivers and the consequential changes on city structure.

In terms of assessing morphological structure the analysis firstly seeks to determine the centricity of the contemporary space economy, delineating either a monocentric, polycentric or beyond polycentrism structure in line with models reviewed in chapter two. Beyond this, determining the density functions of differing variables, using distance analysis of data trends, will investigate the torque force of drivers in changing the city structure. This requires a spatial evaluation of the space economy, residential density patterns and trip demand for the entire metropolitan area.

The interaction of these variables using statistical analysis within a spatialised mathematical model of city structure shall provide an insight into the functional relationships which exist in the Cape Town spatial economy and city structure. This will be used to examine the efficiency of the current structure and the systems which both operate within and construct it.

Analysis of the economic sectoral market mix density, as a section through the spatial economy of Cape Town, shall be performed to determine the demand patterns influencing city structure and economic growth potential as discussed in Chapter two.

Population data will be employed to investigate its relationship to economic nodes within the city structure and to elucidate upon labour integration functions of the city as well as trip demand, contributing towards overall city structure.

In all the objectives above, where data allows, a directional evaluation of change in location and density over a temporal range shall also be done in order to make assumptions for future trends and thereby guide interventions. This will indicate how city structure will look, *ceteris paribus* without planning intervention or market shocks, in the future. This allows the analysis of probable inefficiencies which, with the incremental nature of structural change, can be mitigated rather than adapted to.

All this being said, the goals of the analysis section can therefore be summarised broadly as:

- Delineate the current morphological structure of the Cape Town Metropolitan Area (CMA).
- Establish where this structure evolved from historically.
- Investigate the drivers of this historical change.
- Analyse the density of structure using distance and frequency models.
- Evaluate the functional relationship of variables which construct the city structure and determine its efficiency.
- Measure the direction and rate of change.
- Test the density of market mix across sectors within the city structure model.
- Relate CMA macroeconomic and policy shifts to the changing structure of the city.
- Predict changes to the structure of the CMA to inform decision making.
- Examine the spatial relationship of the CMA population within the city structure framework to evaluate labour fragmentation and transport efficiency.

Structure

This analysis shall be compiled in five sections, allowing for comprehensive coherent analysis within the broad spectrum of investigation.

The first section will examine the historical structure of Cape Town by reviewing secondary data. Primary data, comparable to contemporary forms, does not exist for the city of Cape Town and as such the analysis is limited to secondary data. The historical analysis is paramount as it describes the distortion of land markets and spatial planning through apartheid centrally planned spatial policy. It also is the point of departure where freedom of movement and economic liberalisation contributed largely as a potential driving force for structural change in the city. It furthermore provides a temporal benchmark of city structure on which change can be monitored and aptly explained.

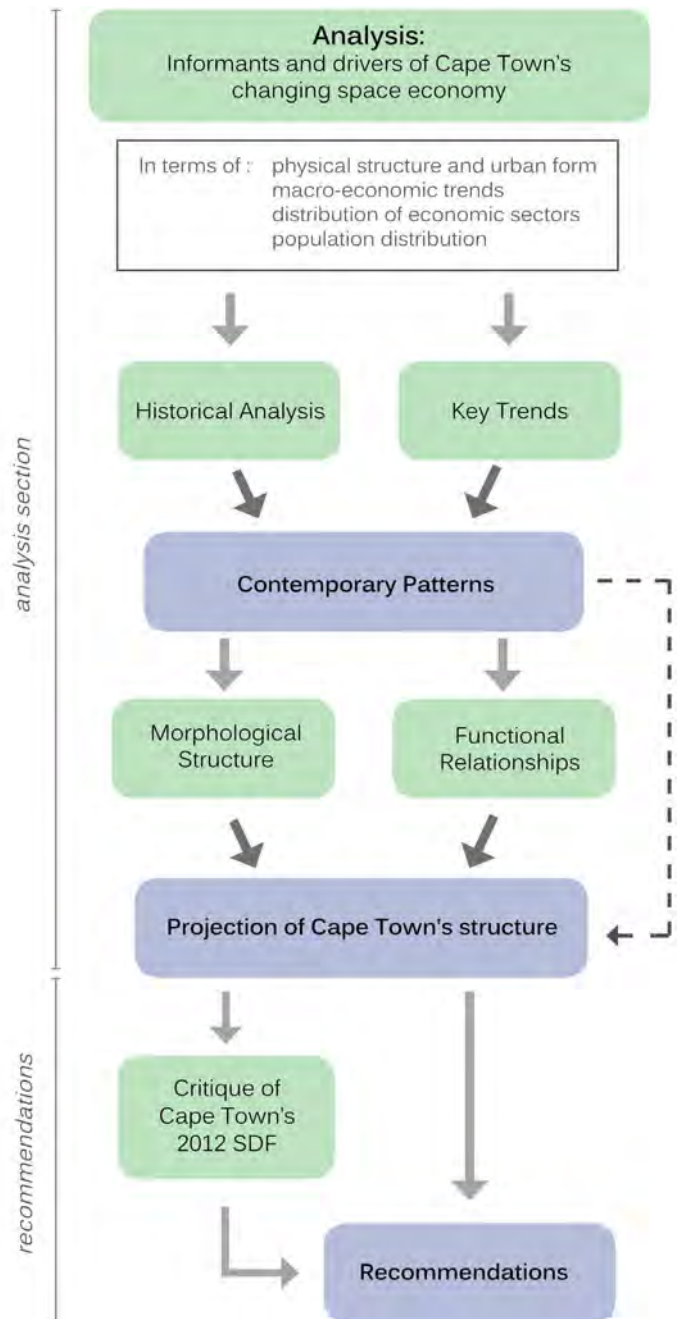
In the subsequent section density distribution profiles shall be constructed for the spatial economy and its three main sectors, as well as for population, bid-rent values and trip data in the city of Cape Town. These are independent variable analysis and their individual contribution towards city structure will be highlighted. Where possible, time series data profiles will be constructed to elucidate upon the trends of changing spatial structure in Cape Town. Subsequently a composite model combining these variables will be examined to provide a holistic view of the current and changing city structure and density of the CMA. At the end of the section this composite model will be supplemented and explained using a macroeconomic

evaluation of Cape Town's economy and population income.

The third section of analysis addresses the delineation of contemporary morphological and function spatial structure of the city, as well as the prevailing trends that are apparent to be driving change in between these categorical evaluations. In order to achieve this, the framework for evaluation which is comparable to other global metropolitan areas is critical. As such the bulk of this analysis section is performed using the constructed composite density range for the city, not dissimilar to the three sector model, introduced by Alonso (1964). This allows a unified, spatially based, framework which frames economic activity, market factors, residential densities and transport demand in one model which is comparable to numerous international studies. The overall directional trends in morphology and functionality will also be further assessed.

The subsequent chapters seeks to evaluate the current strategic and policy approaches put forward by the Cape Town Municipality in directly addressing the form of city structure, particularly from the view point of enhancing the space economy. This will largely involve critiquing the CoCT's spatial development framework, by assessing its application of planning tools and the analysis of the city structure and spatial economy it used to inform its strategies. These will be contrasted against the analysis performed in the previous sections in order to highlight any discrepancies in the SDF's evaluation and intervention of city structure.

Together these sections will establish where the Cape Town city structure has emerged from, how it's changing and why and subsequently how the current policy regime is attempting to engage with these.



3.2 HISTORICAL

Cape Town, as with most metropolitan areas in South Africa was birthed under the auspices of colonialism and was indelibly shaped by the shifting political ideologies that governed its growth and imposed their will on urban planning and the structure of the city. These fluctuating regimes and the endemic change to the metropolitan structure they enforced, led to what is commonly approached as a unique set of structural challenges, although a number of cities globally share similar constraints (Bertaud, 1999). These physical manifestations of political and urban ideology on the city furthermore exerted powerful distortive forces on market equilibrium in the city, thereby altering its ability to self-organise efficiently, a legacy that still permeates the structural arrangements of Cape Town today.

Therefore this section seeks to succinctly analyse the principle historical informants and trends that lead to the prevailing city structure encountered at the turn of the twentieth century. Beyond unpacking the factors, which in composite constructed the city, the section shall further depict, through analysis of various factors, the state of Cape Town's physical and economic structure in this period. This will subsequently be used to benchmark contemporary trends against in order to evaluate structural change.

3.2.1 Metropolitan Physical Structure and Growth

Cape Town Metropolitan area has experienced extraordinary growth, both in terms of population and physical footprint, over the past century. Its population has multiplied by nearly fifty times since the beginning of the 1900's, as can be seen in figure 3.2.1. Simultaneously the urban footprint has grown by at least, if not a larger magnitude, transforming from what is now the area of the CBD to a sprawling urban conurbation equivalent in area to many of the world's most renowned metropolitan areas, as can be seen in figure 3.2.2. However, despite this population and area growth, the

fundamental structure of metropolitan Cape Town largely continues to reflect the patterns of its formative development during the nineteenth and early twentieth centuries (Wilkinson, 2000). For this reason an understanding of what these formative structures were is critical. In this regard Dewar et al(1990) argued that historically there have been four dominant, distinct yet closely interrelated, physical patterns that have pervaded the structural development of Cape Town Metro.

The first predominant theme of structural persistence is centred around the three spines of the city. These Western, Northern and the Southern spines, are the historical roots of the metropolis all extruding from the traditional CBD and had until at least the 1990's served as the predominant sites for the location of non-residential land-uses. These included tertiary, retail and industrial activities as well as the bulk of community facilities in the CMA. Figure 3.2.3 shows these spines in relation to the current CMA.

The second recurring foundation of Cape Town's structure according to Dewar et al (1990) is the polarisation of the South-East area of the CMA with that of the rest of the city. Initially this stratification of the population was based on racial segregation through the application of the Group Areas Act (1950) under the apartheid regime and later becoming divided along economic lines with the South-East housing the major proportion of lower income and indigent households of the City. In such a regard where a city has such high levels of economic inequality and such stark spatial divisions, reinforced through market forces, a situation in Cape Town is presented where at least one third of the population is situated in a singular quadrant on the periphery of the city (CoCT, 2010).

This trend was certainly first created through the racial segregation policies under the apartheid regime and was even powerful at entrenching this pattern of development by forcefully removing up to 150 000 residents of well-established communities from centrally located areas of the city and moving them to the South-East.

The significantly state underwritten subsidised provision of

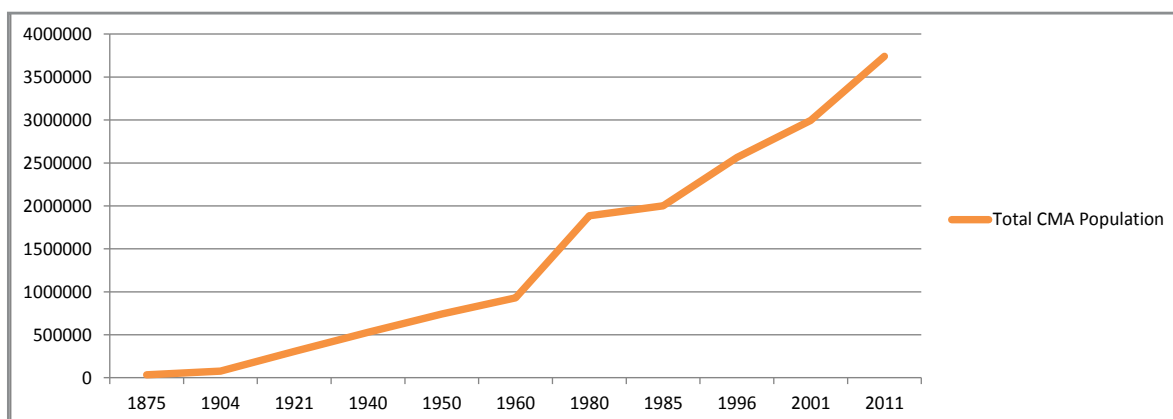


Figure 3.2.1 Population growth in Cape Town 1875-2011

(Data source: CoCT, 2010)

low-cost dense housing roll out on a massive scale in the 1980's only served to perpetuate the resilience of this structure further and create increasing distortions in the ability of land markets to self regulate the city's density function (Wilkinson, 2000).

Together these two trends have a morphological disparity in spatial aggregation, where a vast separation of where employment and the bulk of labour exists, resulting in a form of an inverted monocentric city model where economic activity is centred towards the core and the population density peaks on the periphery. This form of city structure is inherently the most inefficient in almost every possible measure and is fundamentally diametric to self-organising market driven urban development. However it is not a patently Cape Town city, or even South African city malady, and occurs in a number of metropolises which have the simple commonality of centrally planned ideological historical structures, which distorted the land markets of the city. This can be seen in cities such as Brasilia due to centrally planned ideological divisions of population, Moscow due to central socialist planning which negated the existence of an urban land market and Johannesburg due to political apartheid based racial segregationist policies. This population distribution is the inverse of what Alonso(1964), Muth (1969) and Mills (1972) argued, through the monocentric model, is the efficient structural organisation derived from the effect of land prices on urban densities. Therefore historically these cities, including Cape Town, it could be argued were influenced by utopian ideology such that the spatial structure was exerted upon to the critical juncture where basic self-organising principles, commonly thought to be quasi universal, were overridden (Bertaud, 2001).

In terms of functional structural arrangement the result of this inverse monocentric tendency has induced that together these two structural elements have always displayed a functional core-periphery relationship. As the core-periphery model theory, discussed in chapter two, shows this relationship serves to reinforce the underdeveloped nature of the periphery, while enhancing the core and reinforcing the dissymmetry of the city's monocentrically inverse space economy.

Beyond these two structural foundations a recurring theme of

Cape Town's population has also been the continual dispersal of the higher income groups which broke away from the historical axil spines (Dewar et al, 1990). This was facilitated by the improvement of infrastructural transport networks beginning with the increasing use of the personal automobile and establishment of the interurban freeway system largely constructed in the 60's and 70's (Wilkinson, 2000). This movement was typically characterised by suburban, low density, sprawl driven by profit via the land market and speculative land division. This trend saw the increasing establishment of peripheral pockets of residential wealth in areas such as Hout Bay, Durbanville and Tygerberg.

3.2.2 Historical Space Economy

The historical spines of the CMA and their collective centroid, the CBD, had despite the dispersion of high income population, managed to retain a large share of Cape Town's economic activity towards the end of the century and into the new dawn of democracy. Wilkinson (2000) posits that in the mid 1990's approximately 70% of higher order facilities and the majority of employment was located along or closely adjacent to the original spinal corridors.

However the dominance of these structures in retaining economic activity had been incrementally waning over the previous decades with significant decentralisation of office and retail activity, as well as manufacturing and services, giving rise to the growth of important sub-centres at Claremont and Bellville at that time (Wilkinson, 2000; CMC, 1996). Furthermore the previous 30 years had witnessed the increasing shift from smaller local stores to regionally serving shopping centres which sought to locate in the most accessible sites for the largest share of population possible. This predominantly meant the development of large retail nodes near major interchanges in Cape Town's freeway system, creating incentive for retail to relocate from the main street store front model to retail complexes, thereby fundamentally reshaping the retail geography in the city. This as discussed in chapter two is in line with what was a growing trend globally, and particularly in the



Figure 3.2.2 Urban growth in Cape Town 1900, 1980, 1988 and 2013

(Adapted from Dewar et al, 1990)

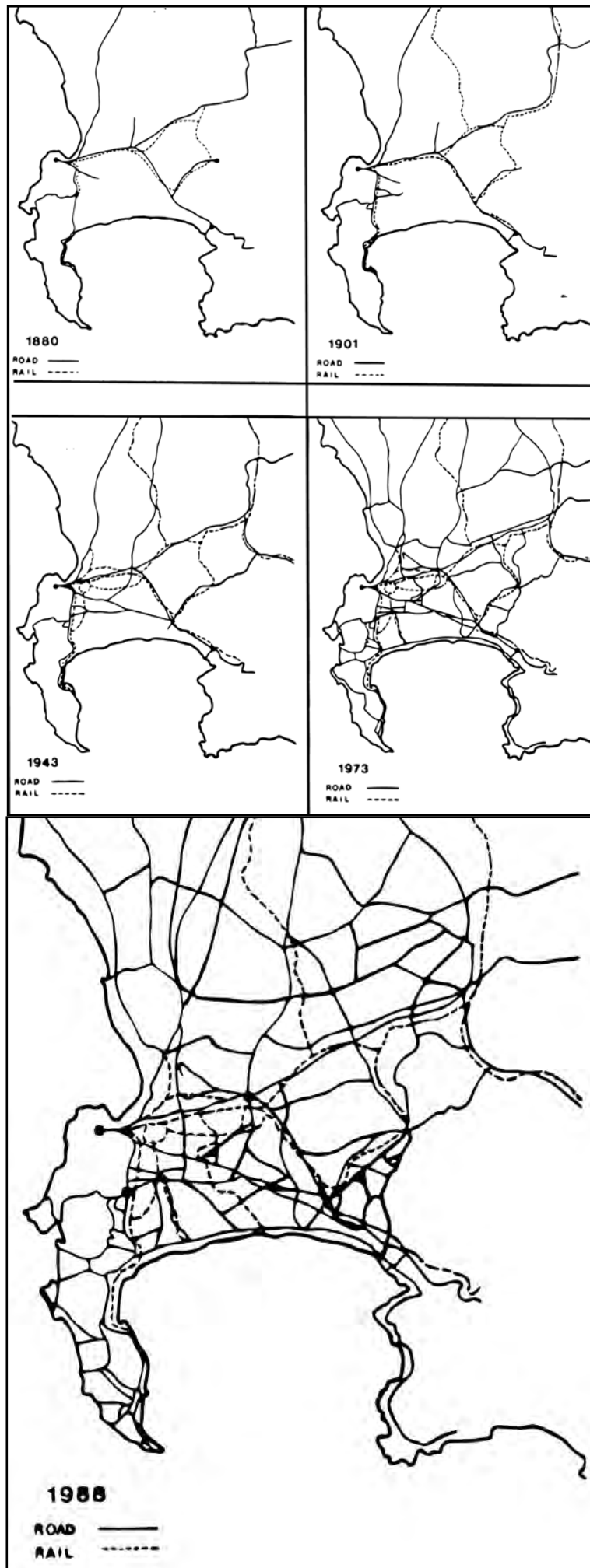


Figure 3.2.3 Growth of transportation routes in Cape Town.
 (Adapted from Dewar et al, 1990).

USA, however in Cape Town it was being further entrenched by the scale of economies needed to service the immense dislocation of consumers due to dispersive residential trends.

In the face of large scale dispersion of urban economic activity, a global trend which has been evident in South Africa's other major metropolises, particularly Johannesburg and Durban, central city decay has been rampant. Historically this was driven by economic and residential decentralisation from the mid 70's and residential dispersion accelerated in 1980's and replacement by lower income groups (Visser & Kotze, 2009). This drove a wave of institutional disinvestment and the dispersal of tertiary service functions all of which contributed to inner city urban decay in most of South Africa's major metropolises. However during this period Cape Town's inner city was relatively exempt from this prevailing to the same extent as with the national trend, except for a few small pockets. The revitalisation of what incremental CBD urban decay occurred was led by the redevelopment of the historic Victoria and Alfred Waterfront, which has induced a wave of new construction and refurbishment of historical building stock seeking to capitalise on the city's renewed attractiveness to foreign tourists and property investors.

Box A: Industrial Decentralisation Policy

In considering the spatial implications of South Africa's economy it must be noted that a specific policy existed to drive the decentralisation of industrial activity from the traditional city sphere. This was a central part of the apartheid regimes settlement policy and sought, through the usage of taxation incentives and land restrictions, to manipulate the spatial designation of industrial activity throughout the country. The target of this interventive policy was the relocation of metropolitan industrial activity to either peripheral areas of the city or to underdeveloped regions of South Africa. Despite shrouded motives and an attempt to link this policy to international development theories the contemporary consensus is that it was initiated to drive the separate development policies of apartheid while continuing to keep economic power in the hands of the capital class while exploiting the 'non-white' labour that were largely unable to locate within metropolitan areas (Dewar et al, 1986).

This policy, and the supposed logic behind it, was what largely drove the subsidised development of Atlantis in 1975 within the Cape Town Municipal area, however 45 km's from the CBD, which sought to create a model industrial hub fueled by cheap peripheral labour within the region. An insight into the locational theorists behind this decentralization policy was that locational subsidies were based on the potential demand which was measured in terms of distance from metropolitan areas, infrastructure, environment and other locational factors, and of the comparative cost disadvantage of certain kinds of industries, which is broadly similar to many of the findings in Chapter two (Dewar et al, 1986).

The subsequent withdrawal of subsidization for industry in Atlantis lead to the nearly complete migration of economic activity back to the industrial suburbs of Cape Town, with only approximately 3% of of the original investment remaining (Stats SA, 2001).

Unfortunately the eventual failure of Atlantis, and consequent destitution of its population served all too well as an example of just why these locational factors are so important to the sustainability of economic activity.

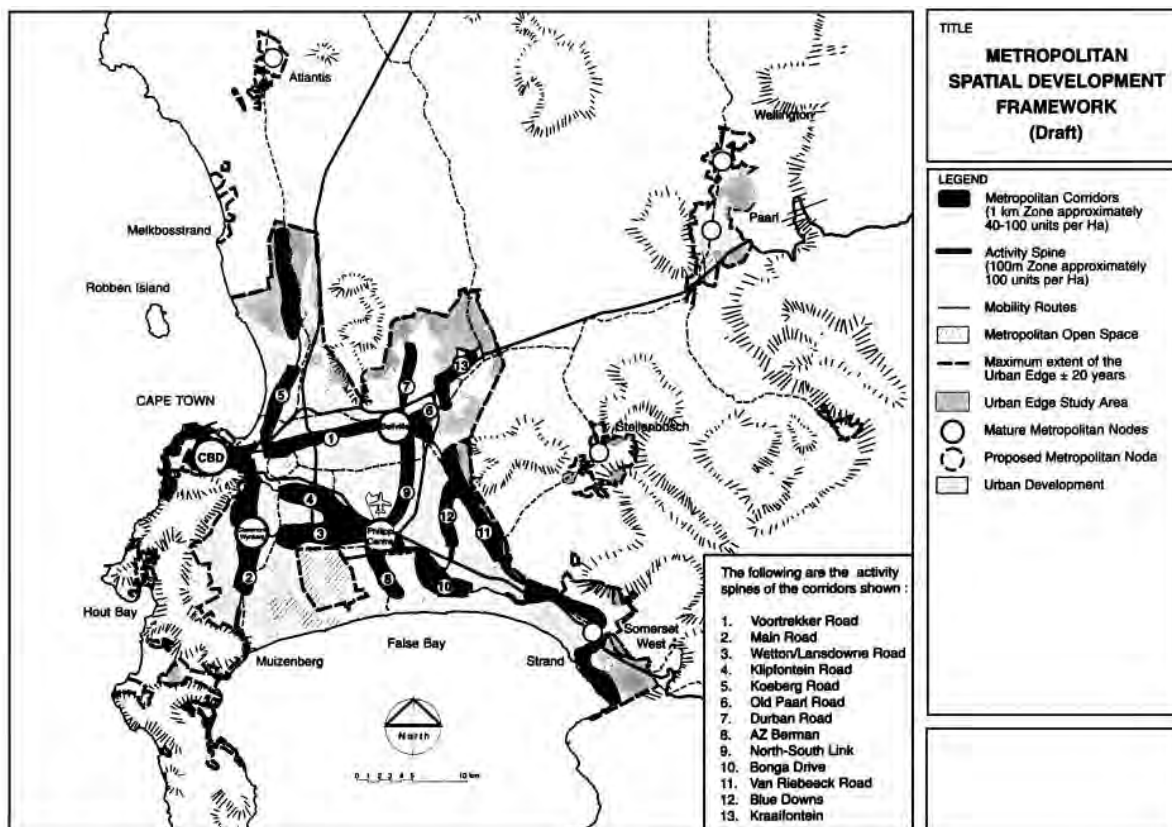


Figure 3.2.4
Cape Town
MSDF 1996
(CMC, 1996).

3.2.3 Post-Apartheid Urban Planning Approach to City Structure

Urban restructuring, as well as the notion of urban density and integration of the city was initially a core pillar of South African post-apartheid urban policy (Todes, 2006). This approach to urban planning in democratic South Africa was first entrenched through the 1994 Reconstruction and Development Programme and through the values of the 1995 Development Facilitation Act and later solidified through the 1997 Urban Development Framework, as well as several White papers and relevant policy documents.

The basis for this central theme of metropolitan urban planning was in an attempt to redress the stratified form of inequality inherent to the cities of South Africa developed under the Apartheid regime. A new school of thought in South African urban planning, began gathering momentum during the latter decades of the twentieth century, this school promoted increasingly normative planning and design principles to address the spatial inequalities of South African cities, in contrast to the predominantly modernist approach of the day. Major proponents for this school such as Dewar et al (1990) argued that rather than the comprehensive zoning lead planning approach, entrenched at the time, should be replaced by a more minimalist intervention system through designing structuring networks for a more effective strategy to urban restructuring. At the turn of political tides in the 1990's this school of planning was positioned to articulate a large contribution to

the approach towards spatial structuring in Cape Town (Todes, 2000). This approach to strategic design in orienting the structure of the city, thereby attempting to induce public and private investment along corridors of infrastructural supported land intensification became in the early 90's the predominant spatial approach adopted to shaping Cape Town. This as can be seen in the 1996 SDF for Cape Town (Fig 3.2.4) where the singular tool used in spatial development guidance is the designation of several intensification corridors linking four metropolitan nodes.

This simultaneously indicates the form of spatial planning at the time, which had a large foci on spatial structure, as well the approach to structural planning of Cape Town which tended to be largely more a corridor than nodal designation.

This approach of spatial justice and redistribution through the restructuring of the urban form served as a major paradigm in South African policy until the mid-1990's, however according to Todes (2006:50) from the late 1990's continued divided development, albeit along class rather than racial classification, cast aspersions on the ability of urban planning generally and city restructuring specifically as a tool for integration and redistribution. Furthermore the principle of urban compaction was increasingly questioned as rising urban unemployment and as polycentrism began to dominate the South African urban form.

Due to urban planning generally withdrawing from the structural planning paradigm and "the lack of a strong constituency for urban spatial policy also meant that policy has remained relatively marginal and ineffective" (Todes, 2006:51).

3.3 BENCHMARK CONTROL

In order to evaluate the contemporary trends of change in city structure, if any exist, a chronological benchmark for control comparison must be established. However it is difficult to select an exact year for benchmarking city structure as comprehensive data-sets for different variables, such as population, space economy, transport and land value are typically chronologically staggered. Therefore the period of 1996-2000 is used as general benchmark for city structure. This is significant for several reasons. Firstly in 1996 a national census was conducted by Stats SA, the first of it's kind in democratic South Africa. Secondly as shown above this time frame represented not only a changing political landscape but also a pivotal moment in urban planning's agenda for South African cities.

As has been reiterated a number of times city structure change is a slow moving process and as such cross referencing multiple data points over four years should at most represent an insignificantly minimal incongruence.

3.3.1 Macroeconomic Trends

Due to apartheid policies, and the international trade sanctions as a ramification of these policies, South Africa's, including Cape Town's, economy saw unprecedented changes with the change in political dispensation. For this reason the analysis of the Cape Town economy will be limited to a far shorter chronological span than the rest of this section and serves rather as a brief snapshot into the prevailing macroeconomic trends of the time.

Cape Town's experienced real annual growth rates between 1991 and 2000 of approximately 2.6% per annum (CoCT, 2001), a relatively slow growth rate compared to international trends of the time. This growth was largely driven by a strong competitive advantage in respect of trade and catering as well as in manufacturing and construction (CoCT, 2001). These advantages saw the growth of these sectors as shown in figure 3.3.1 with manufacturing accounting for the largest share of economic output in the CMA. Figure 3.3.2 further shows that this sector had the highest contribution of employment in 1996. However overall Cape Town displayed a relatively diverse economy as can be seen in both the respective figures.

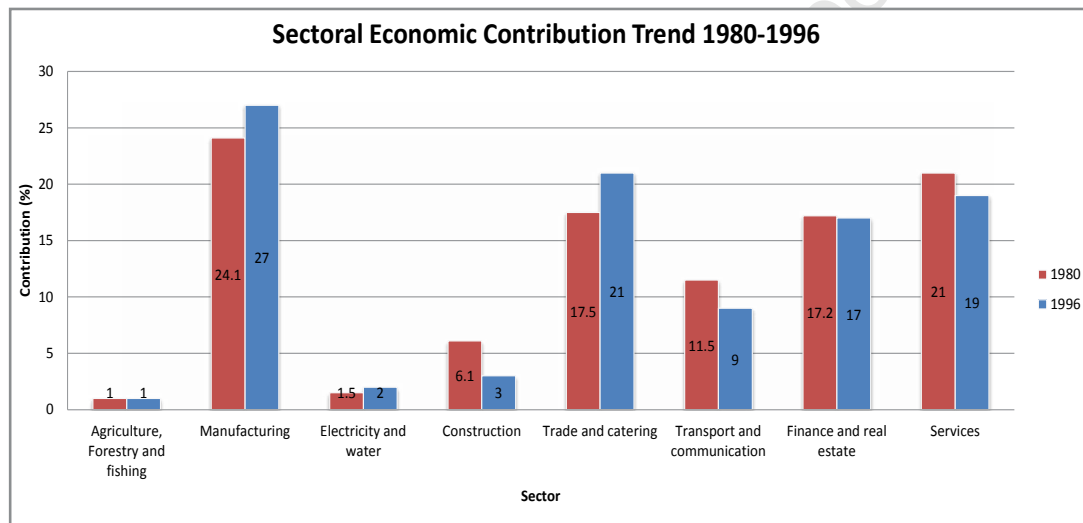


Figure 3.3.1 Sectoral Economic Contribution trends
(Data source: CoCT, 2001).

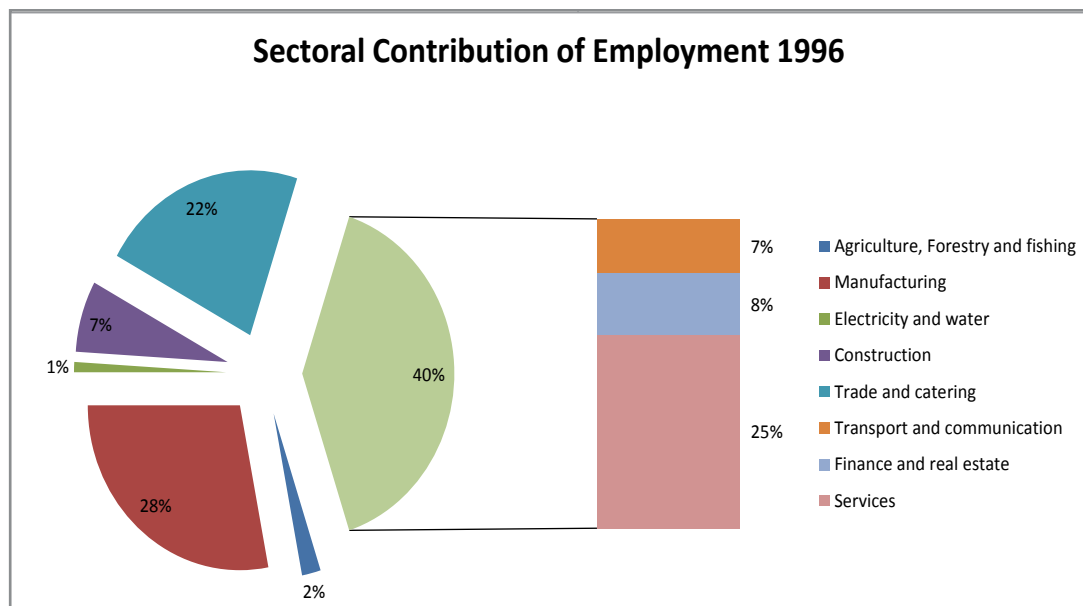


Figure 3.3.2 Sectoral Contribution of Employment
(Data source: CoCT, 2001).

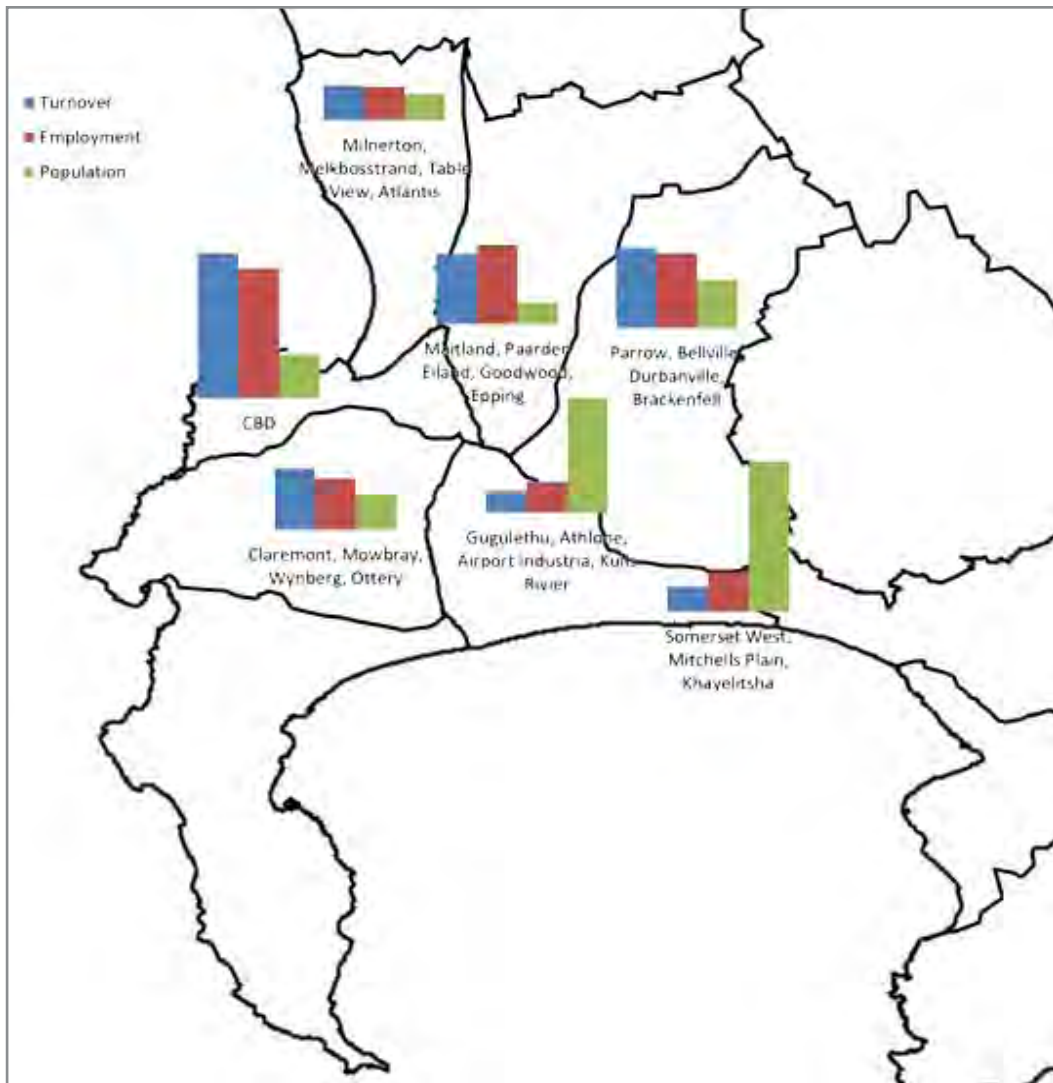


Figure 3.3.3 Relationship of Turnover and Employment to Population in different areas of Cape Town
(Author; CoCT, 2001).

Despite the diversity of the economy, however the turnover and employment of these were still highly inequitably divided spatially as shown in figure 3.3.3 which serves as spatial snapshot of the economy at the time.

This was due to the segregationist policies of apartheid which the few years of democracy in South Africa had yet to effectively counter.

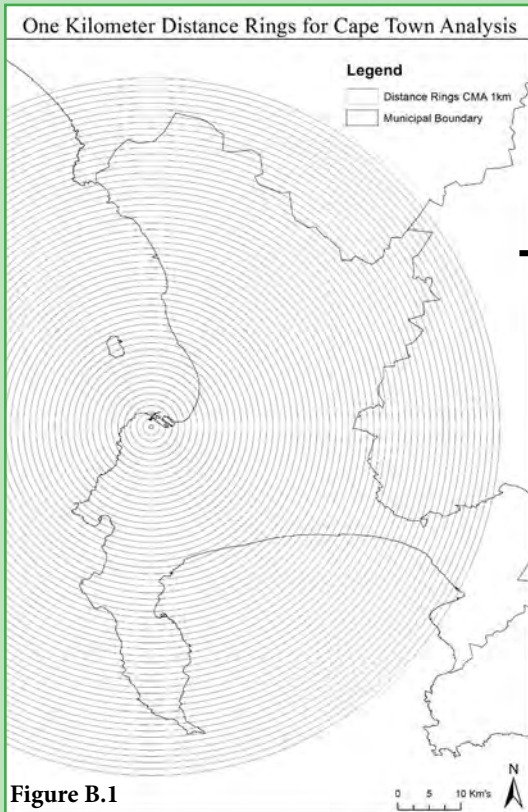


Figure B.1

Box B: Explanation of Profiling Process

To conduct the profile analysis of structure, a number of datasets, originating from different sources are required. These include:

- New build data to assess spatial demand and locational choices.
- Small layer census data to profile residential density in the CMA.
- Sectoral land use data to analyse static benchmark and contemporary space economy.

With these acquired, building the model begins with delineating the Cape Metropolitan Area (CMA) into a set of concentric distance rings, equidistantly spaced at 1 kilometre. These concentric rings begin at a point in the centre of the historical CBD of Cape Town, as would a hypothetical monocentric city model. Figure B.1 shows the distance rings as used in creating the platform for measurement. These rings extend 50 kilometres outwards from the CBD in order to account for the furthest feature in the spatial economy of Cape Town, Somerset West.

By merging these rings using geographical information system (GIS) software, with a particular dataset a measurement of frequency occurring in that ring for a variable data layer is measurable. The quotient of this frequency measure and the built area of the particular distance ring is subsequently obtained in order to accommodate for varying ring footprint areas for both geometric and geographic reasons. The

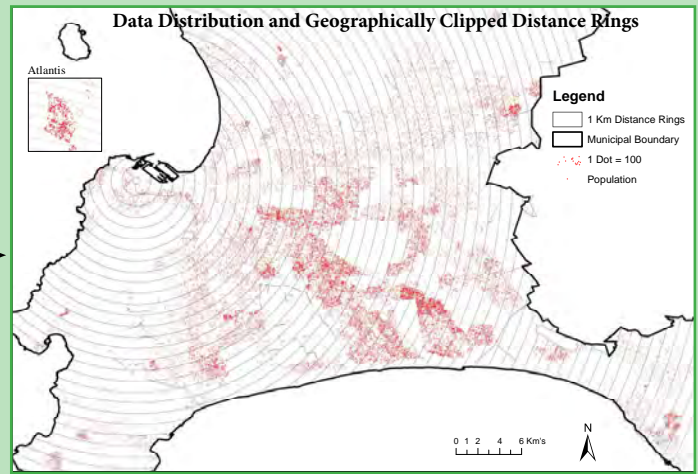


Figure B.2

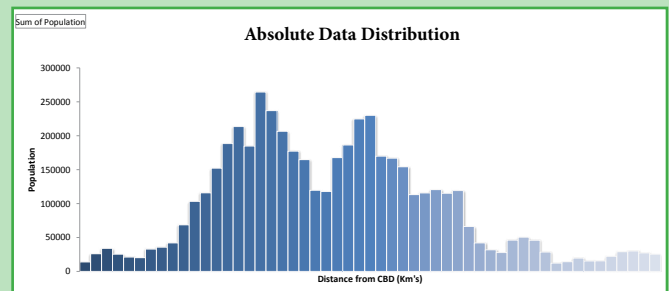


Figure B.3

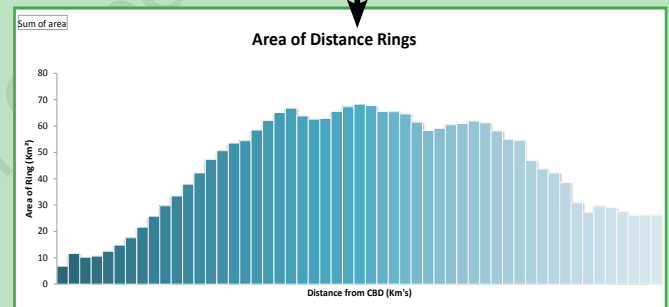


Figure B.4

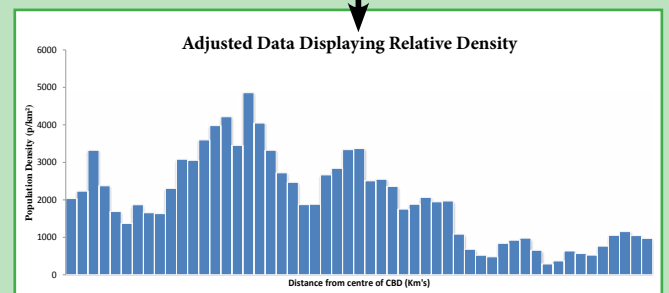


Figure B.5

resultant statistics display a density profile for the city across multiple variables and temporal ranges. This model is then utilized to analyse morphological and functional structures of the city as well as providing an insight into the trends of change as well as relationship and directions of causality across data variables.

The data available over a temporal range, which allows the spatial analysis of trends, consequently allows for the computation of potential future scenarios for city structure using rate of directional and density change for the variables. As such a future model, comparable in the majority of variables is constructed for analysis.

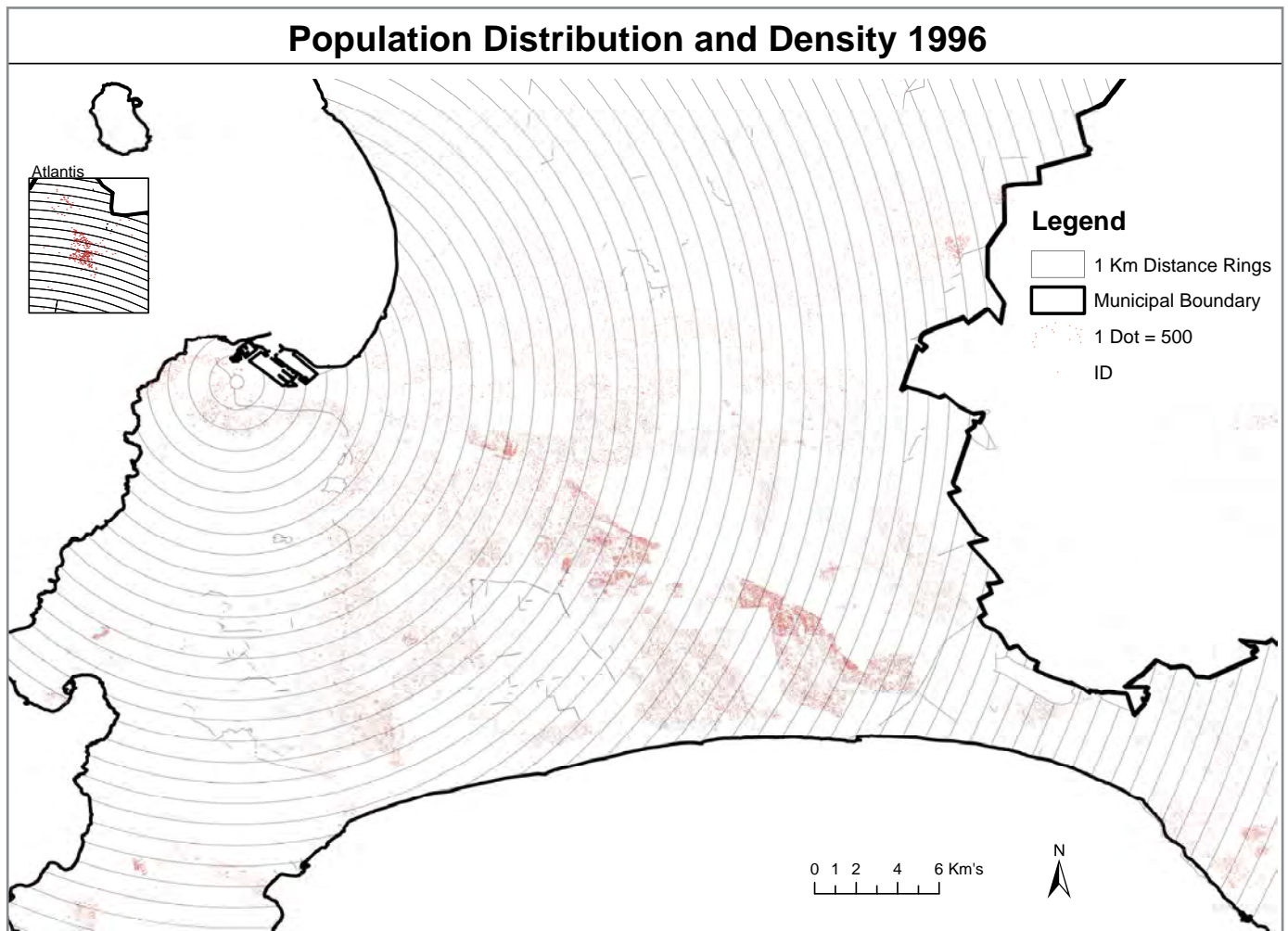


Figure 3.3.4

(Author; Stats SA, 1996)

3.3.2 Population Structure

The dot-density map of population distribution and density for Cape Town in 1996 (figure 3.3.4) indicates several patent prevailing trends in the context of Cape Town's historical development.

Perhaps the most noticeable is that by far the highest densities were still concentrated in the South East quadrant of the CMA. This is despite the fact that freedom of movement and location had incrementally, through the repeal of the Group Areas Act by the Abolition of Racially Based Land Measures Act 1991, and completely, by the introduction of democracy with the new interim constitution in 1993 and finally the new constitution in 1996, at least legally fostered the preconditions necessary for major spatial population shifts.

Secondly the continuation of low density, high land consumption patterns to the North and East of the CBD had been perpetuated.

The CBD along with the historical axes of the city to the West, South and East continued to display a discernible higher population densities than areas immediately adjacent, however drastically lower than those of the South-East.

By relating this back to the growth of the urban footprint, in the 1990's shown in figure 3.2.2, and the total population growth of the CMA of 20% between 1980-1996 (fig. 3.2.1), it is evident that largely this was accommodated through land consumption new builds rather than densification of existing urban areas. This has resulted in what is largely contiguous growth within core urban area of the CMA however towards the periphery large tracts of discontinuous residential growth is evident.

Somerset West, beyond the South East quadrant, was most noticeably an example of this discontinuous growth along with sections of the North-East.

Absolute population distribution as shown in figure 3.3.5 for the Cape Town area almost perfectly reflects the diametric development of Cape Town that supports the core-periphery model of economic feedback.

A superficial analysis of this population distribution profile would indicate a clearly polycentric tendency. Where in a functional land market the bid-rent and density function would indicate that economic activity be focused near the twin peaks of the profile. However given that the historical analysis indicated that the dominant node of economic activity

continued to be focused within the CBD, it becomes apparent that there continued, in 1996, to be a very large distortion of the city's bid rent profile.

Given this, negative labour stratification and restriction to free movement principles of optimum job market setup appear to have been prevailing in 1996.

Furthermore the low level population distribution in the furthest ten kilometers from the CBD, with zero apparent gradient for distribution is extremely inefficient in terms of municipal servicing and has not been adequately maintained by market forces.

However by adjusting for density within the distance rings, thereby counterbalancing physical, policy and geometric constraints for the population, a rather different reflection of the 1996 population structure is revealed, as shown in figure 3.3.5.

The most patent discrepancy between absolute and density distributions is the sudden appearance of the city core population within the first 5 km's of the centre of the CBD. Given that in the density profile this is the highest data peak, it clearly indicates, under the theoretical principles of the bid-rent function, that in 1996 the highest location for residential demand was directly surrounding the historical CBD.

Furthermore a more clearly defined density gradient emerges, which on aggregate slopes negatively with increasing distance from the CBD. This observation shows a defined demand for space building towards and peaking at the historical centre of the CBD. This sloping profile is largely consistent within an overall monocentric city structure, however, given that this gradient is far from perfectly linear, with a number of ranging troughs and peaks in the dataset, suggesting at least a partial tendency towards a polycentric structure of population.

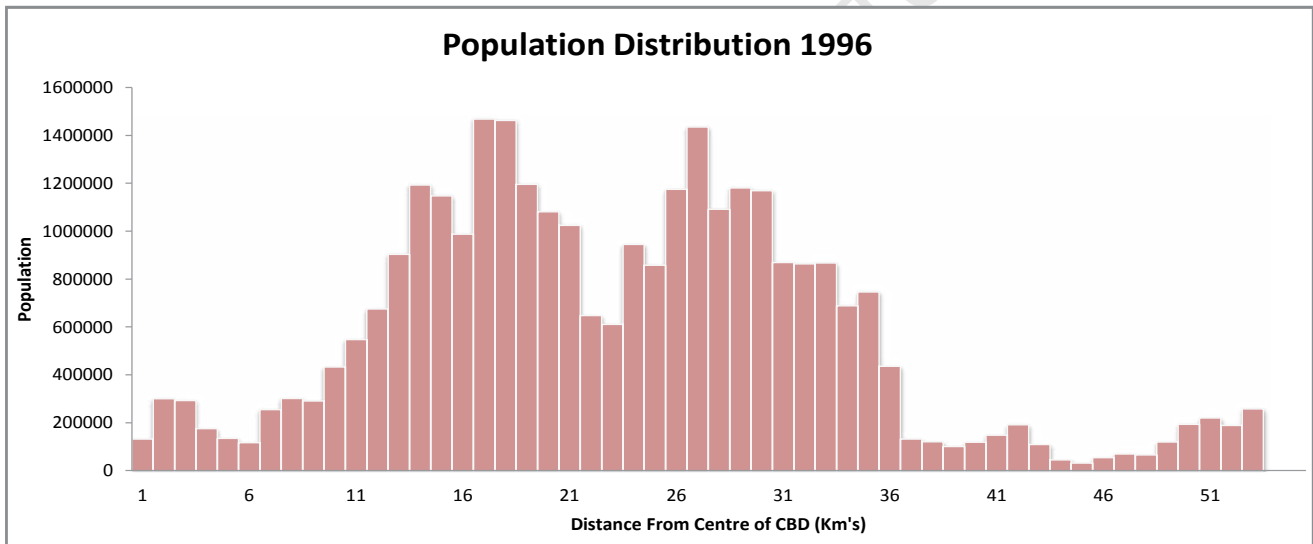


Figure 3.3.5

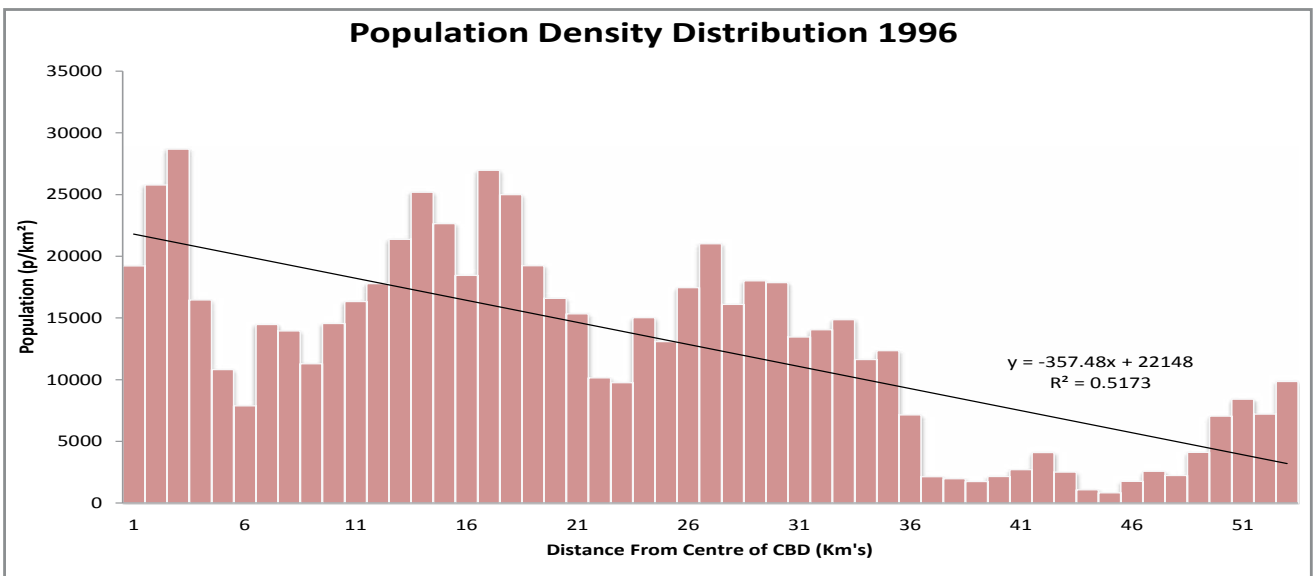


Figure 3.3.6

That proposition is purely from a static point of view but given the historical analysis of Cape Town's city structure found that preceding the benchmark is that it was in flux, qualitatively appearing to be shifting from a historic monocentric towards increasing polycentrism there is a high probability that the emergent profile distribution is depicting just that. In other words, evidence supports that population structure in 1996 was trending away from monocentricity towards polycentrism, yet at the time closer to the former than the latter.

A further critical observation that can be made by introducing the density profile is the divergence from the nationally prevailing apartheid model, entrenched at the time, of the positive density gradient. As evidenced by Dewar et al(2000) the prevailing trend of Cape Town historically had presented a positive sloping density profile entrenching a core-periphery type model, similar to that of Johannesburg as shown in figure 3.3.7. The absolute distribution for Cape Town, although not as severe, is similar however when geographical limitations are accounted for in the density profile a patently negative sloping density exists in Cape Town. This indicates that in 1996 incremental resumption of a healthy functioning urban land market had begun.

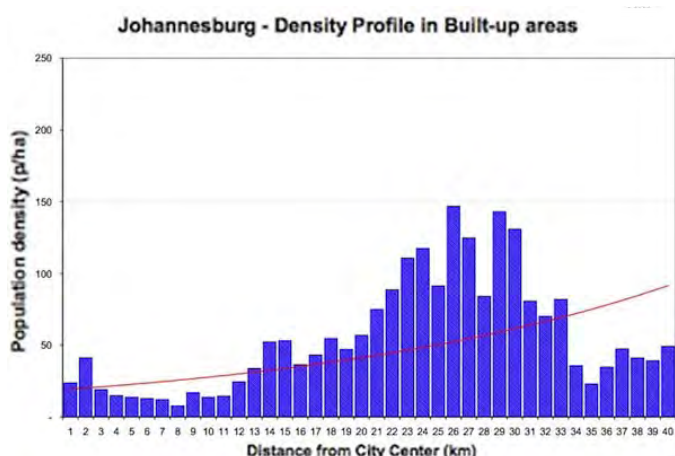


Figure 3.3.7 Density profile for population in Johannesburg (Bertaud, 2001)

3.3.3 Space Economy Structure Benchmark

The benchmark evaluation of Cape Town's spatial economy structure is performed using land-use data from the period. The distribution charts were obtained through statistical analysis of over 300 000 separate site uses.

The analysis and benchmarking is performed for the 1996 spatial economy by deconstructing it into the three main economic sectors so as to allow for cross sectoral analysis of contemporary trends in the subsequent section of analysis.

Tertiary Sector Space Economy '96

The spatial distribution of Cape Town tertiary commercial sector, as seen spatially in figure 3.3.8, indicates strongly the presence of the historical spines in retaining a relatively high locational demand. In this regard, given the established trends covered in the historic patterns it can be seen that in 1996 the centripetal forces of historical agglomeration still, on aggregate, outweighed the centrifugal forces of dispersion due to negative externalities and a shifting populace. However it also depicts the incremental dispersion of locational demand forming a fragmented network of tertiary services, predominantly between the Southern and Eastern historical spines.

The absolute distribution of tertiary services can be seen in figure 3.3.9 which, surprisingly shows that in 1996 the vast majority of these services were located 11 km's away from the centre of the historical CBD. This is counter-intuitive to the monocentric city model which assumes tertiary services to have the highest sectoral bid-rent and demand for CBD space. This would lead to the assumption of polycentric form beginning to entrench, however the figure clearly indicates a singular peak in tertiary service activity. Therefore the most probable explanation would be a shifting of the CBD from the historical centre but still under the monocentric framework.

However, density distribution analysis of this provides another crucial insight as seen in figure 3.3.10. This is because it clearly displays an apparent dual peak density profile for 1996, suggesting that despite the majority of tertiary activity existing outside of the historic CBD, an almost equal demand for space as close to the historic CBD existed in 1996. Therefore two main observations can be made for the tertiary sector in 1996; a high level of spatial density split between two centres of almost equal demand, indicating a dual-centric sector economy, and that despite this equal demand an apparent large deficit in absolute activity agglomerating around the historical centre existed.

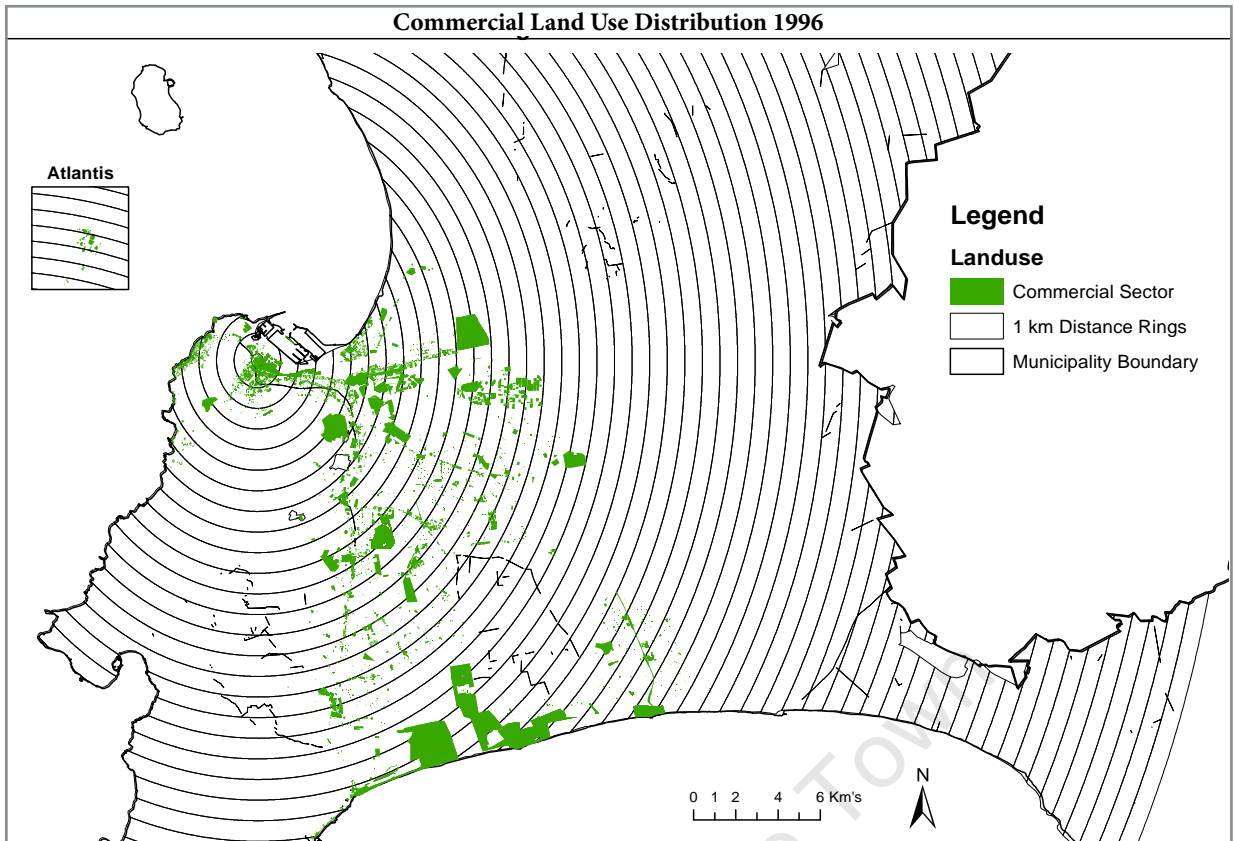
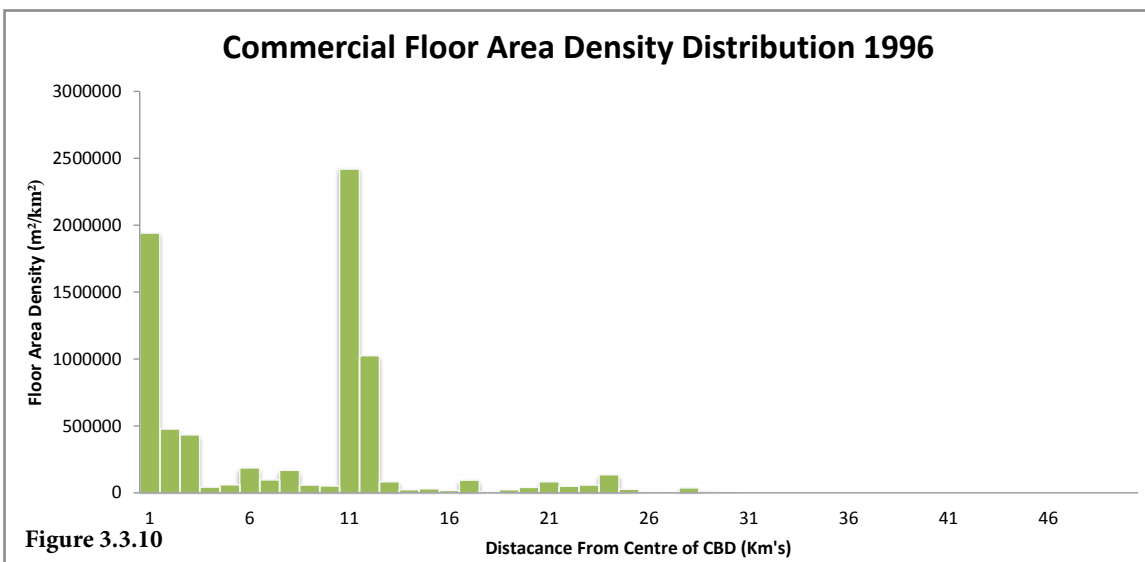
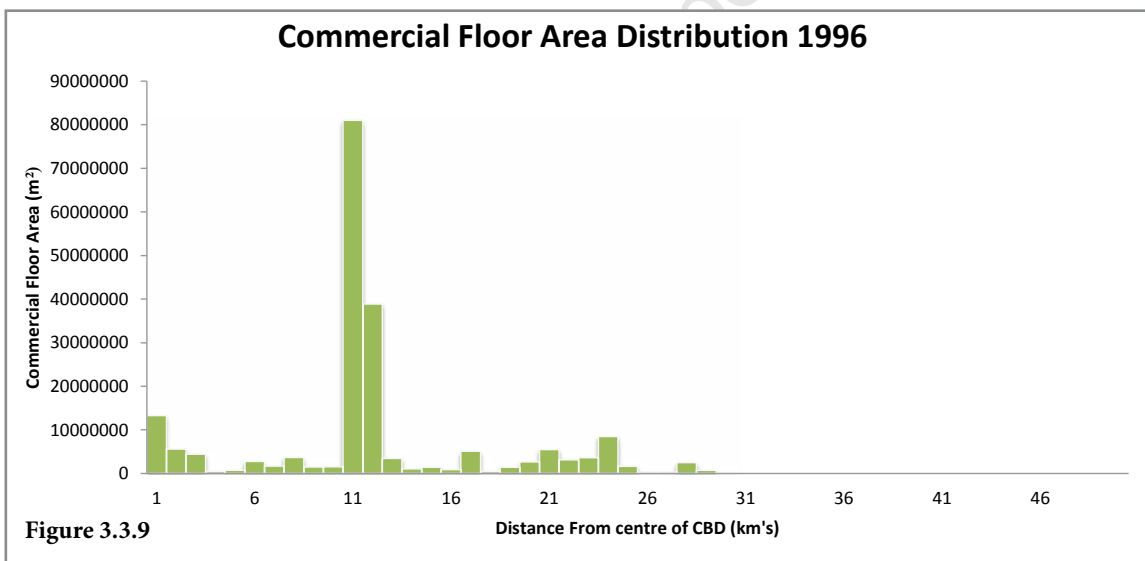


Figure 3.3.8



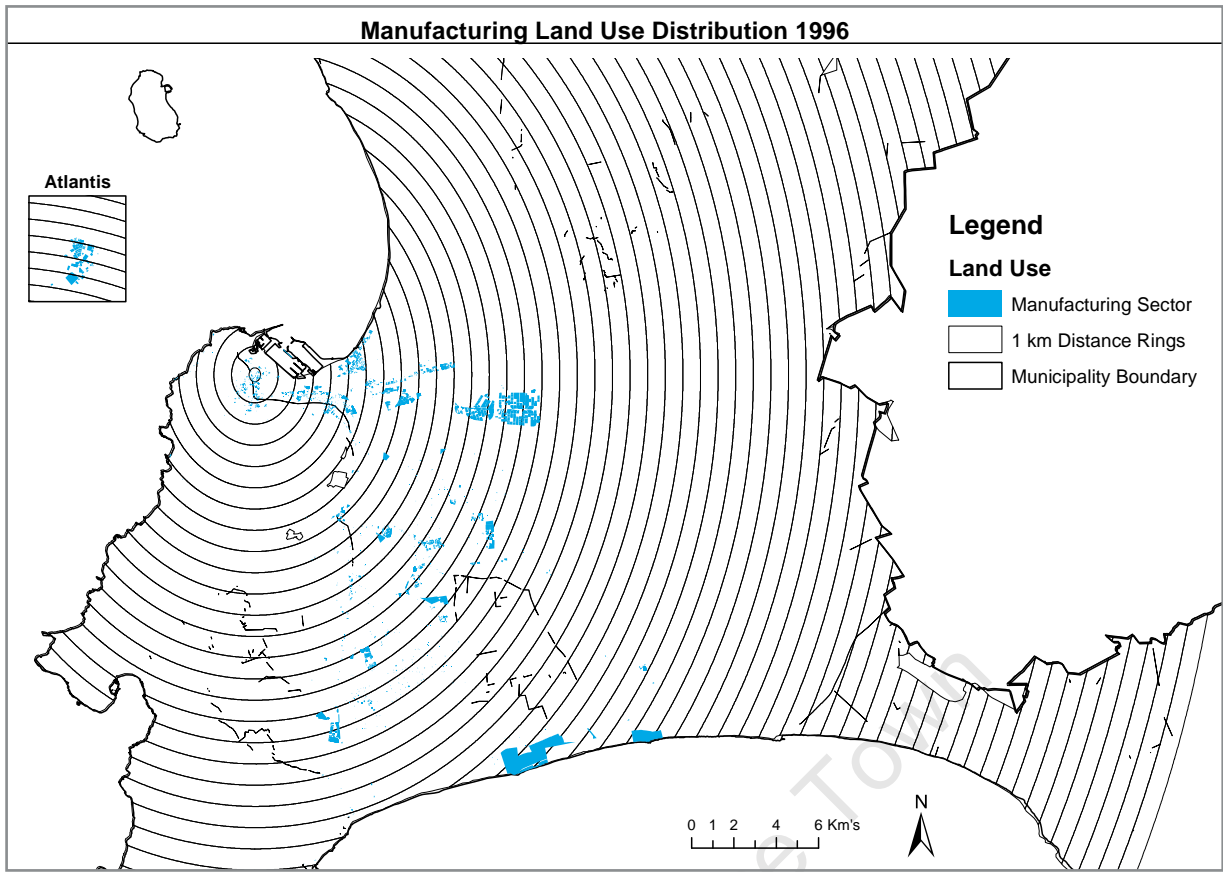
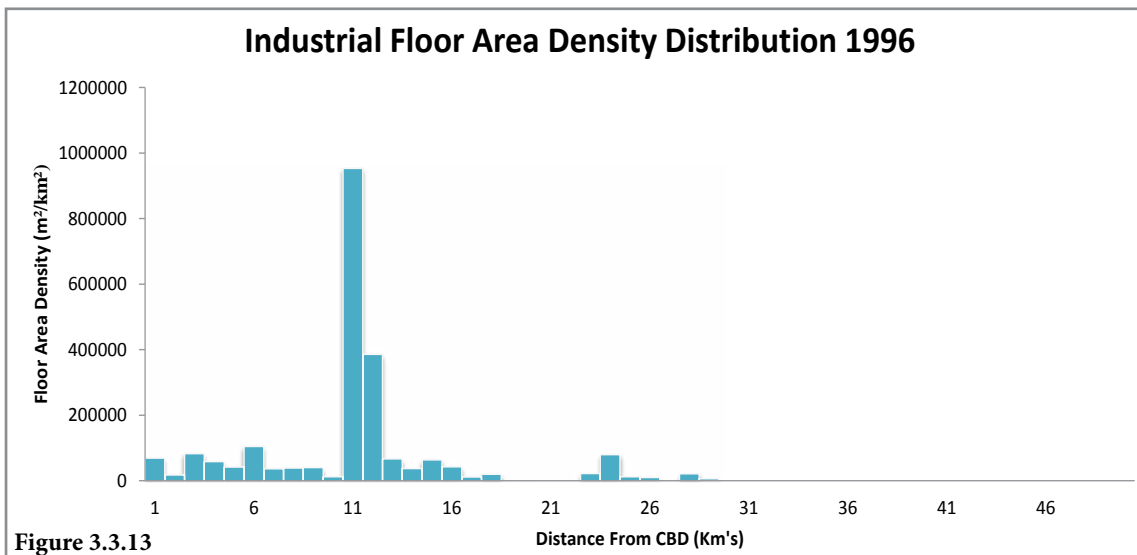
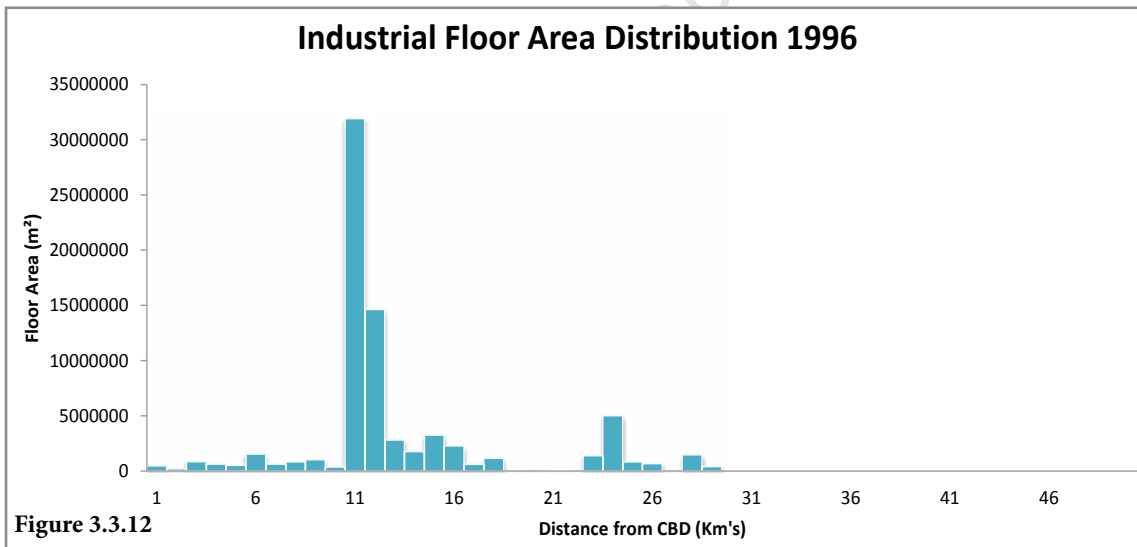


Figure 3.3.11



Industrial Sector Space Economy '96

The spatial distribution of the 1996 industrial and manufacturing sector (figure 3.3.11) shows several trends. Firstly in comparison to the tertiary sector it is evident that it was more geographically concentrated, secondly it is evident that it consumes far less urban footprint than the former sector, and finally it displays, as with the former, a tendency towards historical spine concentration. However a singular major concentration appears to have had agglomerated at the far end of the Eastern spine, discontinuously from the historical corridor, forming the Epping Industria area.

The absolute distribution, shown in figure 3.3.12 indicates that a singular node existed, as with the tertiary sector located 11km outside of the CBD with the majority of remainder distribution occurring further outwards from the CBD. The density distribution profile for industrial activity (figure 3.3.13) does little to change the interpretation of structure for industrial activity, other than indicating a slight increase in demand towards the CBD contrary to the absolute distribution. It does however indicate high levels of agglomerative forces in singular node, which in a static, unitary evaluation indicates a monocentric morphological structure.

Furthermore given the theoretical underpinnings of the monocentric city model, it is congruent that the location of industrial activity be agglomerated outside of the CBD as its bid-rent is secondary to that of the tertiary sector due to income per unit area.

Retail Sector Space Economy '96

Spatial analysis in figure 3.3.14 shows, unsurprisingly, that retail activity in 1996 represented the most dispersed of the three economic sectors. The most noticeable difference of three sectoral maps is the substantial retail in presence within the South-East quadrant, which both commercial and industrial sectors clearly avoided. This can merely however be attributed to the fact that retail is a solely weight gaining sector, under the theory of Weber (1929), meaning that it's primary locational demand is market density and accessibility.

The absolute distribution for retail, shown in figure 3.3.15, by and large supports this assertion, with the nodes of retail being fairly related to the population distribution analysed already. However it does present three distinct nodes of retail activity, corresponding with the CBD, the same node as tertiary and industrial activity at 11km from the CBD as well as a new nodal appearance at 17km's from the city. This node appears to reflect the incidence of retail in the Bellville area. The minor retail nodes are representative of retail activity in the population strongholds of the South East.

The density profile for retail in 1996 (figure 3.3.16) however indicates that at the time the demand for retail was still firmly ensconced within the CBD, which although did not reflect even near the highest absolute population distribution, it was the highest area demand in terms of the population density profile. This reflects strongly a tendency towards the monocentric city model, revolving around the historic CBD centre in terms of retail locational demand. However the majority of the absolute distribution reflect that retail could not compete with the high bid-rent demands of the city centre in 1996, thereby driving the increasing attractiveness of suburban retail and the establishment of freeway mega-malls as uncovered in the previous section of analysis.

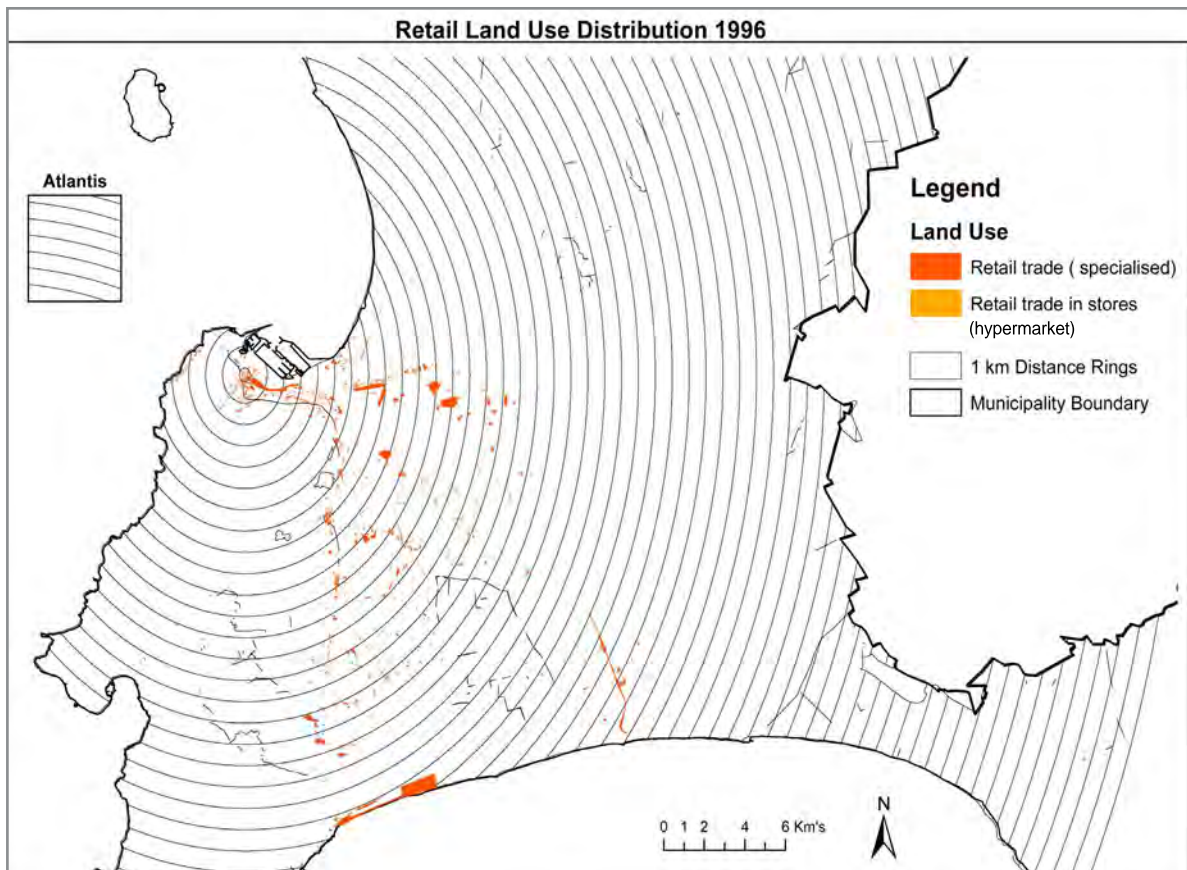
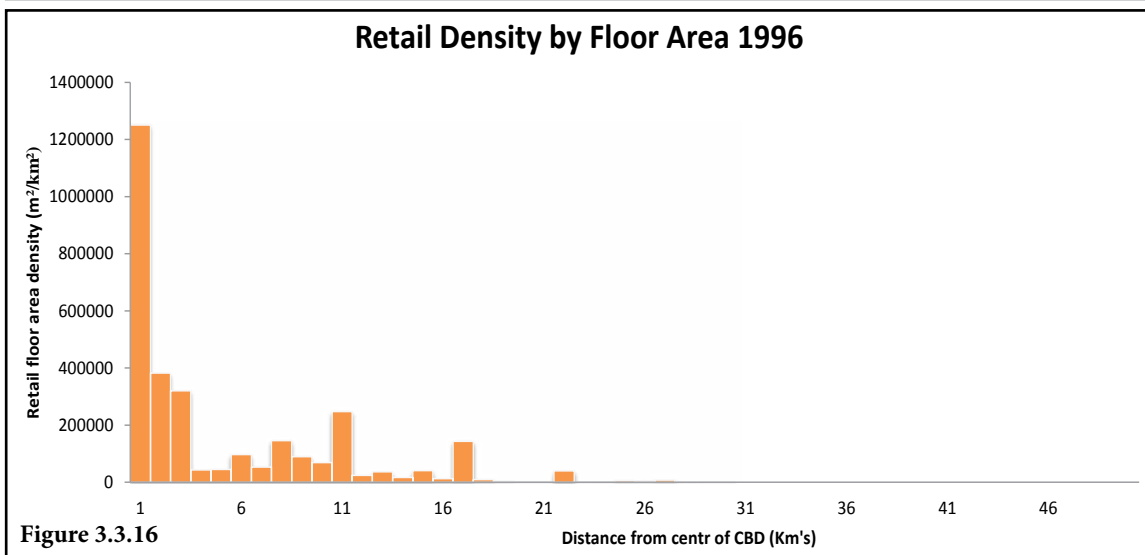
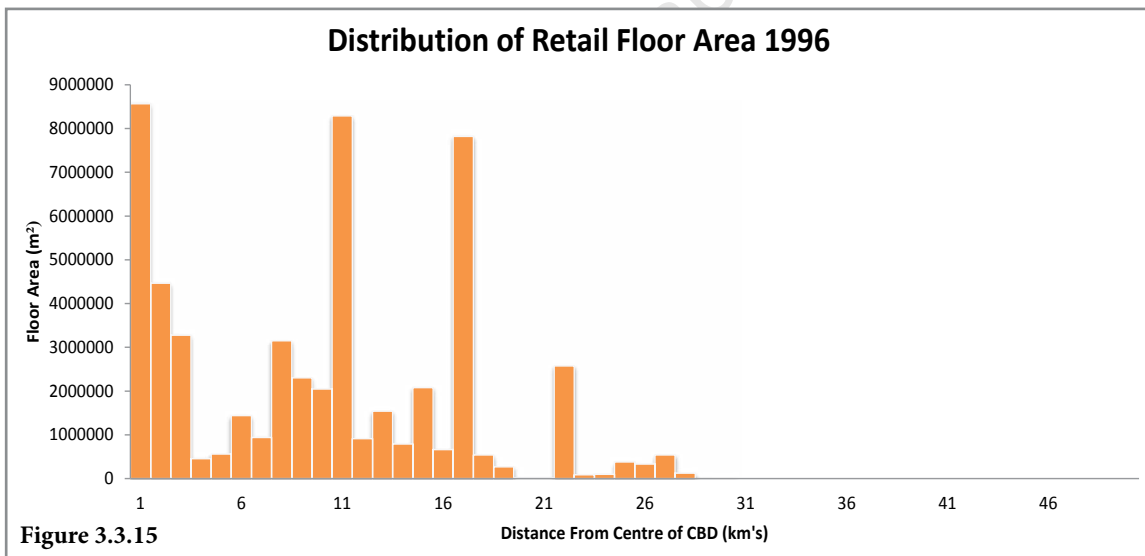


Figure 3.3.14



3.4 COMPOSITE BENCHMARK

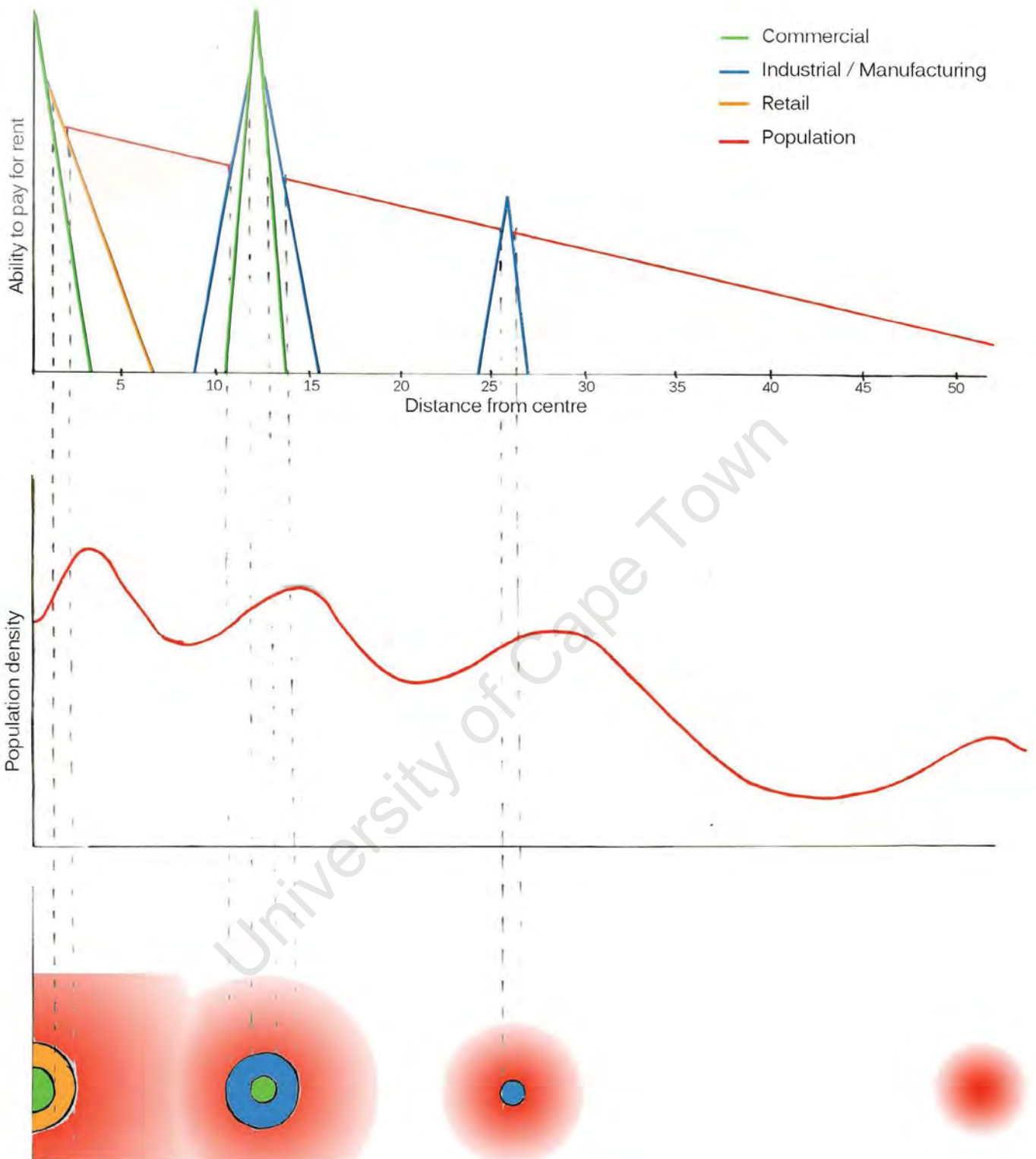


Figure 3.4.1

Figure 3.5.1 above is a composite graphical representation of Cape Town morphological density in 1996. It represents the amalgamation of the three economic sectors and residential density distributions into a unified model for evaluation.

It indicates clearly that at the time of the benchmark period in 1996 Cape Town had two high density nodes of intense mixed use economic activity, which represented the historical CBD and the historical corridors. It further had a third relatively

lower density purely industrial node further out from the CBD along the distribution.

The profile then shows how the peaks in population density occur in line with these nodes indicating a congruent orientation between the space economy and residential distribution. The spatial outcomes of this relationship can be seen in the bottom panel of the figure.

3.5 CONTEMPORARY TRENDS

This section approaches the analysis of Cape Town city structure from the chronological vantage point of changing trends since the inception of democracy in South Africa and into the 21st century. It aims to systematically analyse the independent variables that construct the contemporary structure of Cape Town with a focus on how Cape Town's spatial economy is both informing and responding to the interaction of these variables.

This analysis uses a mixture of quantitative, qualitative and spatial data to deconstruct the prevailing trends within the city and employs the usage of density distribution profiles to create a tangibly comparable framework across variables. The choice of this method for profiling relates directly back to chapter two where the literature on location theory and spatial structure points towards density and distance as being two of the defining characteristics for economic efficiency and promoting sustainable economic growth.

3.5.1 City Form and The Economy Contemporary Trends

The introduction of democracy and lifting of international sanctions allowing the re-entry into global markets and the forces of globalisation at large, in 1994 drove a gradual shift in the Cape Town economic base over the ensuing period till now. Driven by the development of finance, business services, logistics and tourism, Cape Town has incrementally edged towards a service based economy (OECD, 2008).

The re-integration of the Cape Town economy into the global economic market has driven advantages in a number

of subsectors, notably the “dynamic global value chains (agro-food, tourism and hospitality) and emerging clusters (financial and business services, logistics and creative and knowledge-intensive industries), while new demands for urban consumption (housing, retail and construction) driven by a positive business cycle and supported by public investments and social grants, have spurred internal dynamics” (OECD, 2008:55).

This is directly comparable to the economic structural transitions discussed in Chapter 2, where maturing economies transition to a service based economy thereby generating increasing returns on labour and capital. Figure 3.5.1 shows this contemporary transition of sectors within the Cape Town economy, and when contrasted with the benchmarked sectoral composition of 1996, the size of the shift is self evident. Whereas in 1996 the largest relative share of the Cape Town economy was in manufacturing with 27 percent of output accorded to the sector, in 2009 manufacturing had become a secondary sector at 16 percent of output while the tertiary finance sector had become dominant and even retail was on par with manufacturing.

This, at least in theory would've driven a large spatial restructuring of the city through sectoral based locational dynamics. Together with the changing income distributions and shifting population dynamics engendered through these, and the abolition of apartheid, a transformational morphological and functional relationship of these variables is likely to have ensued. It is these spatial changes which this section seeks to investigate and analyse.

It must be mentioned that despite the changing sectoral composition of the Cape Town economy being theoretically positive in a number of ways, such as its linked causality to higher incomes, in the case of Cape Town there are a number

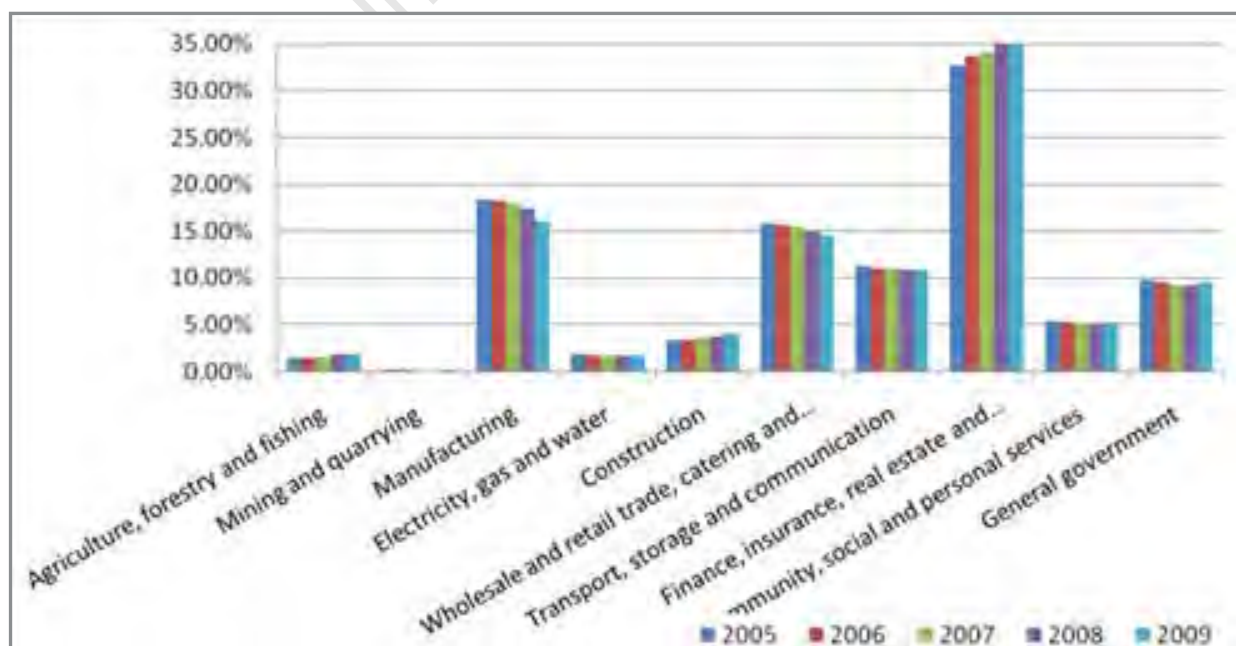


Figure 3.5.1 Change in sectoral contributions to Cape Town's economy 2005 - 2009.

(CoCT online, 2013)

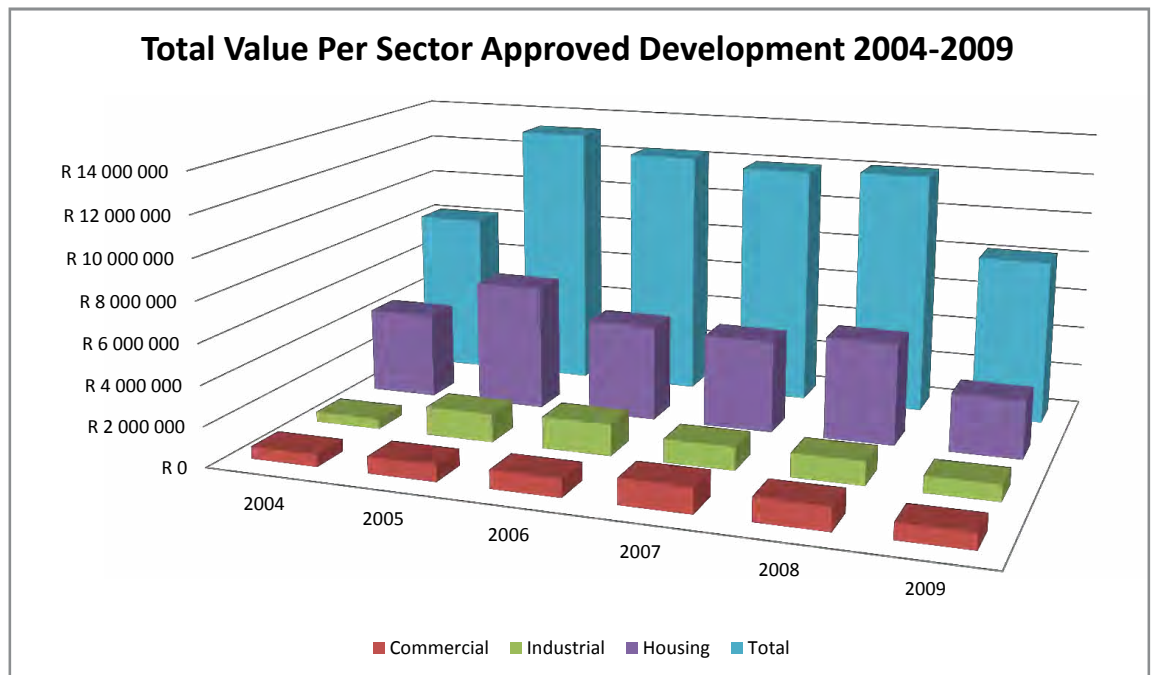


Figure 3.5.2

(Data source: CoCT online, 2013)

negative affects that are induced through this shift, at least in the short term. The most dire of these is the mismatch between skills and opportunities as low levels of education drives a skills shortage, while a move away from labour intensive semi-skilled industries drives a job shortage. This incongruence of demographic and economic factors in Cape Town is well summed up by the Organisation for Economic Co-operation and Development (OECD) in its seminal report on the Cape Town economy below.

“Employers in many sectors are critically short of workers with the appropriate skills, and tend to make up for the deficit with capital or foreign labour, thereby increasing the vulnerability of the city-region’s economy. Cumulatively, this has created an imbalance between the demand for highly skilled workers and the large supply of low-skilled labourers, which in turn, reduces the competitiveness of the main economic drivers.” (OECD, 2008:18)

This, coupled with the continuation of “apartheids land use framework” which “continues to shape urban planning in Cape Town, through the frequent use for social housing of cheap parcels on the urban periphery, often on land already acquired by the apartheid state for township development” (OECD, 2008:22). It can be seen then, that the current administration of urban planning by the CoCT has perpetuated the primacy for quantity over the logic of spatial form, to the detriment of economic and social integration, sustainable resource consumption and fiscal austerity.

This disparity, in aggregate economic and demographic profiles, as well as spatial location of these, when assessed spatially within the framework of metropolitan form is, despite urban planning’s general avoidance of direct economic intervention, highly consequential. The reason for this is evident in the

assertion, which was discussed in chapter two, that the primary *raison d’être* of large cities, is the ability to provide a large enough labour market to support division of labour, and scales of economy through which specialisation may be achieved and consequently increasing returns on labour (Bertaud, 2007; Glaeser, 1994). In this way the limit to a cities growth in the long run is its ability to maintain a unified labour market, and market fragmentation as a result of ineffective management or infrastructural inefficiencies will therefore lead initially to economic decay and subsequently population dispersion (Bertaud, 2007). In this regard the perpetuation of any urban form which in effect is to fragment labour markets and the space economy will not be economically viable in the long run.

Innovation in commercial activity has further been identified as a shortcoming of the Cape Town economy, with only generating 13% of South Africa’s patents as opposed to Johannesburg with 56%, despite being the two dominant regional economies within the country (OECD, 2008:20). As established in the literature review however there are three variables at the disposal of urban planning to promote innovation, These are proximity, density and market mix. In Cape Town the economy is primarily composed of micro, small and medium sized businesses therefore land use density is the critical factor in this.

While the following sections analyse the spatial distribution of sector growth and shifts, figure 3.5.2 shows the total physical growth of these, as opposed to output, or employment. It clearly shows that contemporary development trends are largely disposed towards the construction of housing, while commercial and industrial activity despite their vastly differing total outputs, they have remarkably competitive levels of new construction value.

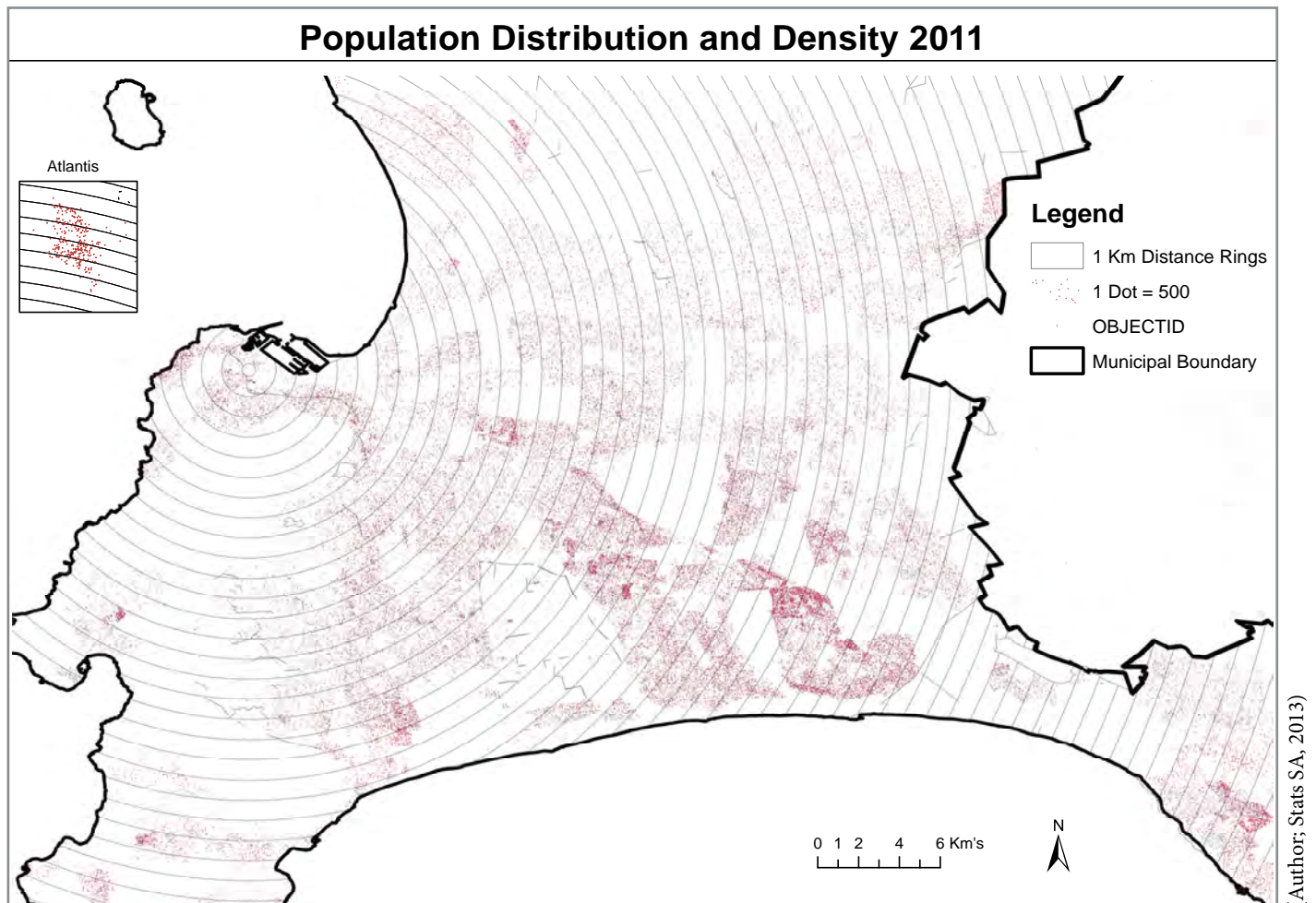


Figure 3.5.3

3.5.2 Population Structure 2011

The national South African census in 2011 provides a comprehensive data set to evaluate the changes in Cape Town's residential structure since the benchmark in 1996.

The map (figure 3.5.3) of Cape Town's population point out several immediate trends when compared to that of its 1996 counterpart (figure 3.3.4). Firstly it is evident that the South-Eastern quadrant has seen the most apparent growths in density. Secondly growth to the North of the city has been rampant and lastly the historical spine corridors, at least relatively to the significance of the other trends, appear unchanged.

The profiling of absolute population distribution (figure 3.5.4) reflects the uneven spatial growth of the Cape Town residential population since 1996 by quantitatively demonstrating the increasing relative share of population which lives within the central quartiles of the distribution. This further verifies the growth of the South-east quadrant and sprawling suburban growth of the North since the 1990's indicating a entrenchment of trends.

Relatively unchanged is the distribution which lies between the sprawling suburbs and the dense South East quadrant but

before the tail peak in the distribution of Somerset West. This indicates a relative fortitude in the restrictive policies of sprawl implemented by the Cape Town Municipality. However a far higher relative share at the tail of the distribution is further a significant trend which can be observed. Given the mapped data and distance from the CBD, it can effectively be attributed to the development of Somerset-West, to the extreme South-East, as an increasingly significant residential node in Cape Town. A further significant implication of the population distribution profile shows the increasing relative share of population growth towards the CBD rather than on the far end of the 1996 peaks. This indicates a tendency of increasing density towards the CBD rather than low density sprawl away from it, which is contrary to global trends but in many aspects a positive trend.

Inspection of the density distribution comparison between the 1996 and 2011 population profiles firstly indicates a structural rigidity in the population landscape, shown in figure 3.5.6. This is evidenced by the striking resemblance of relative density distributions across the CMA over the period of 15 years. The rings of high density have retained their relatively high dense nature and areas of low density have too remained relatively so.

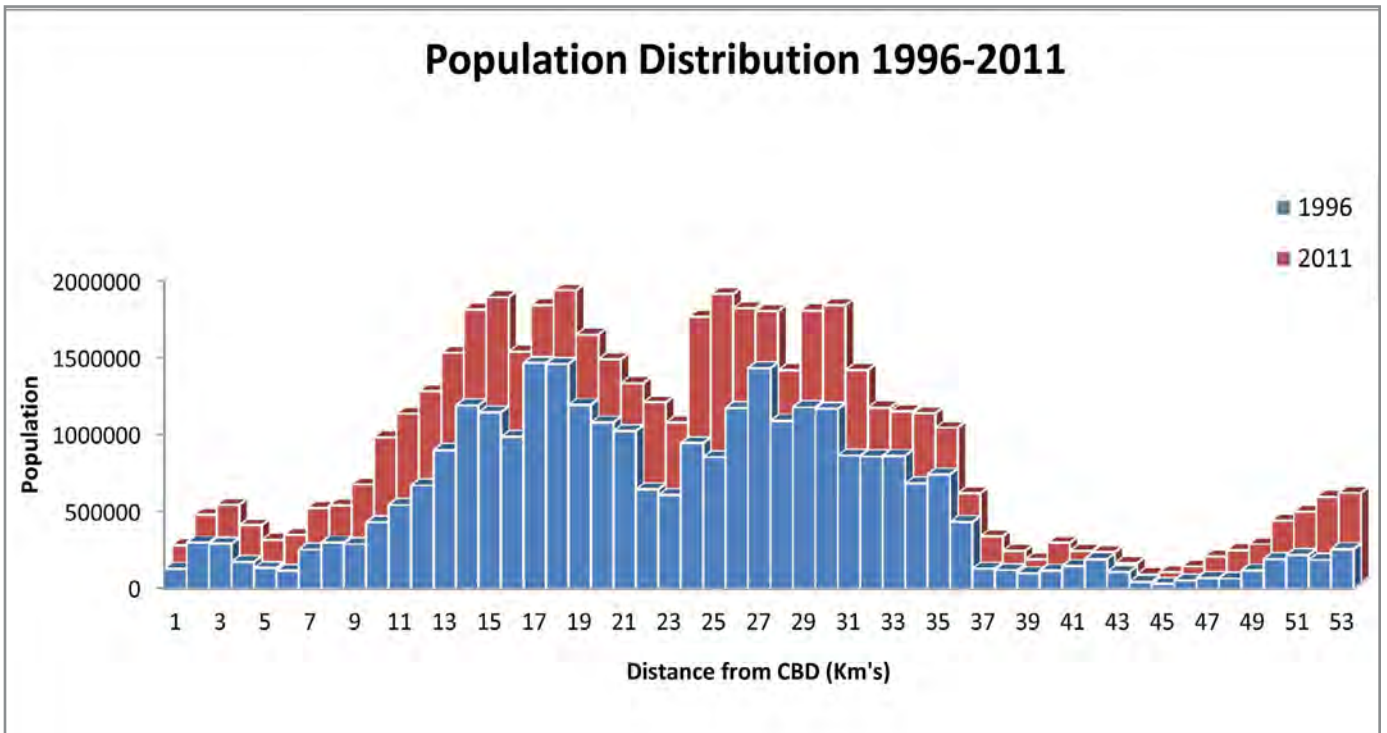


Figure 3.5.5

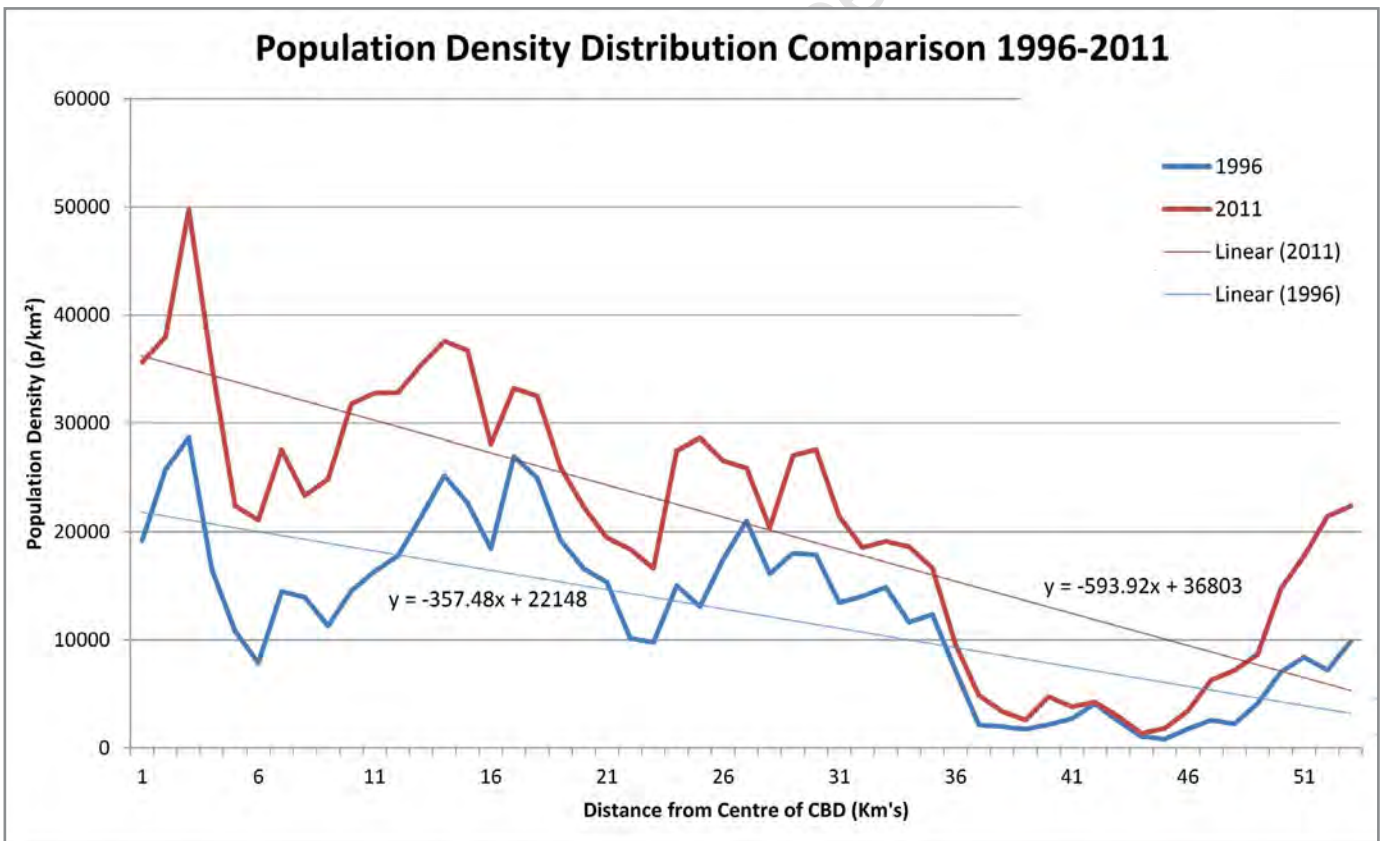


Figure 3.5.6

However upon closer inspection, three critical revelational trends are apparent through the comparison of the two density profiles. The first is the increasing level of relative increase in density that the inner city and CBD has experienced in the last 15 years. This growth has altered the morphological profile of the city by attributing the CBD and its immediately adjacent areas as the clearly identifiable peak in density within the city, shifting from what was a dual peak residential density distribution in 1994.

This change is furthermore indicative of an increasing demand for space in near CBD, which would correlate with its rampant property price inflation over the past decade. It is also arguably the realisation of the disparity between demand and supply which was observed in the analysis 1994 benchmark. The persistence of the sharp depreciation of densities, and hence demand between the immediately surrounding areas and the secondary peak 10km's from the centre of the historic CBD however points to a continual distortion of land market fluidity despite the influx into the CBD.

The density distribution profile of Cape Town's population in 2011 also serves to validate the findings of the absolute distribution profile by depicting the rampant density growth of the tail end density in Somerset West. According to the density profile this represents the highest relative growth area in density over the past 15 years as can be seen in figure 3.5.7, with one ring area seeing growth of over 200 percent in the period in comparison to the overall population growth of 46% in the CMA over the same period.

The final critical trend can be observed by comparing the linear trends of the population density distribution profiles over the

period as seen in figure 3.5.6. The changing linear distribution trend shows clearly that overall density has increased throughout the CMA, reflected in the parallel shift upwards of the linear trend line to 2011. However the comparison further elucidates that population distribution has become more relatively heavily weighted towards the CBD end of the distribution. This results in an increasingly steep negative population density gradient. The quantitative shift in the overall density can be observed in the changing linear function shown in figure 3.5.6 which shows that in 1996 for every kilometer traveled away from the centre of the CBD density decreased on aggregate by 357 people per square kilometer whereas in 2011 the decrease was 593 persons per square kilometer.

The overarching trends can be summarised as:

1. Increasing overall density with a strong demand push towards the historic CBD.
2. Despite this demand the bulk of the population continues to reside in a amorphous, structurally disconnected from the CBD, area in the central quartile of the CMA's distribution.
3. An increasing share of population are being relegated to the extreme periphery of the distribution.

In terms of the theoretical underpinnings of city structure, as covered in chapter two, these trends point to a continuation of a distorted market for land, a disconnected labour force and an inefficient land consumption pattern in terms of municipal servicing and transport patterns.

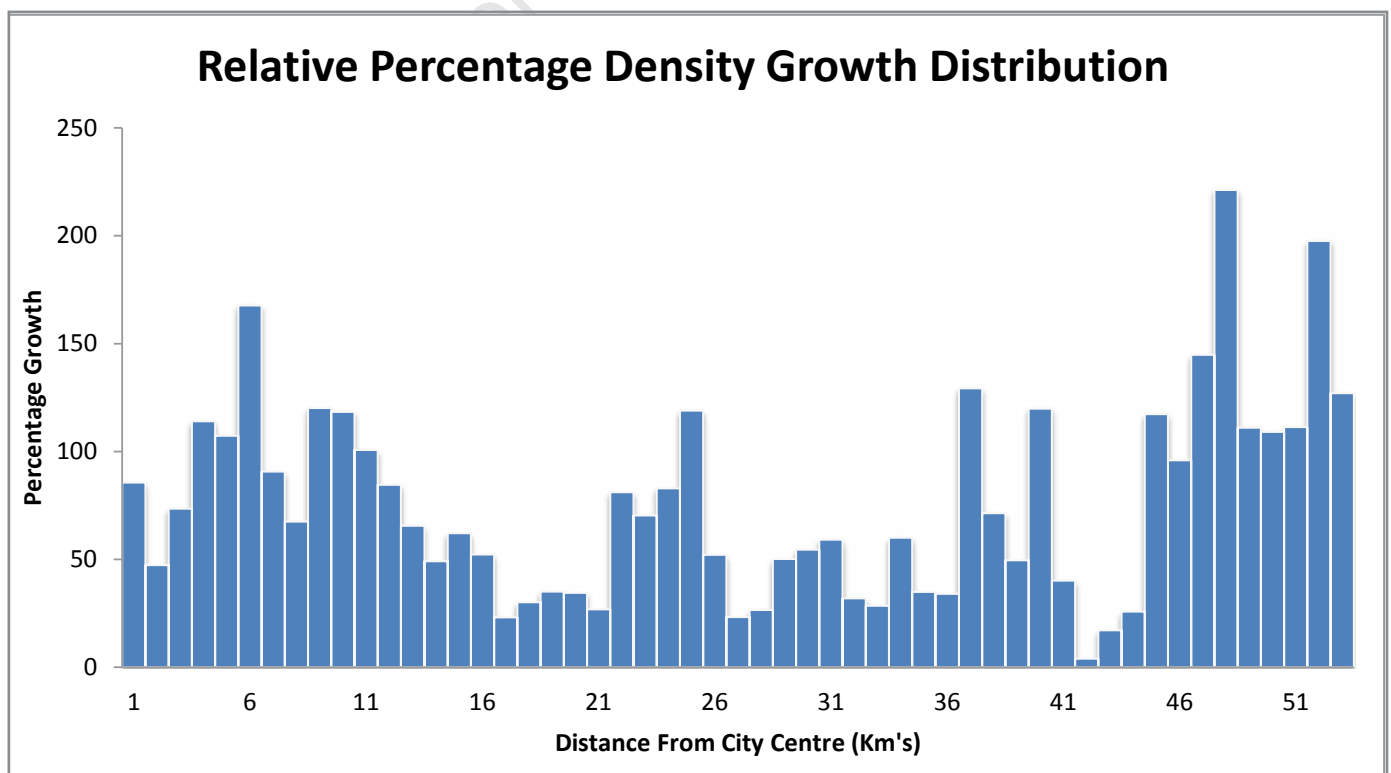


Figure 3.5.7

University of Cape Town

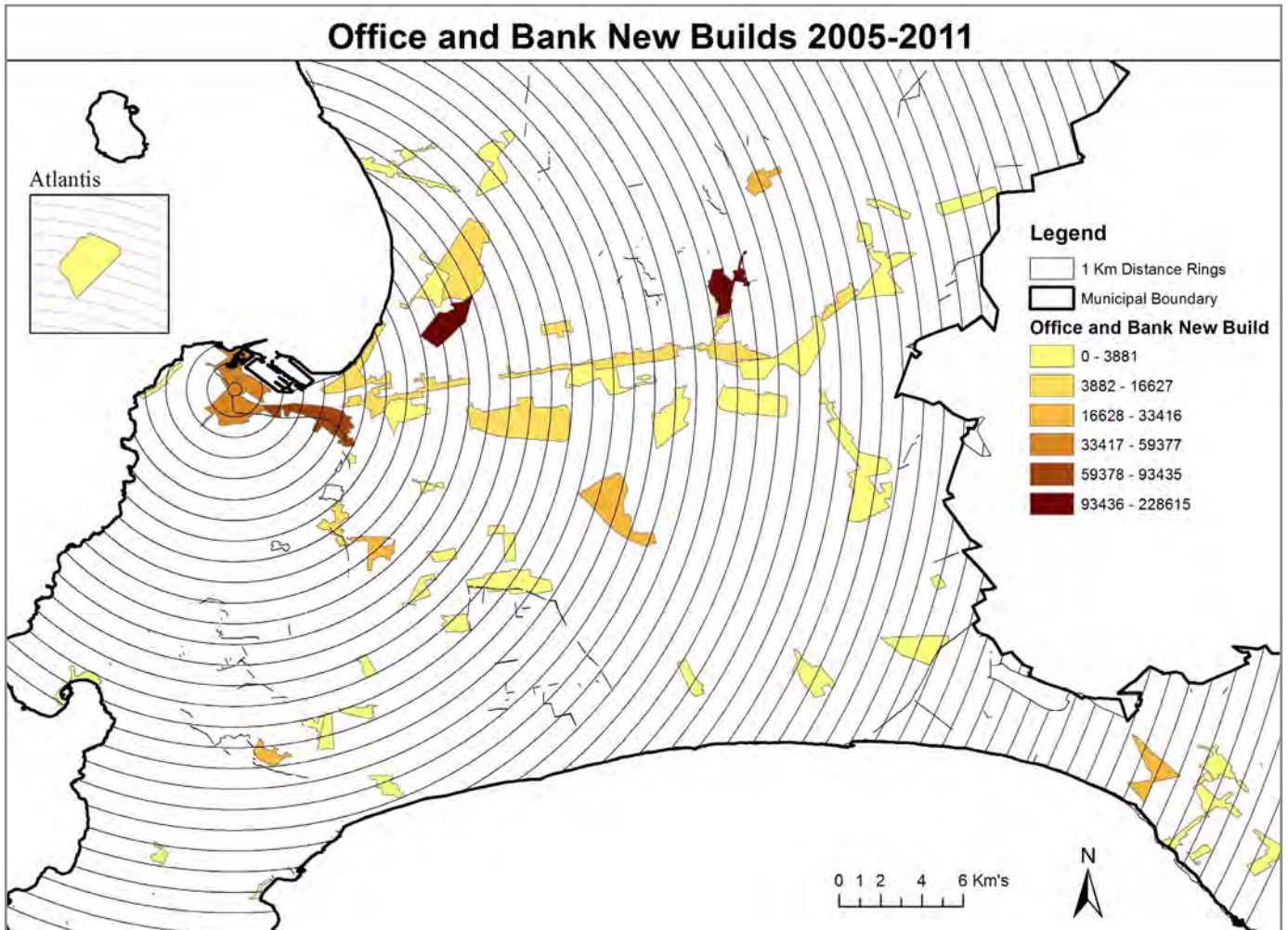


Figure 3.5.8

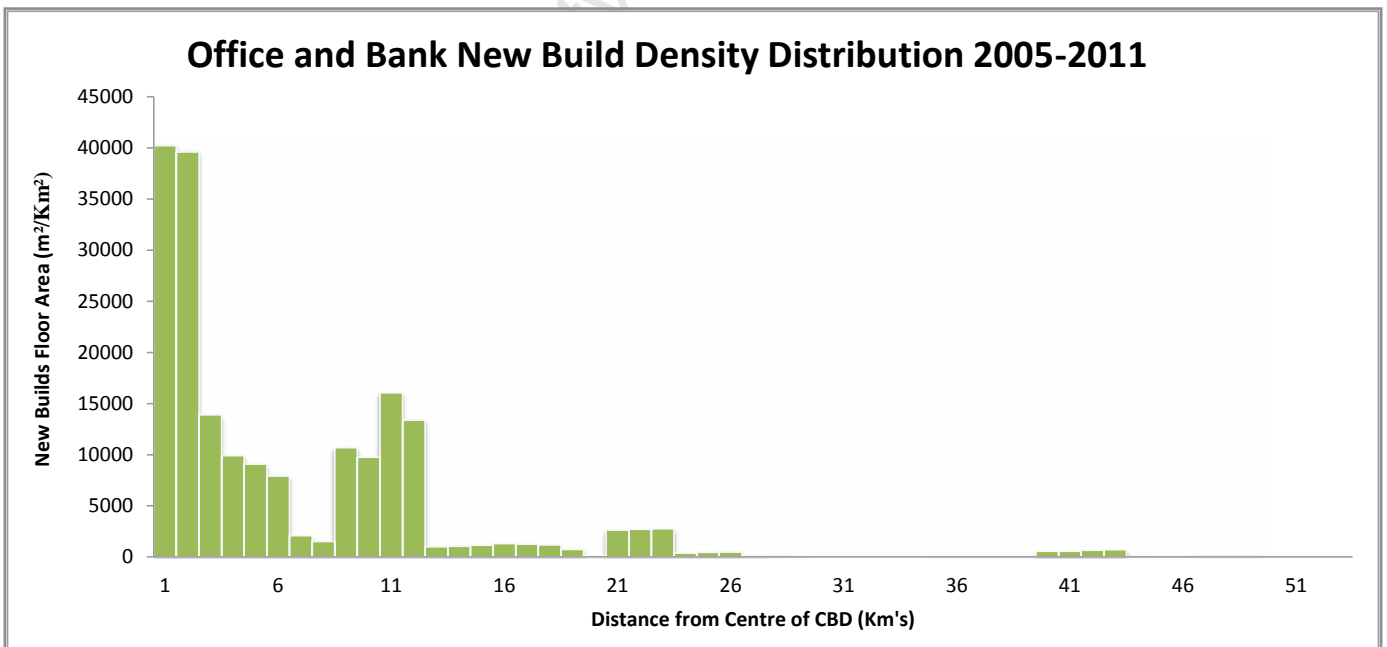


Figure 3.5.9

3.5.3 SPACE ECONOMY STRUCTURAL TRENDS

In order to assess the contemporary prevailing structural trends of the spatial economy sectoral data of new build quantities, in the form of floor area were used. This allows the comprehension of where development, fueled by demand, is occurring and what quantities of development is occurring. A singular shortcoming of this data is its inability to completely convey whether new builds represent a shifting of current activity from one area to another (i.e replacement of activity through location), or if this is purely an extension of what had already and currently existed. However by using macroeconomic analysis in support, the findings will be verified with a higher degree of certainty.

Tertiary Service Sector

The tertiary service sector is reflected in this analysis by office and banking activity new builds a proxy for the entire sector, due to limited availability of data.

Figure 3.5.8 shows the map distribution of office and new builds over the period 2005-2011. It indicates several 'hot spots' for development which show an interesting picture of prevailing trends within the sector.

The most critical trend it shows is that, although the CBD has retained a moderate growth in the tertiary sector over the period, it is relatively insignificant in comparison to the high growth areas observable at Century City, the emergent node since the benchmark in 1996, the privately developed 250 hectare mixed use development including entertainment, residential, retail and office components. Located North of the CBD and at the far end of the historic Eastern corridor in the Bellville/Tygerberg node. Besides for the area immediately adjacent to the CBD, all other areas have seen a moderate to low growth of development in this sector over the period indicating a move away of demand from, or at the very least a surplus of, tertiary activity locating within the historical corridors of Cape Town.

However by assessing the density distribution profile of tertiary service new builds (figure 3.5.9), a demand for space in this sector depicts a different trend. In this view it is evident that the CBD and immediately surrounding areas are in fact the recipients of the highest densities in terms of tertiary service new builds reflecting a heightened demand for this space in the CMA by the sector.

A secondary, relatively minor node also emerges in the density distribution at 11 kilometers from the center of the CBD, which

correlates with the emergent node of Century City. The location of this node, just off the N1 freeway, indicates a growing trend for dispersion towards high access areas similar to the historical retail trends substantiated previously. Although in 1996 this distance represented in fact the area of highest tertiary service density, it was prior to the development of Century city and was in fact reflectant of the dominance of the historical corridors as locational demand points for the tertiary sector. However the absolute distribution trends on the map show that these corridors have not been experiencing anything more than low to moderate growth within the sector over the time period.

Another critical finding of the comparison between absolute and density distribution, is shown by the incongruence between the two, in the new builds occurring in the Bellville node. While this node represents among the highest in absolute new builds it barely features on the density distribution profile of the CMA for tertiary services which, conclusively shows overall deconcentration of activity within the sector.

The absolute values in comparison to the density profiles indicate that the CBD still has by far the largest demand for locational space in the sector, yet the absence in actual new builds within the CBD point to a distortion of the market through either liquidity or that negative externalities are dissuading current investment within the area. This is driving overall deconcentration of the sector, which as shown in chapter two has a number of negative ramifications on both economic potential productivity as well as municipal financial efficiency. The trend also clearly indicates a growing entrenchment of polycentricity within Cape Town's spatial economy from the benchmark of 1996.

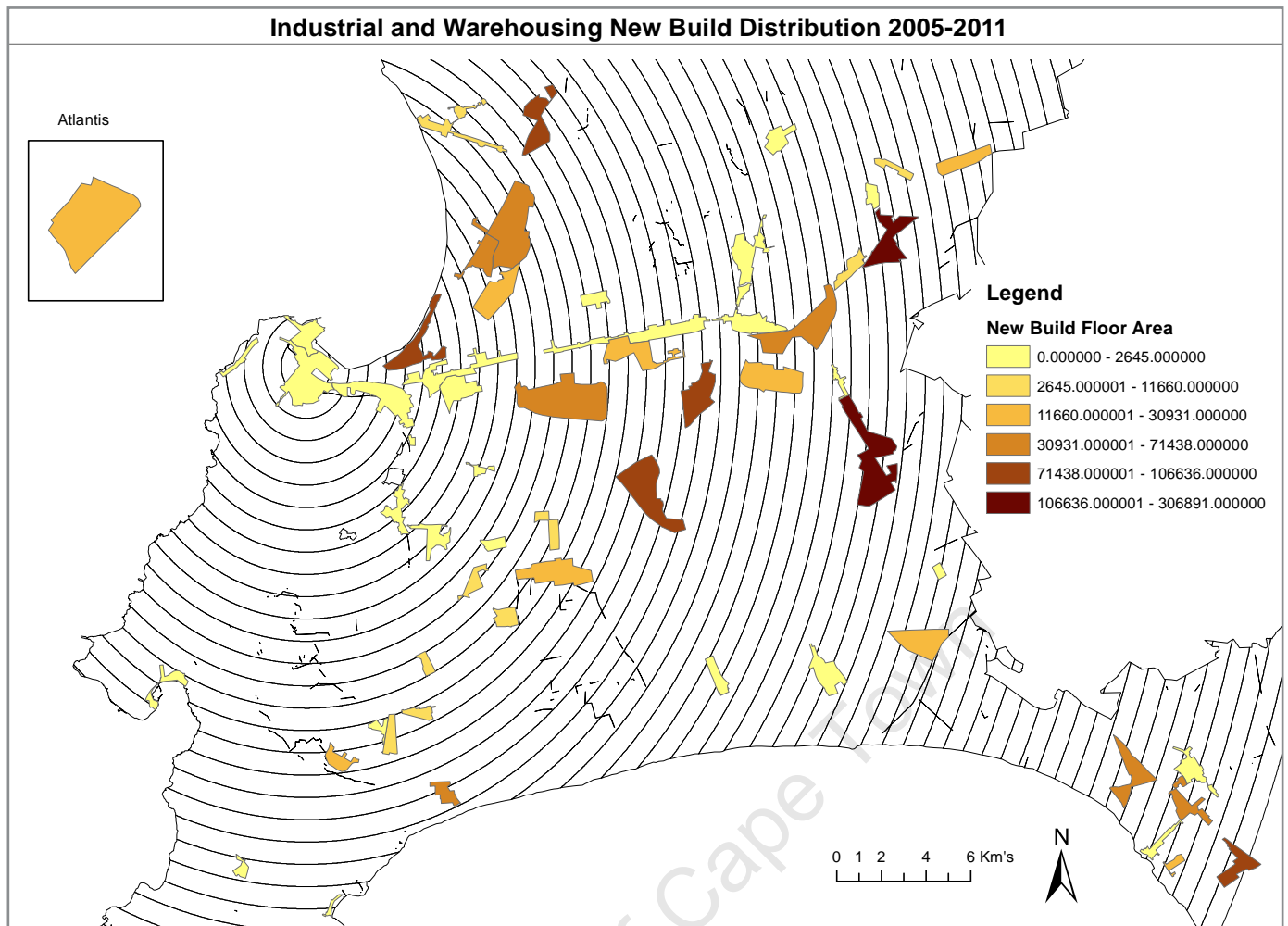


Figure 3.5.10

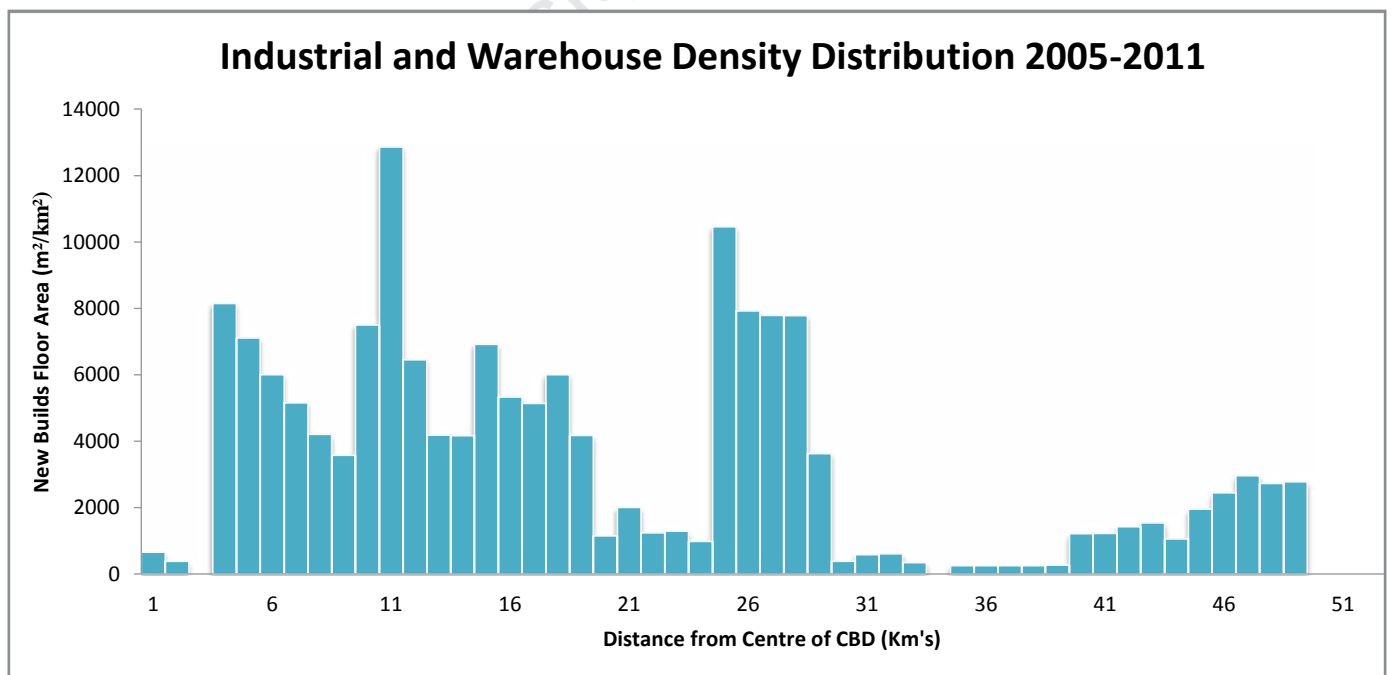


Figure 3.5.11

Industrial/Manufacturing Sector Trends

The map of absolute distribution of industrial and warehousing new builds (figure 3.5.10) shows the aggregate locational trends for the sector between 2005-2011. Spatially it shows three changing trends from the benchmark in 1996.

The first is a noticeable shifting of locational demand within the sector towards the periphery, with two of the three major absolute distribution areas to gain being located on adjacent to the urban edge boundaries. These reflect the growth of industrial nodes such as Brackenfell to the North East of Bellville and Blackheath to the South East of Bellville. Simultaneously the benchmarked nodes for industrial sector activity, which in 1996 was still relatively anchored along the historic corridors, appear to have dissipated in terms of locational demand.

An intriguing, yet difficult to prove, assertion can be made that the redirection of industrial activity, noticeable in the three major areas of development, has shifted to locate around the node of Bellville rather than the CBD. In terms of a monocentric city model this, at least superficially, seems to mimic the secondary bid rent function of industrial activity forming the second ring of land use around the CBD. If valid, this assertion would indicate that the Bellville node may, in functional terms, represent a shifting of the monocentric centre from the CBD. However it is more likely that this represents the chronological transition of the Bellville node from an emerging outlier in 1996 to a mature economic center of parallel status to the CBD. Yet even under this assertion, continuation of the trend indefinitely will ultimately lead to such a transition where the Bellville/Tygerberg node becomes the dominant centre in Cape Town.

The emergence of the airport industrial area, the only non peripheral, but rather geometrically central node of industrial and warehousing new builds, can likely be attributed to the run-off industries generated by the increasing traffic of the airport in both commercial and passenger activities which has seen it become the second busiest airport in Africa (CAPA, 2013). Therefore this nodal growth is likely to represent more an opportunistic space demand than a relocation to due to negative externalities. It further is well located due to its geometric centrality within the CMA and the residential restrictions, associated with airports, due to noise would artificially lower the bid-rent for the area as general retail and services are consumer oriented markets, which typically is well suited to industrial locational demands.

By analysing the density distribution chart for industrial activity new builds over the period (figure 3.5.11), a significant observation can be made that on aggregate there is hardly a in-

dividually discernible node within the CMA, rather the density distribution of industrial activity appears to be homogeneous. This indicates in terms of density trends that vast deconcentration of industrial activity has been occurring and may be delineated morphologically as beyond polycentrism.

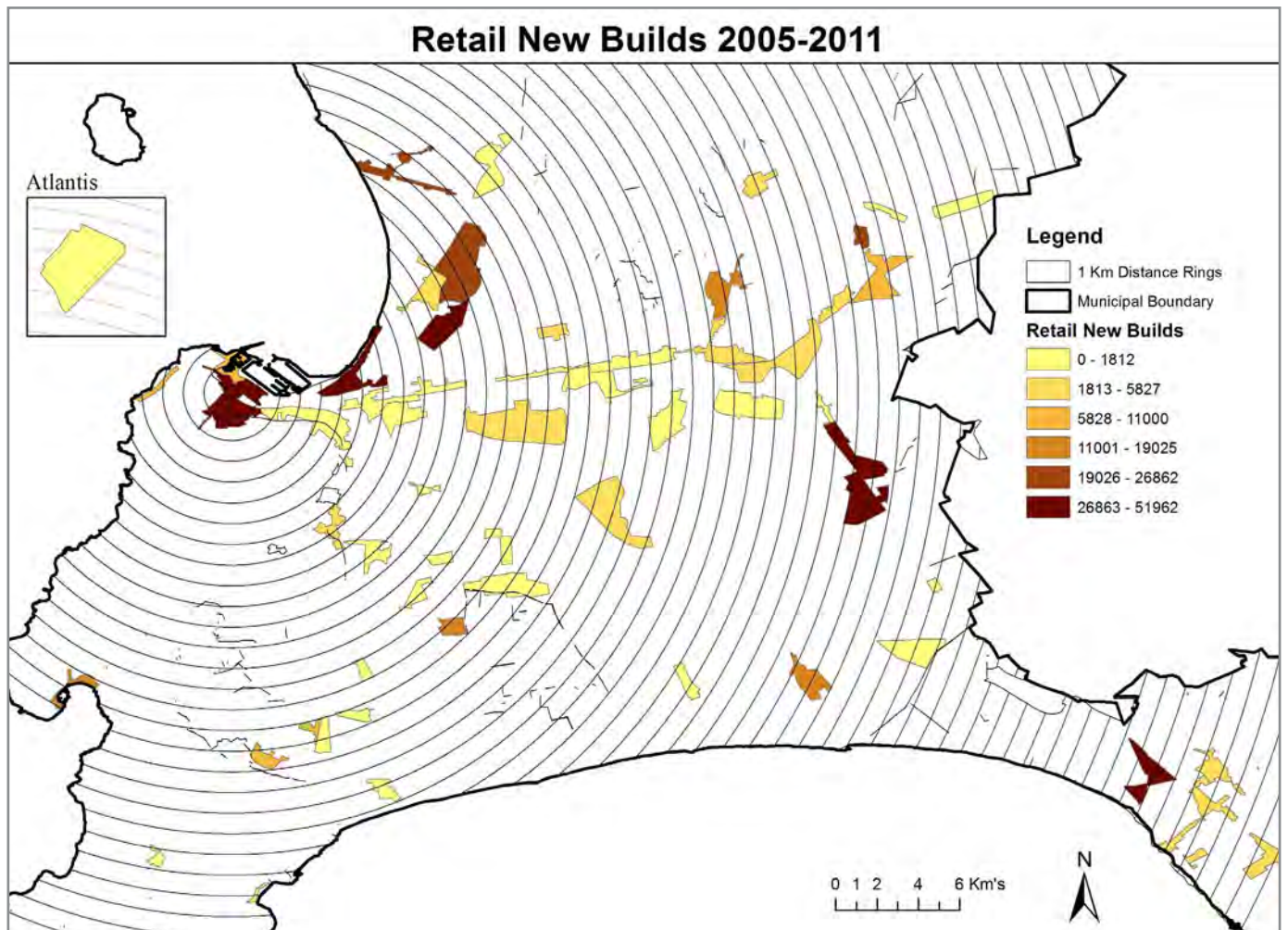


Figure 3.5.12

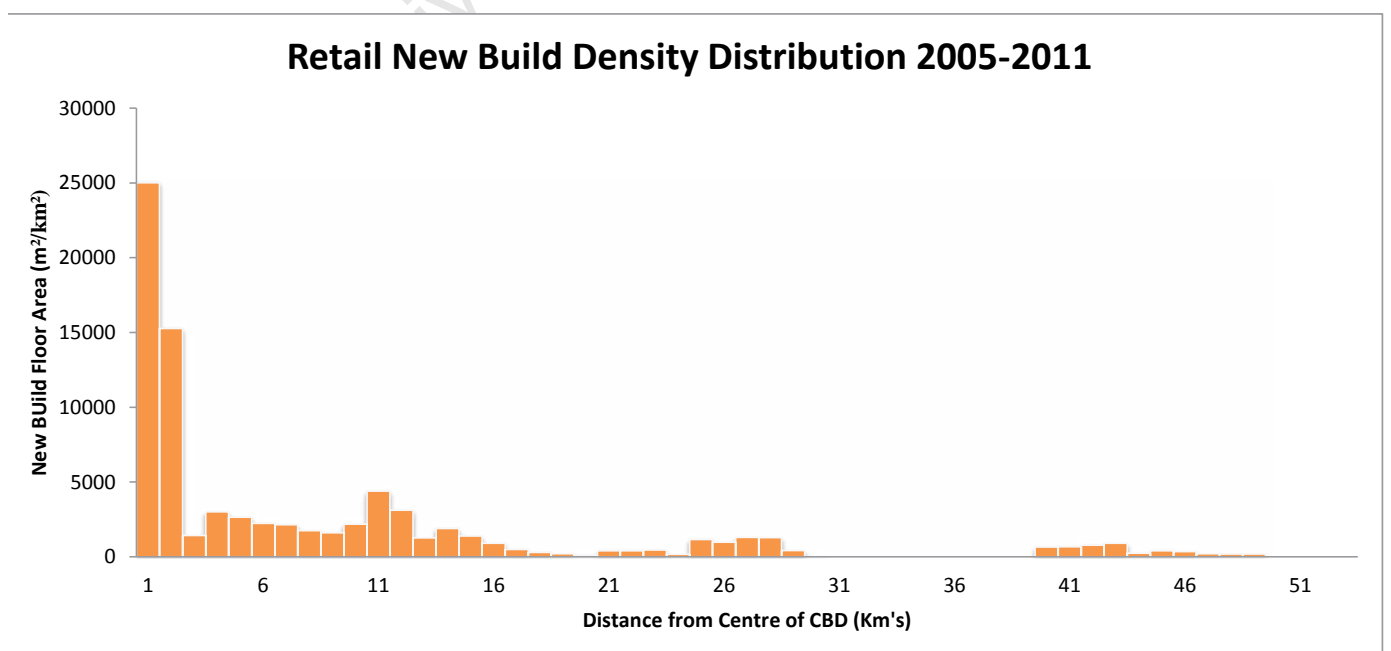


Figure 3.5.13

Retail Sector Trends

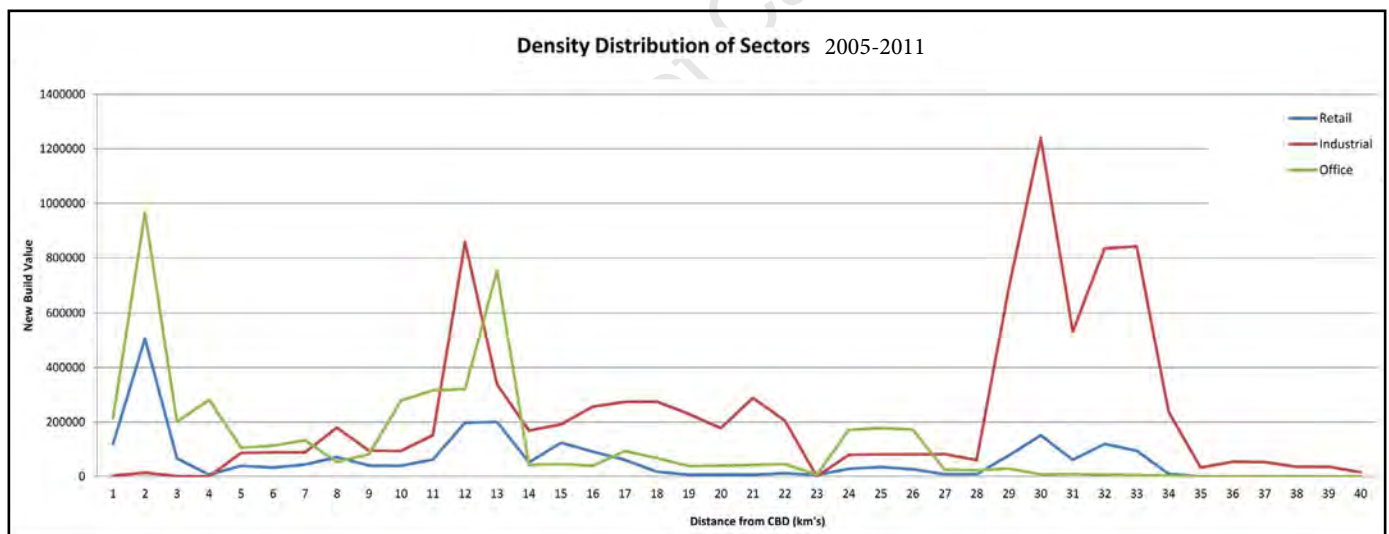
Wormald says retail rentals in the CBD can range from R90 to R350 per square metre depending on the amount of space required and its location.

The spatial distribution of retail new builds between 2005-2011 shown in figure 3.5.12 reflect the increasing diaspora of population across the CMA. This is evident in the fact that according to the data the highest areas for retail new builds were in Somerset-West, South Bellville, Century City however the CBD also managed to retain a high share of new retail activity over the period. Furthermore the historical corridors of Cape Town appear to be relatively lacking in competitiveness to attract new retail business with only low to medium growth occurring along them.

The entrenchment of historical patterns of access for shopping malls over the local small business model appear to be continually entrenched outside of the historic CBD. Furthermore, retail has certainly favoured the middle to higher income areas of the CMA.

The density distribution profile (figure 3.5.13) however indicates that the CBD is still the dominant centre in terms density and the rest of the CMA appears to be experiencing de-concentration of retail activity. By comparing it to the 1996 benchmark for retail it further exemplifies the demand changes away from the historical corridor spines of Cape Town which were so apparent in 1996.

3.5.4 SPACE ECONOMY COMPOSITE TRENDS



3.5.5 STRUCTURAL EVALUATION

The increasing density gradient of residential population in Cape Town indicates an increasingly monocentric tendency to the population because in a polycentric model the proximity to the center of gravity confers an accessibility advantage that is not as large as in a monocentric city. However this can also at times be attributed to infrastructural and transport provision within a city as these too affect the relative spatial advantage of population location.

However in Cape Town, there have since the benchmarked period been no substantial modifications to the infrastructural skeleton which derives these relative demands. This can be seen by comparing the benchmarked map of major roads and rails to that of the contemporary arrangement shown below in figure 3.5.14.

For this reason shifts in locational demands by both residential and non can conclusively be ruled out to be attributed to a changing network of transport within the CMA.

However that is not to say the current network does not present certain inefficiencies in its current form. To the contrary analysis has indicated that on aggregate it has “not been able to accommodate the transportation needs of residents in the multi-nodal sprawl of Cape Town” and furthermore offers “limited connectivity between the different urban nodes throughout the city-region which reinforces socio-spatial segregation” (OECD, 2008:23).

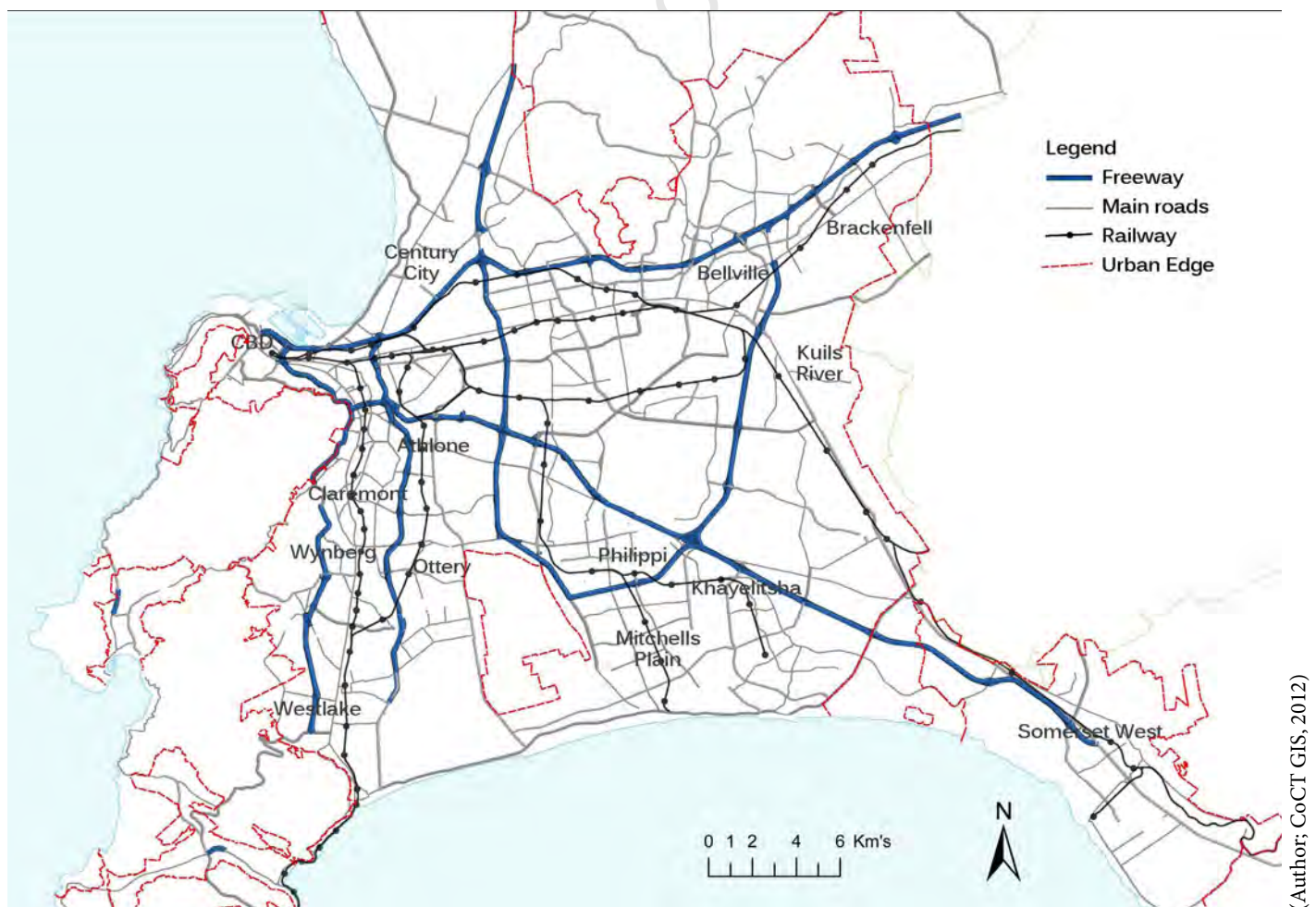


Figure 3.5.14

(Author; CoCT GIS, 2012)

3.6.1 CONTEMPORARY SPACE ECONOMY STRUCTURE

The contemporary evaluation of the contemporary Cape Town space economy is performed using 2012 land use data from the Integrated Zoning Scheme (IZS). Rather than employing the generic categories of land use, the same land use descriptions employed for the benchmark structure were used to dissect the sectoral breakdown into tertiary services, industrial/manufacturing and retail activities.

Commercial Tertiary Service Sector 2012

The absolute distribution of service activities in 2012 (figure 3.6.1) reveals a vast change in the economic landscape over the last sixteen years since the benchmark period. There are three major noticeable differences between these two periods. The first is the emergence reiteration of the CBD as a major absolute centre for these services, whereas in 1996 the CBD was vastly overshadowed, in terms of absolute distribution, by the historic spinal corridors. This resulted in approximately ten times the square footage of tertiary activity in the city centre. Furthermore while the CBD witnessed such growth the square footage of activity in the historical corridors has been largely unchanged over the period, resulting in the stark relational change between the two historical centres of economic activity.

The superlative change in the tertiary sector space economy has to be in the emergence of a node that barely featured in 1996 and which now dwarves the historical corridors, nearly matches the CBD at its peak and as an agglomerative node stretching 5 kilometres has a substantially larger share of tertiary activity than the CBD and immediately adjacent areas. This is largely accounted for by the Bellville/Tygerberg node situated on the distribution between 20 and 25 kilometres from the historic CBD centre. The emergence of this node in the spatial economy and the stark differentiation it presents from the benchmark in 1996 lends credence to the rapidity of the trends analysed which clearly depicted the emergence of such.

The density distribution chart for the tertiary sector indicates that the emergent node, relative to the CBD has a very low density level (figure 3.6.2). This is due to

its vast scale of which it encompasses in comparison to the historic CBD, despite it being the location for the largest total of tertiary economic activity. The growth in the service sector as the primary sector of Cape Town's economy is clearly driving these spatial changes however locational patterns of dispersion and simultaneous deconcentration can be observed. This is evidenced by the emergence of a dominant new node and the seeming abandonment of previously entrenched areas, in the historical corridors, for locational demand in the sector. This therefore represents an aggregate deconcentration and inefficient usage of existing economic and physical infrastructure within the CMA, at the expense of both economic growth potential and municipal financial efficiency. The reasons for this change in locational demands are likely two fold, response to population location and heightened externalities of the historical centres.

Overall the observed sectoral space economy changes can be summarised by a healthy development of the historic CBD, the ailing of the historic corridors in activity intensification attraction and overall deconcentration through the dispersed pattern of development within the emerging dominant node of Bellville.

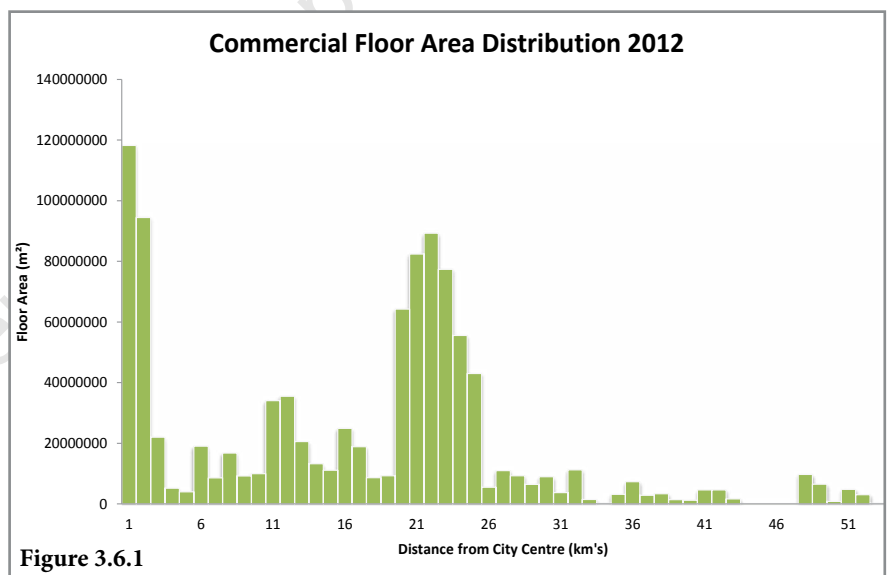


Figure 3.6.1

(Data source: CoCT GIS, 2012)

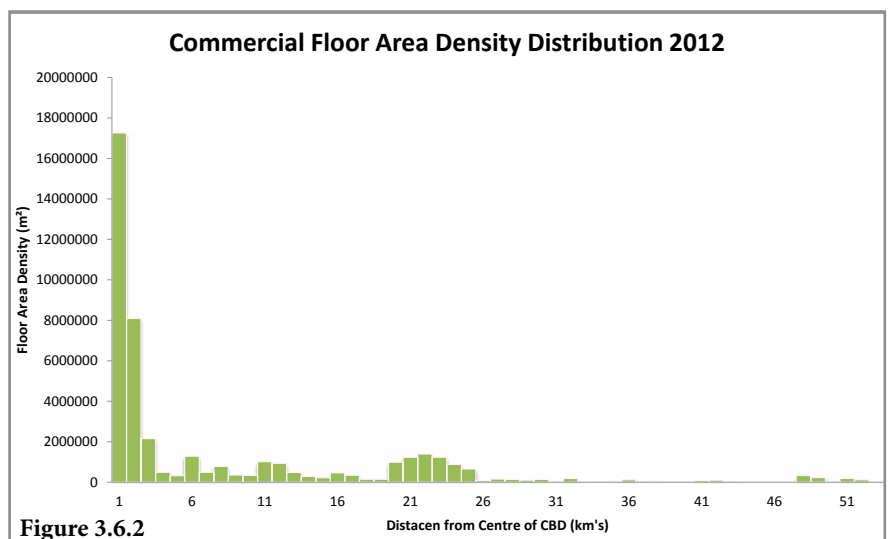


Figure 3.6.2

(Data source: CoCT GIS, 2012)

Industrial and Manufacturing Sector 2012

While the tertiary service sector has experienced a vast nodal growth since the benchmarked period, the industrial and manufacturing period has also seen a vast change in locational patterns however in a far more dispersed homogenous manner. As can be seen in the absolute distribution of industrial activity, shown in figure 3.6.3, the contemporary distribution of this sector is vastly diluted across the CMA. This is far more marked when contrasted to the benchmarked spatial distribution which reflected a concerted concentration of industrial activity along the historic spinal corridors of Cape Town. Although these historic corridors do continue to currently reflect the highest level of industrial activity, the floor area of these has been virtually unchanged since the benchmark while the following 25 kilometres away from the CBD have been the sites of new activity, on aggregate at the least doubling in activity intensity. Beyond this zone of development however little development in the sector has occurred.

The density distribution for industrial activity in 2012 (figure 3.6.4) reaffirms the conclusion of dispersal in a deconcentrated

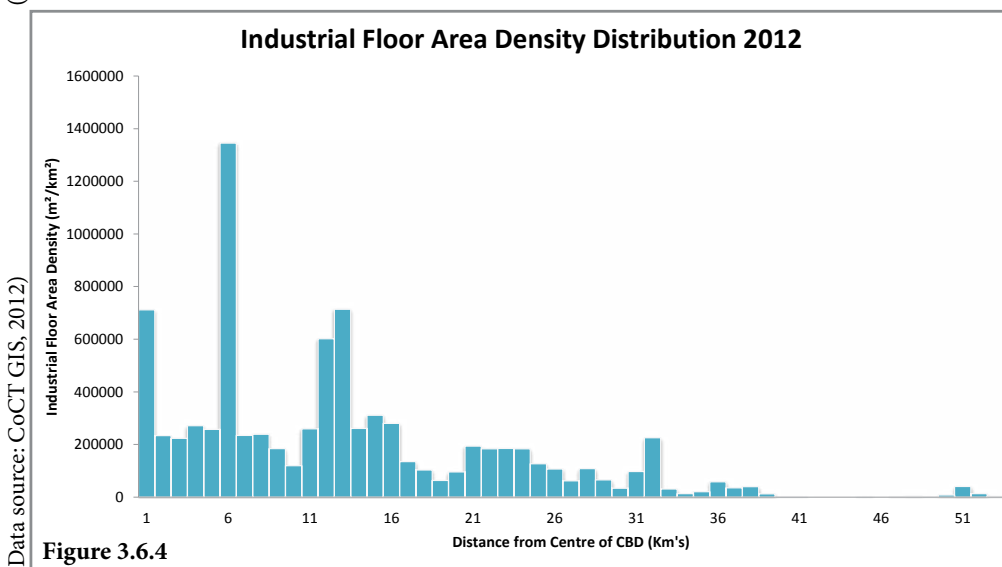
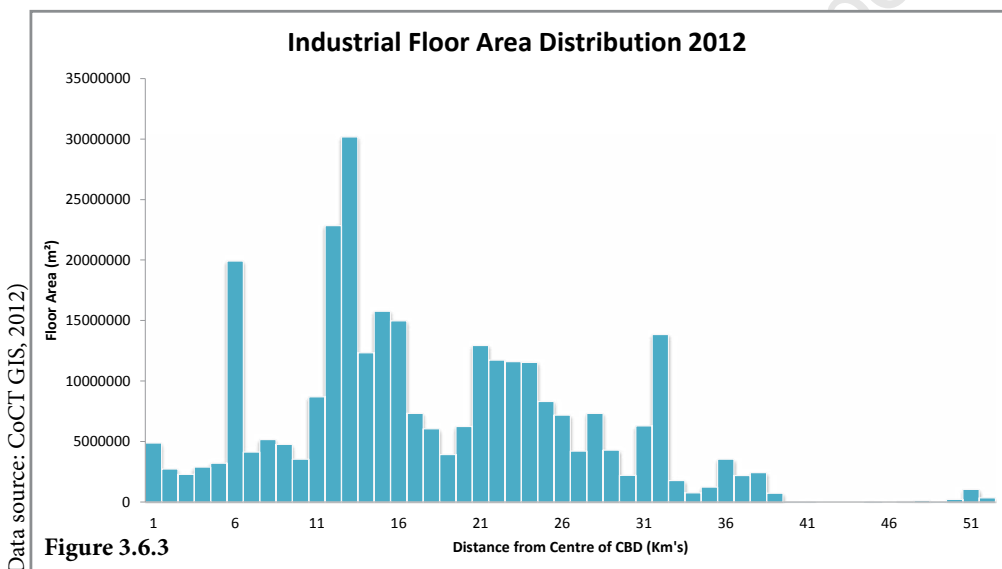
manner, with the benchmark node continuing to display the highest levels of density despite lack of new builds in this set of the distribution and reflects only a minimal increase in the nodes density. The trend analysis previously highlighted the emergence of this form of the urban space economy for manufacturing, and given the continuation of these the levels of aggregate deconcentration are likely to continue.

Given this, it would be very difficult to argue that a dominant node for industrial activity exists in the CMA, instead the morphological structure for the sector is tending towards pure polycentrism and approaching beyond polycentrism levels of deconcentration.

The observed shift in the morphological structure of the industrial sector in Cape Town, given the evidence, can likely be attributed to a mixture of property prices, market performance, labour location, economic development practices and negative externalities arising in the historic corridors. As the historic corridors, became increasingly dominated by the tertiary sector and the emergence of the tertiary sector Bellville node due to the sectoral push by municipal authorities and seeming neglect of industrial activity, it is highly likely that increased bid-rents for these areas drove the manufacturing sector to seek cheaper

land along the periphery of the rapidly changing urban form. The attempts of urban planning in Cape Town to integrate economic centres into the previously exempt residential fabric is likely to have only exacerbated these trends.

The result of this combination of forces would create a surplus of activity in the previously established node relative to the negative externalities imposed upon the node leading to rampant dispersion and subsequently mismanagement of urban form would result in the observed deconcentration of activity.



Retail Sector 2012

The absolute distribution of retail activity in the CMA is the least changed, at least structurally, since the benchmark in 1996. The distribution of activity shown in figure 3.6.5 when compared to the 1996 benchmark reflects a large growth in the sector spatially, with the highest growth occurring within the CBD, by growth of nearly 20 times in floor activity within the first two kilometres of the CBD centre over the period. The density distribution for the sector, shown in figure 3.6.6, further indicates the dominance of the CBD in attracting retail as firms would clearly face extremely high rentals relative to other areas of retail growth within the CMA. This is likely to also reflect the growing residential densities observed within the CBD, stimulating a strong internal consumer market.

Together the distribution and density profiles of the Bellville node provide an insight into the development that has occurred in the 20-25 km range of the distributions. Despite the aggregate retail activity within this range representing a large share of total activity, it has density levels comparable

to the remainder of the CMA minus the CBD. The reason for this can be seen by comparing the contemporary distribution with the historic benchmark which shows quite clearly that the majority of growth has occurred as infill development into the deficit areas of 1996, resulting in the observed contemporary structure.

The emergent node of Century City which was relatively prominent in the trend analysis has failed to make a substantial mark on the contemporary morphological structure of the retail space economy. However given the unabated continual of contemporary trends that is likely to change.

The historical corridors of Cape Town have also seen a moderate growth of retail activity however this has been dwarfed by the other nodal growths in the sector.

In the breakdown of the land use scheme to construct the three sector distribution profiles, for both 1996 and 2012, the following criteria were used per sector:

Tertiary Commercial Service Activities

Insurance and related industry, hospitality industry, marine transport services, banking, entertainment production, office and professional business services, personal services, printing and related activity, private recreation, telecommunications.

Manufacturing and Industrial Activities

Manufacturing of; personal goods, glass products, ceramics and non-metallic mineral products, of medical precision instruments, optical equipment and watches, office accounting and computing machinery, clothing, textiles, leather and carpets, furniture, metal products, pharmaceuticals, chemicals, telecommunications equipment, transport equipment, paper and cork products and also includes warehousing/storage.

Retail

Retail includes; specialised trade, retail trade stores, sale of vehicles, and wholesale trade.

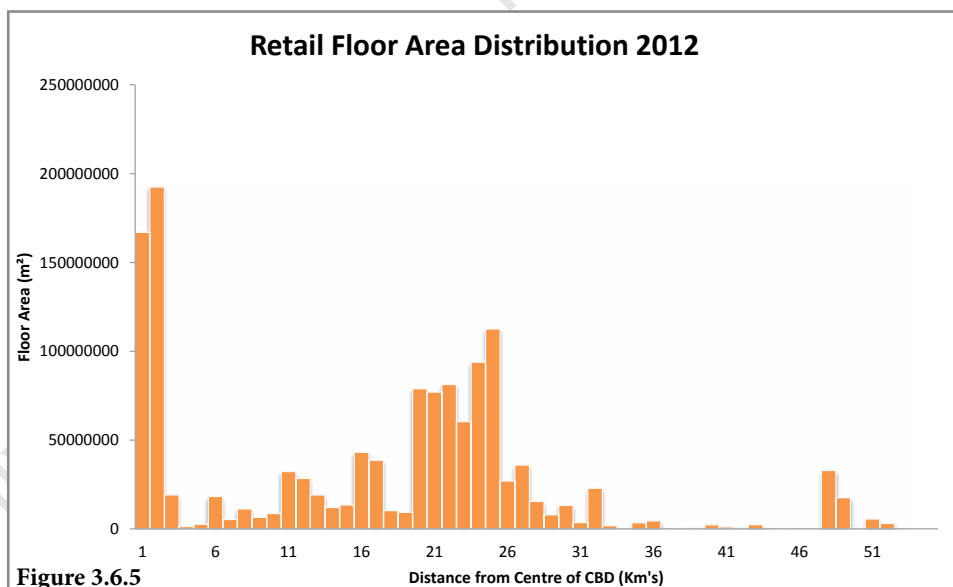


Figure 3.6.5

(Data source: CoCT GIS, 2012)

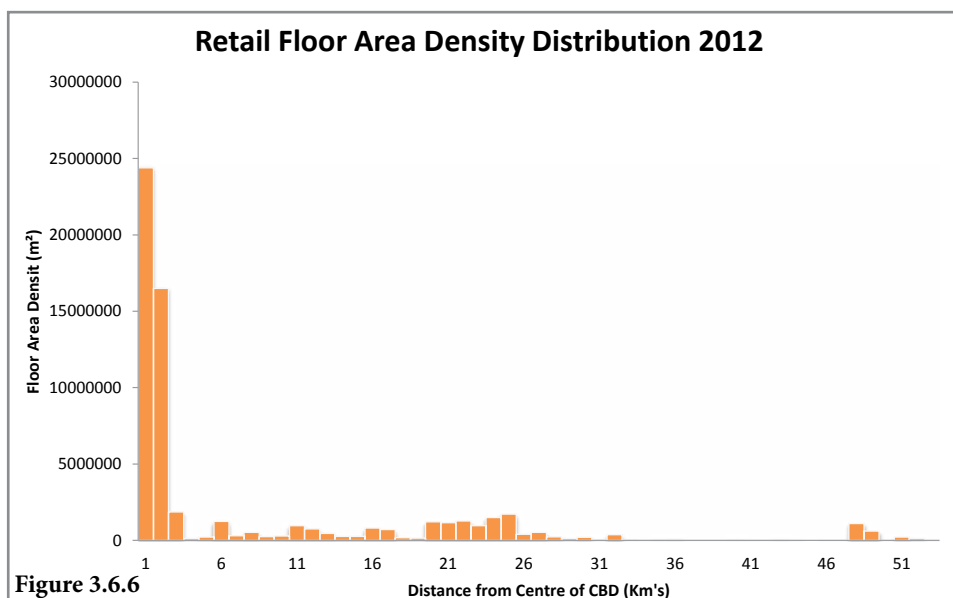


Figure 3.6.6

(Data source: CoCT GIS, 2012)

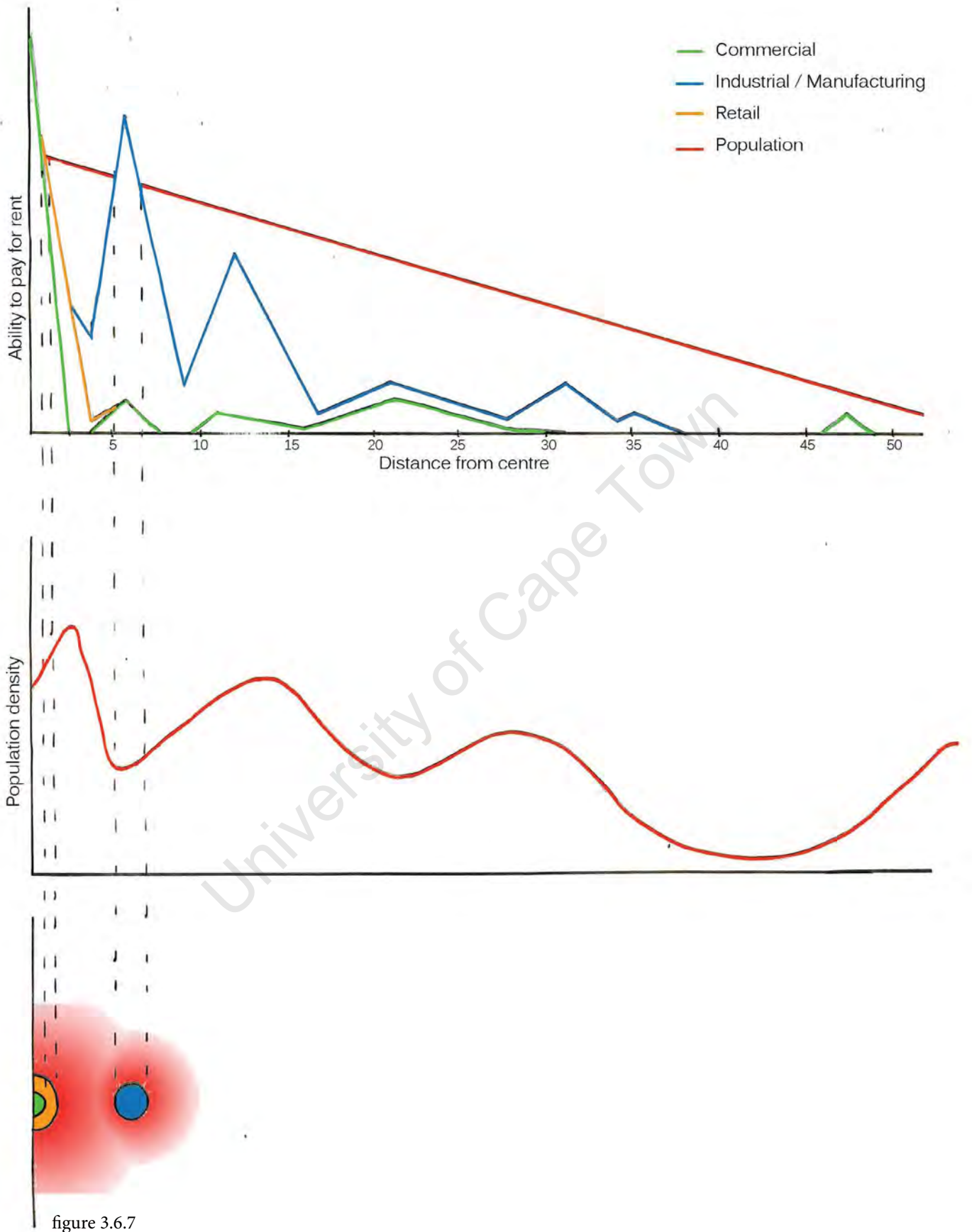


figure 3.6.7

COMPOSITE

The composite graphical representation of the relative densities for the three economic sectors and the residential distribution shown in figure 3.6.7 indicate the current relationship between these variables which construct the morphological structure of Cape Town collectively.

It indicates that the CBD has retained relatively high land use intensities despite the dispersion of economic activity throughout the CMA. However given the findings of the absolute distribution for economic activity in CMA, which places the bulk in the Bellville node, which does not feature in the density composite indicates massive levels of aggregate deconcentration.

When compared to the previous benchmarked composite it shows the complete decline of the historical corridors in land use activity leading to a dissolution of them as major nodes in the Cape Town space economy.

It also shows the loss of market mix across sectors which has been established as a strong engine for innovation in cities.

Lastly it strongly relates why the increased population gradient towards the CBD has been evident with its sole retention of high economic density and further suggesting a monocentric functionality to the structure.

3.7.1 CONTEMPORARY MORPHOLOGICAL EVALUATION

So far the analysis has examined the contemporary urban structure and spatial economy by analysing the individual components which construct it. However it is only by analysing the composite structure of these components, that the full extent of the urban form, and spatial economy it embodies, may be holistically assessed.

Figure 3.7.1 displays the composite construct of these components in an analysis of their dominant nodal forms. It shows clearly how the bid-rent function for space interacts at the macro scale of Cape Town's urban between the three sectors of the economy and the residential population.

In terms of land-use intensity, analysed through the construction and amalgamation of the three sector and residential density profiles, the city of Cape Town is strongly characterised by a traditional monocentric morphological structure. This is evidenced by the highest densities, by an extreme margin occurring in the CBD, for both the tertiary sector and retail

activity in the contemporary evaluation. This is ensconced by a far less steep bid rent for industrial activity, which despite the gentle gradient certainly displays a bias towards the historical CBD. The same can be said for the residential population of Cape Town. Interestingly this relative monocentric land use intensity of the CBD has been increasing over the time, moving away from a dual intensity polycentric historical form. This tells us that the CBD in terms of locational demand, specifically for the tertiary and retail sectors, is still the primary locational choice for these businesses.

However the absolute distribution of economic activity juxtaposes this by unequivocally presenting a dual node dominant polycentric morphological structure of the space economy. Within this the historical CBD and Bellville nodes are the dominant forms in terms of absolute retail and tertiary service sector activity, with the bulk of industrial activity occurring between these two nodes.

Given this, it is patently clear that new development of economic activity, outside of the CBD has been done at a decreasing level of activity concentration, raising the aggregate levels of dispersion in the CMA. Essentially what is occurring is a dislocation of demand for space and supply, resulting in

the deconcentration of economic activity and transition of the morphological structure of the spatial economy of Cape Town. Furthermore the concentration levels of economic activity in the Bellville node and its projected future trends given the current rate of change, coupled with emerging nodes of dispersion, particularly in the industrial sector point to a beyond polycentric arrangement of Cape Town's space economy within the not too distant future.

A further critical insight that the composite model provides (figure 3.7.1) provides is the correspondence of Cape Town's space economy and the population structure. In the typical model of the bid-rent function it is assumed that densities increase around the location of economic activity, although the direction of causality in terms of locational demand are not always clear, as in which are the leading factors, space economy fluctuations or residential distribution fluctuations. In Cape Town however it has been established already that defining physical structural elements have not been altered over the control period and furthermore the residential structure, at least foundationally has largely remained unchanged over the period. Therefore the correspondence and clear relationship between the economic and residential locations indicates that the spatial distribution of economic activity, the more flexible of the two, has in Cape Town been largely responsive to residential locational patterns, particularly along socio-economic lines. Therefore the emergence of the Bellville node can be largely attributed to benchmarked trend of high income residential dispersion to the North of the city. As Cape Town's population has, relative to international standards, a very high level of land consumption per capita at 309m² per capita, the continuation of sprawling residential development will only exacerbate the diffusion of economic activity across the CMA.

This insight pertinently raises that, if urban planning wishes to intervene in the current morphological structure of the spatial economy, it must first or at the very least simultaneously guide the locational decisions of residential patterns to correlate with these. Given the reactionary density profiles of the residential structure around the spatial economy indicate that although there is demand to reside near centres of employment, particularly the CBD, the absolute distribution has been largely unchanged since the benchmark of 1996. This indicates that externalities are preventing efficient market change in residential patterns which urban planning should be addressing in order to foster increasing economic efficiency and integration across the CMA.

However residential distribution is unlikely to be the only reason driving the dispersal and deconcentration of economic activity within the CMA, rather contributing factors such as supply of relatively cheaper available land parcels for development outside of the geographically constrained historical CBD. However the gradual bleeding of economic activity from the historical corridors of Cape Town cannot be as persuasively attributed to these factors.

3.7.2 Morphological Efficiency Evaluation

It has been a recurrent theme throughout this document that density levels across the variables analysed, have a multitude of effects on economic and financial efficiency as well as to an extent effecting the potential of economic growth within a metropolitan area.

In terms of economic efficiency and potential the current morphological structure of the space economy is showing alarming signs of deconcentration. This impacts the overall potential of a particular node to achieve the critical levels of activity intensity required to achieve the scale economies for sustainable division of labour and thereby perpetuating increasing returns on growth for employment centres. Although there is no global benchmark for required levels of land-use intensity to achieve this, rampant deconcentration such as the prevailing trend in Cape Town certainly has a negative impact upon the potential for economic growth throughout the metropolitan area.

Market mix, or a variation of economic activities, at given levels of densities further has an impact on the potential for economic growth, as substantiated in chapter two, by promoting innovation (Glaeser, 1992). In this case the advancement of high density nodal growth is once again a contributing factor to increasing returns on economic potential, especially in the industrial and manufacturing sector with its heavy reliance on innovation for competitiveness. In Cape Town however the industrial sector is by far the most diffuse currently in terms of locational patterns and is facing an overall decline in activity leading to further deconcentration of activity.

Furthermore heightened levels of competition drive innovation and growth within industries, however by stratifying markets and diffusing land use intensity to meet the residential distribution of the population through non-residential location demands, competitive markets are distorted by distance and the intrinsic costs of these.

Externalities which drive diffuse locational patterns of economic activity not only impact the potential for economic growth but also represent inefficient expenditure by municipalities. There are the obvious costs of extending infrastructural provisions as growth occurs outwards rather than inwards within the metropolitan but also the continual provision of services has been conclusively shown for both residential and commercial sectors to be vastly more efficient in high density growth patterns. This can be even more apparent in the extent of services required to maintain an economic centre with the continuously increasing demands on resources and technological services. Currently therefore Cape Town is facing mounting capital costs in the establishment of new economic areas and the costs involved with servicing the increasingly diffuse patterns of location.

3.7.3 CONTEMPORARY FUNCTIONAL EVALUATION

Given the delineation of the morphological structure of Cape Town a functional analysis of the relational properties of these nodes within the CMA assists to provide further insight into the efficiency of form as it currently stands. The evaluation carried out here is in line with a commonly employed technique for functional structure analysis, by using trip attraction data of nodes to measure their relative demand from residents within the city and more holistically understand how the morphological interacts within itself. Ultimately what this analysis seeks to achieve is the delineation of the functional interactions of employment centres, defined within the morphological analysis, and the population of Cape Town, into a definable pattern of usage which will enhance the insights into the contemporary usage of urban structure as it currently stands. It is also a pertinent application of analysis as economic efficiency and potential for growth is so commonly defined partially as a function of distance and transport costs as well as the externalities of congestion induced by morphological structure.

Figure 3.7.2 shows the application of daily trip demand data, obtained from the Integrated Transport Plan (CoCT, 2012), and displayed spatially to demonstrate the functional area demand within the CMA. It shows that CBD still has, by a substantial margin, the highest demand in terms of daily trips. This is a reflection upon the morphological density profile of the city

however it contrasts to the fact that absolute distribution of economic activity is located outside of the confines of the CBD. A further incongruence with the dominance of Bellville as an economic node is the fact that Claremont, a node of the historical Southern corridor still retains a higher trip demand per day. In fact it can be seen that these corridors extending from the CBD together still retain a high portion of daily trips within the CMA. However the Bellville node, although a spatial outlier, does have the third highest share of daily trip demand within the CMA.

Given this distribution and the comparative distribution of population in the CMA the functional structure of the CMA can be delineated as what Bertaud (2006) terms the composite urban model. A typical version of this model is depicted in figure 3.7.3. It represents a functional structure with a dominant economic centre, the historic CBD in the case of Cape Town, and multiple other economic nodes within the urban landscape which attraction a share of trips. Given that in the model, as with Cape Town, population is distributed throughout the urban form, trips tend to display radial movement paths as well as random movement across the city generated by the lesser economic nodes.

Due to the existence of a dominant trip demand centre and multiple smaller nodes within the CMA, a functional structure of the 'classical monocentric model' and the purely 'monocentric model' can be ruled out. Furthermore given the current population distribution of the CMA, the functionality of an 'urban village model' can be further ruled out.

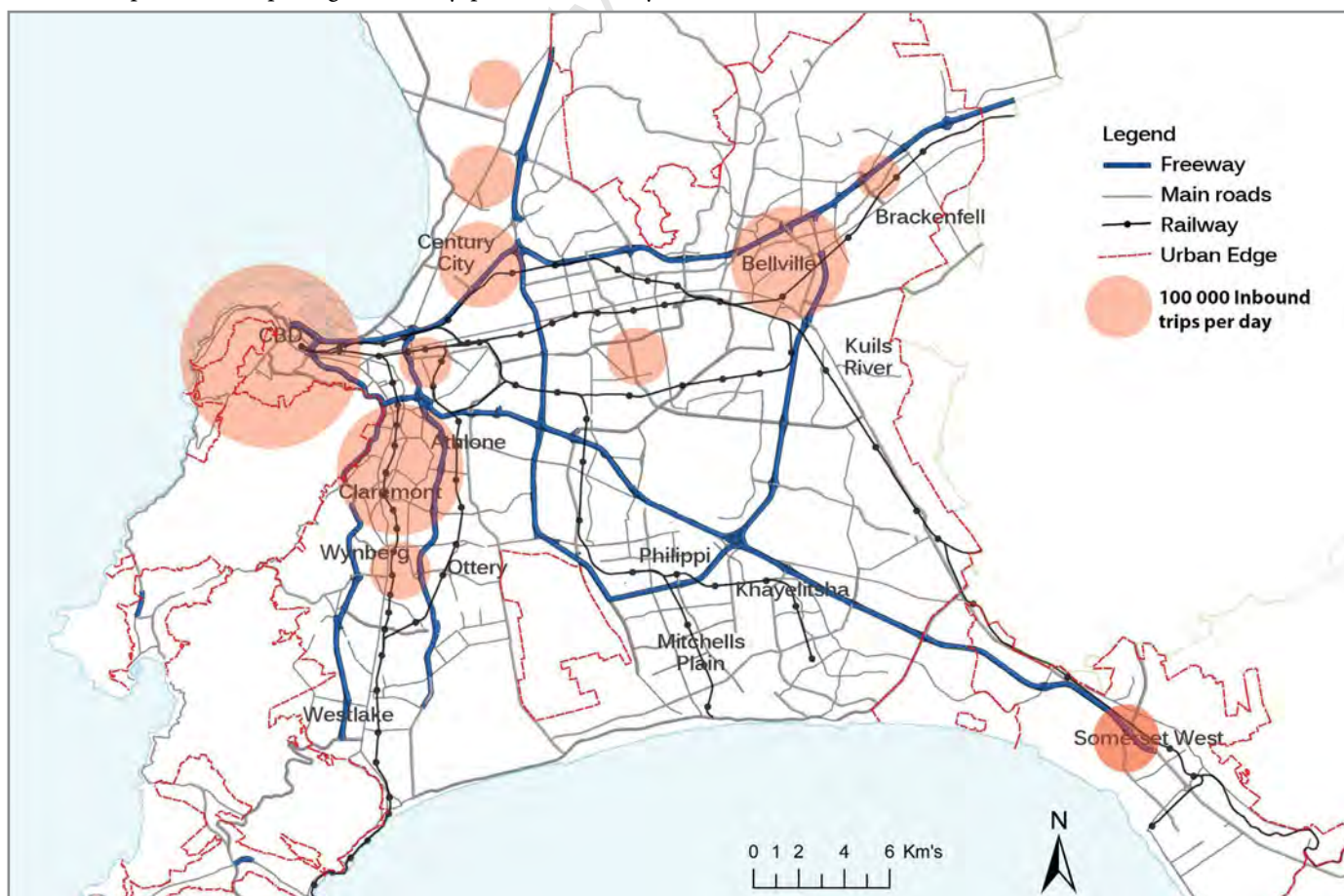


Figure 3.7.2

THE MOST COMMON URBAN SPATIAL STRUCTURES

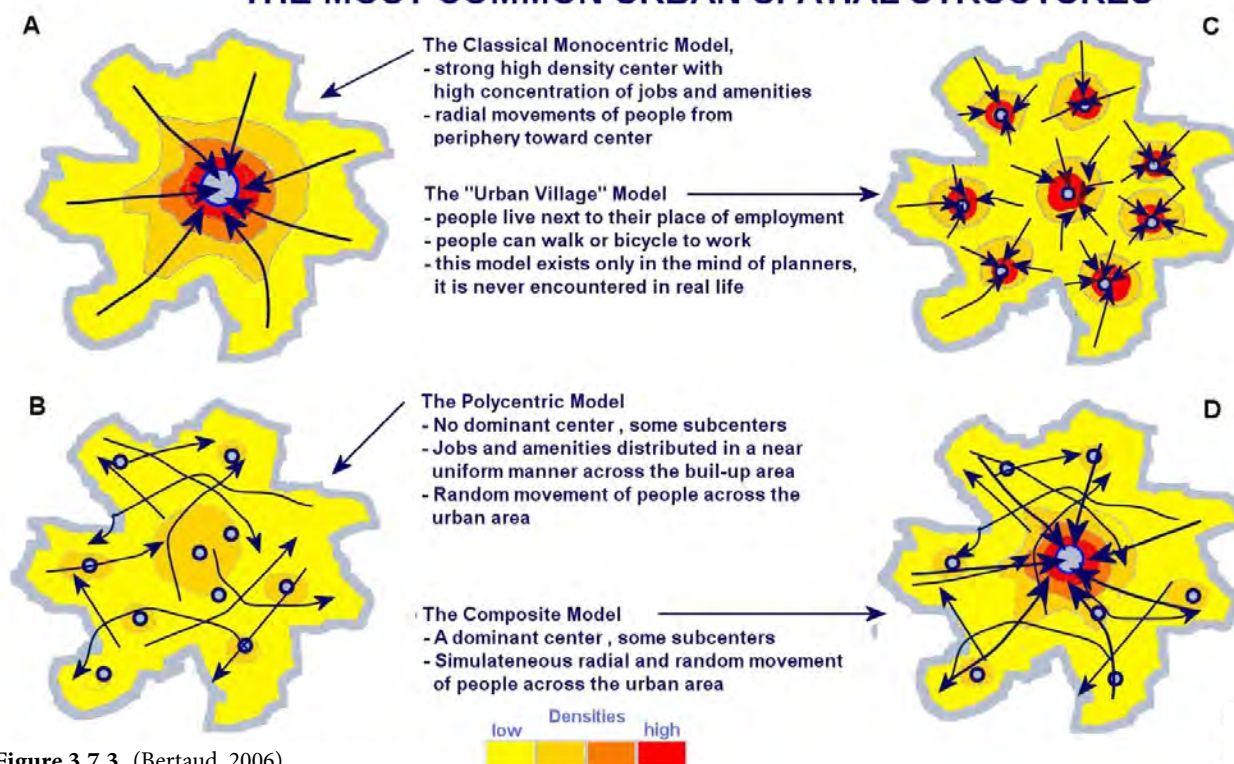


Figure 3.7.3 (Bertaud, 2006)

Given the rampant land consumption per capita in Cape Town and the influence that densities have on the viability of public transport the resilience of the dominant centre in the CBD is unequivocal in importance for the sustainability of public transport services along the radial routes of movement generated by it. This in turn has empirical benefits for decreasing the externalities of congestion generated by higher levels of density in land-use intensity, thereby discouraging dispersion and ultimately deconcentration of economic activity.

“From the available empirical evidence it seems that large cities tend to become less monocentric and that as a consequence the share of transit is eroding in most cities of the world, in spite of heavy investments and subsidies” (Bertaud, 2004).

Clearly then the contemporary trends towards polycentrism in Cape Town will be increasingly perpetuated by a failure to capitalise on the current functional form, withstanding which the city will face decreased levels of economic potential and once again increasing inefficiency in financial management. Low densities driving reliance on personal vehicles, doubling the amplification of economic deconcentration by both raising congestion externalities of land use intensity and

3.8 Urban Planning Challenges

The challenge for urban planning in Cape Town is to encourage the densification of the spatial economy to reduce to the deconcentration of activity intensity that has pervaded the CMA over the past two decades and which is projected to continue unabated if effective intervention is not implemented.

In order to achieve this urban planning must make it a priority to implement strategies which seek to decrease the negative externalities complicit with higher densities of land use and simultaneously incentivising, spatially the formal location of economic activity in the CMA. This will serve to prevent the erosion of existing economic infrastructural, knowledge, competitive and resource sharing capital, and continue to enhance these through increased land use intensity, which is so vital to economic prosperity.

At the same time however as long as producers of final goods have an incentive to locate where they have the largest market, which is where the downstream industry is and producers of final products have an incentive to locate where their suppliers are, which is where the upstream industry is located, yet the stratification of markets, labour and the spatial economy exists, such as in Cape Town, economic inefficiency will prevail. Therefore urban planning should seek to strategically realign the residential population in a manner which is more congruent with the spatial economy restructuring in order to foster greater efficiency in the vertical structures of production.

Lastly, as defined nodal activity serves to minimise transport costs through economies of scale in public transport as well as infrastructure provision and given that the number of economic centres that emerge is determined by the level of unit transport costs which under higher transport costs, there are more centres. As such Cape Town must, in order to the decrease negative externalities of density, seek to establish a transport plan which takes cognisance of the effects it has on morphological structure and seek to minimise levels dispersion created by it.

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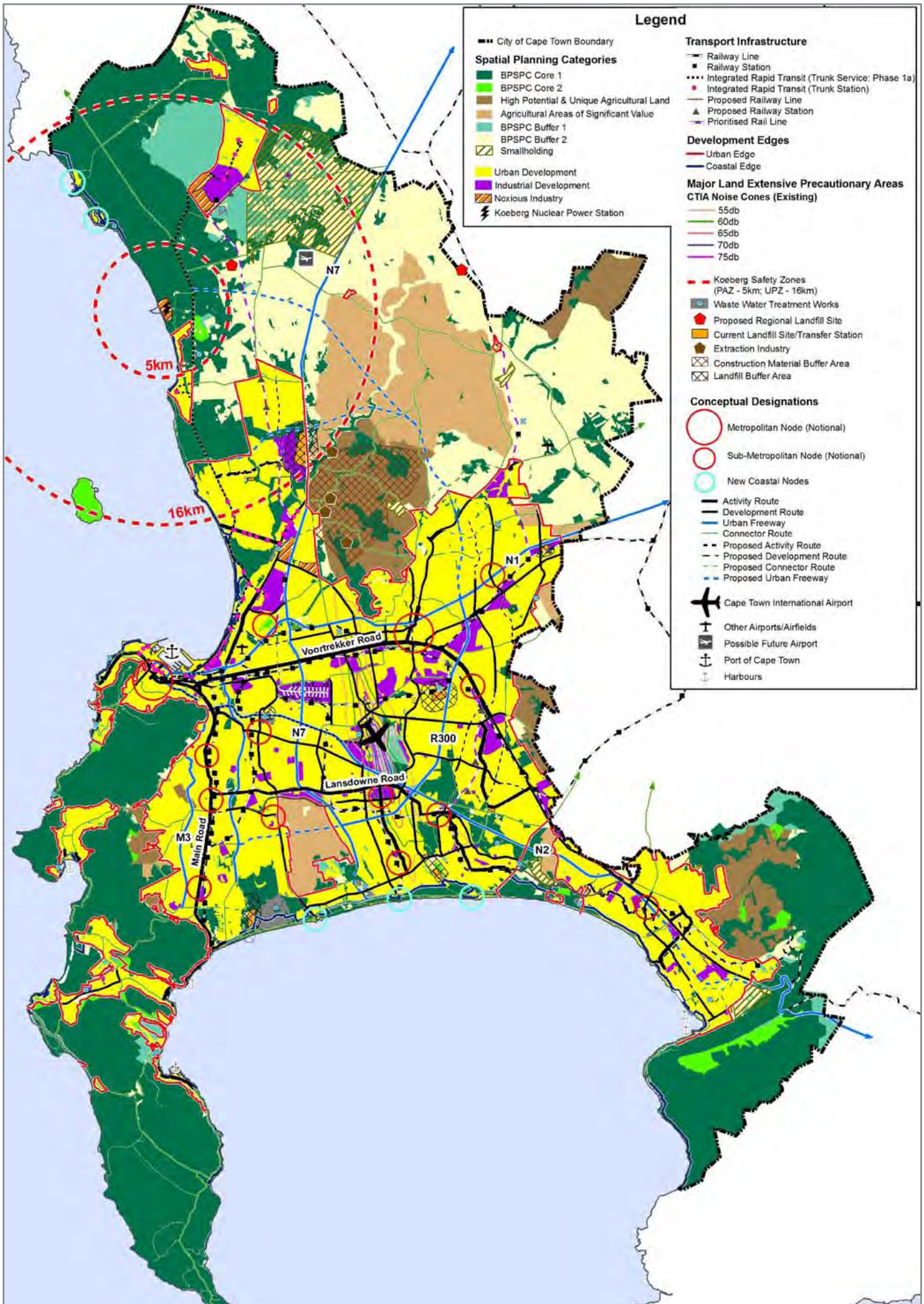


Figure 4.1.1

(CoCT, 2012)

CHAPTER 4: CRITIQUE OF CAPE TOWN'S SDF AND RECOMMENDATIONS

This chapter consists of two sections, the first shall critique the current efforts of the City of Cape Town municipality to manage urban growth and rationalise the structural arrangement of the city as put forward in its primary urban planning policy document, the spatial planning development framework (SDF). This critique shall be gauged against the theoretical motifs on city structure substantiated in Chapter 2 and the findings of the analysis conducted in Chapter 3 of this document, in order to identify any inconsistencies and the effectiveness of spatial structure planning in Cape Town. The second section composes of recommendations aimed at firstly enhancing the current CTSDF, in light of the first sections findings, and further to offer some additional solutions that promote an increasingly rational approach to planning Cape Town's morphological and functional structure, as according to the evidence of chapter 2 and 3 of this document.

4.1 Examining the Current Cape Town Spatial Development Framework

The spatial development framework (SDF) in Cape Town is the primary policy document applied by the municipality to implement long term strategic spatial interventions in order to manage growth and spatial change in the city (figure 4.1.1). Within this it addresses several spatial objectives including:

- A vision towards the desired spatial form and structure of the city.
- Aligns the cities policies and strategies with those of the other tiers of government.
- Guides the shorter term, smaller scale district plans that together compose of the municipality.
- Spatially co-ordinates and prioritises public investment in the city.
- Guides private investment by identifying areas for urban development growth and alternatively areas of restriction.
- Provides guidance to the nature, form, scale and location of urban development, land use change and infrastructure development.
- Prevents the degradation of critical biodiversity. (CoCT, 2012)

Given these broad objectives of the SDF, this section shall selectively critique only the strategic interventions and policies which are directly aimed at the shaping of city structure which pertains to the spatial economy of the Cape Town.

4.1.1 Long-Term Spatial Structure

The SDF describes the long-term metropolitan spatial structure as a “system of interrelated structuring elements that have been developed to provide overall direction to the future spatial form, structure and development of the city” (CoCT, 2012:29). The SDF discusses seven such of these ‘structuring elements’ of which this section will engage with the three most pertinent to the topic, namely:

- Resilience and adaptability
- The multidirectional accessibility grid
- Areas of land use intensification

4.1.2 Resilience and adaptability

The first strategy put forward towards shaping Cape Town's long term spatial structure is the ‘resilience and adaptability’ strategy which calls for a management of growth approach which can respond to change in “rapid urbanisation, contrasting wealth and poverty, high unemployment, infrastructure and service backlogs, resource scarcity, depleting oil reserves, energy and water supply constraints, and climate change”, which will determine the cities sustainability and prosperity in the long run according to framework (CoCT, 2012:29). This mandates urban planning to direct new growth towards appropriate locations, and that the spatial structure of the city to be flexible so as to adapt to market trends, such as shifts in the demand of economic sectors. However simultaneously it calls for the direction of economic activity to respond to the spatial structuring elements of the SDF.

This strategy, the first related to the structuring of Cape Town, is fundamentally contradictory between the two strategies approaches that it promotes. On the one hand it promotes the lifting of barriers to spatial freedom for developers and economic sectors in a bid for ‘adaptability’ and then simultaneously promotes an interventionist approach to guiding economic investment. While both approaches have valid a credit in urban structuring they cannot operate simultaneously without causing misperception. It is akin to promoting laissez faire macroeconomic policies while simultaneously orating the values of redistributive policies and a centrally planned economy. Furthermore the SDF does not state any further context to these contradictory urban management approaches nor categorically delineate them spatially, however by examining figure 4.1.2 from the document it can only be assumed that the guidance of economic activity, through unnamed incentives, is directed towards the standardised ‘areas of intensification’ and the 14 identified ‘urban nodes’.

The immediately apparent conclusion of this, as a strategy, is the promotion of an absolute polycentric form perilously bordering on the transition to levels of economic dispersion beyond polycentrism. This as has been repeatedly substanti-

ated has a vast range of negative effects on the economy and urban efficiency at large, and is being promulgated in order to promote freedom of market principles. This is also a complete contradiction to the first principle of the current CTSDf which states that “the public good shall prevail over private interests” (CoCT, 2012:9).

4.1.3 The Multidirectional Accessibility Grid

The accessibility grid strategy is formulated upon the precept that Cape Town is changing from a historically monocentric structure to that of a polycentric, and in the process areas have become connected by a higher order road network resembling a defined grid system (CoCT, 2012:30). What this seeks to achieve, according to the SDF, is provide an equitable pattern of access driven by a public transport orientation. However what this strategy will result in the increased entrenchment of a polycentric urban form in Cape Town by being counterintuitive to the dominance of the historic CBD and the currently radial trip patterns it generates along the historic corridors as shown in the previous chapter. So not only does it seek to

entrench an increasingly economically inefficient system, where employment and amenities are distributed in a near uniform manner across the metropolitan area creating random movement of people across the urban area. but also does not take cognisance of the current functional form in Cape Town. Furthermore the promotion of the activity corridor along the multidirectional grid creates strip development and economic activity, which autonomously creates distance barriers between firms. Furthermore this economic activity required fulfilling this function of an activity route and trip generator is not likely to endogenously locate as the urban node system has, precisely because of the low levels of agglomeration and the multitude of benefits it creates at the microeconomic level. Therefore substantial economic activity intensity along these routes would likely have to be through the zero-sum deconcentration of the established economic nodes.

Activity routes are characterised by strip urban development along sections of the route. Activity routes are generally supported by a mix of land uses and higher density urban development. They are characterised by direct access and interrupted movement flows, especially at bus and taxi stops and traffic lights. (CoCT, 2012:31)

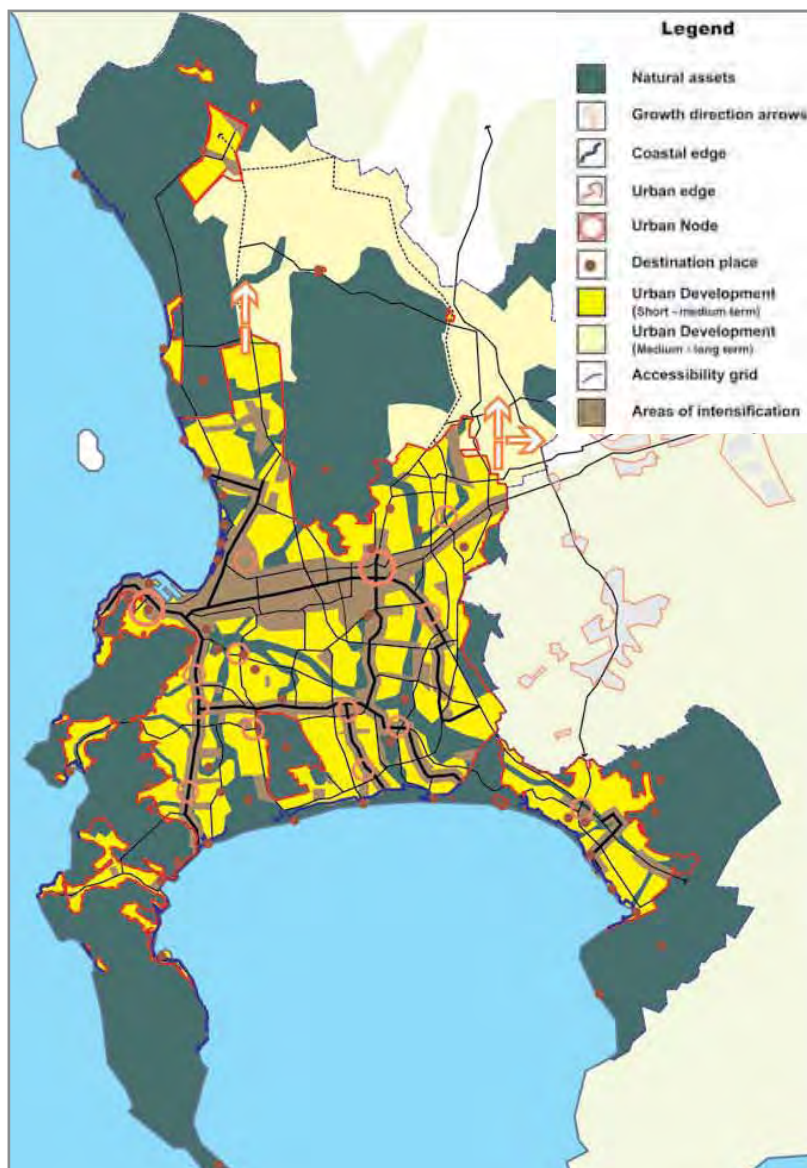


Figure 4.1.2

(CoCT, 2012)

The promotion of the multidirectional grid system, an indelibly rigid transport structure, also creates another confliction of the approach to urban form management by contradicting the previous strategy of an adaptable city structure where fluidity of form is considered a primary necessity.

The strategy does not directly speak of costs incurred for neither the municipality nor the passenger of public transport or road user in this structure, even comparatively to the radial structure, however it can be conclusively said that distance travelled is a large contributing factor to transport costs. And given that the grid structure does not promote direct access to the substantially largest trip generating node in the CMA, it is highly likely that transport costs are on aggregate increased over the CMA. As substantiated in Chapter 2 of this document, higher unit costs of transport positively correlate with a higher number of economic centres and increasing deconcentration of economic activity.

Implicit within the functional approach to structuring of Cape Town in the SDF is also a mixture of what Bertaud (2006) terms, the ‘urban village’ model of functionality. Despite the connectivity of nodes that the grid system espouses the reasoning behind this implicit assumption is the planned diffusion of economic centres, inherent in the strategy. Furthermore the formation of

nodes based on connectivity which seek to service the nearest located communities which are encouraged, through unstated mechanisms, to densify around the 14 pronounced current and 5 future proposed economic nodes of the city. This implicit functional arrangement can be seen in figure 4.1.2.

This approach to functional structure of a city is guided by the misconception that semi-autonomous communities are likely to grow around each cluster of employment, which in aggregate form a large polycentric metropolis. However this functional arrangement, and the morphological structure it engenders, wholly contradicts the *raison d'être* for the triumph of large metropolitan areas over the negative externalities created by high levels of agglomeration, by the increasing returns obtained by larger integrated labour markets. The reason the urban village model, implicit to the approach of urban structure in the SDF, is contradictory to this is that it “is the ultimate labour market fragmentation” (Bertaud, 2002:7).

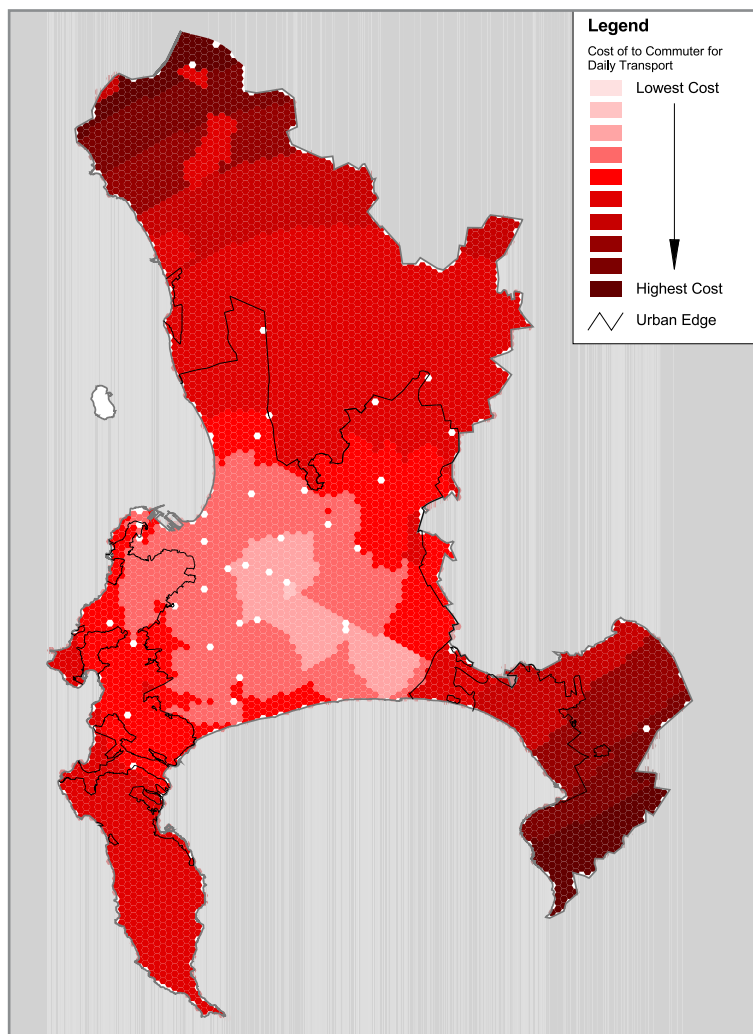


Figure 4.1.3

(CoCT, 2012)

4.1.4 Urban Growth Management

The CTSDf promotes the management of spatial growth of Cape Town by the usage of development edges, known collectively as the urban edge (CoCT, 2012). The urban edge seeks to contain the growth of the outwards expansion and in strategic areas allows the spread of urban land consumption to guide the future development of the city, in order to facilitate the compaction of the city as it matures.

Of course, as thoroughly covered in this dissertation, Cape Town has some of the most inefficient land consumption patterns and low population density levels on a global scale and thus the limiting of vertical urban expansion is of critical importance. In this regard the implementation of an urban edge as a growth management tool is commendable, however there are issues of contention with its application in the CMA.

Firstly as can be seen in figure 4.1.2 the delineation of the urban edge, in a number of areas on the Eastern edge of the city, is apparently informed by the local municipal boundaries for the City of Cape Town. In this regard its geographic morphology can clearly be questioned by its stubborn persistence to prevent the urban conurbation crossing over municipal boundaries, rather than necessarily promoting a more geometrically efficient settlement pattern. This indicates a tendency towards

political interference trumping the logical spatial arrangement of the city as it continues to mature. Although a cross municipal urban boundary may contribute towards increasingly complex practical management practices, the SDF fails to adequately justify its approach of boundary delineation.

While limiting growth on the East the urban boundary has, by encompassing large parcels of green field land within its borders, sought to encourage urban development up the North and North Eastern corners of the current urban footprint. These two areas, however currently as shown in the structural population analysis in the previous chapter, represent on aggregate the lowest densities in the CMA and promotion of development in a similar urban grain as the precedent will do nothing to increase urban compaction. As also previously established, the locational demands of economic activity in the CMA have tended over the period of analysis, to be largely drawn by this dispersion of low density, middle to upper income residential patterns. Therefore this specific approach of urban growth is likely to further deconcentrated the overall economic land intensity in the CMA.

Furthermore the Northern promotion of development does not support the ‘urban core’ approach of the SDF which attempts to place the emphasis of development between the two dominant

economic nodes of the CBD and Bellville. And the North-Eastern growth direction promotes greater distance from the CBD, therefore leading to increased aggregate transport costs and a higher rate of economic dispersion in the CMA. This is evident in figure 4.1.3, which shows a surface cost model of transport service provision prepared by the City of Cape Town independently to the SDF.

Another critical issue of contention between this strategy and the overall approach to a long term urban spatial structure vision as advocated by the CTSDF, is the setting of the urban edge as a medium term management tool while city structuring is intrinsically long term. This has the consequence of providing poor information for forward planning and as well as for the locational decision making of developers and firms in the CMA.

In a city of such stark socio-economic divides, such as Cape Town, the implementation of a tool which fundamentally distorts land markets by restricting the supply of available land on aggregate and specifically so in certain areas of the city, its impacts on land and thereby housing or commercial property must be taken into account as a priority. The SDF for Cape Town however makes no mention of such effects in rolling out this tool for land management. In this regard, in Cape Town, it is commonly accepted that the combined market forces of strong demand and limited supply in the formal property/housing market has resulted in an inordinately steep price gradient for the housing and land markets (Turok & Watson, 2001). This results in the effect that entry into the formal market is greatly restricted as prices are so high relative to average wages for new entrants. In addition, incremental pricing for improved housing or better location for work and public amenities is extremely steep, limiting upward mobility. This has led to the detrimental market failure for housing in Cape Town. In the case of the Cape Town formal housing market this is the failure for the provision of housing which is affordable to those ineligible for state subsidised housing, yet do not have enough income to enter into the lower end of the formal housing market which is relatively expensive. Therefore the failure of the SDF to broach this subject is an egregious oversight in the decision process of delineating an urban edge boundary.

The nature of the urban edge as deployed in the CMA encourages only generic densification and infill development, which in itself is not a negative aspect, however the burden of land shortage in the CMA falls to the most vulnerable, the urban indigent. Therefore the SDF requires a far more targeted strategy for urban densification, which takes into account the dynamics of area specifics and the effects such would have on the local population as well as the management of economic activity locational patterns.

4.2 RECOMMENDATIONS

This section shall provide a number of recommendations for the enhancement of the Cape Town SDF and the economic rationality of Cape Town in general. It proposed recommendations are grounded in the theoretical hypotheses discussed in the literature review and are a direct response to the findings of the chapter 3 analysis of Cape Town as well as the inadequacies of the SDF.

The recommendations are not intended to be fully fledged plans for the restructuring of Cape Town's morphological and functional structure but rather strategic spatial guidelines that in the long term will increase Cape Town's potential for economic growth and financial sustainability.

The recommendations are categorised according to the tools of which are at the disposal of urban planning as a variable in the shaping of future city structure. These tools and their relationship to urban structuring are depicted in figure 4.2.1. However firstly the overarching vision which must guide these tools in the endeavour of restructuring will first be discussed.

Cape Town's Morphological and Functional Structure Vision

- The SDF for Cape Town must in future create a guiding vision of both morphological and functional structure for the long-term which are mutually beneficial towards the entrenchment of one another. It must entrench a vision supported by strategies which do not contradict each other just to achieve a sense of holistic planning, as is currently the case. Rather key strategies should seek to achieve a unitary goal in urban restructuring with all elements of the structural system contributing towards this singular morphological and functional form.
- This form should, in line with the *raison d'être* of large urban areas, seek primarily to reunify the high level of labour fragmentation that currently is entrenched within the structural inefficiencies of Cape Town. This shall require the shifting of the currently static residential foundations that define the residential component of morphological structure presently.
- Congruent to this form, the SDF must actively seek to stymie the torrent of economic land use intensity deconcentration by taking into the finding of this analysis that population structure is, in Cape Town, the lead spatial indicator for economic dispersion and ultimately deconcentration. Therefore the restructuring of the morphological structure of Cape Town must be residential led. Together these can promote active reconsolidation of economic activity in the CMA rather than the lacklustre 'adaptive' approach currently deployed. This in turn

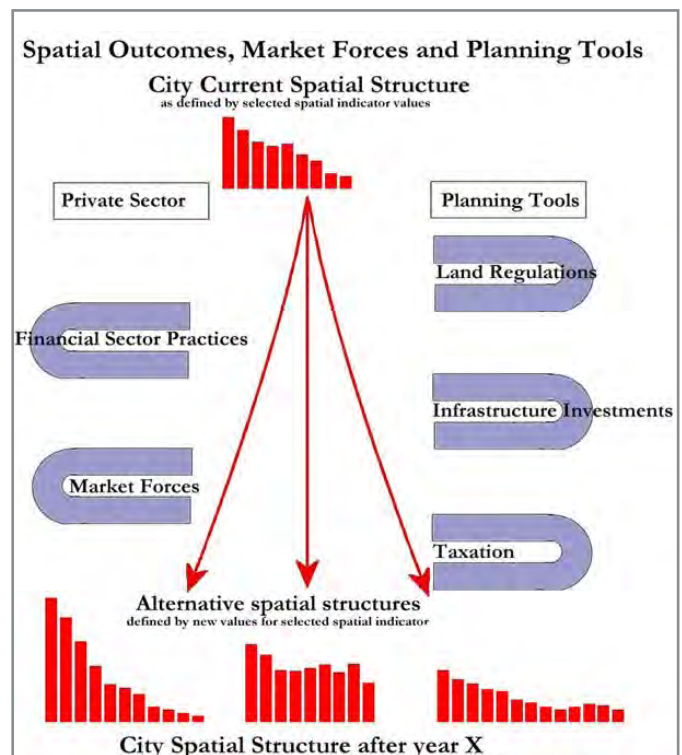


Figure 4.2.1

will result in a functionally far more efficient structure of the city.

- The SDF must factor in the effects that the proposed vision has on aggregate transport costs, given the necessity for low costs to drive a consolidation of economic land use.
- Measures must be taken to counter the inverse densification of the city, where on the South Eastern periphery densification reaches hazardous levels in informal settlements and the simultaneously the Northern suburbs with the West coast display entrenched diffuse development which is inefficient for infrastructure provision and detrimental to environmental sustainability. This means a two pronged approach of diffusing densification from the South East towards the main corridors of the city the densification of middle-upper income areas.
- The grown dominance of the Bellville node is too large to negate and therefore a strictly monocentric orientation would be ill advised to pursue however the containment of these as the two dominant nodes and reconsolidation, particularly for Bellville, of economic activity within them should be the priority of the SDF. This a severe withdrawal from the deconcentrative corridor policies promoted within the current SDF. However the CBD should be entrenched as the primary node in the city for economic activity by employing a hierarchical functional structure which supports it as the main destination. The restructuring guidelines that follow should also have a more intensive application to the historic CBD and immediately surrounding areas. This is necessary in order to preserve the vast social, economic, infrastructural and historical capital inherent with the Cape Town CBD which attracts foreign investment in the city.

- Lastly the effects that morphological structure of both the space economy and residential land uses have on capital running costs must be taken into account when devising a given structure for the city.

Land Regulations

- Although it is commonly occurring argument that the rational firm will locate optimally, given a 'perfect market' and thus a free market for development would best promote development, the fact that certain positive externalities of agglomeration cannot arise without a critical level of co-operative threshold, which can be difficult to achieve endogenously, intervention may promote otherwise unachievable levels of positive externality. The allocation of land-use zoning should therefore seek to encourage vertically integrated economic activity by providing the 'guiding hand' to achieve the critical mass required for increasing returns to be endogenously perpetuated. This will require a significant level of co-operation with both the private sector and industry specialists in order to facilitate the correct market mix of activities and understand the nature of industry specific horizontal complementation of production.

- In order to create the preconditions necessary for vast spatial restructuring of Cape Town towards an increasingly rationalised and efficient morphological structure, the allocation of well-located undeveloped land is a necessity. This is required in order to drive the foundational shifts of large scale residential populations away from the periphery and towards the CBD. It is also necessary for the development of land that is within the primary economic nodes, to service growing demand in a more concentrated pattern.

- To achieve this government land and associated organs of state must be encouraged to unlock land within these areas, particularly within the CBD, of which there is a substantial amount. This could work on long term lease basis if the land must be kept for strategic reasons. These unlocked parcels should further be incorporated into the current urban development zones (UDZ's) located in the CBD and Bellville so as to incentivise the densification of economic land use. Unlocked land for residential purposes should be subjected to strict enforcement of residential zoning which only permits high level densities.

- The zones deemed by the SDF as critical for high densities to promote the desired morphological structure should be achieved by limiting regulations which constricts the construction of high density development and subdivisions.

- Single residential zoning should not be permitted within the City Bowl or region of the CBD for new construction.

- New residential development that occurs within a designated area of the dominant economic nodes should be subjected requirements of a percentage of moderately priced high density units being set aside for inclusionary housing needs, as is common practice internationally (OECD, 2008). This would promote higher densities, as well as offer improved accessibility for lower income groups to economic opportunities while simultaneously increasing the residential stock of Cape Town.

- To facilitate the promotion of more affordable high density residential stock near the two dominant nodes the municipality should relax its regulations in the zoning by-laws which stipulate the restrictions on minimum unit size in apartments. This will allow micro-unit development, an already well-established typology within a number of global cities which allows far higher densities of living for single person homes at lower cost.

- Currently the SDF promotes the idea of "identifying areas of land use intensity that encourage the concentration of economic activities in more accessible areas" (CoCT, 2012:27), however this, given the analysis findings is a fallacy of causation in that economic activity already seeks market accessibility in Cape Town, at the cost of activity concentration. Therefore the SDF should rather promoted increasingly efficient transport structures which reduce the costs passed on to the population and making the dominant economic centres more accessible through transport initiatives, rather than moving activity from the concentrated areas to deconcentrated areas.

- The usage of 'red tape reduced' and fast-tracking of development permits, land use changes etc in prescribed zones of strategic densification importance should be used to incentivise development in line with a structural plan put forward by the SDF.

- Targeted retail urban renewal programs, led by SDF designation, in the dominant nodes should be created to discourage the externalised model of shopping centre development that is not in accordance with spatial restricting, in order to help generate the daily functional trip patterns needed to entrench the dominant nodes and reduce dispersal. These trip generators also serve to increase the scales of economy for specific routes into the dominant nodes thereby reducing aggregate transport costs and curtailing economic deconcentration while enhancing the viability of public transport networks.

- In order to promote densification in the key planning districts of the CMA, as determined by the long term structure promoted by the SDF, a targeted plan for yearly growth in housing supply should be implemented. Within this directive city council is given an up or down vote on the required density increases that should be targeted per annum by residential zonings, and until this target is reached by cooperation between

the municipality and developers, no density reductive zonings in residential areas should be permitted within said district. This thereby ensures a net increase in the housing supply (Roderick & Shleicher, 2011).

- In order to truly promote an adaptability approach for economic location of activity, through urban planning as stipulated by the current SDF, does not mean promoting completely open spatial markets. Rather the SDF should identify areas where zoning is being restrictive of an areas development and add these to the 'red tape reduced' zones in order to encourage change and cancel the negative effects of non-cumulative zoning practises. This is particularly applicable to industrial activity, which is subjected to constraints on surrounding activity due to non-cumulative policies. This commonly results in deconcentration of industrial activity and the persistence of inefficient land usage when the land is intensively operated on, often resulting in warehousing and other low intensity activities that are not requisite of optimal location in nodes.

- The implementation and designation of an urban edge by the CTSDF should not counter urban form imperatives with those of political jurisdiction. Rather, the urban edge, given the inherent ecological and topographical constraints, should promote growth in the long run towards the most geometrically efficient shape determined in terms of trip distance to the CBD. This extension of the urban edge should only occur once designated levels of aggregate population density have been reached within its borders.

Infrastructure Investment

- Value capture should be promoted as tool for use by the SDF in determining zones where servicing new developments are deemed inefficient and against the structural plan of the SDF. This will simultaneously discourage such developments and when they go ahead, the municipality will not have as exhaustive a capital burden. This is in order to address the recurring problem shown in the SDF, where "the provision of new infrastructure services to greenfield developments has taken place at the expense of the maintenance and upgrade of infrastructure services in existing urban areas". This affliction of management if not addressed will only serve to increase the negative externalities to agglomeration on the established nodes of the city and drive the demand for greenfield development and leading to economic activity deconcentration.

- In order to minimise the negative externalities of congestion arising from heightened densities the SDF should promote a threshold of density beyond which private cars access should be severely restricted within the dominant nodes of the CMA. In lower density areas, the low land rent price does not justify the transaction cost of having paid parking; in the high land use intensity economic nodes with high land rent,

having cars pay a market rent for the land they occupy is the only way to obtain an efficient land allocation. This should seek to reflect the true costs of private vehicle use, and promotes the critical masses need to reduce costs on public transport.

- The transport infrastructure regime in the city should be primarily aimed at direct linkages to the dominant nodes. The radial road hierarchy to the historic CBD should be entrenched through upgrades to ensure the continued primacy of the CBD as the dominant node. This should be a priority above that of the rigid grid system which promotes increasing economic dispersion. Furthermore a composite model of urban functionality should thus be maintained over the polycentric and certainly the implicitly applied urban village model of the current SDF.

Rates and Incentives

- The current SDF mentions the employment of incentives to fulfil its functions however aside from the UDZ's it has little to offer in what form these incentives will be offered. However financial incentives can be a powerful tool in locational economics as it allows the substitution the decreased substitution of capital for land in the firm's locational decision process. These incentives could most simply be offered in terms of rate rebates for establishing business in a desired location according to a structural plan.

- At the same time municipal property rates can be used as a disincentive for certain locations. Therefore a rate structure based a 'deconcentration index' could be implemented which provides rebates for high land use intensity activities and discourages deconcentrative locational patterns.

- These incentives could also be industry specific targeting which essentially means altering the bid-rent function for certain industries to allow agglomerative activities without the externality of property price creating as large of a negative externality to these conditions thereby decreasing dispersive patterns of economic activity. This would be most effective for certain industrial activities which benefit from co-locative patterns but which do not generate enough revenue per unit area to outbid competing land uses.

- Densification and conversely the external costs of dispersion (environmental, infrastructural and opportunity costs) can also be reflected in the percent calculation on properties that do not meet such standards. These incentives would all have to be carried out within the law of the Municipal Property Rates Act 6 of 2000 and through the constitutional power vested in municipalities for the determination of property rights.

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