The application of the Planning Indicators Model as a tool for measuring the success of the Metropolitan Spatial Development Framework in the Cape Metropolitan Area.

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Declaration

I, the undersigned, hereby declare that the work contained in this thesis is my own original work and that I have not previously in its entirety or in part submitted it at any university for a degree.

Signature: ……. Date:……..……

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Dedicated in memory of my late father Sebete Letsie

ABSTRACT

Recently there has been growing interest in evaluating the performance and outcomes of spatial planning policies worldwide. In response to this a research was carried out to evaluate and monitor the effectiveness of spatial planning policies in the Cape Metropolitan Area (CMA). The Planning Indicators Model (PIM), which consists of a set of twenty-six indicators, was applied to monitor and measure the extent to which the Metropolitan Spatial Development Framework (MSDF) has affected land use and physical development in the CMA.

To achieve the aim of the study, the research was divided into three phases. The first phase involved a literature review, the second phase involved interviews with planning officials and lastly, the collection of different thematic datasets required to run the Planning Indicators Model. The data sets were used to monitor and display spatio-temporal variations in conformance and performance indices in the form of maps. These maps were used to identify areas where strengths can be protected and where weaknesses need to be corrected.

From a set of 26 indicators used for this study only two indicators monitored conformances (Growth of informal housing townships) over the period 1993 – 1998; the others simply indicated the present conditions. This means that the rest of the indicators did not show trends. However, the data are presented in this report as a useful baseline for future conformance and performance monitoring exercises. The study also revealed that for the past twelve years the MSDF has been the subject of extensive debate within the local authorities. Also several indicators seem to overlap and need to be clearly defined, thus it is recommended that some of these indicators should be combined to avoid duplication and confusion. Generally, the PIM can assist in making the impact of spatial planning greater in the CMA.

Key words

Planning indicators, sustainable development, conformance indicators, performance indicators, land use, physical development, urbanisation, and urban sprawl.

OPSOMMING

Onlangs is daar wêreldwyd groeiende belangstelling in die prestasies en uitkomstes van ruimtelike beplannings- beleide. In reaksie daarop is hierdie navorsing gedoen om die doeltreffendheid van die ruimtelike beplannings- beleide van die Kaapse Metropolitaanse Gebied (KMG) te evalueer en te monitor. Die Beplannings Aanwysers Model (BAM) wat bestaan uit ‘n stel van ses-en- twintig aanwysers, is aangewend om te meet tot hoeverre die Metropolitaanse Ruimtelike Ontwikkelings Raamwerk grondgebruik en fisiese ontwikkeling in die Kaapse Metropolitaanse Gebied beïnvloed het.

Om die doelwit van hierdie studie te verwesenlik, is die navorsing gedoen in drie fases. Die eerste fase bestaan uit ‘n oorsig van die literatuur en die tweede fase uit onderhoude met amptenare verantwoordelik vir beplanning. Die laaste fase beslaan die versameling van die verskillende tematiese stelle data wat benodig word vir die Beplannings Aanwysers Model. Die stelle data is gebruik om die ruimtelike- en tydsvariasies in die konformering- en prestasie indekse te monitor en ten toon te stel in die vorm van kaarte. Hierdie kaarte is gebruik om die gebiede te identifiseer waar sterkpunte behoue moet bly en waar swakpunte reggestel moet word.

Uit die stel van 26 aanwysers wat gebruik is vir hierdie studie, het net twee aanwysers konformering (Die groei van dorpsgebiede met informele behuising) gedurende die periode 1993 – 1998 gemonitor; die ander het eenvoudig die huidige toestand aangetoon. Dit beteken dat die ander aanwysers nie tendense aangetoon het nie. Die data word egter in hierdie verslag weergee as ‘n nuttige basis vir die toekomstige monitor van konformering en prestasie. Die studie toon ook aan dat daar gedurende die afgelope twaalf jaar baie deur plaaslike owerhede gedebatteer is oor die Metropolitaanse Ruimtelike Ontwikkelings Raamwerk. Ook oorvleuel sommige van die aanwysers en moet hulle meer duidelik omskryf word. Dus word daar aanbeveel dat sommige van die aanwysers gekombineer moet word om duplikasie en verwarring te voorkom. Oor die algemeen kan die Beplanning Aanwysers Model help om die impak van ruimtelike beplanning op die Kaapse Metropolitaanse Gebied te bevorder.

Sleutelwoorde

Beplanningsaanwysers, volhoudbare ontwikkeling, prestasieaanwysers, konformeringsaanwysers, grondgebruik, fisiese ontwikkeling, verstedeliking, en stedelike kruip.

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CHAPTER 1: GIS BASED SPATIAL PLANNING POLICY EVALUATION

Growth and development are vital in order to address the problems of underdevelopment and deprivation plaguing South Africa's cities and towns. These urban settlements are socially divided, highly inefficient spatial structures, mostly dependent on state subsidies for public transport (Turok & Watson 2001).

In the Cape Metropolitan Area (CMA), the Metropolitan Spatial Development Framework (MSDF) identifies key spatial problems such as sprawl, separation of work and residence, inappropriate development, reliance on private mobility and unsustainable growth patterns (City of Cape Town, 2003; Urban Econ 2001). Thus, attempts are being made by the local government to lay a foundation for a different pattern of physical growth, mainly through the formation of new growth opportunities to benefit the historically disadvantaged communities.

In order to measure and monitor the success and performance of the recommended strategies, a set of evaluation criteria is required. These criteria can be quantitative or qualitative in nature, specific, measurable and can operate within a timeframe. A performance and conformance evaluation and monitoring study was carried out to measure the success of the MSDF.

1.1 RATIONALE

There is an emerging global trend to evaluate performance of government. Public administrators worldwide are required to monitor and evaluate their own performance through continuous evaluation of actions and outcomes (Urban Econ 2001). The importance of performance management strategies is highlighted in a recent document of the Community Law Centre (Republic of South Africa 2001). In addition, spatial plans and land use policies also require evaluation and monitoring, a process that involves a

detailed understanding of urban trends and conditions. Sustainable urban indicators are one of the tools used to monitor urban trends, as well as to measure and communicate urban performance. These indicators highlight particular problem areas and give a reasonable alternative strategy for policy and decision makers.

There has been growing interest in evaluating the performance and outcomes of the spatial planning policies such as the Metropolitan Spatial Development Framework (MSDF) and Spatial Development Frameworks (SDFs) of the Cape Metropolitan Area (CMA). The development of the Geographical Information System (GIS) based Planning Indicators Model (PIM) was commissioned as a starting point in this evaluation process.

In order to monitor the effectiveness of the spatial planning policies in the CMA, this research was carried out by applying the Planning Indicators Model, which consists of a set of indicators to monitor and measure the extent to which the MSDF and SDFs have affected land use and physical development in the CMA. The research assessed the CMA performance and conformance using 26 indicators under five major thematic groupings, namely: natural environment and resources, urban development, economic development, social development, transport and infrastructure accessibility. The research was undertaken with the following objectives in mind:

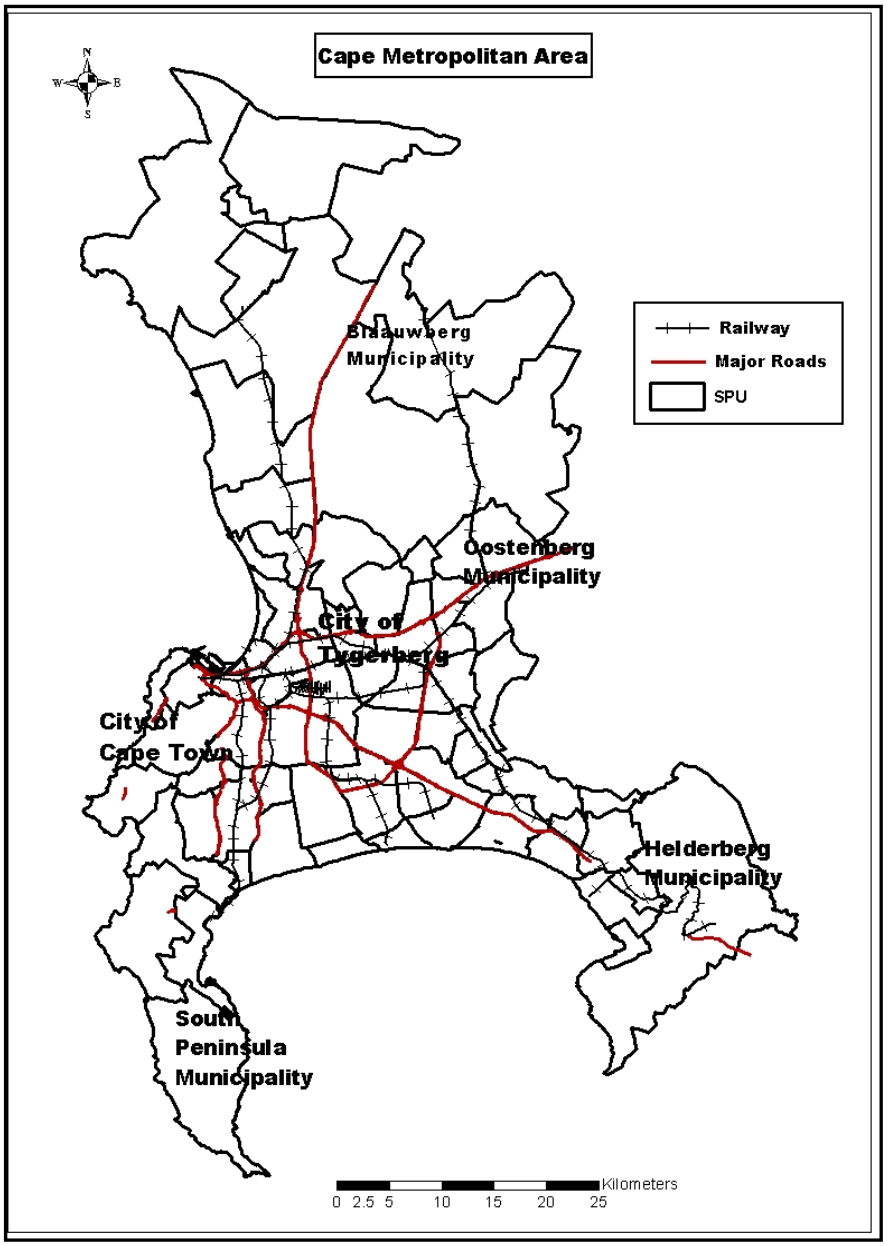
- Apply the Planning Indicators Model (PIM) to measure the success of spatial planning policy (MSDF) in achieving its objectives;
- Compute conformance indicators to test if land use is changing in the direction promoted by spatial plans;
- Compute performance indicators to measure the performance of the CMA in terms of achieving its spatially measurable goals;
- Evaluate the usefulness of the PIM as a spatial planning tool in the CMA.

1.2 DELIMITATION OF THE STUDY AREA

The City of Cape Town is a municipality that was formed in December 2000 by the amalgamation of the Cape Metropolitan Council and five metropolitan local councils,

namely, Tygerberg, Oostenberg, Blaauwberg, South Peninsula, Helderberg and Cape Town. The jurisdiction of the new council covers an area of 2 487km^2 . The spatial extent of the Cape Metropolitan Area (CMA) is displayed in Figure 1.1 below.

The city of Cape Town has 3,1 million people with an annual population growth rate of approximately 3,5% (Dorrington 2000). The high population growth occurs mainly among the poorer sectors of the population.



1.1 The location of the Cape Metropolitan Area

1.3 AN OVERVIEW OF THE CMA

The CMA consists of four closely interrelated structural features. The first feature consists of three so-called “arms” or “spines” radiating from the historically older parts of the metropolis that comprise the Cape Town CBD. The western spine includes Green Point, Sea Point and areas up to Camps Bay. The northeastern spine is referred to as the Tygerberg Arm (Cape Metropolitan Council, 1996), which includes the developments along Voortrekker Road and the neighbouring areas of Goodwood, Parow, Bellville and Kuilsriver. The southern spine refers to the area along Main Road from Woodstock and Salt River in the north to Wynberg and stretching further southwards to Muizenberg and Simon’s Town.

The second structural feature is the area between the Southern Arm and the Tygerberg Arm – the Cape Flats. This area accommodates the majority of the disadvantaged populations, African and Coloured, and includes Langa, Gugulethu, Nyanga, Crossroads, Brown’s Farm, Mitchell’s Plain, Khayelitsha and Blue Downs. These areas originated under the former Group Areas Act, which was aimed at separating different racial groups into separate spaces to avoid interracial contact and presumed conflict. These areas were initially seen as new towns, which were supposed to be self-reliant with their own commercial centres and industries. They turned out, however, to be dormitory towns with only a limited number of dispersed commercial and industrial sites, which resulted in the majority of people commuting to work at some remote urban nodes such as Bellville and Cape Town CBD.

The third structural feature includes the high-income residential areas that developed from the historical spine in search of amenities, for example, areas like Constantia, Hout Bay, Durbanville and other developments towards Tygerberg Hill and Kuils River. These developments are mainly the result of suburban low-density sprawl, which has gradually eroded the agricultural character of these areas.

Finally, informal housing areas scattered across the CMA form the fourth element. Some of these settlements are located in environmentally sensitive areas and are situated far from social and economic opportunities. These growth patterns are described in detail in the MSDF Technical Report (Cape Metropolitan Council 1996).

1.4 DATA REQUIREMENTS

Most of the data required for this study were obtained from the Cape Town City Council and the Department of Geography and Environmental Studies of Stellenbosch University. Different thematic layers sharing a common spatial base were collected for this research project; these data sets were required to run the Planning Indicators Model. The model uses data in the form of point and polygon features. The data themes are as follows (All year 2000 data, except census population data):

- Land use
- 1996 census population data
- Transportation data
- Housing and cadastral data
- Economic development data
- Nature conservation and agricultural data.

All data were collected, converted into compatible formats, entered into ArcGIS. (Appendix A shows semi –automatic steps for calculating the indicators in Arcview). The data collected was then analysed by the Planning Indicators Model (PIM). These data were used to monitor and display spatio-temporal variations in conformance and performance indices in the form of maps.

1.5 DATA ANALYSIS

The data were entered into the system and the PIM was run to produce quantitative and spatially explicit outcomes. The geographic results (maps) were used to map indicators in order to identify areas where strengths can be protected and where weaknesses need to be corrected.

Insights into the metropolitan spatial planning process were gained through interviews conducted with several officials in the Cape Metropolitan Council. A comprehensive literature review was conducted from books, journal articles, reports and the Internet to obtain knowledge of GIS based planning indicators, urban sprawl, urban growth and sustainability.

1.6 RESEARCH FRAMEWORK

This chapter lays the foundation of this research report by stating the aims and objectives, the rationale behind the study and demarcating the study area and giving an overview of the CMA. The research framework depicted in Figure 1.2 indicates the logical and sequential research steps followed in this thesis to realise the study aims and objectives as they are presented in the various chapters.

The first chapter introduces the research problem by providing the background and rationale of the research, demarcates the study area, and then discusses data requirements and analysis. The second chapter looks at the theoretical background and explores existing knowledge on urban growth and GIS based planning indicators. Chapter three gives an overview of the Metropolitan Spatial Development Framework and discusses the Planning Indicators Model and its functionalities. Chapter four and five constitute the core of this research report and consist of research findings expressed through text and maps. The last chapter summarises the research findings and comments on the research objectives and the research limitations.

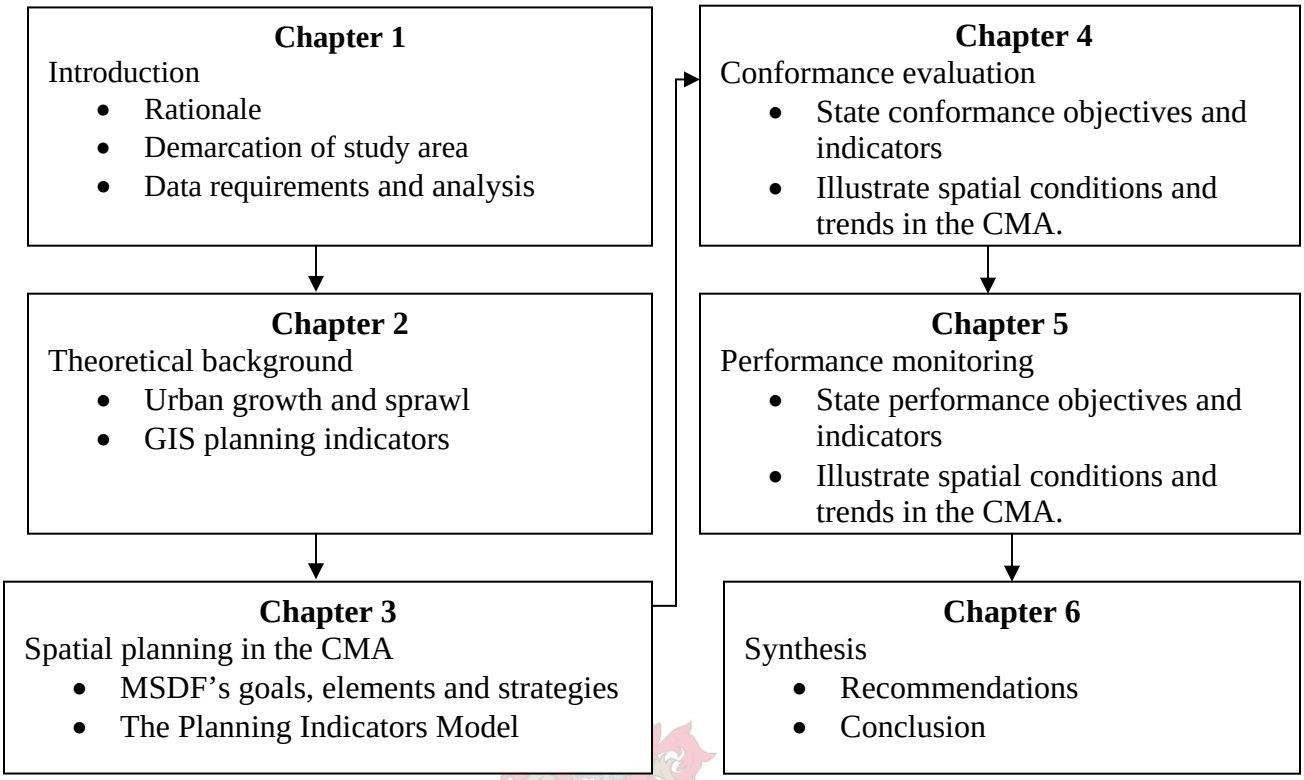


Figure 1.2: Research design flow diagram

This introductory chapter has provided relevant background information to the research problem. The next chapter entails the theoretical background of this research, which led to identification, demarcation and formulation of the research problem.

CHAPTER 2: THEORETICAL BACKGROUND: GIS IMPLEMENTATION IN URBAN PLANNING

The aim of this chapter is to discuss the theoretical background to using GIS tools in urban planning. Firstly, there is a discussion of the significance of geography to urban planning, while other sections present an overview of cases in which GIS based planning indicators were applied.

2.1 WHAT IS GEOGRAPHY?

Laudre (1994) defined geography as being primarily concerned with the description and explanation of the operation, development and interaction between the socio-physical and spatial structures of the earth's surface as the living area for human beings. Fiebleman (1972) defines geography as a science that describes and explains the changing world. On the same note, Barnard (2001) defines geography as representing a specialised and systematic way of looking at the earth's surface: collecting facts, transforming them into concepts and addressing problems. These definitions imply that geography should be oriented towards problem solving, and should contribute to policy evaluation and decision making, all of which constitute the focus of this report. It is imperative therefore to discuss the significance of geography in urban planning.

2.1.1 Why urban geography?

From the statements in the previous paragraph, it is apparent that there is no single accepted definition of geography, but a number of them exist depending on the interests of the individual geographer. The urban geographer traditionally has been most interested in populated places and in the relationships that exist within such places (Laudre 1994). Urban geography thus provides an understanding of the living environments of the majority of the world's population. Urban places are naturally complex phenomena. However, urban geography untangles this complexity by explaining the distribution of

towns and cities, and the socio-spatial and temporal similarities and differences that exist between and within urban places.

The following sections discuss the issue of urban growth, its effect on land use patterns and the formulation of land use policies to address urban growth and land use changes.

2.1.2 Urban growth

The world is becoming increasingly characterised by urban areas. The proportion of the world's population living in cities is continuously increasing. This trend entails major demographic, economic and social changes (Barton 2000), which have caused urban areas to become the focal point of present-day problems. Urban policy as a global, national and local task will thus assume increasing and crucial significance (Longley 2002). The environmental effects of urban growth are one of the main issues on the agenda of most countries worldwide. This research report aims broadly to contribute towards understanding this phenomenon; taking into account that urban growth is currently one of the most important driving forces behind land use changes and urban sprawl.

Sustainable development has generated a new kind of thinking by highlighting existing problems, such as urban sprawl. Urban sprawl, for example, is a complex process that derives from distinctive geographic, demographic and economic circumstances. This pattern of urban expansion is visible in cities all around the world, and is generated by current consumption trends and lifestyles that influence transportation networks, urban growth and land use changes. The following sections look at the relationship between urban growth, land use planning and GIS based planning tools in evaluating land use policies.

2.2 URBAN LAND USE

All urban planning activities concern land use, yet it is difficult to predict future land use, population growth and development patterns in urban areas. Nevertheless, flexible tools must support planning for the optimum sustainable use of land (Hopkins 1998). GIS includes a range of monitoring, evaluation and management tools with which the long-term conditions of urban systems can be assessed (Van Kamp et al. 2003). However, there is little experience of using GIS for maintaining environmental indicators for sustainable land use planning.

2.2.1 Evaluating planning policies

Evaluation of land use policy focuses on defining spatially measurable goals. Evaluation of the outcomes or impacts of spatial plans and other land use planning policies are relatively new to spatial planners and this area in the literature is therefore currently undeveloped. However, new management systems require public administrators worldwide to evaluate their performance and outcomes. Morrison and Pearce (2000) in their review of factors in the UK that impact on planning evaluation state that “new public management” has a strong emphasis on the need for monitoring and evaluating public sector activities (Harris & Elmes 1993; Campbell 1994; Urban Econ 2001).

Current debates on the evaluation of spatial plans highlight two specific focus points, namely, conformance of land use change in relation to the plan, and urban performance in response to the plan (the extent to which the goals of the plan are achieved). Such evaluation includes changes in both decision making as well as the built and social environment.

A recent approach applied in this study is discussed below; this examines impacts of planning policies by use of sustainable indicators.

2.2.2 Measuring sustainability

Decision making and management regarding complex issues of urban development and land use changes require methods for representing these issues by simple units of measurement. These units are referred to as indicators, i.e. condensed information for decision making (Hall & Pfeiffer 2000). The natural environment constitutes a typical example of such a complex issue for which there is a need for appropriate indicators.

Generally, the requirements of environmental indicators are that they should be objective, understandable, significant (i.e. covering all relevant aspects), consistent with the objectives, responsive to stakeholder expectations, and allow for meaningful comparisons at a reasonable cost (Bartholomew 1995).

On the other hand, the intent of an urban indicator is to summarise the position at which matters currently stand and to suggest how the situation might be improved in the future. In particular, positive information is required about the actual status quo and how policy instruments affect it, as well as normative insights concerning where to concentrate resources (Ceccato & Snickars 2000; Haughton & Hunter 1994; Huxhold & Martin 1996).

Indicators are normally used to measure the performance of policies and programmes, examine trends, monitor the condition of a region, inform decision makers, raise public awareness, define targets, set planning objectives, compare localities across space or over time, raise red flags in an early warning system, and guide strategic investment choices (Barndt 1998, 1999). The following paragraph defines indicators and explains the criteria for their selection.

2.2.3 Planning indicators

Indicators can serve both analytical and theoretical purposes in planning. Whatever their purpose, normative or positive indicators involve measurement (Van Kamp *et al.* 2003;

OECD 1994; IISD 2000; IUCN 1980). Hence, their validity is of critical concern when they are chosen as planning tools. In the context of the Third World, availability of data and, more generally, the complexity of the indicators are matters of concern.

A number of authors (Cartwright 2000; Hammond et al. 1995) discuss criteria for the selection of indicators and the role of performance indicators. Using case studies from the state of Oregon and from Santa Monica in the US to support his view, Brugmann (1997) advocates that, at the local level, indicators are ideally suited for performance measurement. Similarly, in their assessment of the US experience, Guy and Kibert (1998) report that indicators can assess performance of policy projects. This is in agreement with Hammond's view that indicators can "provide a measure against which some aspects of policy issues/performance can be measured" (Hammond *et al.* 1995). However, Hammond *et al*. also stress that, in order to improve communication, indicators should provide information in a simple and understandable form. A brief history and use of planning are presented below.

2.2.4 History of planning indicators

The use of indicators to inform policy decisions dates back to at least the mid-1960s in the US, when there was an increasing interest in the measurement of social change by social scientists and civil servants (Wong 2000). This idea spread from the US to international organisations such as the Organisation for Economic Corporation and Development (OECD) and the United Nations (UN), and to European countries, which began to compile compendia of social statistics and to develop social accounting and reporting schemes (Horn 1993). Unfortunately, this rapid movement suffered a setback in the late 1970s due to the failure of social research to resolve conceptual and methodological difficulties.

From 1994, onwards the United Nations Centre initiated an Urban Indicators Program for Human Settlements. Its aims were "to build national and local capacity to collect and use policy-oriented indicators as part of a strategy to develop sustainable human settlements"

in cities, in order to “anticipate, recognise, measure and interpret urban problems” and to respond to them through policy formulation (OECD 1994). In response to measuring urban problems, GIS based planning indicators have been developed and adopted to control unsustainable land use patterns. The use of GIS based planning indictors and their significance in spatial planning and policy evaluation are presented below.

2.3 GIS BASED INDICATORS

The visualisation techniques of GIS can be combined with specific policy oriented indicators to assess the quality of life in order to guide effective distribution of public resources. Such “equity mapping” (Talen 1998) is beneficial in both urban revitalisation activities and public policy research. Few studies have attempted to develop GIS based indicators that can have a significant relevance to local planning and policy formulation processes. A major objective of GIS based indicator studies therefore is to assist in policymaking and evaluation.

GIS based indicator studies were developed to assess the quality of urban life at the neighbourhood scale; these studies have significant relevance to the local planning and policy formulation process. Ghose & Huxhold (2000) discuss the value of using neighbourhood indicators in planning. Their article explores GIS based indicator studies conducted by the University of Wisconsin to examine inner-city neighbourhood conditions in Milwaukee, Wisconsin. The findings from the stakeholders indicate that such studies are helpful in monitoring neighbourhood conditions, assessing past success and failures, and in formulating new planning policy.

Notwithstanding numerous attempts at standardisation, the variety of GIS based indicators for measuring sustainability remains enormous. In spite of this, GIS based neighbourhood indicator studies are gaining popularity in policy research (Kingsley 2000; Drummond 1995). These indicators focus on environmental, economic, societal, psychological, communicative and political processes. Many of them are routinely used in European countries and the USA. These indicators intend to set targets and measure

the effectiveness or success of certain planning policies to enable periodic review and adjustment. The next sections present an overview of lessons learned and problems of using GIS based planning indicators in spatial planning.

2.3.1 Lessons learned from previous studies

Most of the past indicator studies focused on sustainability either in general or on a specific policy at a national level. Application of such indicators at a local level presents serious problems due to the unavailability of data and lack of focus on urban specific issues (Maclaren 1996). The review of past indicator systems showed that it is difficult to obtain data at a local level. Conversely, most of these indicators are not spatial in nature and some pressure response systems are only valid for certain spatial units (Archibugi 1998).

The main objective of most of the indicators reviewed is to provide an indication of the overall performance of a city or a nation in terms of its environment or its environmental policies. However, the scope of these indicators is not limited to demonstrating the state of the environment, as they also provide indications of how the city's various activities are affecting its environment and how well the response measures taken by the government and non-governmental sectors are progressing.

The review of past indicator studies provided better insights into the indicator system that is of interest to this study. The review helped in understanding the scope of the issues, possible approaches, potential areas of indicator use and possible hurdles to overcome. The major issue affecting the development of GIS based planning indicators is discussed further in the next paragraph.

2.3.2 The missing link between planning indicators and GIS

Looking at the way planning is practised in the new millennium, the application of GIS instruments was, is and apparently will remain quite limited (Wong 2000; Kingsley 2000;

O'Looney 2001; Geertman 2002). In general, planners and designers appear to have been quite antagonistic to the development of highly systematic and computer based indicators, or at least distrustful of them. No additional tools for planning support are available now than were available ten years ago (Klosterman 1998; Harris 1998; Wegerner 1998). In the opinion of these authors, the development of analytical tools for planning will continue to lag behind. In the same vein, Nedovic-Budic (1998) demonstrates that GIS is persistently under-utilised in planning practice. This shows that the impact of GIS on planning decisions is still low.

Geertman (2002) and Klosterman (1998) took a closer look at the missing link between the current planning indicators and the (potential) support function of GIS. Innes and Simpson (1993) provided a historical reflection on this relationship. Geertman (2002) discussed sustainable planning indicators and highlighted ways that GIS technology can contribute towards sustainable development.

However, participatory and collaborative uses of GIS are clearly high priority topics as the numerous papers about sustainable indicators and GIS uses can attest (Jankowski *et al* 1997; Laurini 2001; O'Looney 2001; Ceccato & Snickars 2000; Hall & Pfeiffer 2000; Jankowski & Nyerges 1997; French & Wiggins 1990; Wiggins 1993; Harris & Elmes 1993; Budic 1994; Huxhold & Levinsohn 1995; Carley 1981; Hall 1993; Nedovic-Budic 1998; Kline 1993 and Williams *et al* 2001). O'Looney (2001) provides a fresh approach to urban planning based on computers. This 'flood' of books and articles in all the major journals in geography, GIS, urban planning, and related areas shows the importance of GIS based indicators in urban planning.

All the literature listed in the previous paragraph indicates that, in order to maintain the "sustainable growth" of cities, urban planners have to move beyond the drawing of land use plans and will have to start using GIS based systems analysing urban societal and environmental problems.

2.4 SUMMARY

A literature review of the use of indicators in an urban context was presented in this chapter. This chapter also revealed that challenges posed by current urban growth trends require for their management the integration of a spatial dimension. Monitoring tools such as indicators are intended to support local authorities in their efforts towards achieving sustainability, and to provide objective and comparable information for that purpose.

The next chapter gives a brief outline of spatial planning policies for the CMA; it then discusses the PIM and its functionalities.

CHAPTER 3: PLANNING IN THE CMA

This chapter gives an overview of the Metropolitan Spatial Development Framework (MSDF) as a major spatial planning policy for the Cape Metropolitan Area (CMA), and then discusses the Planning Indicators Model (PIM) and its functionalities.

3.1 SPATIAL PLANNING IN THE CMA

Planning in the CMA is facing the challenge of balancing a valuable and relatively well-developed (natural, cultural, infrastructure, service and economic) environment with the impacts of poverty, urban sprawl, long travel distances and poor public transport, inadequate housing and low residential densities (Cape Metropolitan Council 2000b). In order to address these challenges, the Cape Metropolitan Region (CMR) focused on the preparation of the MSDF from the early 1990s.

The MSDF is a spatial planning initiative, which started in 1989 in response to the insufficiency of the Guide Plans for the CMA. The MSDF's goals, strategies and principles were subject to public stakeholder debate and were set out in the MSDF Technical Report of the Cape Metropolitan Council (Cape Metropolitan Council 1996). This report provided a comprehensive growth management framework, including a vision statement and regional outline plan. Its objectives identify the desired outcomes for the CMA.

Accordingly, these objectives provide the starting point for any performance monitoring and conformance evaluation. However, for some years, the MSDF has been the subject of extensive debate within the local authorities and institutions of the CMA and there are suggestions that certain aspects and elements of the MSDF require revision (City of Cape Town 2003). The MSDF objectives and associated indicators are presented in subsequent sections of this report.

3.1.1 MSDF guiding principles

There are six major spatial principles that form the basis of the MSDF:

- Management for sustainability;
- Creating quality urban environments;
- Containing sprawl – protect valuable natural and agricultural resources, while promoting compact urban form, within corridors and nodes, for better use of resources and economic development and public transport usage;
- Residential intensification – strategic location and design of development and services to maximise the overall urban system, through higher density residential development, by locating housing near transport, employment and social facilities, along activity streets and nodes;
- Urban integration - establish nodes and corridors to promote efficient and cost effective service provision in the CMA;
- Redressing imbalances – direct public and private investment to create quality urban environments in previously deprived areas.

The principle of sustainable management, and creating quality urban environments are very broad and non-specific, and operate as overarching goals that apply to all situations and contexts. The four principles of containing sprawl, residential intensification, urban integration, and redressing imbalances are more specific (City of Cape Town 2003). These are linked to the first two broad principles and support them.

3.1.2 Structuring elements

The MSDF identified four spatial structural elements that form the spatial context within which other aspects of the framework fit. However, the fifth and sixth elements Spatial Planning Unit (SPU) and Suburbs were adopted during the development of the Planning Indicators Model.

The four structuring elements identified by the MSDF are:

1. Urban nodes - these refer to centres of high population densities, where many activities jointly support one another. The MSDF identified the Cape Town CBD, Bellville CBD, Claremont and Wynberg CBD, Philippi East node, and Helderberg as metropolitan nodes (See Appendix B).

Nodes are located at modal interchanges and are locations for higher order health, recreational, educational, commercial and residential activities.

2. Activity corridors – These are linear zones of development bordering a public transport route (characterised by large populations, mixed land uses and public transport facilities and integrate a variety of employment opportunities with high-density residential functions). A corridor ranges up to a maximum of ten to twelve minutes' walking distance.

Three types of corridors as identified by the MSDF are *mature metropolitan activity corridors* (the corridor along Voortrekker Road and Main Road); *incipient metropolitan corridors* (the corridor along Koeberg Road, Old Paarl Road, Durban Road (Durbanville), Van Riebeeck Road (Kuils River to Faure) and roads through Somerset West and Strand. *Proposed metropolitan corridors* are corridors along Wetton/Lansdowne Road, along Klipfontein Road, between Philippi and Bellville (North-South link), Khayelitsha to Somerset West along Van Riebeeck Road, from the Brackenfell Boulevard towards Kraaifontein along AZ Berman, and through Blue Downs (Cape Metropolitan Council 1996).

3. Metropolitan Open Space System (MOSS) – This is a rationalised network of interconnected open spaces aimed at:

- Complementing the built fabric by providing the urban environment with variety, character, a sense of visual relief, open space enjoyment, recreation and general amenities;
- Protecting biodiversity in urban areas, and providing animal and plant species with habitats.

MOSS is the unbuilt component inside the urban edge. It is an inter-connected and managed network of open space, which supports interactions between social, economic and ecological activities, sustaining and enhancing both ecological processes and human settlements. MOSS encompasses nature areas, mountain areas, public and privately owned:

- Human made or delineated spaces,
- Undeveloped spaces,
- Disturbed natural spaces, and
- Undisturbed or pristine natural spaces and farmlands within the urban edge which, when all linked, create a green network.

4. Urban edge - This is a demarcated line, which is linked to a policy that serves to manage, direct and limit urban expansion for a specified period (Cape Metropolitan Council 1996).

In the case of the MSDF, the urban edge is a growth management policy instrument, which defines the 20-year outer extent of urban development. For instance, the edges around the Table Mountain chain and the Philippi horticultural area are intended to protect these sensitive areas within the developed urban environment from urban development. The role of an urban edge is to contain urban sprawl; protect significant environments and resources; re-orientate growth expectations; densify built environments; and rationalise service delivery areas.

Figure 3.1 below and Appendix B show these spatial elements in the CMA, as outlined in the MSDF (Cape Metropolitan Council 1996).

5. Spatial Planning Units (SPUs) – these provide a set of spatial units that cover the entire CMA, unlike the other elements that are not space filling SPUs are closer to the neighbourhood level (Zietsman 2004, Pers Com).

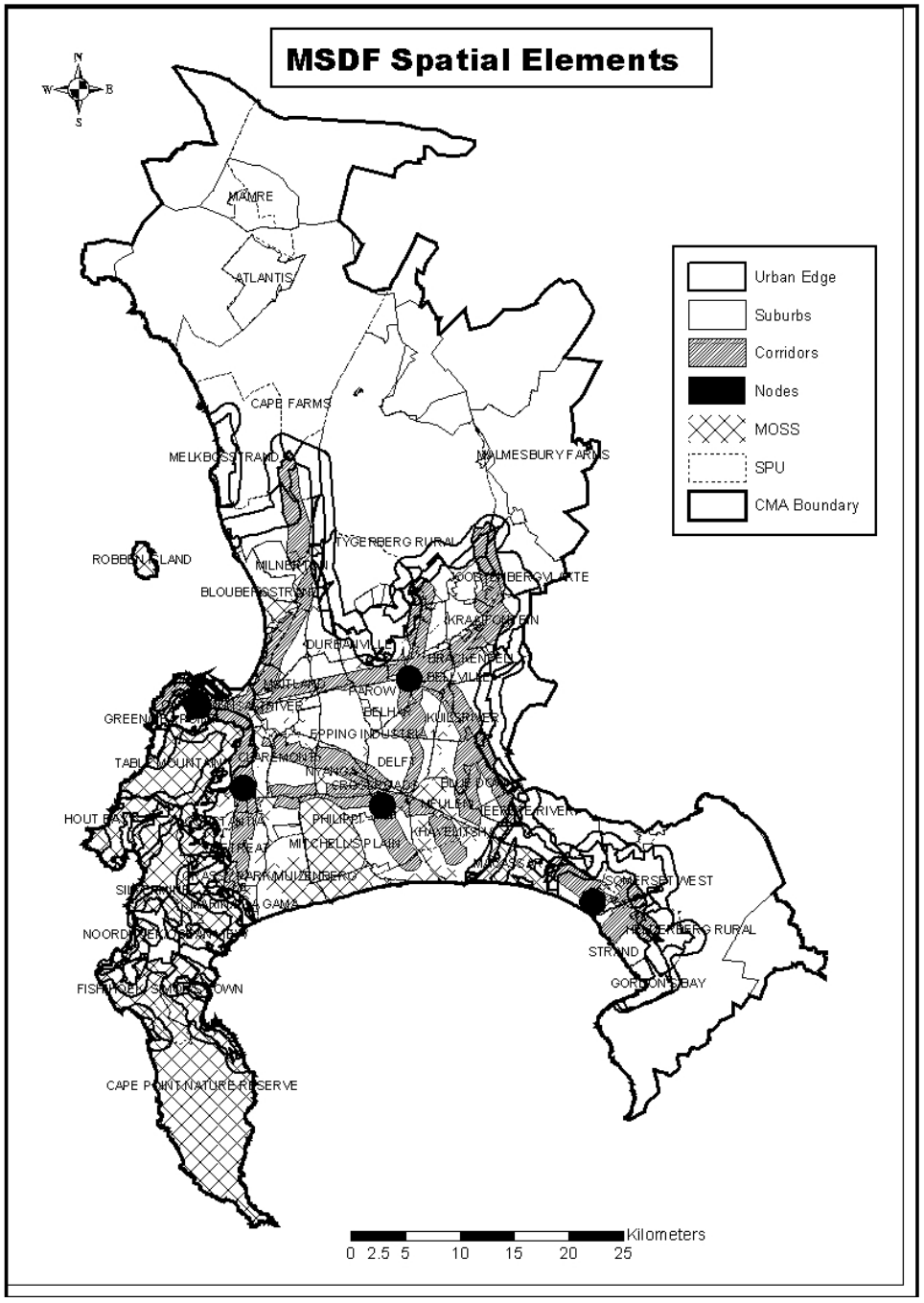


Figure 3.1: Spatial structural elements of the MSDF

The spatial elements discussed above also function as reporting units in the Planning Indicators Model (PIM). The reporting units are discussed further in the next section, which deals with the PIM and its functionalities.

3.2 THE PLANNING INDICATORS MODEL (PIM)

The PIM was commissioned by the Spatial Planning Department to provide a GIS based tool for monitoring and evaluating the Cape Town Metropolitan growth and development in relation to the spatial planning policies (MSDF, SDFs and the City Vision) of the CMA.

The PIM applies two fundamental sets of indicators and indices to monitor and evaluate the outcomes of the city's spatial planning policy. One set of indicators monitors and measures the extent to which land use and physical development conform to the main spatial strategies (corridors, MOSS, SPUs, nodes, and urban edge). The other set of indicators monitors and measures performance of the CMA in terms of achieving its spatially measurable goals (i.e. the extent to which the broader socio-economic and environmental goals are achieved). The PIM was an outcome of the Planning Indicator Study (Zietsman & Sinske 2002) that was aimed at identifying:

- Conformance indicators to test if land uses are changing in the direction promoted by spatial plans;
- Spatially measurable goals;
- Indicators to determine performance of spatial guidelines of the CMA;
- Data sources and determining availability of data.

The PIM is comprised of a series of user-friendly indicators and indices to monitor and evaluate the outcome of the MSDF. The aim is to use the PIM to gauge the extent to which spatial planning policy has contributed to improving the quality of life for the CMA residents and the efficiency with which land is being used and developed. The next section looks at the PIM and its functionalities.

3.2.1 The Planning Indicators Model and its functionalities

The PIM is an object-oriented model, written in Visual Basic for Applications (VBA) and runs in the ArcMap environment of ArcGIS 8.1. The VBA programming code (formulas

related to the indicators) is linked to the ArcGIS 8.1 database in order to compute the conformance and performance indicators (Zietsman & Sinske 2002). The indicators are computed in ArcMap through a special graphical user interface (GUI) and user-specified functions that access the necessary spatial data (reporting feature class and input feature class data) from ArcGIS personal databases.

The indicators are calculated statistically by computing standard scores (z-values) for all variables. The z-values have a mean of zero and a standard deviation of 1,0 and indices are then computed by adding the z-values. However, the Spatial Planning Department needs to weight each index for every MSDF objective as the PIM allows for relative weighting of the z-values. Zietsman & Sinske (2002) recommend that the weights should add up to 100. However, in this study, indicators are not expressed as standard deviations to avoid confusion during interpretation; they are mostly in area units (ha) or expressed as percentages.

The PIM enables the definition of spatial reporting (output) feature classes such as Urban Nodes, Corridors, Suburbs, SPUs and MOSS. It also caters for the definition of spatial input feature classes such as enumeration areas and land use areas. Once these have been specified, the model can calculate conformance and performance indicators for the selected reporting feature classes. The model supports the storage of historic snapshot data for monitoring change in conformance and performance indicators over time.

3.2.2 PIM Graphic User Interface (GUI) layout

The PIM has a user-friendly Graphical User Interface (GUI), comprising eight GUIs:

- Feature Class GUI (allows selection of the spatial input feature class, time slice or time interval and the reporting feature class for conformance or performance analyses);
- Conformance GUI (allows selection, editing and calculation of conformance indicators after selecting a conformance objective);

- Performance GUI (allows selection, editing and calculation of performance indicators after selecting a performance objective);
- Results: Tables GUI (displays the output results of the analyses, for instance the attribute table of the currently active reporting feature class);
- Results: Graphs GUI (displays the results of the analyses that can be viewed by creating various types of charts),
- Results: Layers GUI (allows spatial viewing of results in a map format);
- Pre-processing GUI (an additional customised wizard for unifying and intersecting multiple layers automatically) and;
- System Set-up GUI (allows setting up of the system according to user requirements).

These eight GUIs are accessible via menu tabs. The model also has eight status boxes for reporting feature class, time slice, time interval, reporting feature class selection, conformance objective, conformance indicator selection, performance objective, and the performance indicator selection to indicate the current system setting and selection status.

Conformance and Performance monitoring is about measuring, evaluating and comparing outcomes. It requires the identification, calculation, assessment and reporting of a number of indicators. Hence, the next chapter analyses and interprets the conformance indicators.

CHAPTER 4: EVALUATING CONFORMANCE IN THE CMA

Chapters four and five present spatial analysis of conformance and performance indicators. As indicated in chapter three, indicators are bits of information that summarise the characteristics of systems, or highlight what is happening in a system. They assess conditions and trends in relation to goals and targets, as a response to a set of objectives and policy goals and signify if objectives have been attained (these indicators were calculated based on year 2000 data).

This section identifies, calculates and analyses conformance indicators for the CMA. Conformance indicators measure the extent to which actual urban development conforms to the strategies as identified in the MSDF as well as the SDFs at the local level. That is, conformance indicators measure and monitor the extent to which land use and physical development correspond to spatial planning strategies, especially along the corridors and in the nodes.

4.1 MSDF OBJECTIVES AND CONFORMANCE INDICATORS

The PIM provides a set of 15 indicators with which to assess the following five conformance objectives:

a) Densification – Increase urban densities in the Nodes, SPUs and along Corridors;
b) Diversification – Increase land use diversity in Nodes and along Corridors;
c) Commercialisation – Increase retail and industrial activities along the Corridors and Nodes;
d) Edge encroachment – Prevent edge encroachment on the MOSS and on the Urban Edge;
e) Green space protection – Prevent environmental degradation on the MOSS and in agricultural areas.

Each of these objectives and the corresponding indicators that measure their conformance to the MSDF and SDFs will be discussed in the section that follows.

4.1.1 Densification

According to the MSDF, densification is widely recognised as a strategy for promoting sustainable and quality urban environments. Hence, it is an important method for promoting the development of corridors and nodes and for enforcing the implementation of the urban edge.

4.1.1.1 Take-up of vacant land

- Take-up of Vacant land (*VacArea*) measures the amount of vacant land (ha) available in a reporting unit (more especially in the SPUs, Corridors and within an area adjacent to the Urban Edge) at a particular time slice.

For the purpose of this indicator, vacant land is considered to include land not utilised, occupied land with no civic or electrical infrastructure, development in progress, under utilised land, private open spaces, land used for low intensity agricultural purposes, and buffer strips around townships and public open spaces.

The MSDF requires the identification of vacant and under developed land within urban areas for promoting urban densification and appropriate development of the CMA. The current focus excludes all land outside the MSDF Urban Edge, land that is not physically suitable for development, land proclaimed for nature reserves and land used for high intensity agricultural purposes.

Figure 4.1 below illustrates tracts of vacant land along the metropolitan corridors. The corridor between the Cape Town CBD and Melkbosstrand (Koeberg Road) has the highest area of vacant land, that is, 1900ha. This area can be used for infill development as it has a well-developed infrastructure and established residential, recreational and commercial areas.

The Northern Arm along Voortrekker Road and the Southern Arm, which is a corridor from Cape Town to Claremont/Wynberg, has small areas of vacant land, which range

from 11–43ha in size. These are mature corridors with intense residential, commercial, industrial, recreational and social activities.

Figure 4.1 also illustrates the areas of vacant land for the whole CMA in relation to the corridors and the SPUs as the structuring elements. From this figure, it can be seen that the areas with large tracts of vacant land are at Mamre and Melkbosstrand, Noordhoek, Grassy Park and Delft.

Phola Park is a low income area strategically located within the planned Wetton-Lansdowne development corridor. This settlement occupies vacant land between former “coloured” and “black African” townships (Manenberg and Gugulethu respectively).

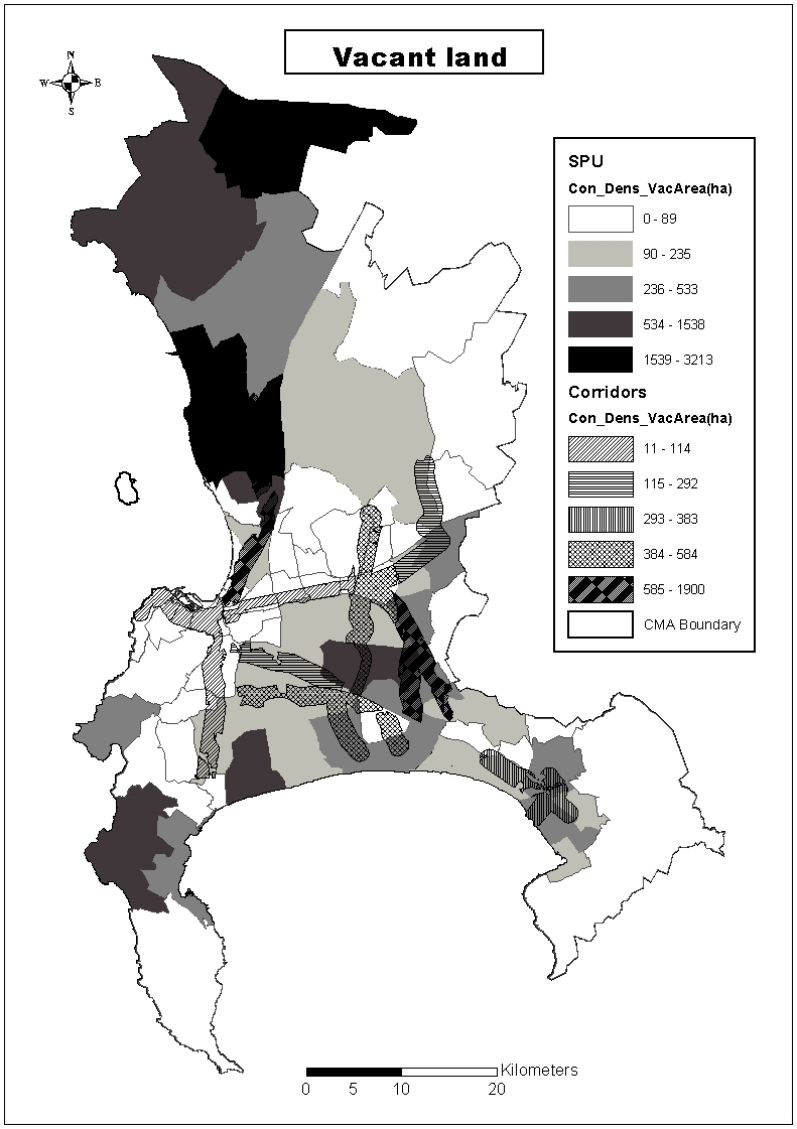


Figure 4.1: Vacant land in the CMA

The spatial distribution of vacant land shows more land in the northern part of the city and less in the southeastern and central parts. Most areas in the centre and the south eastern areas of the city have vacant land ranging in size from 110-533ha; these are areas such as Khayelitsha, Mitchell's Plain, Strand, Kuils River, Hout Bay and Kraaifontein. There are only a few or no patches of vacant land in the vicinity of the Cape Point Nature Reserve, Helderberg, Green Point, Gordon's Bay, Malmesbury Farm and Cape Farms ranging from 0-41ha. These areas comprise intensive agriculture, formal nature conservation, road reserves and private open spaces.

These tracts of vacant land in the CMA could be used for strategic infill and densification of the metropolitan built environment. The MSDF mentioned that, where appropriate, vacant land could also be utilised for the establishment of an adjoining system of green spaces (MOSS) throughout the CMA for recreation and nature conservation purposes (see Figure 4.1 above). The vacant land within built-up areas can be released for urban development to take the pressure off the urban edge.

This indicator will be very useful in future for calculating the take-up of vacant land, but presently it does not show any change, since the data available are only for one year, precluding a comparison over time.

4.1.1.2 Population density

- Population density (*PopDens96* – people per hectare). This indicator is expressed as the number of persons per hectare in each reporting unit.

Residential densities in South African cities are relatively low. By settling more people in a residential area, the density is increased. If densification is increased, city functioning will improve, thus supporting resource protection, and ultimately promoting urban containment. The MSDF encourages increased population densities in the SPUs, Nodes and along the Corridors.

Figure 4.2 demonstrates population densities in the suburbs of the CMA; the densities range from 0–115 people per ha. The northern and southern parts of the city have a relatively low population density varying from zero to four persons per hectare. These areas are either intensive agricultural farms or nature conservation areas (Cape Farms, Helderberg Rural, Silvermine, Philippi Rural, Malmesbury Farms, Melkbosstrand, Cape Point Nature Reserve and Table Mountain). Other low density residential areas are located at Constantia and Wynberg, adjacent to the nature reserve areas, and at Tygerberg, adjacent to the agricultural areas. These are mostly high-income residential

areas adjoining the nature reserve areas and agricultural land, encroaching on the latter due to urban sprawl.

The medium density residential areas (17-65 persons per hectare) are generally situated in the Cape Flats and are separated from one another by movement channels (roads and railways) and buffers of open space. The residential areas in the activity corridors alongside the activity spine are generally of medium density (areas along the activity spines of Voortrekker Road, Main Road, Durban Road); these areas are actually designated for housing high density development (Cape Metropolitan Council 1996).

The central and south eastern parts of the city have the highest population densities, ranging from 66–115 persons per hectare; these include Mitchell's Plain, Khayelitsha, Langa, Nyanga, Epping Industrial and Parow. Most of these areas constitute informal settlements or low income housing, where the majority of the population (low income group) reside.

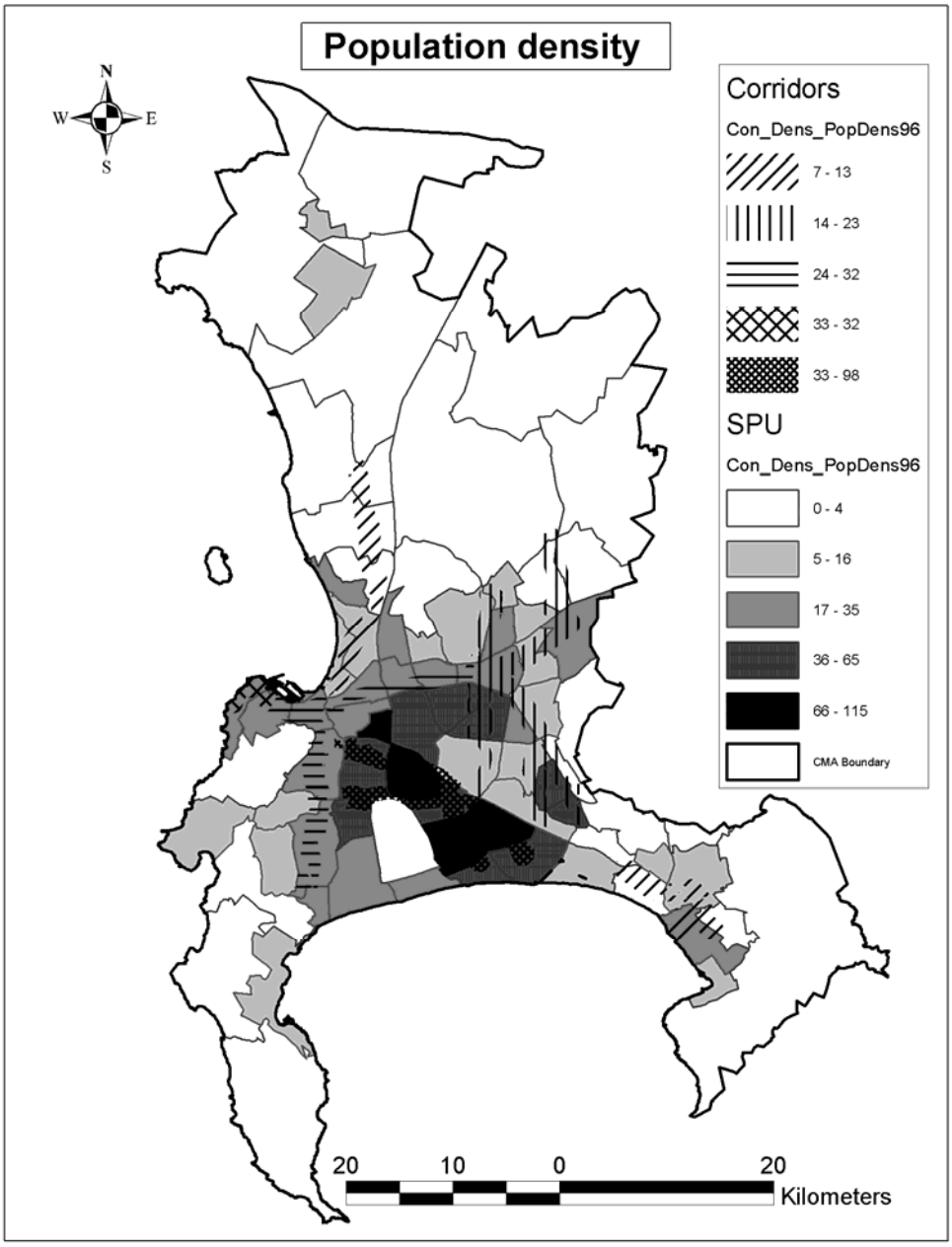


Figure 4.2: Distribution of population density in the CMA

Other high density residential areas occur at Sea Point, due to the limited space around Lion's Head, and in Gugulethu, Crossroads, Brown's Farm, Delft and Blue Downs, due to the rapid growth of population and informal settlements in these areas. These settlements are located around the north-south link corridor, Klipfontein Road and Koeberg Road. See Figure 4.2 for population distribution and densities in the CMA.

4.1.2 Greater mix of land uses

4.1.2.1 Land use mix

- Diversity Index *(DivIndex)* measures the diversity of land use in an area. Index = 1.0 means that there is just one land use type in the reporting unit. While Index = zero means that all land use types are presented in equal proportions. The higher the diversity index, the lower the diversity.

According to the Cape Metropolitan Council (1996), mixed use development is a "horizontal and vertical integration of suitable and compatible residential and non-residential land uses in the same area". Mixed use development aims at integrating various types of residential, employment, educational, social and recreational opportunities, which are accessible to everyone. The MSDF encourages land use mix in the Nodes and along Corridors. Figure 4.3 below illustrates land use mix in the CMA, in relation to the nodes and corridors.

The diversity index of land use in the four nodes of the CMA ranges from zero to one (0-1.0). Cape Town CBD has the highest mixed use of land (most diverse node), with an index of 0, (this area has a range of residential, economic and social facilities) followed by Bellville and Claremont - Wynberg Centre. All these areas have integrated residential and non-residential land uses within the same parcel of land. In these areas, residential areas are within close proximity to employment, educational, social and recreational opportunities. Whereas Strand is the least diverse node.

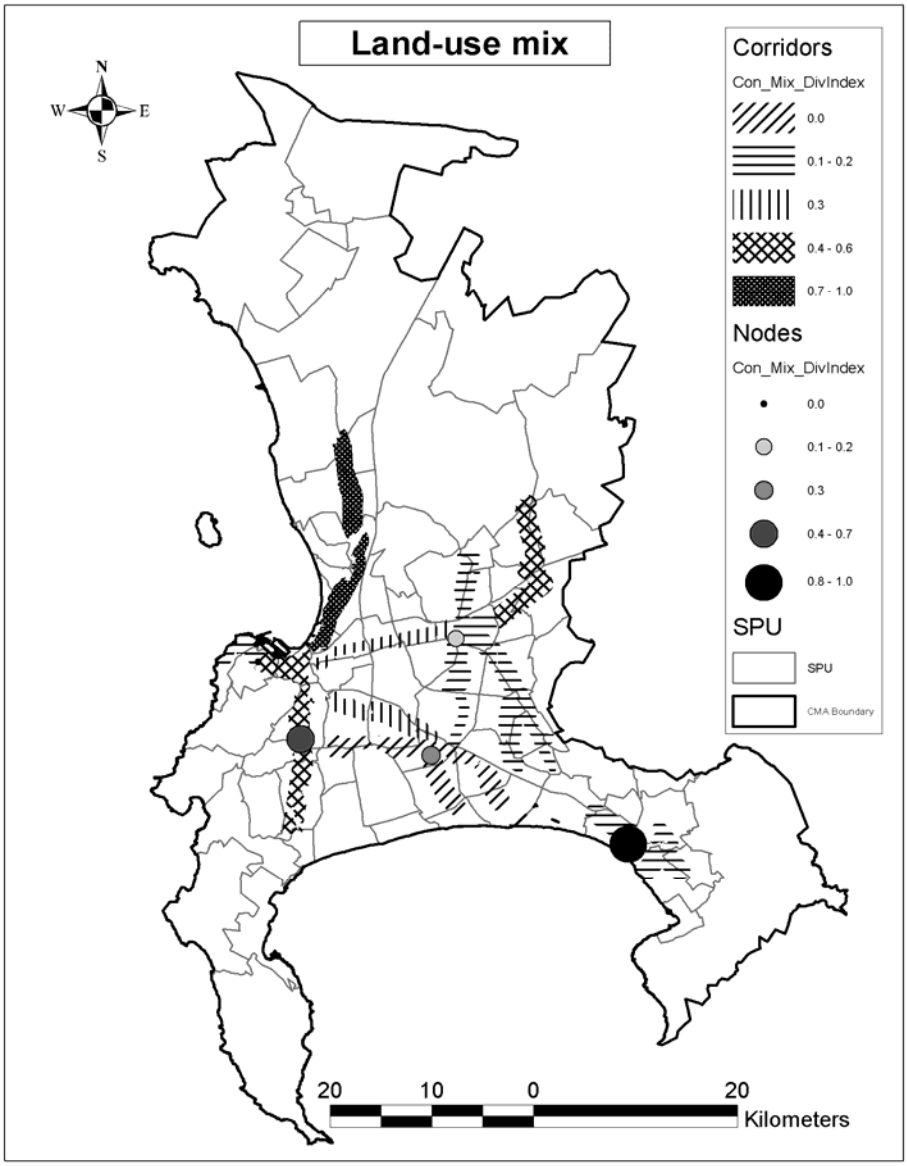


Figure 4.3: Diversity of mixed use development

The diversity index of the corridors in the CMA also ranges from 0–1.0. There are high diversity index values (0.4-0.6) along the Wetton/Lansdowne Road (Philippi and Claremont/Wynberg), Bonga Drive and Van Riebeeck Road, then Voortrekker Road and Klipfontein Road. These are mainly established commercial areas and residential areas with social and recreational facilities. However, the Northern spine alongside Koeberg Road has lowest diversity index. The spatial pattern of these corridors is displayed in Figure 4.3.

Facilities along a corridor are more accessible than facilities arranged around a point. A successful mixed use development incorporates important metropolitan transport routes. On most of these routes, different transport modes are available to different nodes, for example, rail, bus and taxi. A greater mix of land uses should be encouraged along the identified corridors and nodes.

However, the land use mix indicator is very general in nature and may be inappropriate in different areas of the city. This indicator needs to be used with caution and should be investigated further as diversity of any type of land use is not always desirable in all parts of the city (Zietsman & Sinske 2002).

4.1.3 Increased commercial, industrial and retail activities

Changes in the relative growth of various economic sectors and locational requirements influence where in the CMA investment is taking place. Three major economic activities of the CMA are discussed below.

4.1.3.1 Major (New) developments

- Major new developments – major developments include only those projects covering an area of 2ha or more or projects valued at R10 million or more in the CMA.
- Number of new developments (*NumDev*) is the number of developments in an area. The information on major new developments is necessary to coordinate future land use planning and investment by the private and the public sector across the CMA.

The City of Cape Town (2003) report states that there has been decentralisation of formal business from the Cape Town CBD and the old CMA corridors and a shift towards the northern parts of the city, especially to Durbanville and to Milnerton. These areas have good road access, appropriate infrastructure, safety and a skilled professional labour force.

According to the Cape Metropolitan Council (2000), there were 193 major development proposals in 1999. These were either residential or mixed land use proposals, which include residential, commercial and industrial uses. There were 57 major development proposals in Tygerberg most of these were commercial developments. The areas with the second and third most development proposals were Helderberg and South Peninsula with 39 and 37 developments respectively; most of these were residential developments.

Somerset West and Khayelitsha had 18 and 14 development proposals respectively, followed by Durbanville, Muizenberg, Fish Hoek, Noordhoek, Strand and Delft (see Figure 4.5). These areas are located near low income residential areas and as a result provide employment opportunities in close proximity to these residential areas. Large scale private sector office and shopping centre developments, in particular, tend to occupy sites outside corridors and nodes. In contrast, low income housing projects and public investments in basic services are focused on the Cape Flats.

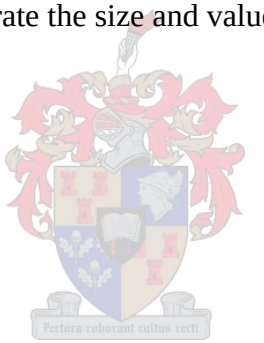
Figure 4.5 also shows the strength of selected investment centres, mainly Tyger Valley and Milnerton in the northern suburbs, the Waterfront and Cape Town CBD, and Claremont in the southern suburbs. Turok & Watson (2001) state that there has also been some private investment in dispersed locations across the CMA, but little of this has occurred in the populous but poor south eastern region. This remains a dormitory area with few signs of major private development, even in the priority zone of the Wetton – Lansdowne – Philippi Corridor.

The mass of new private sector investment is located in areas with good (freeway) access, amenities and safety (Tyger Valley, Blaauwberg and Helderberg). Investors have been reluctant to invest in the metropolitan southeast, which is characterised by crime and poor services and infrastructure.

- Total value of investments. (*Con_Com_ValDev*) – This is the monetary value of the previous indicator and shows the total sum of money (R) invested in an area.

Large sums of money were invested in Delft, Khayelitsha (social services and housing), Milnerton, Epping/Elsies River, Tokai, Cape Town CBD, Plattekloof and Somerset West; these values range from R3110 million - R10090 million. Plattekloof and Somerset West, as well as Tokai, have many residential developments. Some of these areas have substantial tracts of industrial, manufacturing and commercial investments. However, only a few of these locations are in the disadvantaged areas, where there is a need for major developments and employment opportunities.

In contrast, places like Atlantis, Claremont, Eerste River, Epping Industrial 1, Faure, Mamre, Malmesbury Farms and Goodwood have attracted few investments. Most of these areas are either agricultural farms and conservation areas or well-established industrial and commercial areas, and thus there is no space for further development in them. Figures 4.4 and 4.5 demonstrate the size and value of major developments.



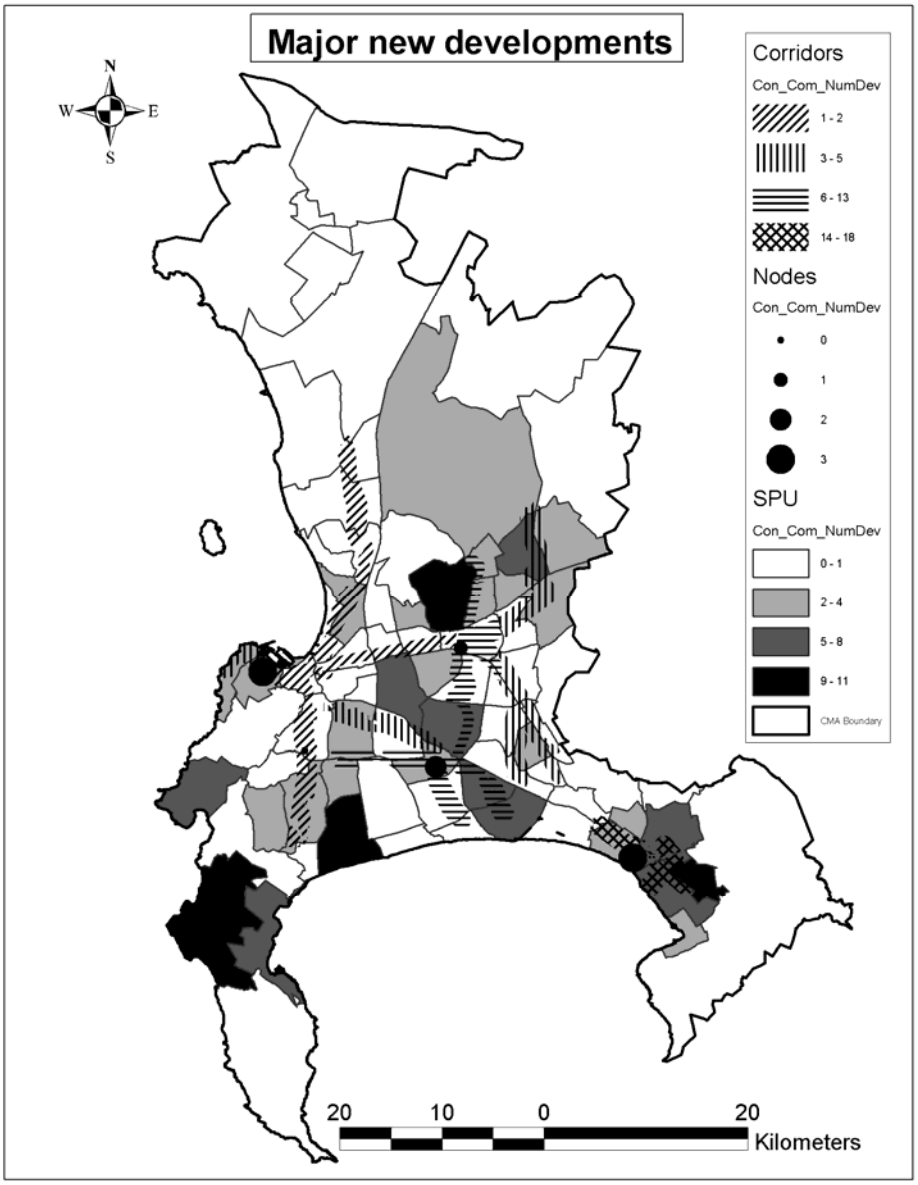


Figure 4.4: The major developments

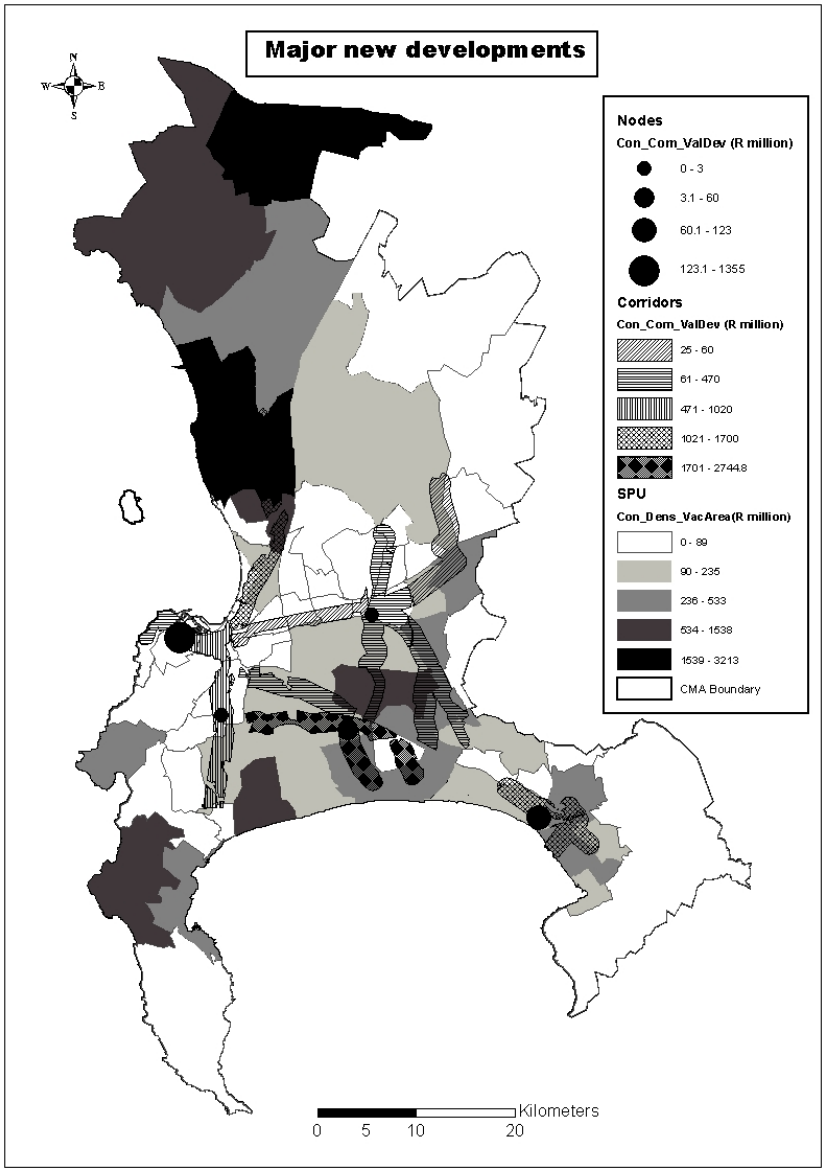


Figure 4.5: The monetary value of major new developments (R)

The bulk of major investments in the CMA has taken place outside of demarcated corridors and nodes rather than inside them. Private sector investment and job growth are occurring in or close to prosperous suburbs in the north of the city. These expanding employment centres are also less served by the commuter rail and bus network than the CBD is. The outcome is a more fragmented pattern of low density, car oriented development in and around the affluent areas, which confirms statements by Turok & Watson (2001).

4.1.3.2 Increase in commercial activities in the CMA

- Commercial erven (*CommArea*): this is the amount of land used for commercial purposes (in hectares), that is, the Commercial Erven in the CMA.

Historically, commercial activities were concentrated in the Cape Town CBD. As the city grew along Voortrekker and Main Roads, development followed these routes, developing clusters at points where accessibility (due to rail and route intersections) was higher. Retail and office developments later spread to major sub-centres such as Rondebosch, Claremont, Wynberg and Bellville (City of Cape Town 2003).

Figure 4.6 below shows the spatial distribution of commercial activities in the CMA, where Somerset West and Cape Town CBD have the largest commercial areas of 635-1738ha, followed by Epping, Claremont, Bellville South, Parow and Constantia, which range from 103-270ha of commercial area. These areas have large shopping complexes and some other retailing activities. Most of these areas are established nodes or mature business districts in the CMA. Somerset West has the largest single tract of commercial area in the whole CMA. This is followed by Noordhoek/Sun Valley/Ocean View, with a commercial area of 75.9ha. However, these figures are misleading because not all the land (the surface area) of the parcel is actually developed and in use for commercial purposes.

Conversely, the areas on the rural fringes of the city are agricultural and conservation areas and this explains the absence of commercial uses in these parts. These areas include Mamre, Cape Farms, Melkbostrand, Malmesbury Farms, Table Mountain, Cape Point Nature Reserve and Helderberg Rural.

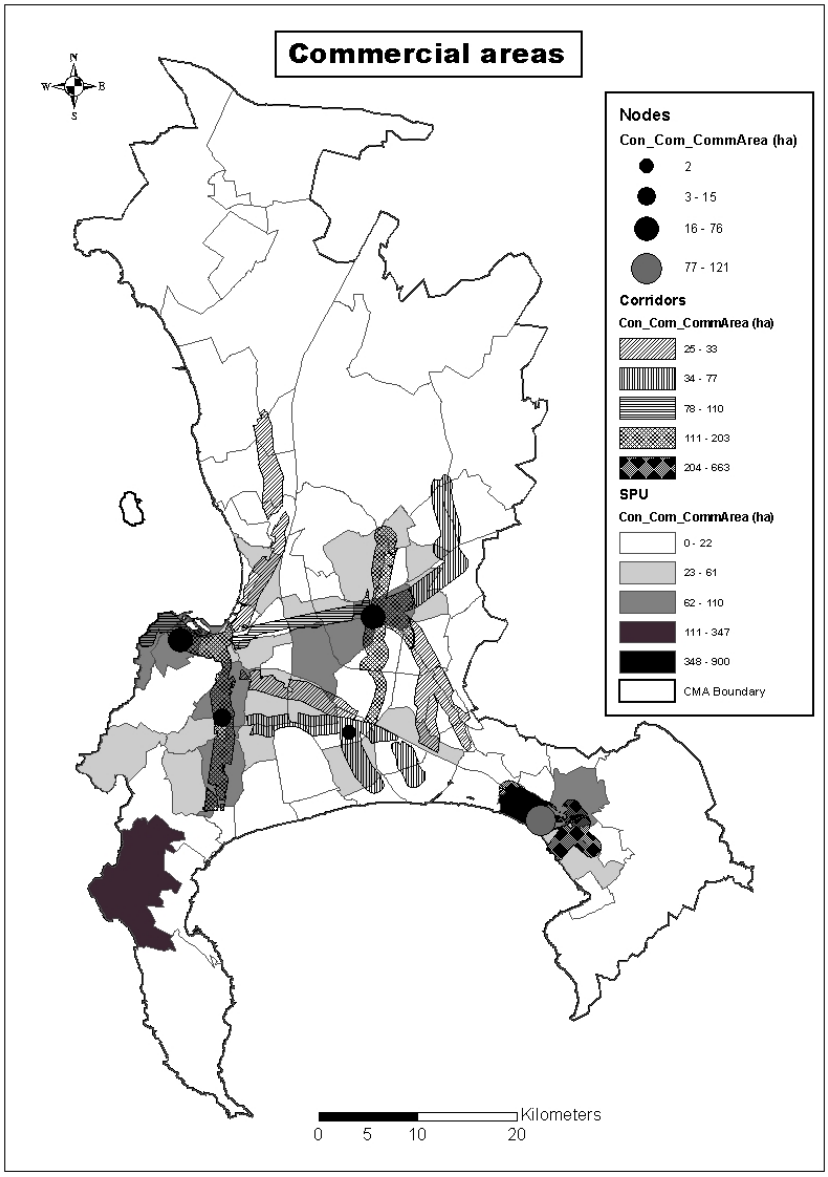


Figure 4.6: Spatial distribution of commercial activities

Commercial expansion was accompanied by residential development because of the economic opportunities generated by these developments. The majority of commercial activities are concentrated in the north west of the city with the bulk of the remainder distributed along the northern and southern arms. Generally, commercial areas are in historically well-off parts of the CMA, while only two such areas are prominent in the Cape Flats (Athlone CBD and Mitchell's Plain).

4.1.3.3 Increase in industrial activities in the CMA

- Industrial erven *(IndArea)* - this is the amount of land used for industrial purposes (in hectares) in the CMA.

Industries in Cape Town are located around the Cape Town CBD, in Woodstock, Salt River, Maitland, Paarden Island, Epping and in Brackenfell historically due to cheaper land. Industrial areas were developed along the major transport routes on the outskirts of the city, and later followed residential developments. The majority of the blue collar labour force is located in the peripheral residential areas of the Cape Flats (south east) where there is relative absence of major employment and commercial complexes and these people heavily dependent on the other parts of the city for employment.

The largest industrial areas are Salt River, Epping Industrial, Blackheath, Brackenfell, Bellville and Goodwood, Vasco Estate and Montague Gardens. These are old established manufacturing and industrial centres, with the exception of Montague Gardens, which is a recently developed area. The areas with the largest industrial area range from 145,5-333,0 ha of industrial land. As mentioned earlier, these areas are in the old parts of the CMA adjacent to residential areas and transport routes. They constitute 13,39-23,27% of the total metropolitan industrial area in the CMA. Just as with commercial erven, places with the lowest industrial use are Mamre, Cape Point Nature Reserve and others, with 0-6,4ha of land used for industrial purposes. These areas support small agricultural industries. As with commercial erven, these areas are either conservation areas or farmlands. They occupy 0-0,12% of the metropolitan industrial areas. Figure 4.7 below depicts the spatial distribution of industrial areas in the CMA.

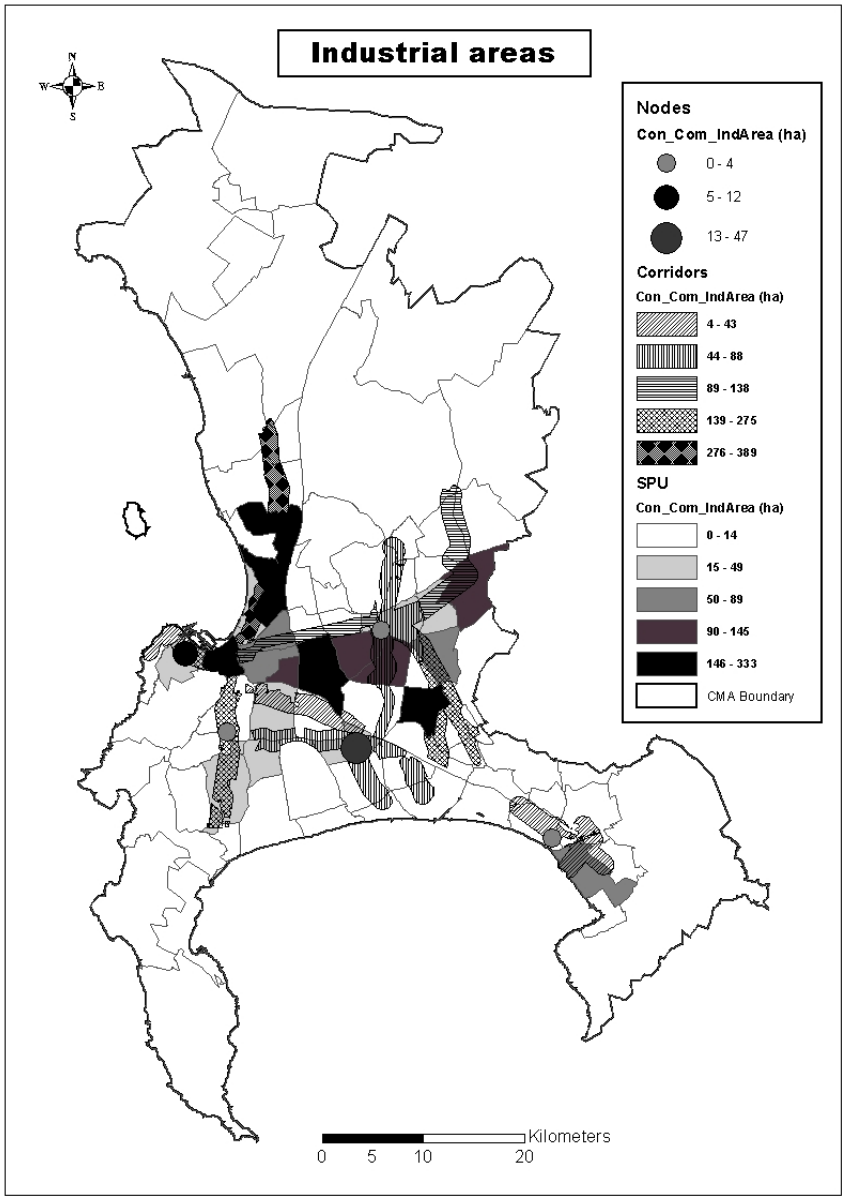


Figure: 4.7: Spatial distribution of industrial activities

The current spatial pattern of industrial activities reflects a concentration of industrial activity from the Cape Town CBD, through Woodstock and along the northern railway line through Epping, Parow, Bellville, Brackenfell to Blackheath, with recent locations at Montague and Killarney Gardens in Milnerton and the airport industrial area. There has been a lack of sustained industrial growth on the Cape Flats. Philippi Industria is an example of an area where crime and a poor image have kept investment away.

4.1.4 Edge encroachment

4.1.4.1 Growth of informal housing townships

- Number of shacks (Com_LHouse_NumShacks) - This is the number of informal housing units in 1993, and in 1998 respectively, in the whole Cape Metropolitan Area, SPUs and on the MOSS.
- Change in number of shacks (Com_LHouse_NumShacks_Delta) – This is a change in the number of informal housing units from 1993 to 1998.

Informal settlements have grown rapidly within the metropolitan area in the past ten to fifteen years. The vast majority of them are built on low cost peripheral land in places such as Philippi, Blue Downs and Delft. The bulk of informal housing (backyard and freestanding shacks) is also prevalent in the southeast. Most of these settlements can be attributed to in-migration and population growth. The number of informal shacks grew rapidly from 28,300 in 1993 to 72,140 in 1998 in the whole metropolitan area.

In 1993, Khayelitsha had the largest number of informal settlements with 9897 informal housing units, then Nyanga with 4331 shacks. Kraaifontein and Milnerton with 1949 and 908 informal housing units respectively followed these. Most of these establishments are along a corridor between Bellville and Kraaifontein, where settlements range in size from 66-439 shacks. Wallacedene and Bloekombos in Kraaifontein emerged because of illegal squatting on land away from other types of land uses (see Figure 4.8 below).

Places with few informal housing units in 1993 include the eastern part of Strand and Hout Bay (but, there were 69 informal shacks in 1993 on the MOSS around the Hout Bay area). These patterns are shown in Figures 4.8 and 4.9 below.

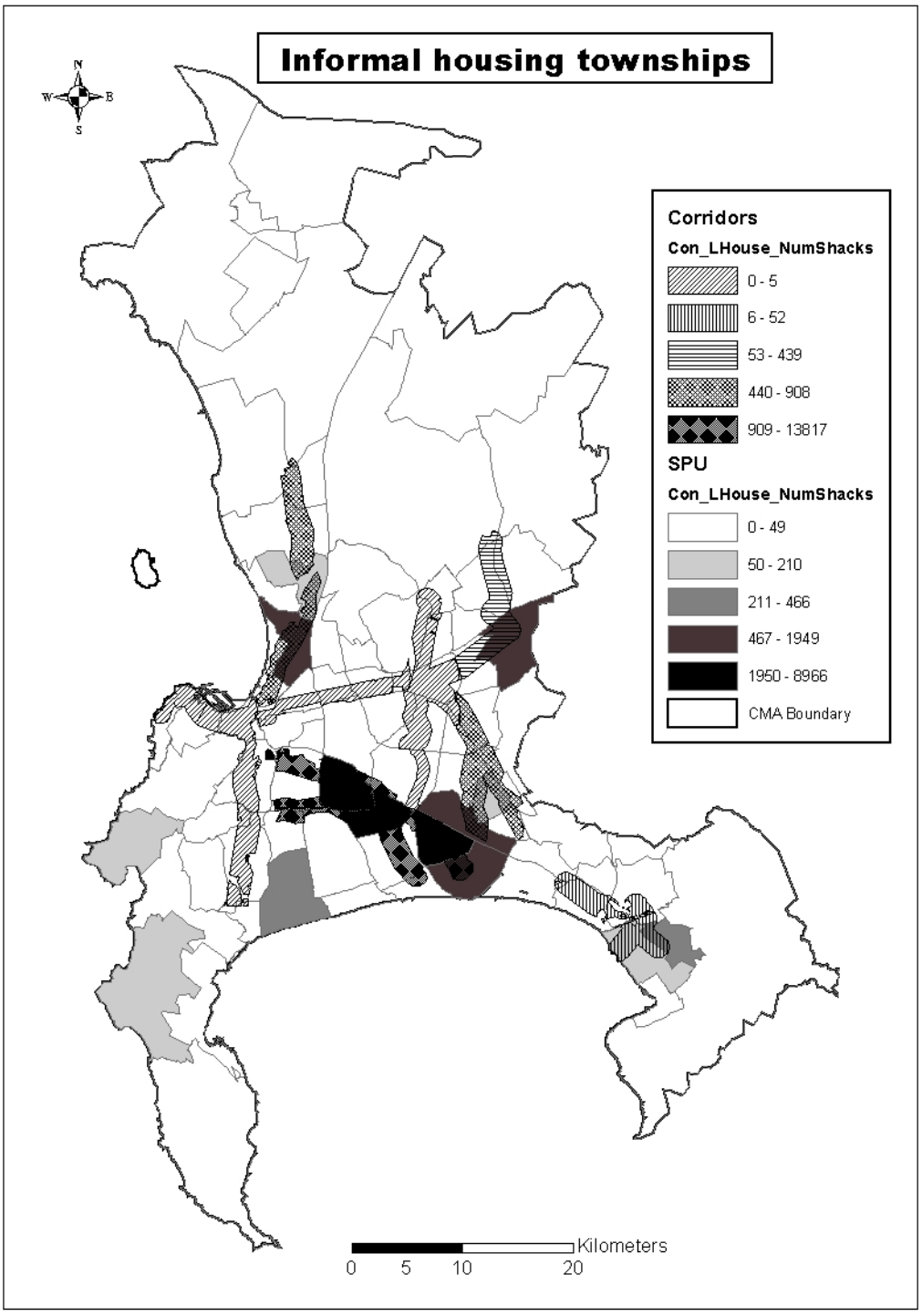


Figure 4.8: Number of shacks in the CMA in 1993

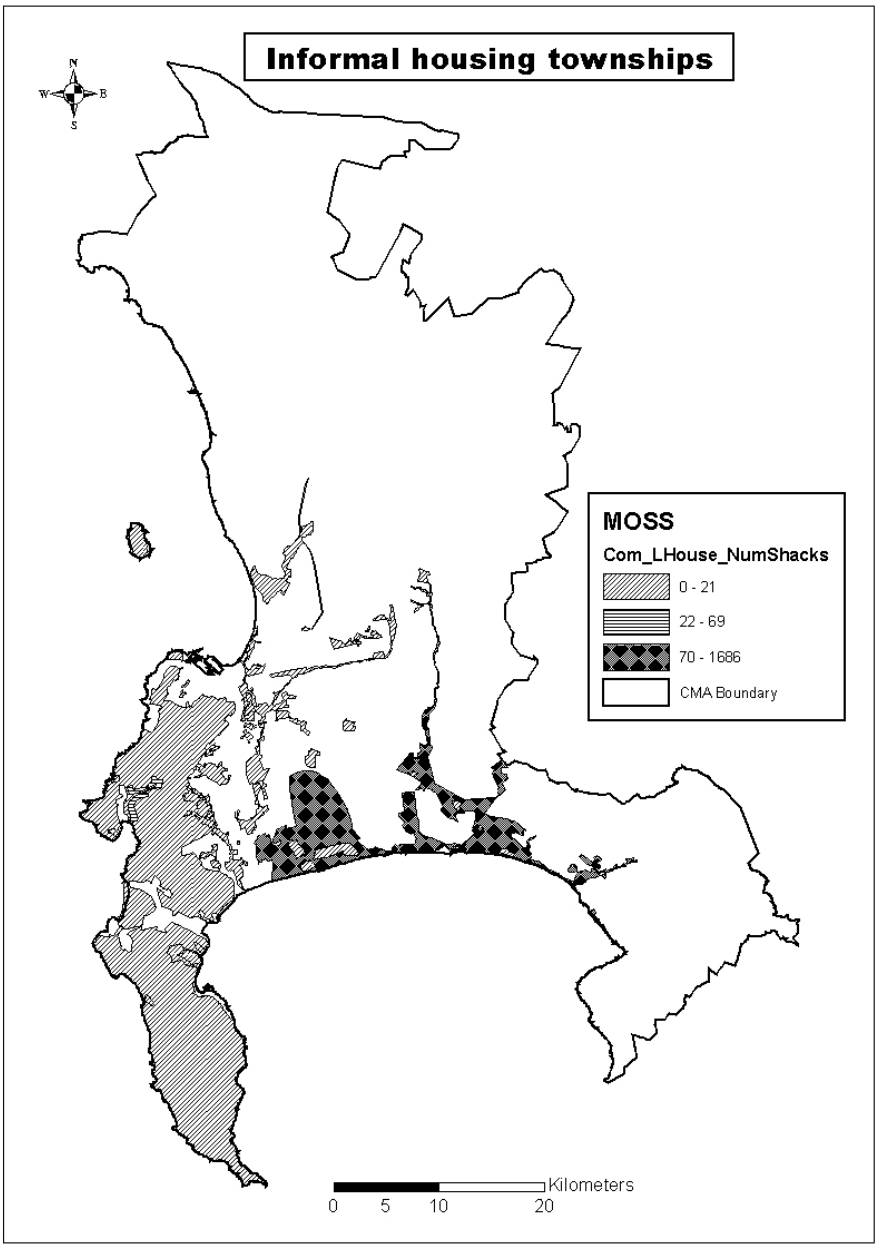


Figure 4.9: Number of shacks in the MOSS in 1993

In 1998, the area in Khayelitsha had 19841 shacks; this was followed by Philippi with 12391 and Nyanga with 11688 shacks. New establishments emerged around Bloubergstrand and Strand with 1453 and 2731 shacks respectively; there were noticeable encroachments at Macassar with 231 shacks. The corridor between Bellville and Joostenbergvlakte had pockets of 500-1240 shacks, followed by Strand with 236 shacks.

The number of shacks in reporting units within the Paarden Eiland, Milnerton, Bloubergstrand and Melkbosstrand corridor ranges from 440-908. The number of shacks around the Hout Bay MOSS increased from 69 in 1993 to 724 in 1998, followed by Philippi, Da Gama, Grassy Park, Rocklands, Muizenberg and some parts of Khayelitsha, Somerset West and Crossroads where the number of shacks ranged from 91-256. Figures 4.10 and 4.11 below illustrate the spatial distribution of informal settlements in the CMA in 1998.

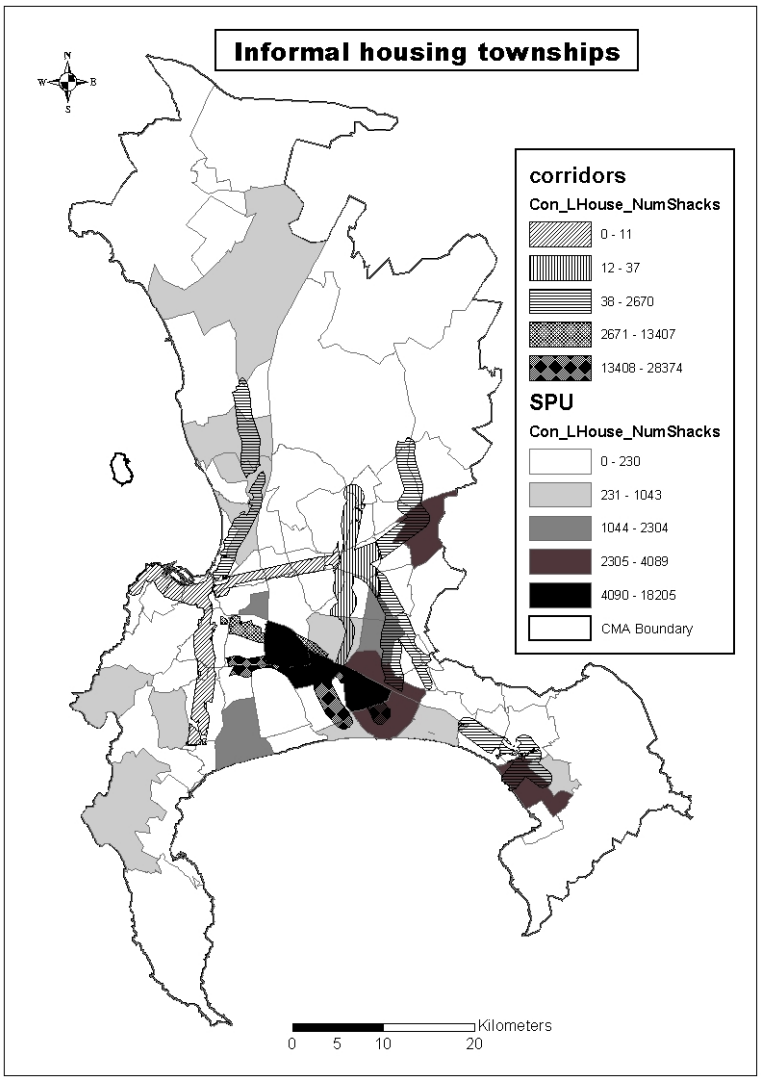


Figure 4.10: Number of shacks in the CMA in 1998

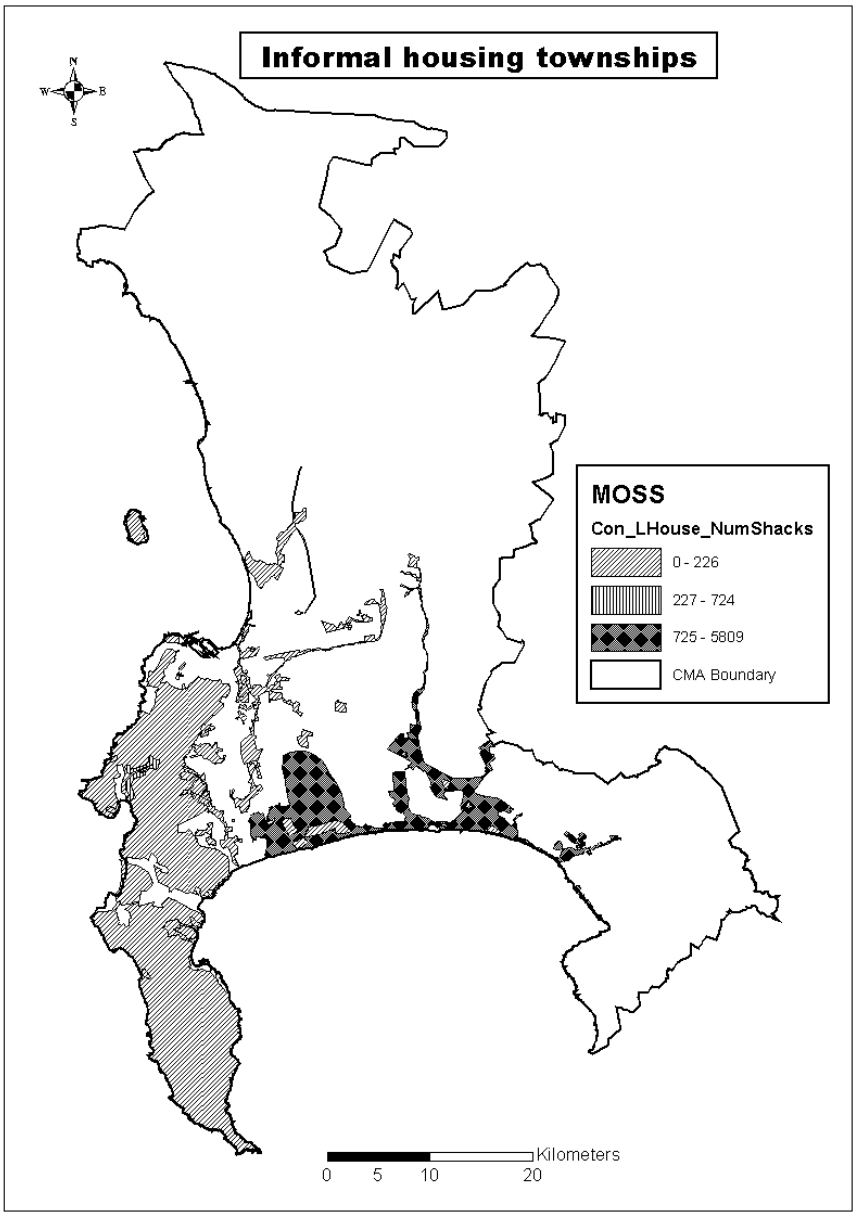


Figure 4.11: Number of shacks in the MOSS in 1998

Figures 4.12 and 4.13 below show the annual change in low cost housing in the whole of the CMA and in the MOSS from 1993 to 1998. The annual change in the informal housing in the CMA indicates the establishment of new townships and determines the pattern of new developments.

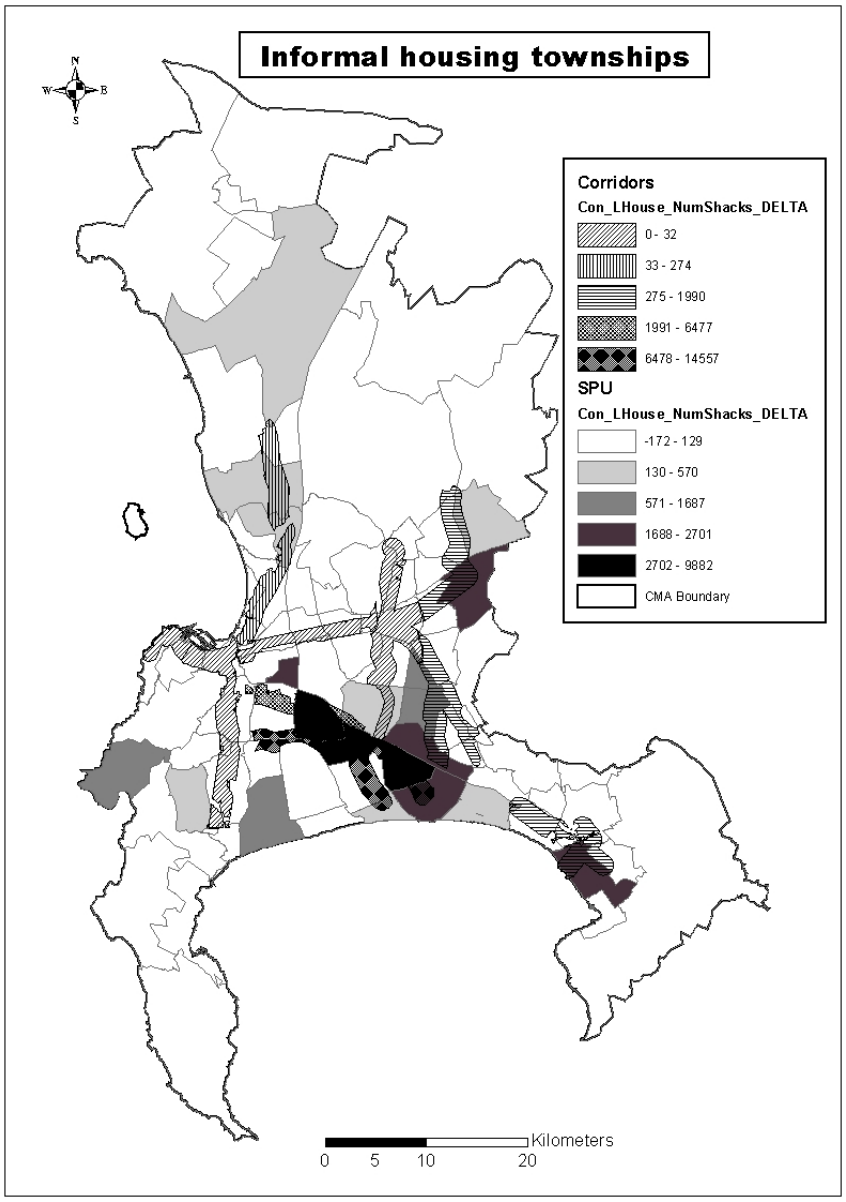


Figure 4.12: Annual change in low cost housing in the CMA between 1993-1998

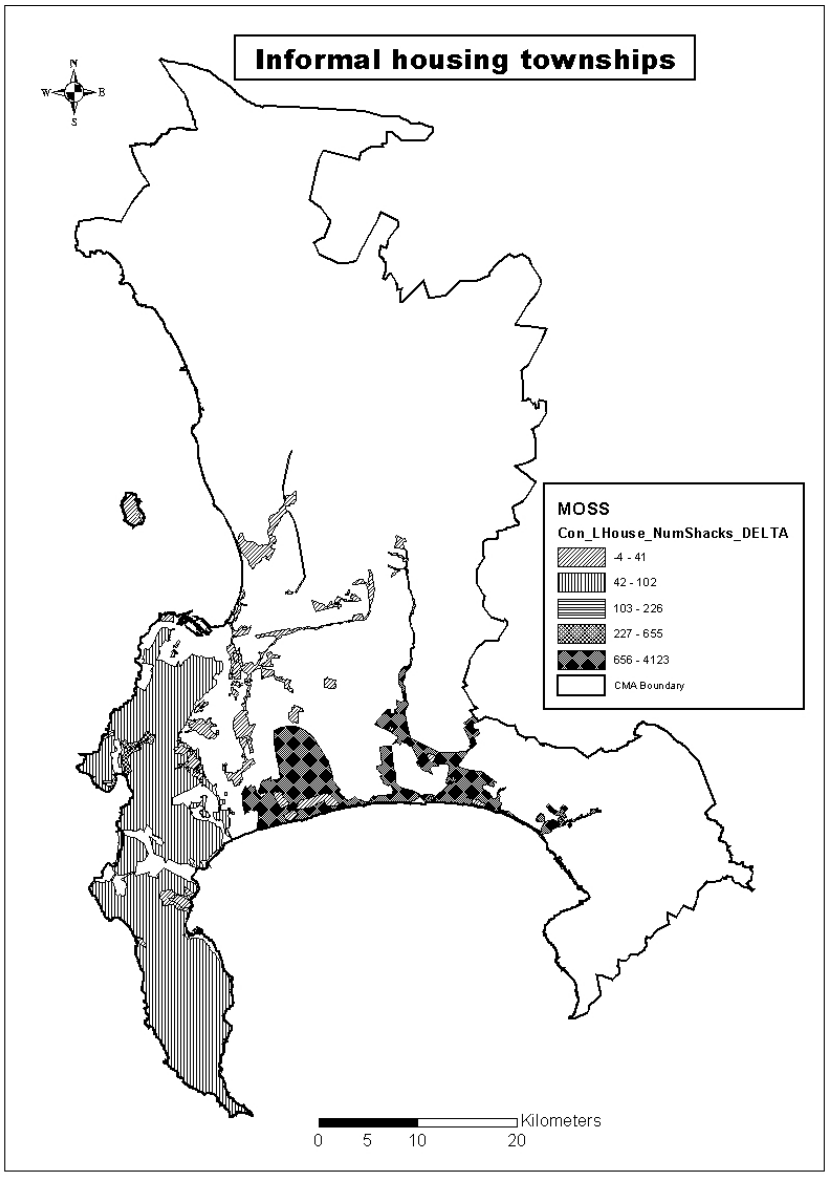


Figure 4.13: Annual change in low cost housing between 1993-1998 in the MOSS

Informal settlements usually develop on the edge of existing urban developments and tend to become permanent features in the urban landscape. The majority of these are located far from employment opportunities, whilst some pockets of informal settlements, such as Marconi Beam, are situated close to business areas. Provision of efficient public transport, social services and job opportunities is difficult because of the inaccessibility and location of some of these settlements.

4.1.4.2 Growth of informal housing townships in the buffer zone

- Number of shacks (Com_Edge_NumShacks) - This is the number of informal housing units on a 1km buffer from the urban edge in 1993 and 1998 respectively, in the whole Cape Metropolitan Area, SPUs and on the MOSS. This indicator also looks at growth of informal housing in the MOSS within the Urban Edge.
- Annual change in number of shacks (Com_Edge_NumShacks_Delta) – This is a change in the number of informal housing units on a 1km buffer from the urban edge from 1993 to 1998 (*InfBuf93_98*).

Rapid growth of informal housing on the urban edge places pressure on both valuable agricultural land and available infrastructure. Backyard shacks have always been a common feature of South African townships. Abbott & Douglas (1999) note that there has been an increase in backyard shacks in the former municipalities of Oostenberg, South Peninsula and Tygerberg and in the recently developing low-income areas. Figures 4.14, 4.15, 4.16 and 4.17 show spatial distribution of informal housing on the urban edge and MOSS between 1993 and 1998.

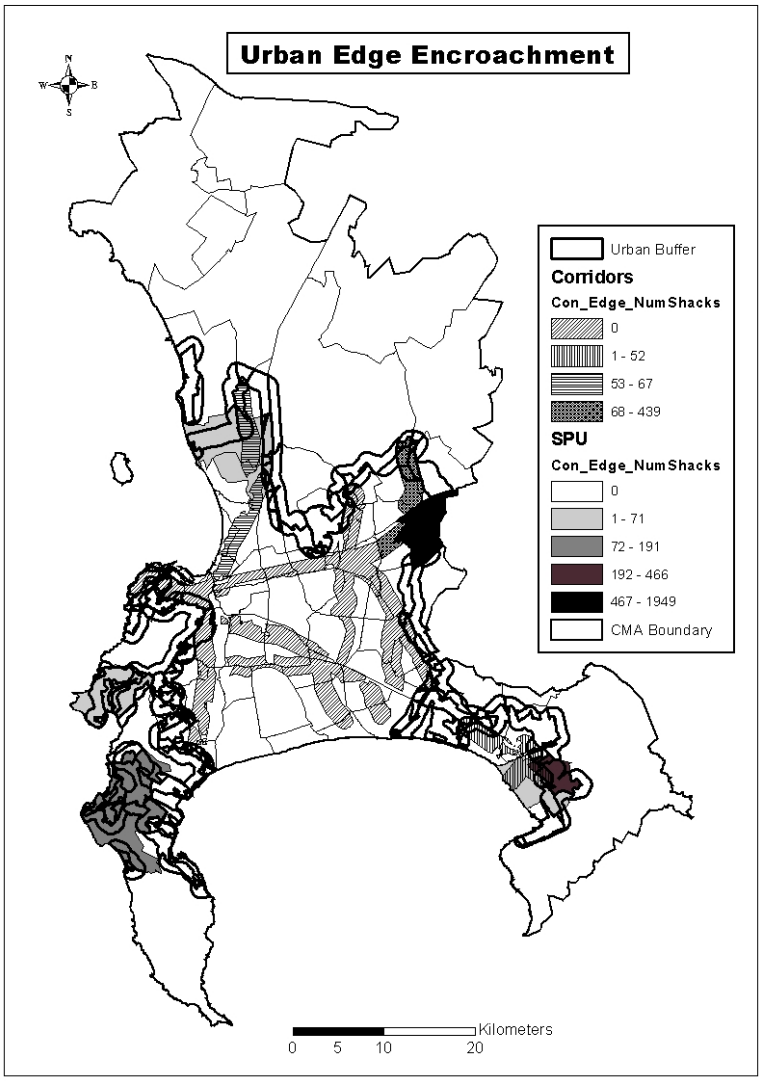


Figure 4.14: Edge encroachment in the CMA in 1993

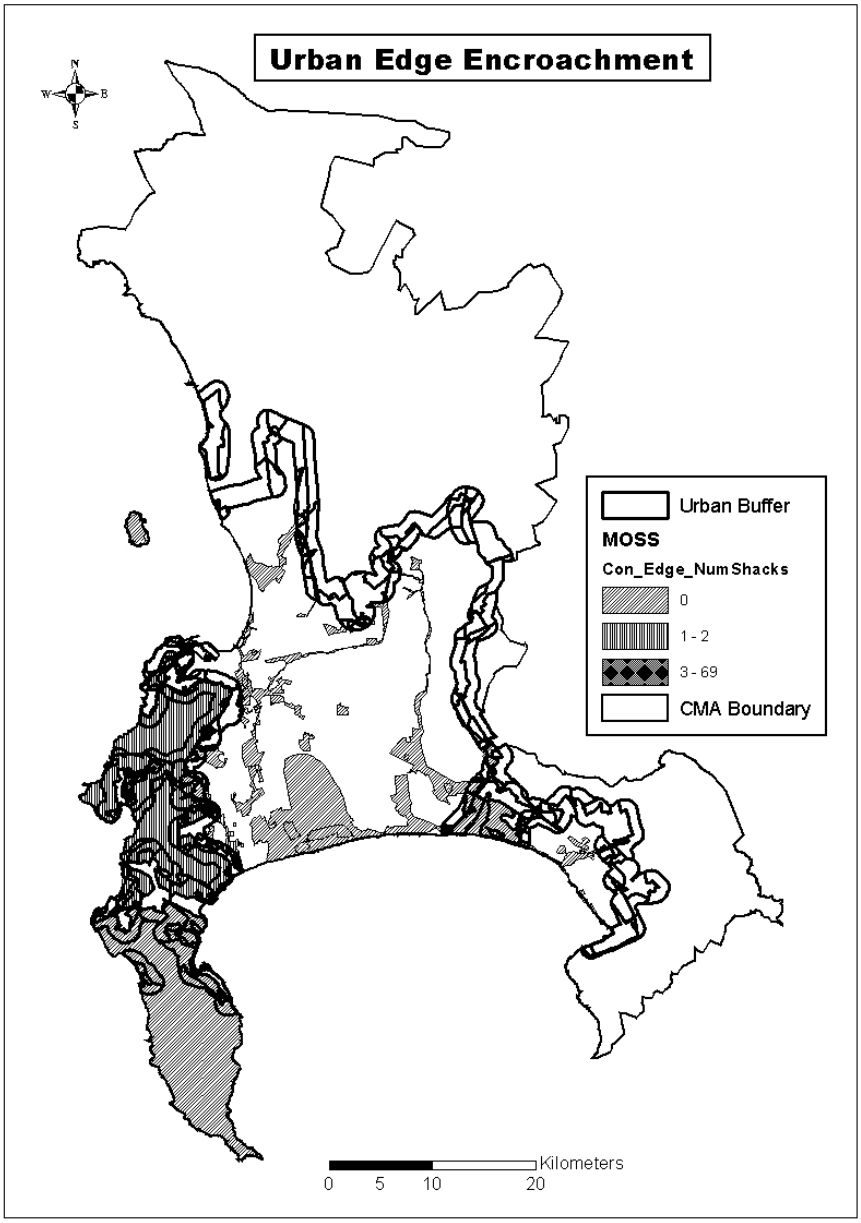


Figure 4.15: Edge encroachment in MOSS in 1993

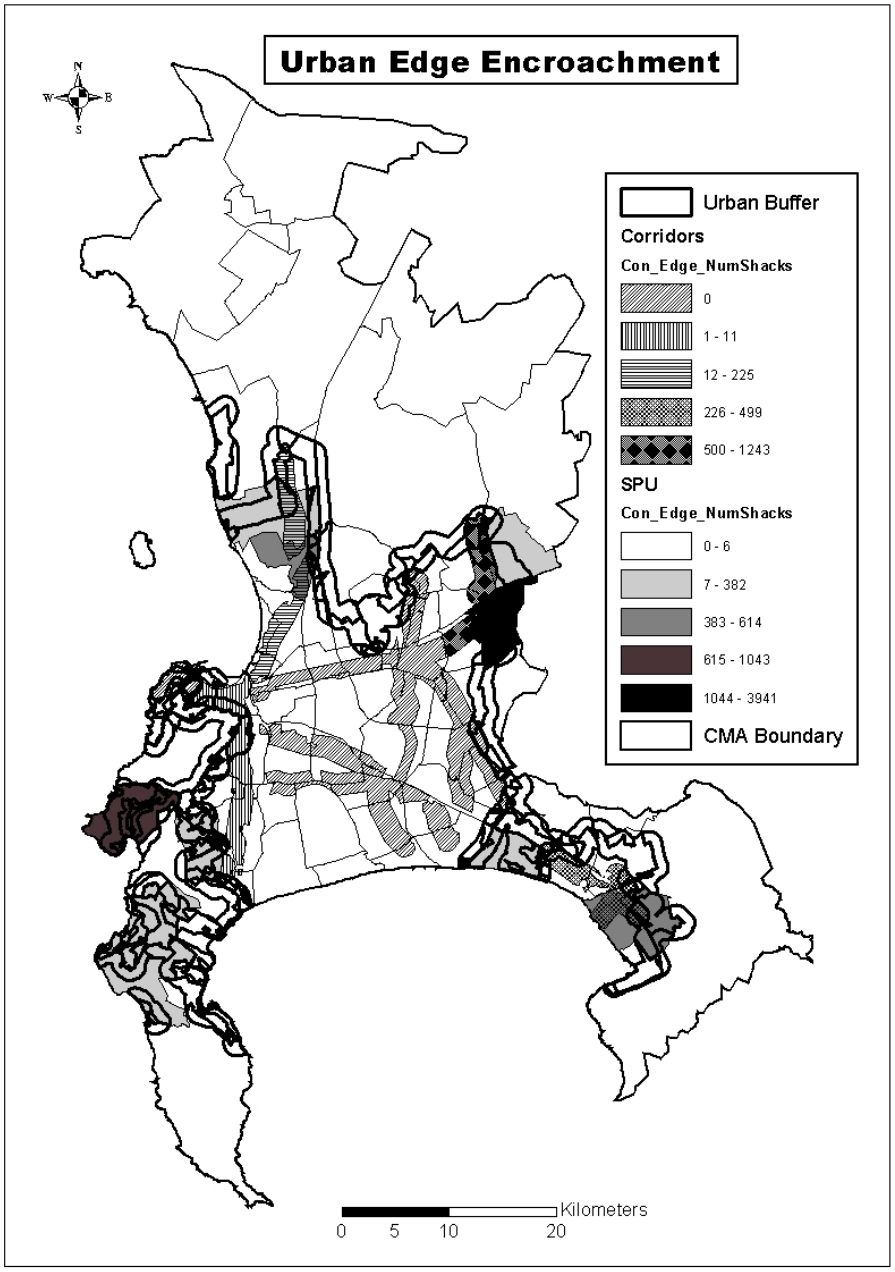


Figure 4.16: Edge encroachment in CMA 1998

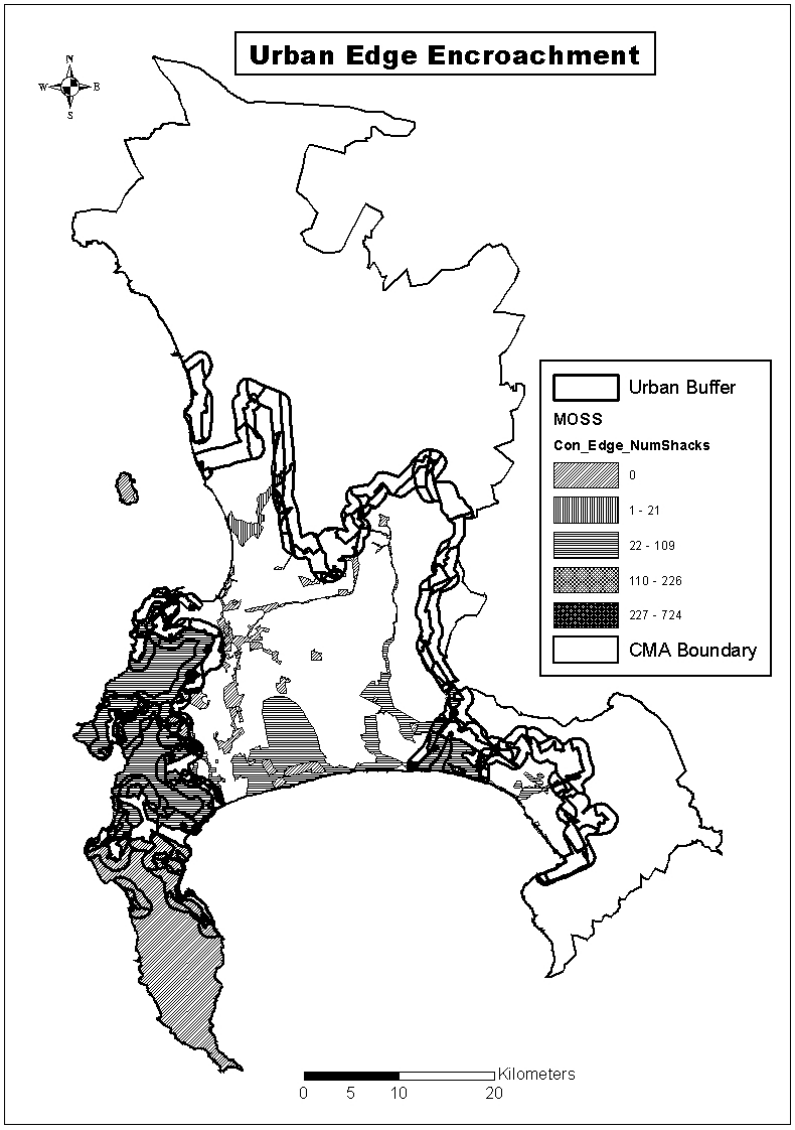


Figure 4.17: Edge encroachment in the MOSS in 1998

From these maps, it can be seen that Hout Bay has the highest number of informal shacks in its MOSS. Other MOSS areas within the urban edge have 226 shacks. Bloekombos, Wallacedene and Nomzamo, situated along the Bellville/Kraaifontein corridor and the Bellville/Strand corridor, had the largest number of informal housing of 226-499 and 500-1243 shacks respectively in 1998, while there were 53-67 and 68-423 shacks in 1993. These figures show that there has been a gradual increase in informal settlements from 1993 until 1998. Figures 4.18 and 4.19 below show the change in these settlements from 1993 to 1998, which follows the same pattern discussed in the previous paragraph.

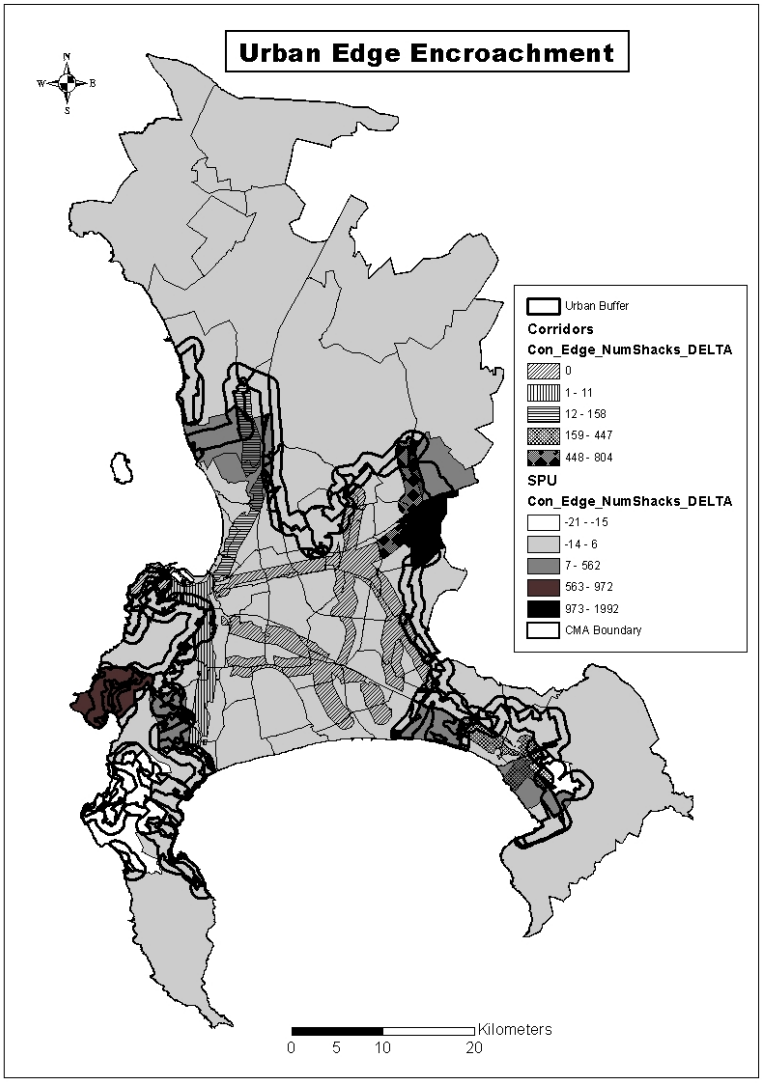


Figure 4.18: Annual change in informal housing in the CMA 1993-1998

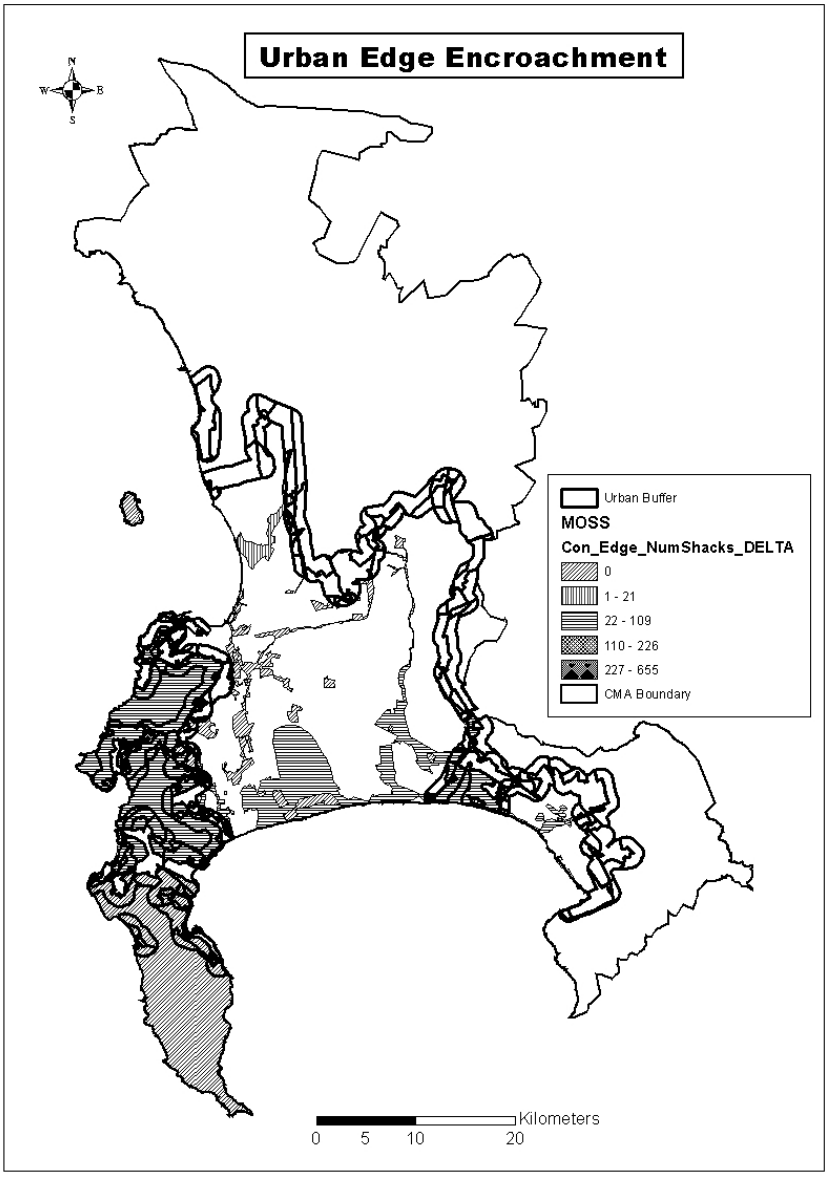


Figure 4.19: Annual change of informal housing in the MOSS areas in 1993-1998

The annual change in informal housing units in the buffer from 1993-1998 amounted to 44,899 shacks in the whole metropolitan area. In 1998, Kraaifontein/Brackenfell had the highest number of informal housing units within the buffer zone, followed by Hout Bay, Strand, Milnerton, Macassar and Tokai. This shows that there is an informal housing encroachment outside the urban buffer (these areas are normally rural agricultural land or MOSS). Encroachment on the MOSS is very high at Hout Bay, where there were 655

shacks on the urban edge in 1998. Areas with no encroachment on the urban edge are mostly nature reserves and farmlands.

Informal housing units remain the primary form of housing for the lower income groups in the CMA. As a result, there is a need to identify areas for infill housing to alleviate existing overcrowding in informal settlements. However, the major problem in these areas is that they are located in environmentally sensitive or remote areas. These settlements also lack access to public services

4.1.5 Green space protection

The CMA contains a diverse and unique set of ecosystems due to the Mediterranean climate, the location of Table Mountain and its associated microhabitats, the surrounding sand flats and the sea. According to City of Cape Town (2002), the land area with formal conservation status in Cape Town is 476 km^2, representing approximately 19% of the city's total area and includes national, provincial and local nature reserves. However, these reserves are under pressure from development and urban expansion.

4.1.5.1 Area of the CMA that has formal conservation status

- Conservation Areas *(ConsvArea)* - This indicator measures the extent to which metropolitan green areas are being protected. However, in this report conservation areas are defined as any conserved area of the CMA, with or without formal conservation status.

City of Cape Town State of Environment Report (2002) identified 23 formal nature areas across the city, the largest being the Cape Peninsula National Park, followed by the Helderberg conservation area. Conservation areas in disadvantaged communities include Drift Sands and Red Hill. Figure 4.20 below shows the spatial layout of nature areas in the CMA.

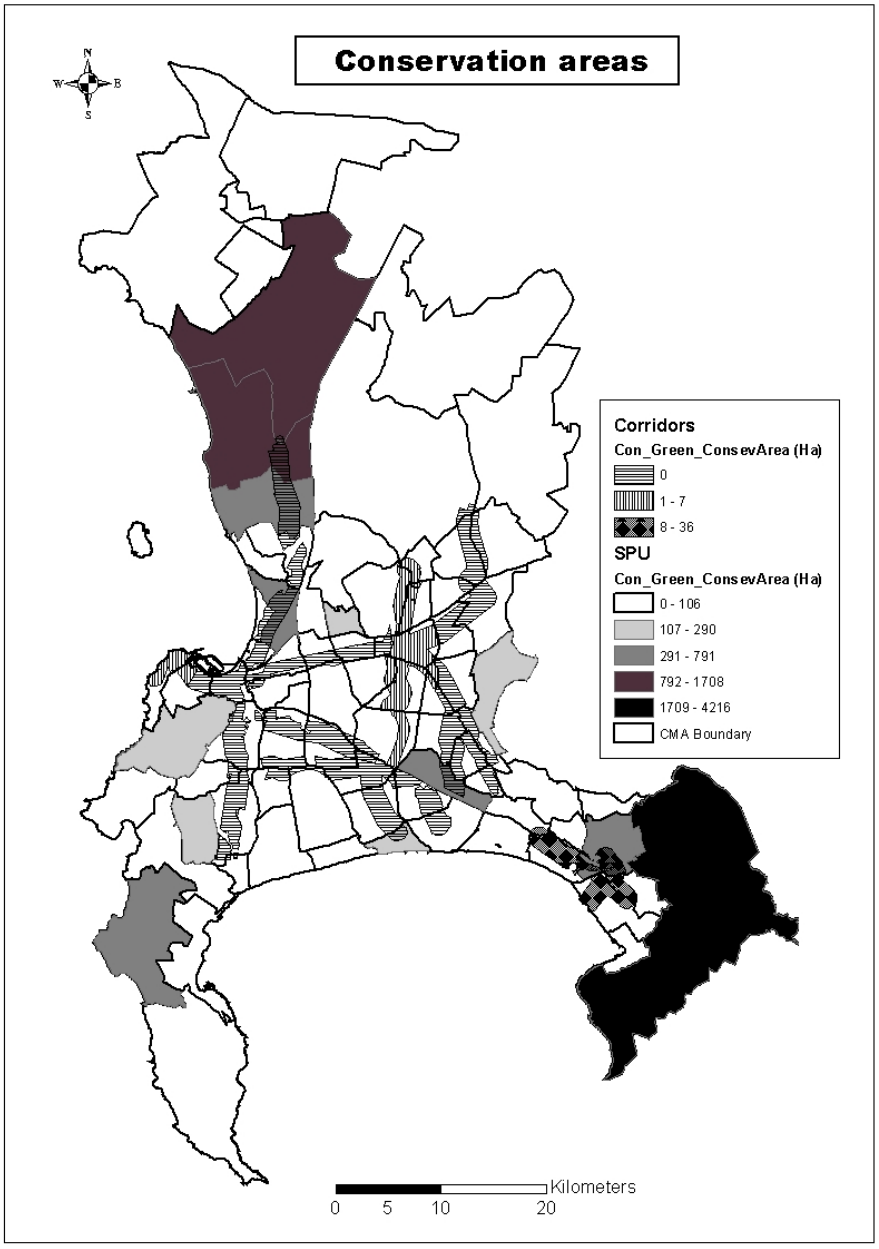


Figure 4.20: Areas with formal conservation status in the CMA

From Figure 4.20 above it can be seen that Redhill, Lourens River, the Table Mountain Range and Koeberg form the majority of the CMA's nature reserves. From this figure, it can be concluded that the northern part of the CMA does not have formal nature conservation areas. In 2000, the area of the CMA with conservation status was 45,489 hectares or 16% of the CMA (City of Cape Town 2002).

4.1.5.2 Area of the CMA that comprises nature reserves

- Nature Reserves *(NatArea)* - This indicator is similar to the previous one and there is a need to redefine its meaning or to combine it with the previous one.

Figure 4.21 displays all conservation areas in the CMA. The largest is the Cape Point Nature Reserve, Blaauwberg Conservation Area, Helderberg, then Wolfgat, Zeekoeivlei, Driftsands and Tygerberg.

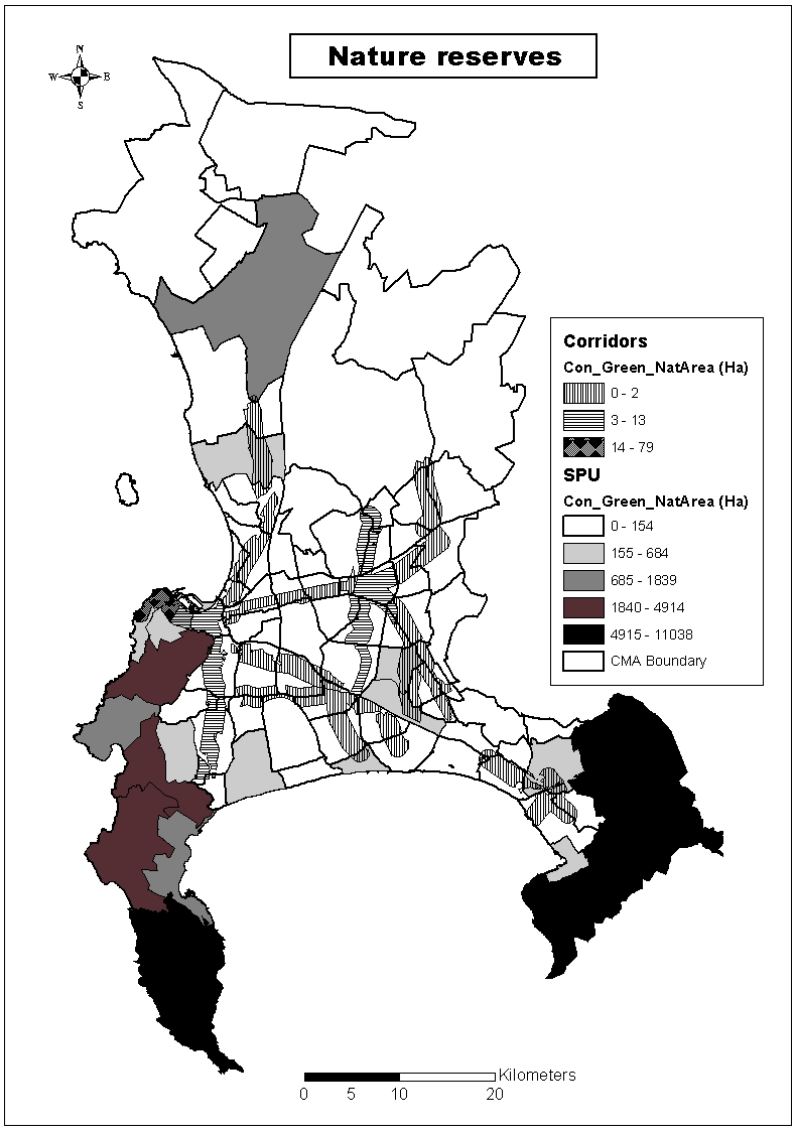


Figure 4.21: CMA nature reserves

The southern part of the Cape Nature Reserve, Cape Peninsula and the mountainous parts of the former Helderberg municipality form the largest area of the CMA nature reserves. These areas are national and provincial conservation areas, and cover form 11,038 to 10,778 hectares of land. These are then followed by the Table Mountain Range, which covers up to 4,914 hectares of land. The central part of the CMA has few or no areas in nature reserves, as this comprises established residential, industrial and commercial areas.

The corridor from Table Mountain to the Cape Town CBD has the largest area of nature reserve, which ranges from 14-79 hectares. From the map above, it can be seen that most corridors have few conservation areas, which means that the conservation areas are located far from the major transportation routes and are thus less accessible to the public.

Figure 4.21 above indicates that the Cape Point Nature Reserve forms the largest part of the city's nature reserve; it is 15,588 hectares in size. There are also some small patches that form part of the MOSS in the inner parts of the CMA. The Strandfontein/Muizenberg area also forms the largest part of the city's MOSS, encompassing 1,576 hectares of land. However, the southwestern part of the city forms the major portion of the CMA's MOSS.

There has been an increase in the area of land with conservation status; this is due to the increase in the number of hectares cleared of alien vegetation by the City's Open Space and Nature Conservation Branches (Hennessy 2004, Pers Com). Major clearings were undertaken in the South Peninsula Administration, Tygerberg Administration and Helderberg Administration and these were included to form part of the conservation areas.

4.1.5.3 Ecologically valuable areas in the CMA

- Ecological Areas *(EcoArea)* - This indicator determines the amount of ecological land available in the CMA and is currently held under the following categories: protected nature reserves, private nature reserves, undisturbed or pristine natural spaces, protected green areas and public open space.

Figure 4.22 below depicts all areas with ecological value in the Cape Metropolitan Area. From this figure it can be seen that Helderberg Rural has the largest area of land with ecological value, (15287 hectares), followed by Cape Farms and Noordhoek. The majority of areas with ecological value are situated near the low-income housing settlements; this may be a problem as these areas are likely to experience uncontrolled urban expansion, and areas like the Cape Flats for example, have unique plant species (e.g. pelargoniums, red disa, ericas, cape reeds), which are threatened by uncontrolled urban sprawl.

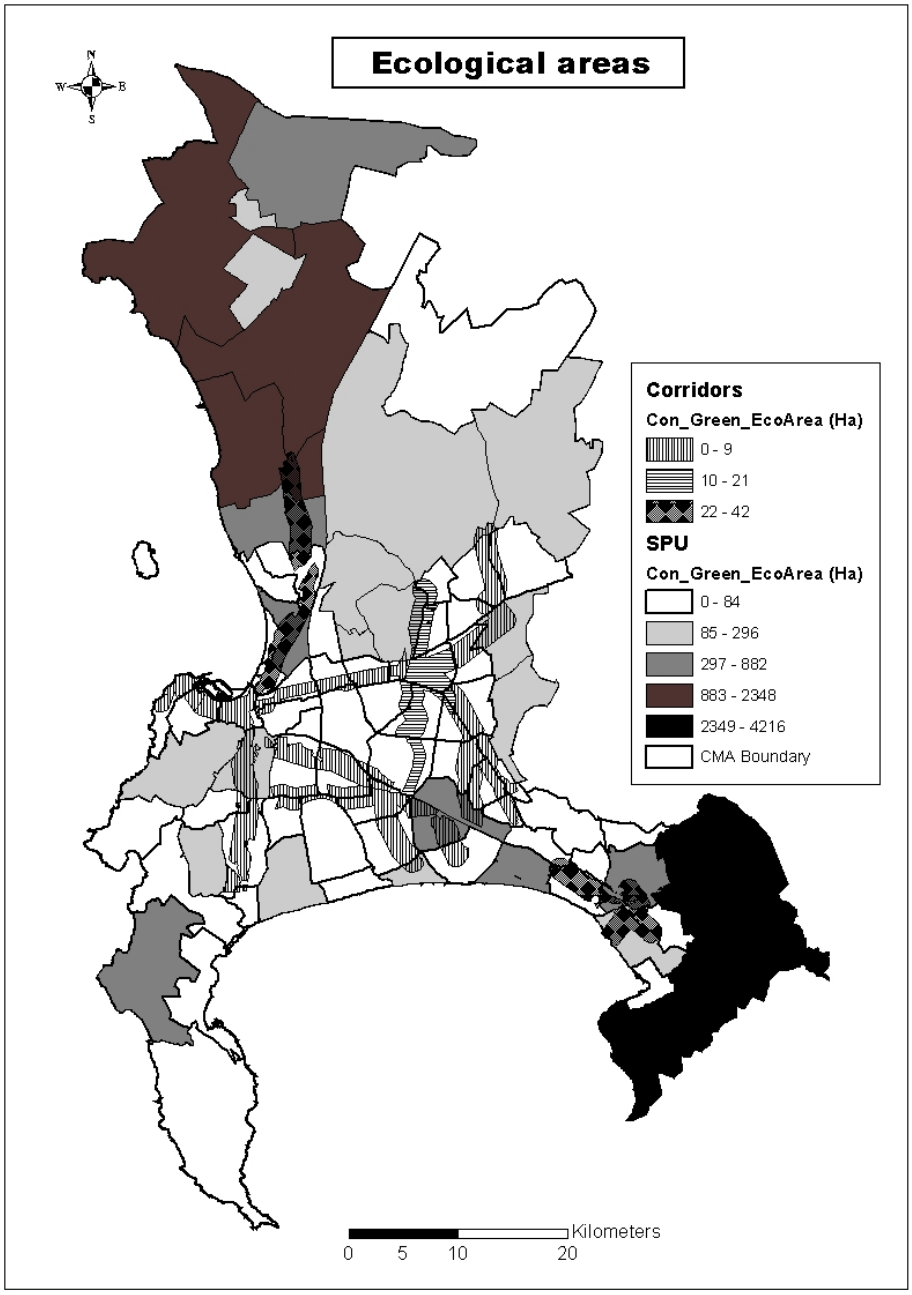


Figure 4.22: Areas with ecological value

4.1.5.4 Area of the CMA that is in the MOSS

- Metropolitan Open Space System (*MOSSArea*) - is a network of open spaces that complements and augments the built fabric of the urban areas within an urban

edge. These green chains enhance recreation and ecological potential in urban areas.

MOSS includes ecological and nature areas, mountains and farmlands within the urban edge. Figure 4.23 shows MOSS areas in the CMA.

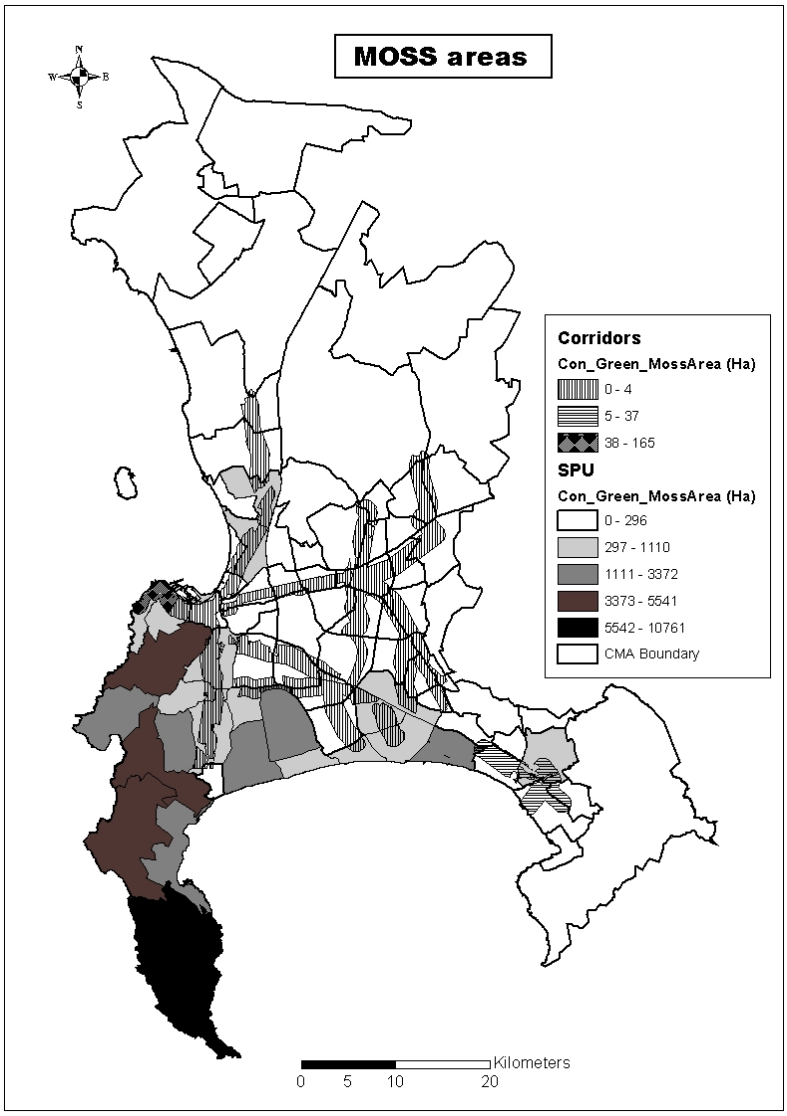


Figure 4.23: MOSS areas in the CMA

The large areas of open space in the CMA are Cape Peninsula Park, the Table Mountain Chain, Philippi Horticultural Area and Kuils River. The Cape Point Nature Reserve, which is about 16,040 hectares, has the greatest area of the CMA that is in the MOSS. Some areas in the south eastern and central CMA fall within the MOSS, while the rest of

the CMA, which consists of commercial, industrial and agricultural land uses, is not part of the MOSS.

From Figure 4.23 above it can be seen that the land adjacent to Cape Town CBD (Table Mountain and Sea Point) has significant areas that form part of the MOSS as compared to other nodes.

Conservation areas and open spaces provide invaluable urban amenities for a large urban population. However, low-density urban expansions, as well as informal settlements, are encroaching on a number of valuable natural areas, many of which do not have official status as protected environments. Open spaces within the city are also under pressure from urban development, particularly those along watercourses and on steep slopes. Crime, security and limited maintenance budgets are considered major factors influencing the identification of open space for inclusion in the city's MOSS (Hennessy 2004, Pers com).

This chapter displayed and analysed 15 conformance indicators in relation to various spatial reporting units (for instance Nodes, Corridors, MOSS and SPUs). The next chapter analyses and discusses MSDF objectives and performance indicators in the CMA. Thus, the chapter describes, analyses and displays a number of performance indicators for the CMA in relation to the spatial objectives set by the MSDF.

CHAPTER 5: MONITORING PERFORMANCE IN THE CMA

This chapter addresses the concept of performance monitoring, which involves measuring and comparing spatio-temporal outcomes. Performance monitoring requires the identification, calculation, assessment and reporting of a number of policy based outcomes. Indicators presented in this chapter were calculated based on year 2000 data.

Eleven performance indicators were used to assess and evaluate the CMA's performance in relation to spatial goals. These indicators identified trends in a range of key performance areas, and assisted in measuring the progress towards achieving the agreed objectives of the MSDF. Indicators attempt to monitor performance over time; however, as only one time slice of data is available, all indicators show only current conditions. Nevertheless, this information will be useful in future comparative studies.

5.1 MSDF OBJECTIVES AND PERFORMANCE INDICATORS

Performance indicators measure and monitor the degree to which the spatially measurable goals of spatial planning policy (MSDF), which are: equity and access, efficiency and sustainability, are being achieved.

The PIM provides a set of 11 performance indicators with which to assess the following four performance objectives:

a) Accessibility – Increase access to services and facilities in the Corridors, SPUs and Nodes.
b) Efficiency – Increase efficiency of land use in the Nodes and Corridors.
c) Ecologically sensitive areas – Protect ecologically sensitive areas in the MOSS and within the Urban Edge.
d) Agriculture – Protect valuable agricultural land in the SPUs and within the Urban Edge.

Each of these objectives and the indicators that measure their performance against the MSDF and SDFs will be discussed in the section that follows.

5.2 INCREASED ACCESS TO SERVICES AND FACILITIES

The MSDF seeks to address unequal distribution of and access to facilities and opportunities that were created by past planning policies. One of the major MSDF objectives is to increase access to services and facilities; hence, the following indicators measure accessibility to services and facilities by computing the percentage of people living within 800m of facilities.

5.2.1 Percentage school population who live within 800m of a school

- Accessibility to schools *(PupPerc)* – this indicator measures the number of the school aged population (5–19 years of age) who live within walking distance (800m or ten minutes walk) of a school, as a % of the school population within the reporting unit.

About 90-100% of the school population in the central and south eastern parts of the CMA live within 800m of a school. The corridors in these areas have the highest percentage of the schooling population. These areas are high and medium density residential areas surrounded by commercial and social services and located near major transport routes. These patterns are illustrated in Figure 5.1 below. Areas with low access to schools are found in the outer parts of the CMA and are either farm areas or nature conservation areas, for instance, Helderberg Rural, Cape Point Nature Reserve and Philippi Horticultural Area. Atlantis (a medium density settlement) also has a notable school going population; this area is located in the northern part of the CMA.

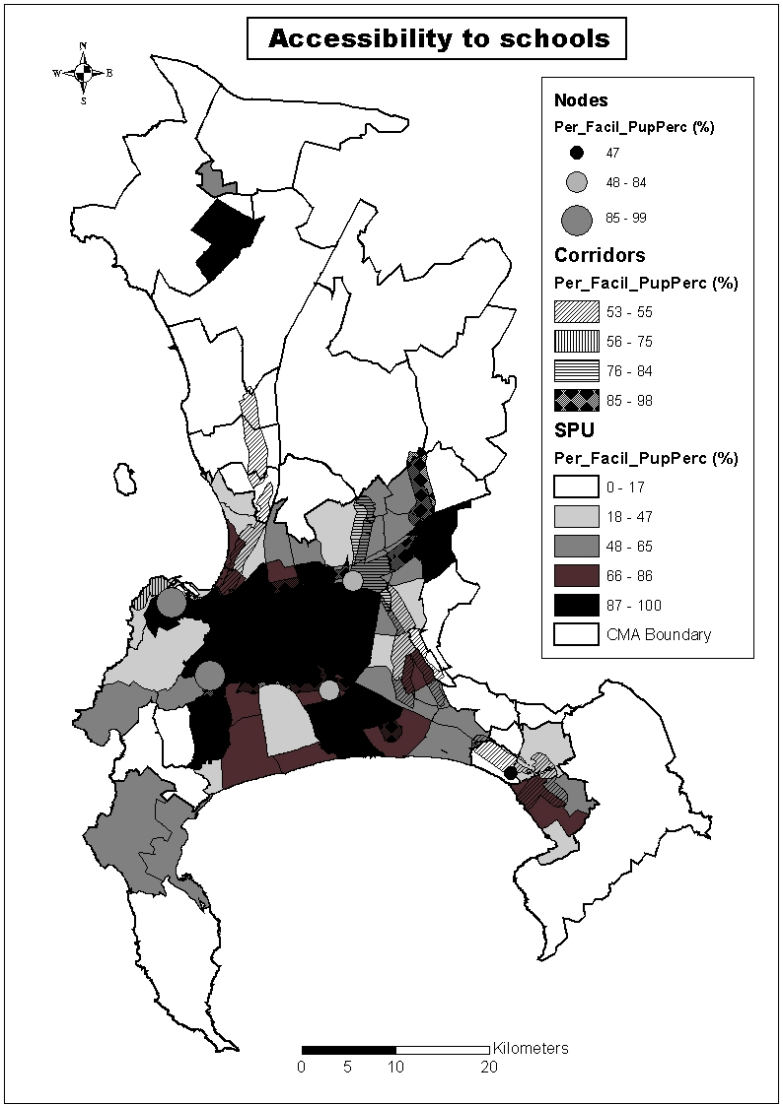


Figure 5.1: School-aged population with access to schools

5.2.2 Number of people per facility

- Accessibility to institutional and social facilities (*PopFacil*) - This indicator measures the degree to which various communities in the CMA have access to social and institutional facilities. These facilities include hospitals, libraries, police stations and recreational spaces.

The majority of the population with access to social facilities is again situated in the high density, low income settlements, because these house the majority of the City's population. The spatial distribution of this indicator is shown in Figure 5.2 below.

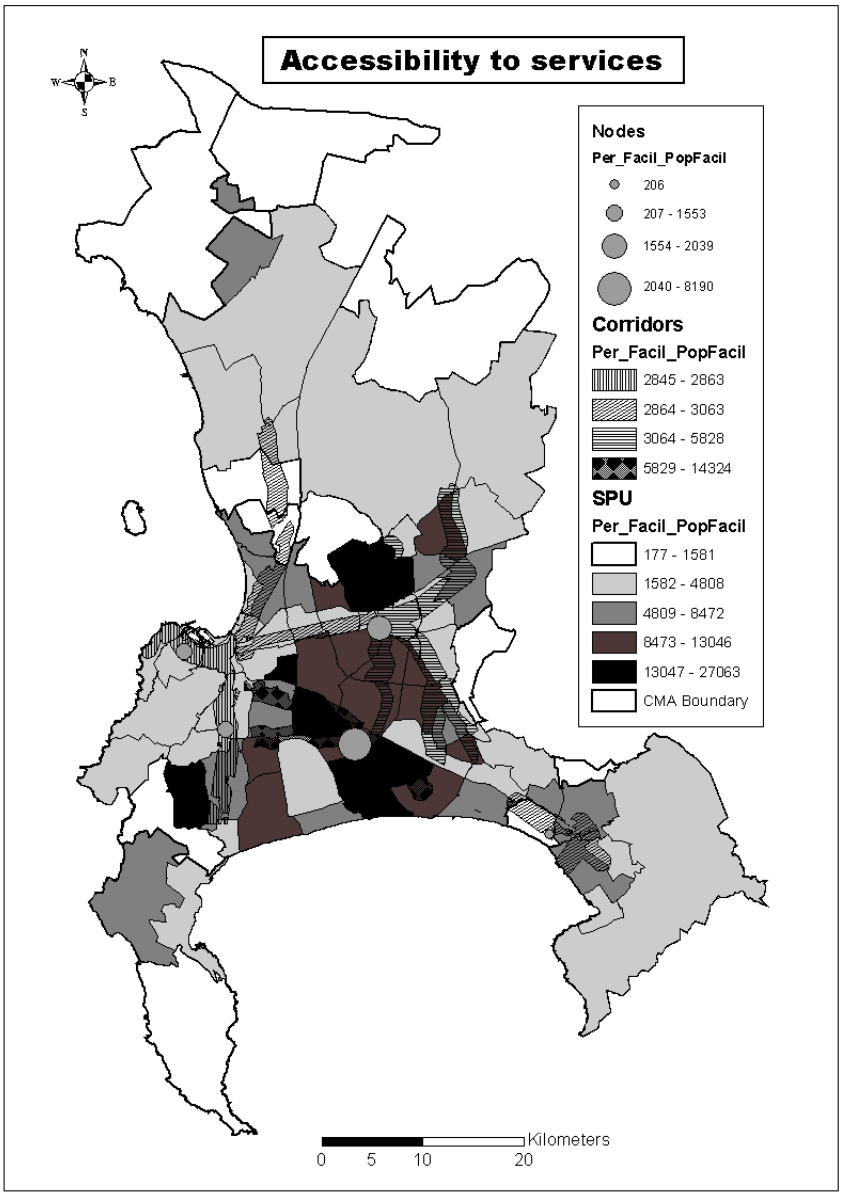


Figure 5.2: People with access to institutional and social facilities

However, new schools, clinics, libraries, community centres and recreation facilities tend to be planned and built independently of one another resulting in a dispersed spatial pattern. These facilities have not been used to reinforce specific Nodes of activity and create places with a critical mass of related amenities.

5.2.3 Percentage of population that lives within 800m of sports facilities

- Accessibility to sport facilities (*Percsprt*) - This indicator measures the number of people aged five or more years who live within walking distance (800m) of sports facilities, as a percentage of people aged five or more years within the reporting unit.

There is a need to provide and improve sports facilities in the disadvantaged areas of the Cape Flats and the south east Metro. Investment is also needed in public transport to improve the overall mobility of disadvantaged communities and to improve access to recreation facilities. There is a need to redress the physical and spatial imbalances, which are characteristic of the apartheid city, by providing bulk services and transport links for training and for access to competition venues in the disadvantaged areas. Such provision will attract future private sector investment in these areas, thus providing jobs and improving accessibility to potential future workplaces.

Figure 5.3 below shows access to the sporting facilities in the CMA. In line with the previous indicators, the majority of the CMA population with low access to these facilities is living in disadvantaged communities. From this map, it can be seen that accessibility to sport facilities is highest (46-89) along the mature corridors (for instance Main Koeberg, Voortrekker and Van Riebeeck Roads).

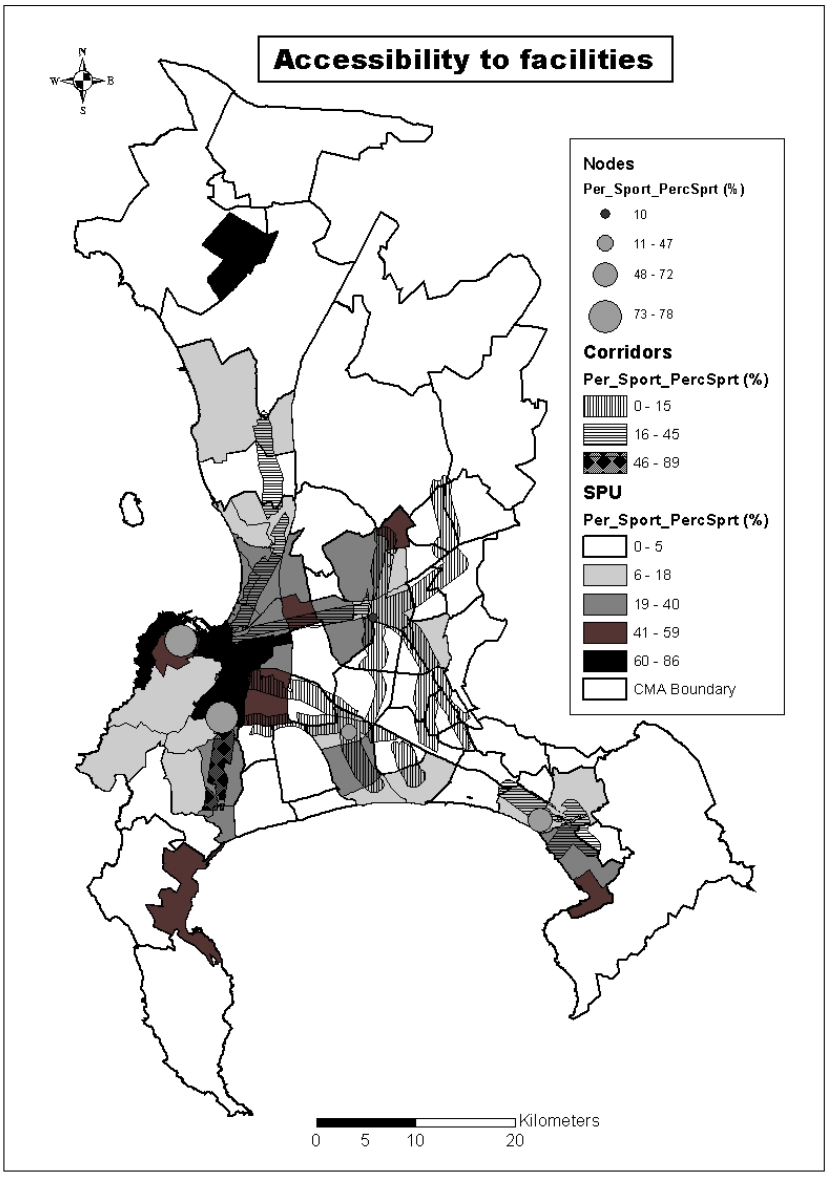


Figure 5.3: People with access to sports facilities

5.2.4 Increased access to employment opportunities

- Accessibility to employment *(JobRat)* – This indicator measures the number of jobs per 1000 working age population, that is, the number of jobs per 1000 population aged 19 to 66 years.

During the past few years, there has been decentralisation of economic activities, which involved a shift in economic activities away from the Cape Town CBD and other established centres towards suburban nodes, particularly in high income areas. This has a negative impact on the MSDF and spatial planning. Turok and Watson (2001) state that this shift resulted in impoverishing the south east sector of the CMA (as there is a low investment rate in these areas) and thus increased imbalances across the CMA. They further state that the established employment districts were accessible by public transport, but newer decentralised developments are mainly private transport oriented.

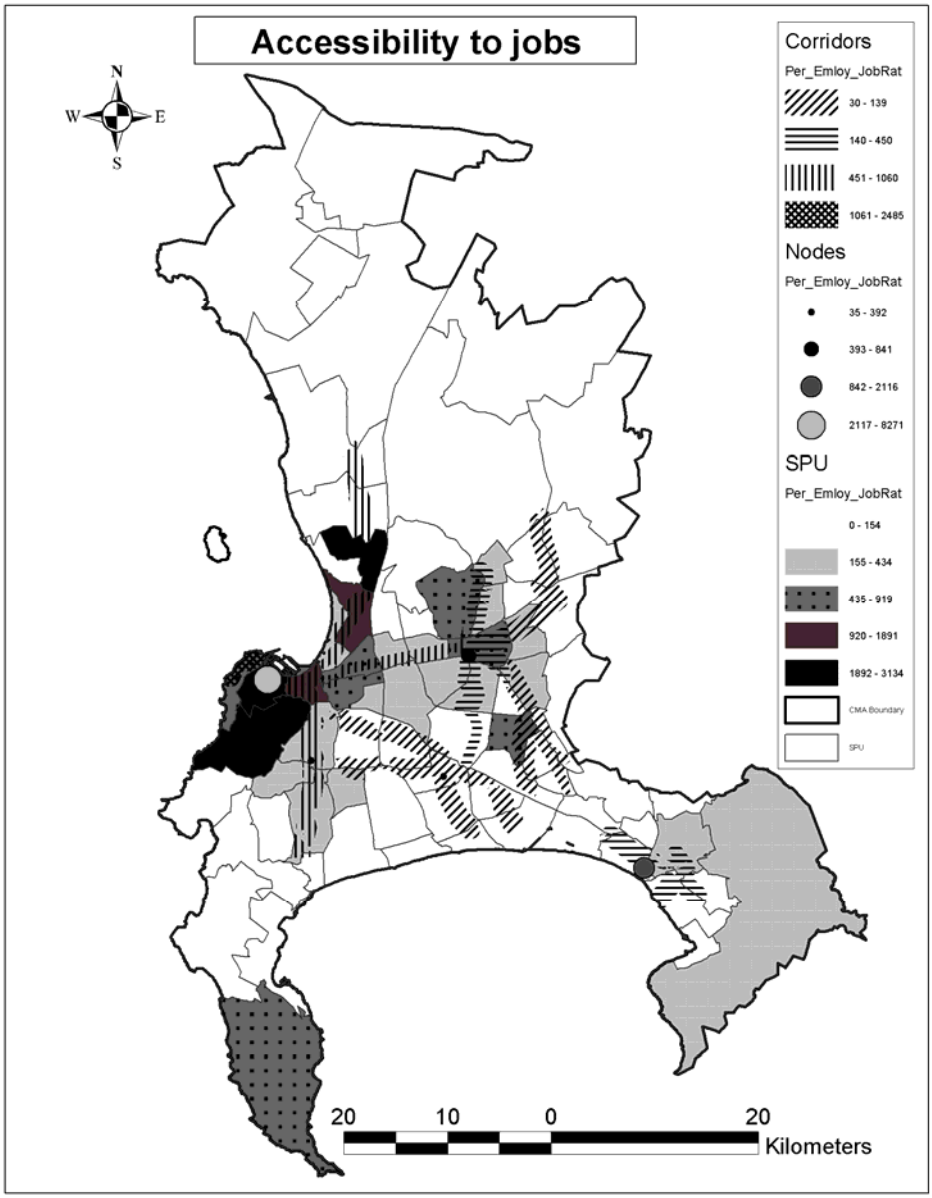


Figure 5.4: People with access to employment opportunities

There are three major commercial nodes in the metropolitan area, namely, Cape Town CBD, Bellville and Claremont (see Figure 5.4 above). The most important existing activity corridors are Main Road, running from the Cape Town CBD to the southern suburbs, Voortrekker Road, stretching from Woodstock to the northern suburbs, and a new developing business spine off Voortrekker Road along Durban Road and Willie van Schoor Drive to the Tygervalley Shopping Centre. Century City, a large-scale mixed land use development along the N1, is likely to have a significant impact on surrounding Nodes.

The spatial pattern shown in Figure 5.4 results partly from past planning practices but mainly from historical and economic forces that resulted in an inefficient and inequitable distribution of economic activities in relation to population distribution. This spatial pattern imposes long distances and high transportation costs on the poor as well as income leakage from poor to rich areas. This implies that job opportunities are not sufficiently provided where the need is greatest, that is in areas of excess labour supply (Cape Metropolitan Council 1996). Formal economic activities take place in Cape Town's two established CBDs and two historical corridors (Cape Town CBD, Bellville, Maitland/Paardeneiland and Claremont/Mowbray).

As new low income housing continues to be located in peripheral locations, and as formal jobs continue to be concentrated in the wealthier northern metropolitan area, so commuting distances are increasing. Private investments are attracted to these areas by good freeway access, high amenity value, safety and good infrastructure – factors that are absent in the poorer areas. Despite high mixed use development along Corridors, discussed earlier, very few workers live along the Corridors and are within walking distance of their work.

Existing mega projects tend to divert development away from existing Nodes and Corridors, highlighting the need for appropriate MSDF policies and CBD management plans (Cape Metropolitan Council 1996). In addition, the proposed new Node at Philippi East is taking more time, investment and effort to materialise than initially expected,

mainly because of lack of business and physical infrastructure, poor security and absence of area investment incentives.

5.3 INCREASED ACCESS TO PUBLIC TRANSPORT

The current development patterns in the CMA have a significant impact on social, economic and environmental costs. Uneven, low density sprawl destroys valuable natural and rural resources and results in long travel distances. The urban sprawl pattern continues, as development tends to take place on the city edge and reinforces poverty and inequality. Poorer residents live further away from economic services and as a result experience higher transport costs. Furthermore, there is poor integration between different modes of transport.

The City of Cape Town State of Environment Report (2002) states that there is lack of investment and commitment to the funding of public transport in the CMA. Inappropriate land use planning has also resulted in a poorly developed transport system with poor integration between road and rail transport networks. Rapid urbanisation and urban growth has led to large numbers of people requiring access to public transport.

The three indicators discussed below measure the number of people over five years of age who live within walking distance (800m or 10 minutes walk) from transport services (train stations, bus stops and taxi routes).

5.3.1 Population within walking distance of bus stops

- Accessibility to bus stops *(PercBustp)* – This indicator measures the number of people aged five or more years who live within a walking distance (800m) from a bus stop, as a percentage of people aged five or more years within the reporting unit.

The largest and almost exclusive operator of passenger bus services in the CMA is Golden Arrow Bus Services (Pty) Ltd. The routes with the highest bus/passenger demand are in areas without direct rail services to employment centres.

In 2000 only 9% of public transport users travelled by bus in the CMA (City of Cape Town 2003). The majority of public transport users prefer taxis to buses. Figure 5.5 indicates large numbers of people with good access to bus stops in the metropolitan south east, Cape Town CBD, Claremont and Wynberg. One of the busiest routes is from Mitchell's Plain and Khayelitsha to Blaauwberg, probably due to an increase in job opportunities in the northern arm of the CMA (City of Cape Town 2002). Employment in this area would impose longer daily travel on people who live in the Metro south east.

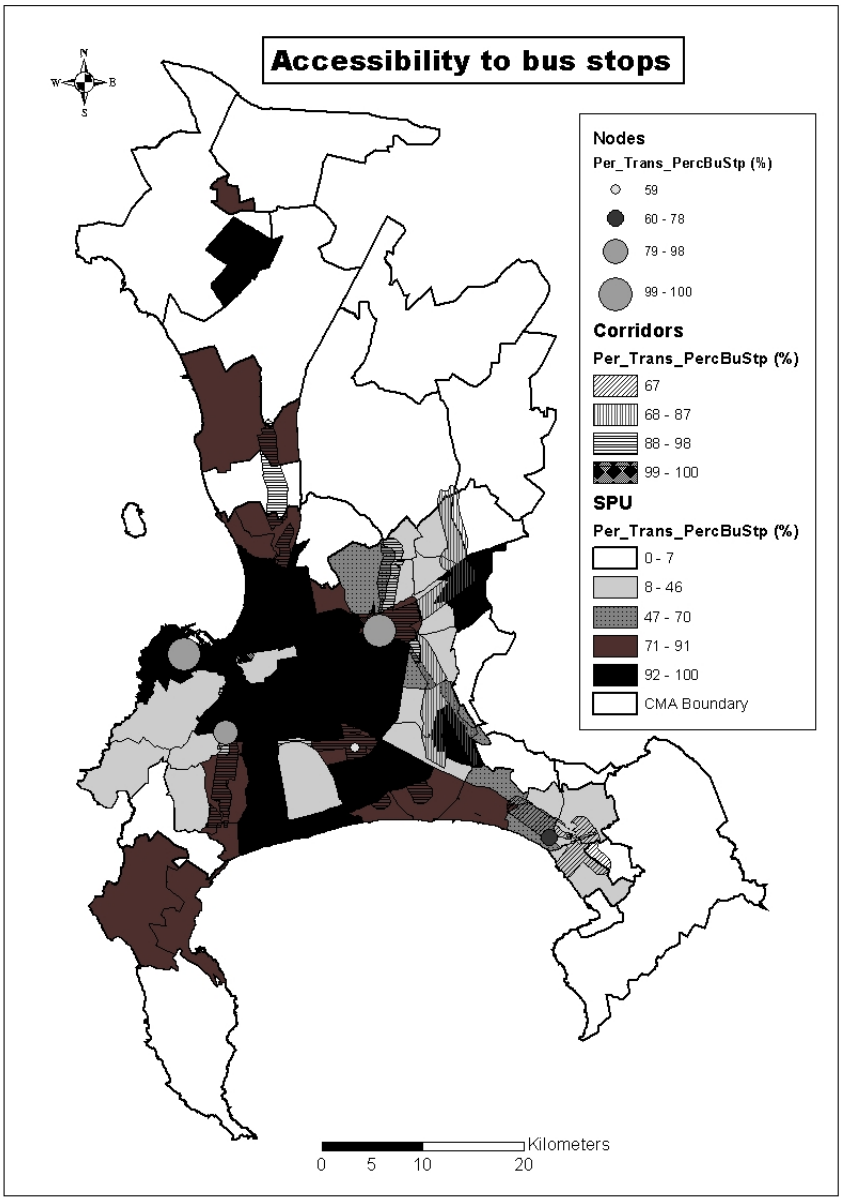


Figure 5.5: Population living within walking distance of a bus stop

Atlantis has the highest percentage of people living within walking distance of a bus stop; Blue Downs has 99%; Kraaifontein has 96%; Eerste River 94%; Strandfontein and Muizenberg have 95% and 96% respectively. About 92-100% of people are within walking distance of a bus stop in areas like Cape Town CBD, Mitchell's Plain, Khayelitsha, Elsies River, Milnerton, Paarden Eiland, Goodwood, Maitland, Parow and Bellville. In Noordhoek and some parts adjacent to the Cape Point Nature Reserve, only 59% of people are served by bus stops.

The spatial pattern of development on the Cape Flats (introverted and fragmented suburbs, planned to disperse traffic flow rather than concentrate it) is a significant factor contributing to the inefficiency of the bus system. A competent bus system entails a limited number of clearly structured routes supported by high thresholds of potential passengers (City of Cape Town 2003).

5.3.2 Population within walking distance of taxi routes

- Accessibility to taxi routes *(PercTxtRt)* – This indicator measures the number of people aged five or more years who live within a walking distance (800m) of a taxi route, as a percentage of people aged five or more years within the reporting unit.

According to the Cape Metropolitan Council Report (2003), taxi travel has increased its share compared with rail and bus use, due to its flexibility, frequency, relatively low cost and its penetration into areas not served by bus and rail routes. Figure 5.6 illustrates the spatial distribution of people living within walking distance of taxi routes. The busiest taxi routes are those to work destinations (Cape Town CBD, Wynberg and Bellville) and the residential areas of Mitchell's Plain and Khayelitsha. Thus, there is high accessibility to taxi routes in areas not served by rail or poorly served by bus. As with other transport systems, access to the Metro southeast to Cape Town CBD link is strong, as well as along the N2 or along Lansdowne Road.

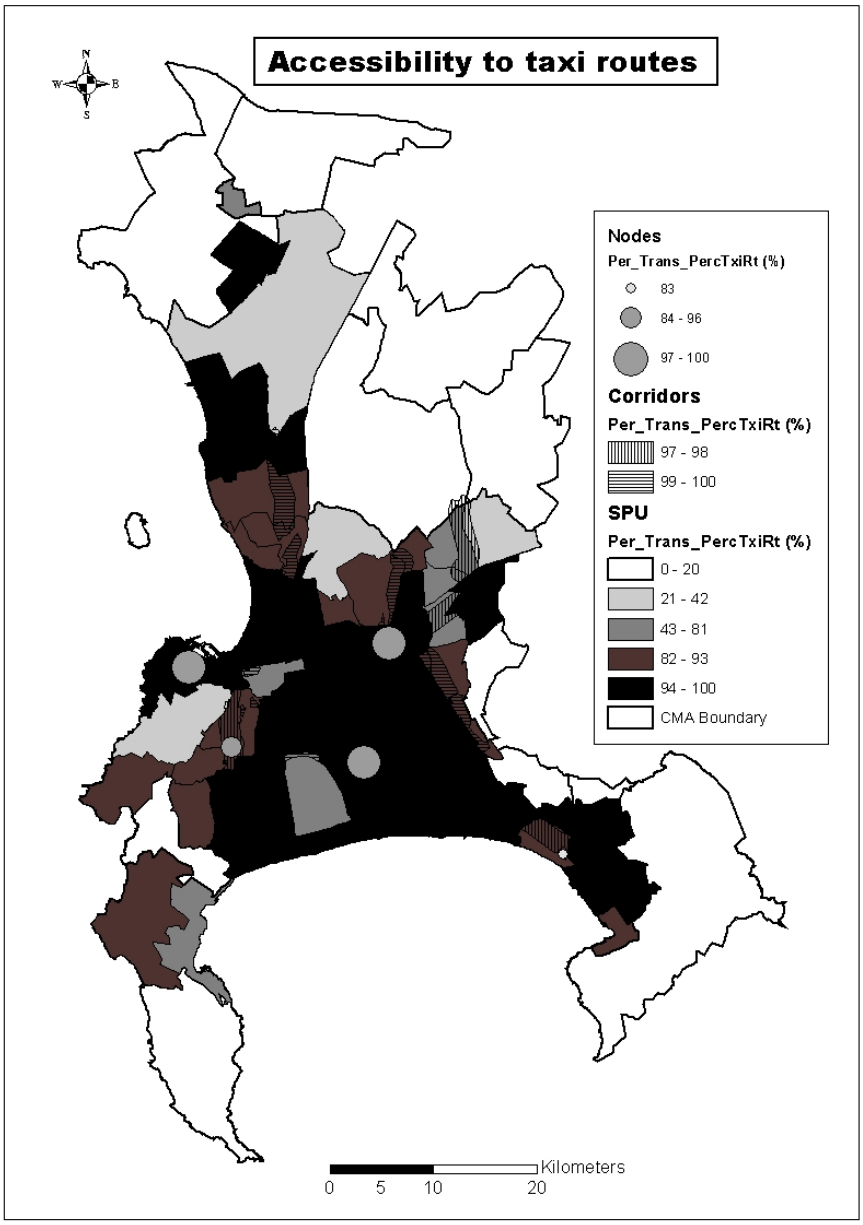


Figure 5.6: Population living within walking distance of a taxi route

5.3.3 Population within walking distance of a train station

- Accessibility to train station *(PercStn)* - This indicator measures the number of people aged five or more years who live within a walking distance (800m) of a train station, as a percentage of people aged five or more years within the reporting unit.

The CMA has an extensive rail network and is characterised by a radial pattern extending outwards from the Cape Town CBD. The commuter rail services originated before the era of high car ownership, principally to serve the residential southern suburbs terminating in Simonstown, and the north eastern residential suburbs between Cape Town and Bellville. The rail network also serves suburbs on the Cape Flats (see Figure 5.7). Stations on the southern suburbs line are less than 1km apart whereas those on the Cape Flats line are more than 2km apart (Cape Town Metropolitan Council 2003). However, most of these facilities have become degraded through lack of maintenance.

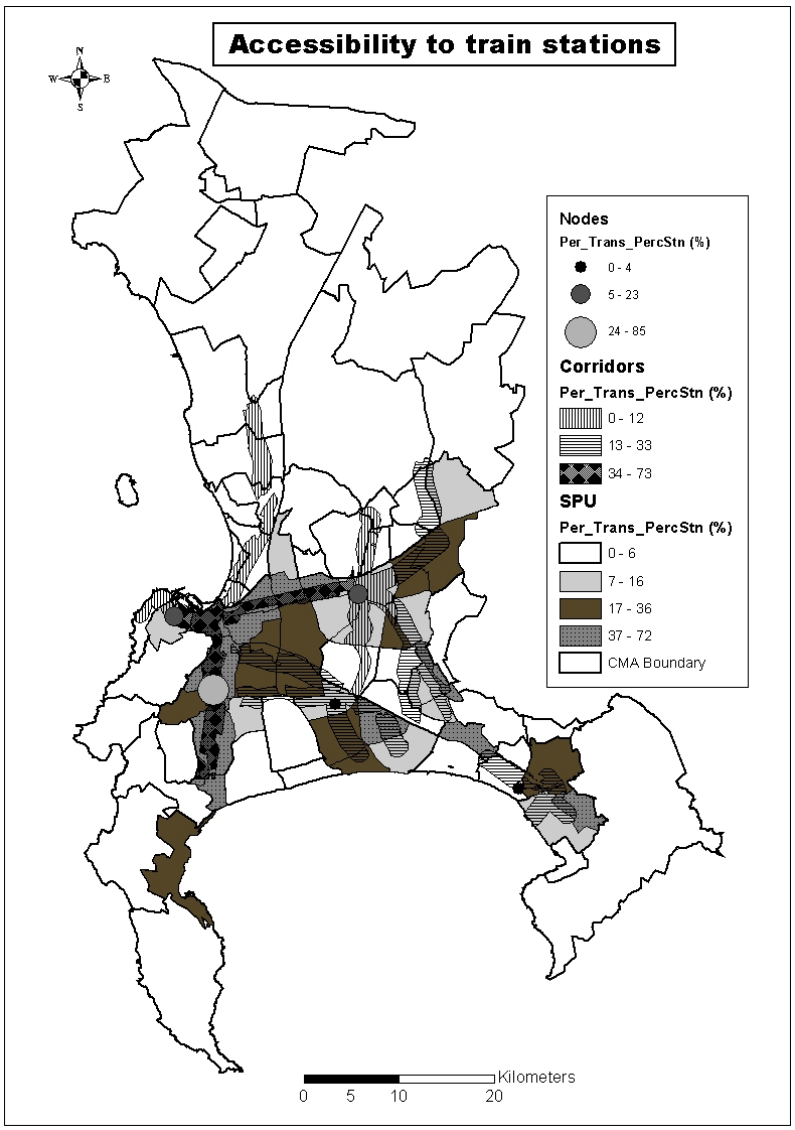


Figure 5.7: Population living within walking distance of a train station

The corridor between Cape Town CBD and Claremont has the highest percentage (34-73%) of people living within walking distance of a train station. Van Riebeeck, Blue Downs, Old Paarl Road, Main Road and Lansdowne corridors have 13-33% of their population living within walking distance of a train station, whereas the north-south link, Durban Road and Koeberg Road have the lowest percentage of people living close to train stations.

Lack of personal security on trains operating in the CMA undermines the viability of rail as a form of public transport (Pheiffer 2004, Pers com). This is exacerbated by inadequate ticket control mechanisms, which jeopardise the profitability of the Metro rail service. It has been noted that personal security concerns relating to public transport result in more people choosing to use private transport.

5.4 INCREASED ACCESS TO PUBLIC AND PRIVATE INVESTMENT

The public sector investment is addressed in this section, that is, the distribution of public expenditure from the capital budget of 1996-2001 in the CMA. Public investment is not an economic sector as such, but it does provide an important pre-condition for private sector investment.

5.4.1 Increased access to public property investment

- Value of public investments (*PubInv*) – This indicator measures the amount of public investment in different areas of the CMA. It includes public expenditure on a variety of community facilities such as clinics, halls, sports fields and stadiums.

Rapid population growth in the CMA, particularly in the informal settlements, places vast pressure on the service delivery of the local authorities; these areas generally have few services and lower quality of public facilities. There are also major problems of under utilisation of facilities and bad location and therefore waste of valuable resources (City of Cape Town 2002).

Figure 5.8 represents the spatial distribution of access to public property investments. The area with the highest public investment value is the one funded by Wesbank housing at Kuils River, which is valued at about R116, 272 650, followed by Mfuleni Extension 4, then Cape Flats sewer upgrading, Fisantekraal housing, and the upgrading of Prince George Drive, the last valued at around R35, 000 000.

The majority of investments are housing programmes in the poor communities; followed by social services, transport facilities, roads and economic markets. Social services include recreation, health, cemeteries and community libraries.

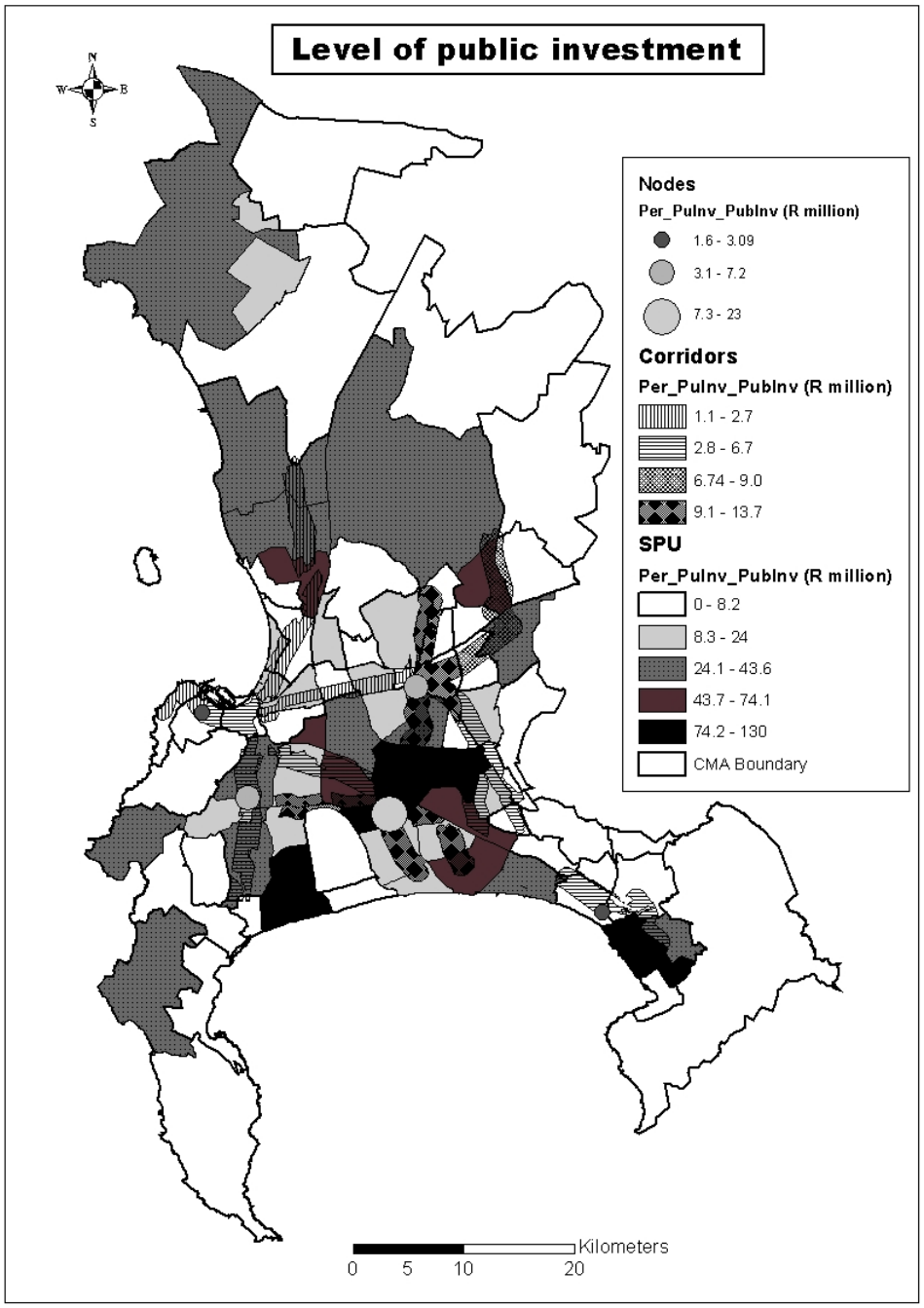


Figure 5.8: Level of public property investment

There has been relatively more public sector investment on the Cape Flats than in other parts of the CMA. Most of this expenditure has been directed at improving social infrastructure and providing subsidised housing. However, more public and private investment took place outside demarcated Corridors and Nodes than inside.

5.5 PROMOTE EFFICIENCY OF LAND USE

The CMA is consuming more land per capita than in the past, resulting in decreases in the measure of broad population density. This means that land resources in the region are now being used inefficiently because of low-density development in newly urbanised areas and in former agricultural areas.

5.5.1 Promote efficiency of land use

- Developable Land *(Sum_DevArea)* – The indicator measures the amount of developable land parcels within the CMA boundary, that is, the area (ha) of developable land in the zone.

It is important to note at this stage that the discussion definition of developable land currently includes occupied land with no civic or electrical services as well as public open spaces.

From the vacant land indicator map presented earlier, large tracts of land can be identified, which could be developed. This land includes occupied land with no civic or electrical services as well as public open space as mentioned in the previous paragraph. Identification of developable land is a fundamental element of the MSDF, which is based on the vision of a well managed, integrated metropolitan area in which development is intensified and integrated and sprawl contained. There were 2037 hectares of developable land in the CMA in 2000 (Cape Metropolitan Council 2000). This indicator forms part of the vacant land indicator, and Figure 5.9 shows this relationship. Just as with vacant land, there are large tracts of developable land in Blaauwberg, around Khayelitsha, Kraaifontein and Kommetjie.

The areas of the CMA with developable land are found mostly outside the inner parts of the city. The greatest area is found north of Mamre and in Melkbosstrand; these areas

also have large tracts of vacant land (see Figure 5.9 below), most of which is currently used for agricultural purposes.

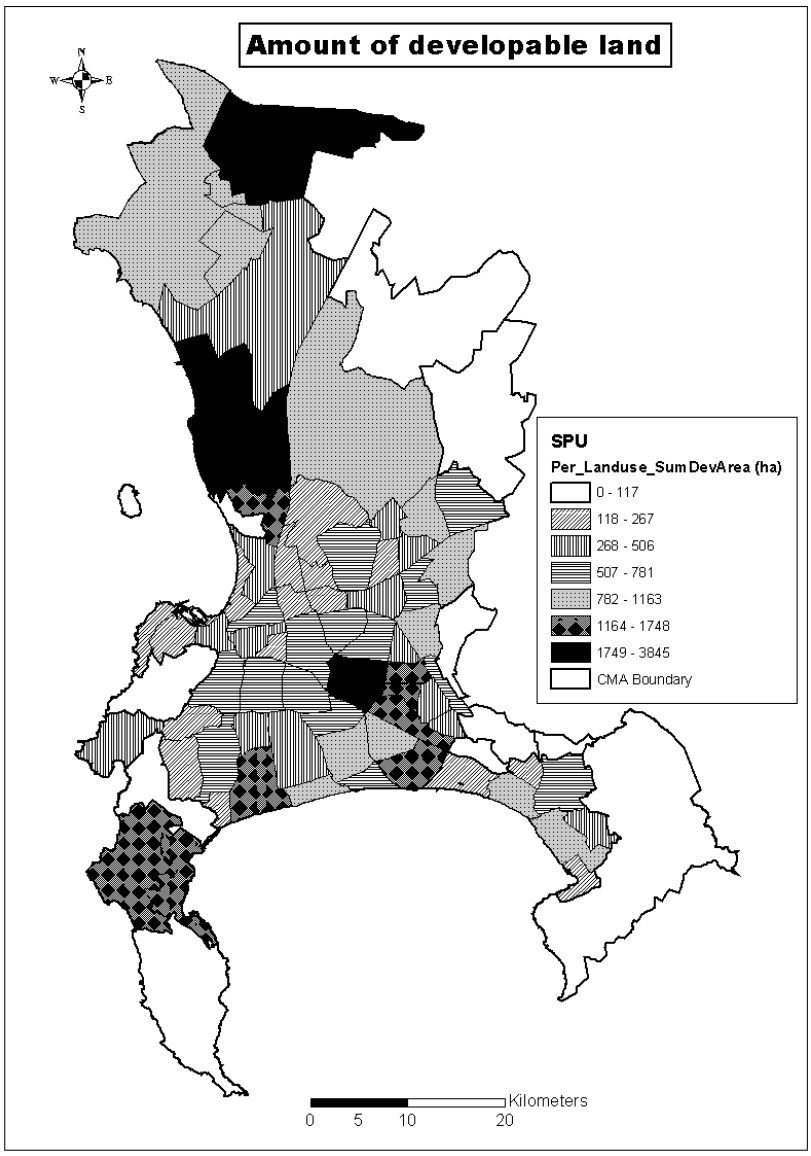


Figure 5.9: Developable land in the CMA

Hout Bay and Noordhoek also have substantial amounts of developable land in the CMA. Other parts of the CMA regarded as developable land are Khayelitsha, Mitchell's Plain, Marina Da Gama and Delft. The developable land in these areas ranges from 1749 to 3845ha. The farming areas in the Cape Magisterial District on the northern and western fringes of the CMA also have around 1012-1748ha of developable land. Areas outside the

urban boundary do not form part of the CMA's developable land. Places like Hout Bay, Macassar, Strandfontein and Muizenberg have large areas of developable land.

The identified parcels of land present opportunities for strategic infill and densification in the built environment or could be used to establish a contiguous system of green spaces throughout the CMA for recreation and nature conservation purposes.

5.6 PROTECT ECOLOGICALLY SENSITIVE AREAS

The Cape Metropolitan Area has a diverse set of ecosystems that is under pressure from urban expansion and development. The City therefore has to ensure that these ecosystems are protected and enhanced for the benefit of current and future generations.

5.6.1 The amount of land that has ecological value

- Protect ecologically sensitive area *(EcoVArea)* - This indicator measures the amount of land (ha) in protected nature reserves, private nature reserves, green areas and private open spaces.

Most of the sensitive areas within the CMA are wetlands, storm water management and conservation areas, potable water sources, old farm dams in residential areas, and farm dams used for irrigation. Some of the ecologically sensitive areas of the CMA shown in Figure 5.10 include:

- A wetland near Belhar, between effluent ponds and the Kuils River, a wetland created through earthmoving and development at Blue Downs and another at Borcherds quarry are made permanent through development.
- Brackenfell has a wetland filled by runoff and Brakkekuyl has a non-perennial river flowing through a dam.
- Buffels River has a river wetland and Silver Stream is a water source for Atlantis. The Cape Flats Sewage Works has a wetland between dunes made by permanent ponds at the sewage works.

- At Helderberg, there is a water reservoir, which is a water source for Helderberg.
- Kenilworth Race Course is a proposed fynbos conservation area. Philippi and Schaapkraal form part of the Philippi Horticultural Area, where there is a wetland made permanent through development (Hennessy 2004 Pers com).

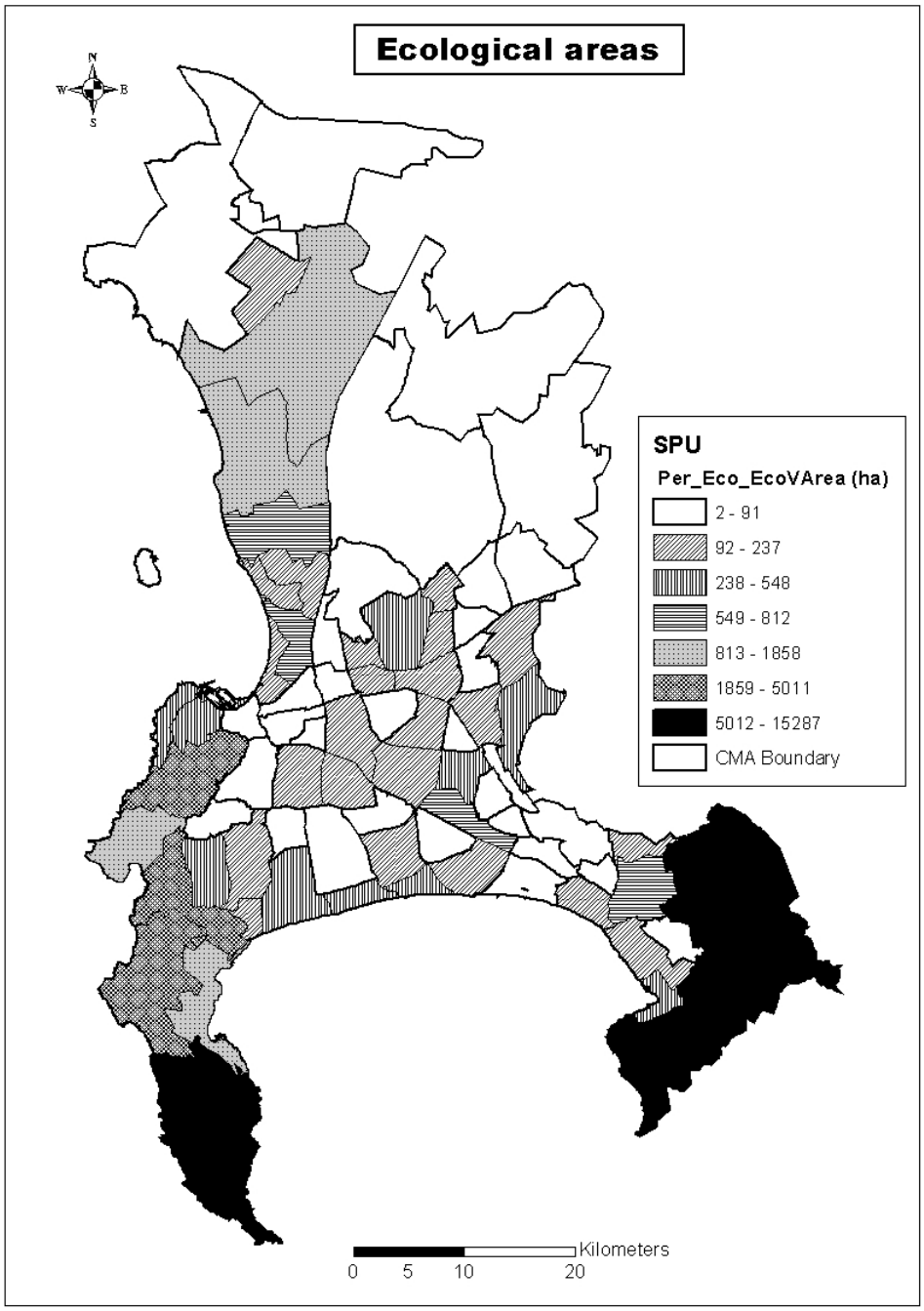


Figure 5.10: Ecologically sensitive areas in the CMA

5.7 PROTECT VALUABLE AGRICULTURAL LAND

Agricultural land is essential around the urban areas for easy access to the metropolitan market. However, the CMA's agricultural areas are under threat from urban development, informal settlements, illegal dumping and alien invasive vegetation (Hennessy 2004, Pers com).

5.7.1 Protect valuable agricultural land

- Area of agricultural land *(AgricArea*) - This indicator measures the amount of agricultural land (ha) within the boundaries of the CMA.

In the CMA, agricultural lands are concentrated in the north east, along the Tygerberg Hills, in the south east around the Helderberg Mountains and in the south around Constantia and Hout Bay (see Figure 5.11 below). Continued low density residential expansion into these areas is placing pressure on the remaining good soils and agricultural land. The Philippi Horticultural Area situated to the south of the City of Cape Town is also under threat from urban expansion.

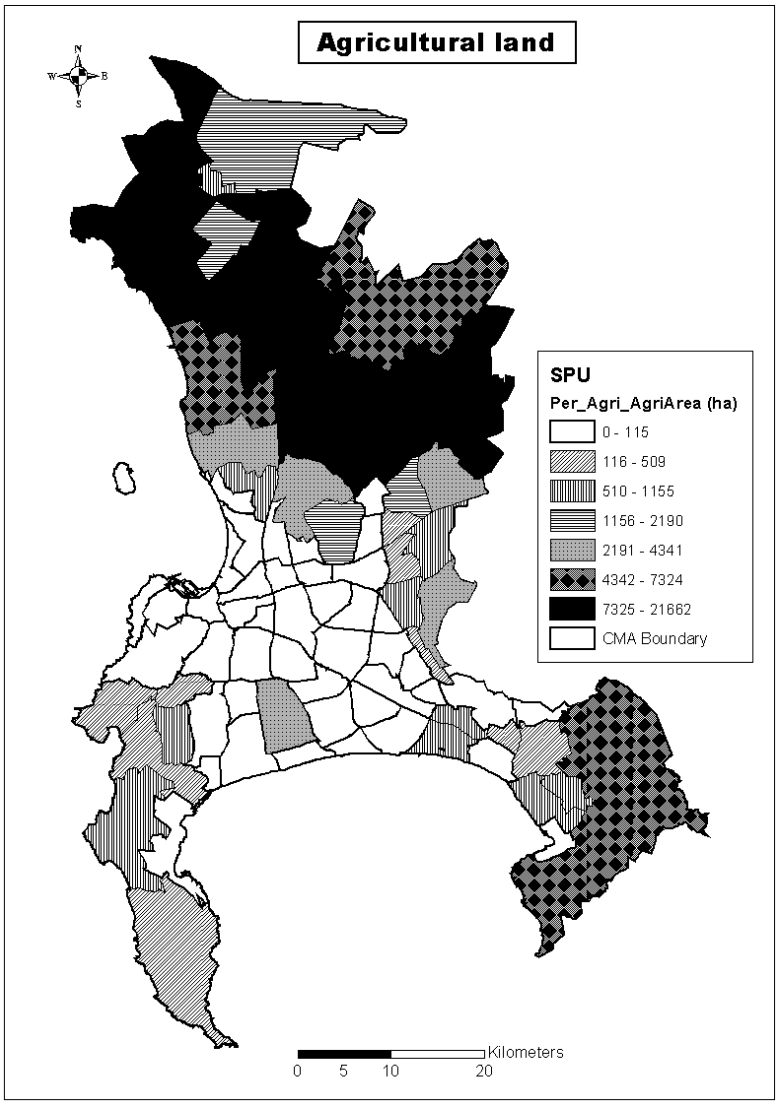


Figure 5.11: Agricultural land in the CMA

The majority of agricultural land falls within the established farmlands of the CMA. The fully developed areas of the CMA, namely, the residential, commercial and industrial areas, have little to no agricultural land. The Cape Point Nature Reserve does not form part of the agricultural land, since it is a proclaimed nature reserve.

The MSDF suggests that any kind of development should be excluded from metropolitan agricultural land and from horticultural areas, except if the development is specifically related to agricultural uses.

CHAPTER 6: SYNTHESIS

This chapter is a synthesis of all the research results and begins with a summary of the objectives and an evaluation of results. It concludes with planning recommendations derived from the research.

6.1 RESEARCH OBJECTIVES REVISITED

The aim of this study was to apply the Planning Indicators Model, which consists of a set of indicators to monitor and measure the extent to which the MSDF and SDFs have affected land use and physical development in the CMA. Consequently, 15 conformance and 11 performance indicators were identified and the PIM was run to compute these indicators in order to measure the success of the spatial planning policies in achieving their objectives.

The research assessed the CMA's conformance and performance using 26 indicators under five major thematic groupings namely: natural environment and resources, urban development, economic development, social development, and transport and infrastructure. The geographical results (maps) were used to identify areas where strengths can be protected and where weaknesses need to be corrected. These maps display spatial variations in conformance and performance indicators.

The CMA is a rapidly growing area with complex growth dynamics and interrelationships. Therefore, it would be unrealistic to think that any set of indicators could tell the whole story of the City's performance. Nonetheless, conformance and performance indicators in this report should be regarded as "flags" that identify trends and possible issues in certain key outcomes (Barndt 1998, 1999). Where indicators appear to raise concern over a particular issue, additional research and investigation are required to identify the underlying causes and propose policy response options.

As this was the first comprehensive monitoring exercise for the CMA, a lack of reliable data hampered the measurement of a number of conformance and performance indicators (for instance, transport data were not available in a functional format and most data sets needed to be updated). This meant that relevant conformance and performance indicators, about 24 in all, could not show trends over time. The two indicators that were the exception were those that measure change in informal housing unit, and the growth of informal housing units in the buffer zone. Because there were accurate data available for two time slices (1993 and 1998). Hereby, the time interval 1993-1998 could be computed.

Practically, the unavailability of data was a major constraint on the choice of indicators. In most instances, historical data were simply not available (all databases except for the informal housing units were for the year 2000 only). In these cases, the single time period data are presented as a baseline for future monitoring.

Apart from data constraints, the PIM is currently not able to handle linear spatial features such as routes. As a result, some of the proposed indicators relating to transport routes are not included in the current version of the model. To incorporate data relating to linear features in this version of the PIM, the data were transformed so as to be related to polygons or points (Zietsman & Sinske 2002).

6.2 PLANNING RECOMMENDATIONS FOR THE CMA

1) Several indicators seem to overlap and, as a result, it is recommended that some of these indicators should be combined to avoid duplication and confusion during interpretation. From the interviews held with the planning officials, it became clear that there is a need to clarify the definitions of some of the indicators (for example, ecologically sensitive areas, MOSS, nature areas, areas with ecological value, major investments, public property investment, and level of public expenditure).

2) From the four spatial strategies outlined in the MSDF, two have remained relatively unchallenged, they are: the proposal for an urban edge to protect agricultural and nature areas on the urban edges thereby promoting intensification, and the proposal to identify and protect the MOSS. Nonetheless, proposals to direct public and private investment to the Philippi Area and other activity Corridors in poorer areas have been highly controversial. Other issues raised against the MSDF are:

- The MSDF exhibits strong elements of a static blueprint planning approach in that it presents a spatial vision, but does not suggest how to achieve this (it does not designate strategically where investment should be directed and which are the priority areas);
- The MSDF presumes that it is possible to legislate where private sector investment should be located (mainly on defined Nodes and Corridors), yet private investment tends to occupy sites outside Corridors and Nodes that have freeway access and amenities.

3) It is proposed that a second comprehensive study on conformance evaluation and performance monitoring in the CMA be conducted in the next five years. The resulting findings should be used to inform the city's planning process.

4) The CMA's conformance and performance evaluation documented in this research report has identified a number of key issues that require further detailed consideration and evaluation through the CMA's spatial planning process. These key issues may be summarised as follows:

Natural Environment and Resources

- There is a need for continued expansion of the conservation area with formal conservation status. The land area does not guarantee conservation; only effective management can attain this.
- The CMA's MOSS, conservation, and agricultural areas are under threat from urban expansion and informal settlements.

- Crime, security and limited maintenance budgets are major factors influencing the identification of open space for inclusion in the Metropolitan Open Space System.
-

Urban Development

- The MSDF needs to show how the city's population will be accommodated in the next 20 years.
- Philippi East has not succeeded in attracting significant population and employment growth.
- Future population projects are likely to place major demands on the public sector in terms of providing land, shelter and services.

Economic Development

- There is lack of investment in industrial and commercial activities on the proposed Node in Philippi Industrial. Crime and a poor image are deterring support from investors.
- The majority of major investments have not been made in demarcated Nodes and Corridors. The commuter rail and bus networks serve these potential employment centres poorly.
- Job opportunities are inadequately provided where the need is greatest, specifically in areas of surfeit labour supply.

Social Development

- The residents of the CMA are continuing to experience significant inequalities in employment and social services.
- Some areas of the city continue to exhibit relatively high levels of socio-economic disadvantages.

Transport and Infrastructure

- Rapid population growth, particularly in the informal settlement sector, places immense pressure on service delivery.
- Urban sprawl has increased distances between work and residence.

- Most people prefer private transport to public transport because of concerns relating to personal safety.
- Lack of integration between modes of transport in the CMA contributes to overcrowding and congestion in public transport (bus, taxi and train).
- There are long travelling distances and proportionally high transport costs for the city's poor population.

6.3 CONCLUSION

From the findings of this research, it is apparent that GIS based planning tools can assist decision making in spatial monitoring. Wong (2000) indicates that there has been a rebirth of interest in recent years among policy makers in using performance and conformance indicators to inform urban and environmental planning.

The PIM, which is a GIS based tool, forms the basis for monitoring and evaluating spatial policy, through the use of indicators. The PIM is a user-friendly tool which complies with the IT and database specifications of the City of Cape Town. Furthermore, the results from the model are reliable and thus show the effectiveness and efficiency of the PIM. The PIM can demonstrably assist in making the impact of spatial planning greater in the Cape Metropolitan Area.

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APPENDIX B: MSDF spatial elements