

The urban development boundary
as a planning tool for
sustainable urban form: Implications for
the Gauteng city region.

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The Urban Development Boundary as a
Planning Tool for Sustainable Urban Form:
Implications for Gauteng City Region

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Abstract

1 Urban development boundary as a planning tool for sustainable urban form

The aim of this research was to determine a sustainable urban form for the Gauteng city region, by means of the urban development boundary (UDB). Current urban settlement formation in the developing urban areas of South Africa tends to be very poor in terms of quality, service provision and standards. These environments have very little chance of developing into vibrant, enriching and efficient urban environments (Behrens & Watson, 2000:iii).

While the reasons for poor environmental quality are undoubtedly diverse and complex, having political, economical and social dimensions, it is argued that the prevailing approach to layout planning in South Africa is part of the problem. This study aims to develop an alternative approach that is more appropriate and likely to produce spatial layout and development plans with the ability to initiate urban environments of quality and sustainability. This study is a guide and stimulus, providing suggestions and ways to address the current problems by means of development proposals that will enhance urban sustainability and ensure a sustainable urban form for the Gauteng city region. There are important elements and forces that determine the success or failure of a sustainable metropolitan region, also applicable to the findings of this study. For purposes of this study, the following elements will be evaluated and studied against a planning perspective: urban form, environmental management and spatial planning.

1.1 Urban Form

Urban form was developed and transformed ever since formal planning evolved within the urban environment. However, urban areas change, grow and develop in a certain form, subject to forces, impacts, needs and preferences of residents. The research is seeking ways to develop a sustainable urban form for metropolitan areas in developing countries, based on the findings of the Gauteng city region case study.

For purposes of this research, it is important to understand the different urban forms, how they developed, and what the main driving force behind them was. The concept of the Garden City was the first concept of the ideal city (Hall & Ward, 1998:5). This concept, as well as similar other sustainable urban growth concepts, will guide the proposed sustainable urban form. These models are an example of sustainable urban form in terms of enhancing the quality of the urban environment, integrating the environmental elements into the urban areas and adding meaning to city centres. Various concept models will therefore be evaluated to determine a sustainable concept and urban form for metropolitan areas in developing countries. The planning tools that manage and control the urban form are also a core issue. The urban edge and the urban development boundary are two planning tools that are currently manifesting within the urban environment. These two concepts have different approaches in terms of definition, demarcation, implementation and success towards achieving sustainable urban form.

1.2 Spatial planning

Space is often at a premium in city centres. The dominance of the European vision of compact cities as ideal places to live and experience the vitality and variety of urban life, has been questioned by Jenks *et al.*, (1996). This question forms a relevant part of this research, as the most appropriate ideas from the developed world guide, shape and control the future of cities in the developing world. Concentrating urban functions offers considerable advantages when it comes to developing powerful urban networks: it stimulates the efficient use of space and puts a brake on mobility, especially when the new centre is near a traffic hub. The differences between the concepts of compact urban form for Europe and Africa have to be explored. These concepts of the compact city and sustainable urban forms have changed and evolved over the past two decades and a number of them have relevance to developing countries. Spatial planning must therefore ensure effective implementation of the proposed concepts, in order to achieve sustainable urban form within the metropolitan areas.

1.3 Environmental management

From a town planning perspective, environmental management is one of the core elements driving sustainable development. Living within the environment implies achieving equity and social justice, and inclusiveness in decision-making processes. In developing countries, where there is an enormous range of people, cultures and economies, the size of the problem is immense and growing fast. Nevertheless, there are a number of points of comparison between the international developed countries and the local situation of developing countries.

Compactness appears to be an aspiration and a hoped-for solution to the problems of the explosive growth of urban areas, as mentioned in the previous section (1.2), and spatial planning, especially in terms of the intensification of many sub-centres within a metropolitan region. Compactness does not mean an intensified urban area, but rather a thoroughly planned area where open green spaces are as much an integral part of the urban core-, as the spatial elements. The integration of the two core magnets in the urban area (spatial planning and environmental management) needs to be explored in terms of developing sustainable urban form. This also implies that an interface is needed between Integrated Environmental Management plans and Integrated Development plans, to ensure sustainable development.

2 Conclusion

The development of a sustainable urban form is subject to a comprehensive development framework, guiding and controlling development in urban areas, as well as development in surrounding rural areas. The urban edge concept was implemented into the South African urban environment to address these objectives. The interpretation and implementation of the urban edge concept is simplistic, manifesting as a development line on a map, which divides the urban and rural areas. It is argued that this simplistic approach has resulted in unsustainable cities and urban sprawl, present in the current reality.

The urban environment strives towards integrated spatial planning and environmental management, resulting in sustainable development and a sustainable urban form. This is a multi dimensional approach and needs to be managed accordingly. In terms of definition and implementation, the urban development boundary seems to be a more effective and promising planning tool to address the above-mentioned objectives. The urban development boundary concept needs to be explored in terms of the South African urban environment, according to the interpretation and implementation as a development zone, controlling development and structuring the Gauteng urban environment and urban form.

3 Key terms

Urban development boundary concept, Sustainable development, Environmental management, Spatial planning, Sustainable urban form, Gauteng city region.

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Opsomming

1 Titel

Die stedelike ontwikkelingsgrens as 'n beplanningsinstrument om 'n volhoubare stedelike vorm te bewerkstellig: Implikasies vir die Gauteng stad-streek.

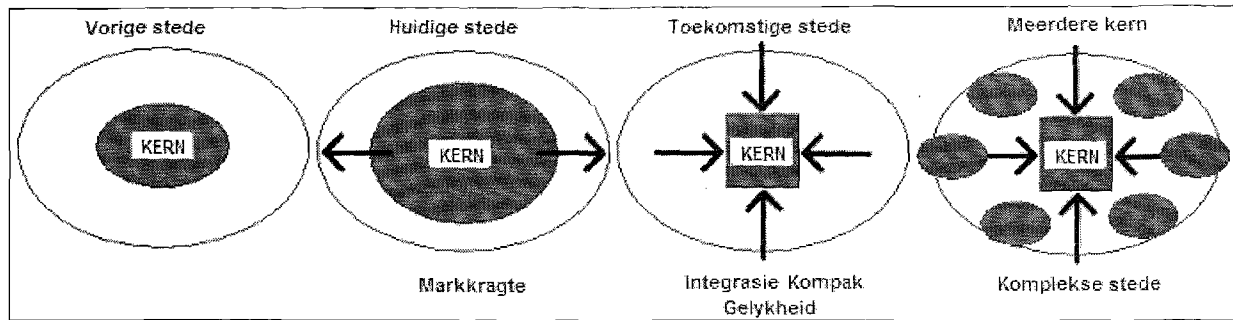
2 Doel van die studie

Die doel van hierdie studie is om te bepaal of daar 'n volhoubare stedelike vorm ontwikkel kan word vir die Gauteng stad-streek deur middel van die stedelike ontwikkelingsgrens. Die doel van hierdie studie is dus om 'n alternatiewe benadering te formuleer wat meer toepaslik sal wees en wat kwalitatiewe uitlegplanne tot gevolg sal hê. Die Gauteng stad-streek moet volhoubaarheid nastreef om sodoende internasionaal kompetender te wees.

3 Agtergrond

Die stedelike kern is die hart van alle ontwikkeling. Historiese stede was bekend vir hul kompakte stedelike kern, min inwoners, baie oop areas, goeie toeganklikheid en dus ook volhoubaarheid. Vandag se stede lyk heelwat anders. Die stedelike kern is onvolhoubaar, stadskruip kom voor, ontwikkeling is oorgelaat aan die vrye mark en word nie deurlopend beplan nie, gevolglik ly die kwaliteit van die omgewing daaronder.

Daar bestaan tans 'n behoefte vir transformasie na volhoubare stede, gelykheid, beter lewensomstandighede, meer integrasie, toeganklikheid en 'n beter kwaliteit omgewing. Die bekendstelling van die stad-streek konsep vir Gauteng het verskillende perspektiewe en beplannings benaderings tot gevolg gehad. Die huidige ontwikkelingsgrense word geëvalueer in terme van hierdie uitkomstes. Die kompleksiteit van die stedelike omgewing word beklemtoon deur stede met meervoudige kerne, soos geïllustreer in Figuur 1.

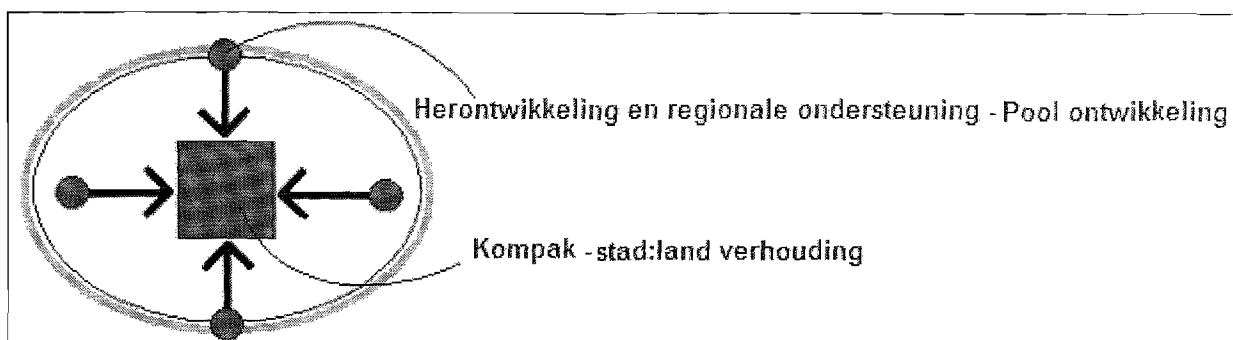


Figuur 1: Ontwikkeling van stede

Bron: Eie verwerking (2007)

Daar is 'n behoefte vir gelyke ontwikkeling, toeganklikheid, effektiwiteit en regionale ondersteuning van die huidige onvolhoubare stedelike vorm na 'n meer kompakte en volhoubare vorm. Volhoubare ontwikkeling, in hierdie konteks, beteken om 'n balans te vind tussen stedelike en landelike gebiede. Daarom moet stedelike ontwikkeling (alle ontwikkeling binne die stedelike grens) en landelike ontwikkeling (alle ontwikkeling buite die stedelike grens) beheer en gekontroleer word (Helsinki University of Technology, 2007:11).

Die groei-kern teorie bevorder regionale en landelike ontwikkeling. Die fokus is op gelykheid, homogene ontwikkeling en bevordering van volhoubaarheid. Die teorie is gebaseer op die akkumulاسie van ekonomiese, tegniese en sosiale elemente van die area en is beplan en geïntegreer om die stedelike kern te ondersteun. Ontwikkeling buite die stedelike ontwikkelingsgrens sal dus beheer word deur middel van nodusse (Figuur 2), soos ontstaan uit die polisentriese ontwikkelingspatrone. Hierdie benadering word internasionaal geïmplementeer om volhoubare ontwikkeling te bewerkstellig. Ontwikkeling binne die stedelike ontwikkelingsgrens moet die sentripetale kragte versterk, omdat dit 'n kompakte en volhoubare stedelike struktuur tot gevolg sal hê. Die stedelike ontwikkelingsgrens is dus die beplannings instrument wat transisie van stedelike na landelike gebiede beheer. Dit moet die landelike areas beskerm en terselfdertyd die stedelike areas bevorder.



Figuur 2: Toekomstperspektief

Bron: Eie verwerking (2007)

Summary

1 Title

The urban development boundary as a planning tool for sustainable urban form: Implications for Gauteng city region.

2 Aim of the study

The aim of this study is to determine and develop a sustainable urban form for the Gauteng city region by means of the urban development boundary (UDB). This study aims to develop an alternative approach that is more appropriate and likely to produce layout plans with the ability to initiate urban environments of quality and sustainability. The Gauteng city region needs to be sustainable in order to be internationally competitive.

3 Background

The urban core is the heart of all development. Previously cities have been known to be compact, have few residents, and have plenty of open spaces, great accessibility and sustainability. The urban form of today is very different. The inner city area is unsustainable, urban sprawl is occurring, unplanned development is increasing and the quality of the living environment is decreasing accordingly.

There is a need for transformation, for sustainable cities, for equity and less poverty, better integration, more accessibility and therefore qualitative living environments. The introduction of the global city region concept in Gauteng initiated different mindsets and planning approaches. Current urban development boundaries are evaluated in terms of these objectives. The complexity of the urban environments is emphasised through the multi-core cities of today, as illustrated in Figure 3.

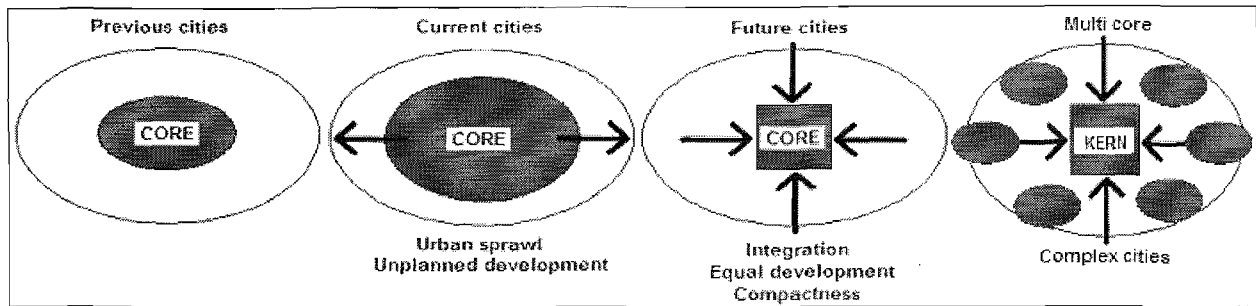


Figure 3: Development of cities

Source: Own creation (2007)

The urban environments are in need of equal development, accessibility, efficiency and regional support and of redevelopment of the current unsustainable urban phenomenon into a compact and sustainable urban core. For the purposes of this study, the urban development boundary was evaluated as a planning tool for sustainable urban form. Sustainable urban form, in this context, implies achieving balance between urban and rural areas. Therefore, urban development (inside the urban development boundary) and rural development (outside the urban development boundary) should be managed and structured (Helsinki University of Technology, 2007:11).

The growth-centre theory supports regional and rural development. It focuses on equity, homogeneous development and enhancing sustainability. This theory is an accumulation of the economic, technical and social issues of a region, planned and integrated to support the core urban environment. Development outside the urban development boundary will thus be managed by node developments (Figure 4), derived from the polycentric development pattern. Internationally the concept of polycentric development is accepted as the best way to ensure sustainable development. Development inside the urban development boundary should strengthen the centripetal force, as this will ensure a compact and sustainable form-giving urban structure. The urban development boundary should guide this transition from urban to rural. It should protect the rural area and enhance the urban area, as well as ensure effectiveness.

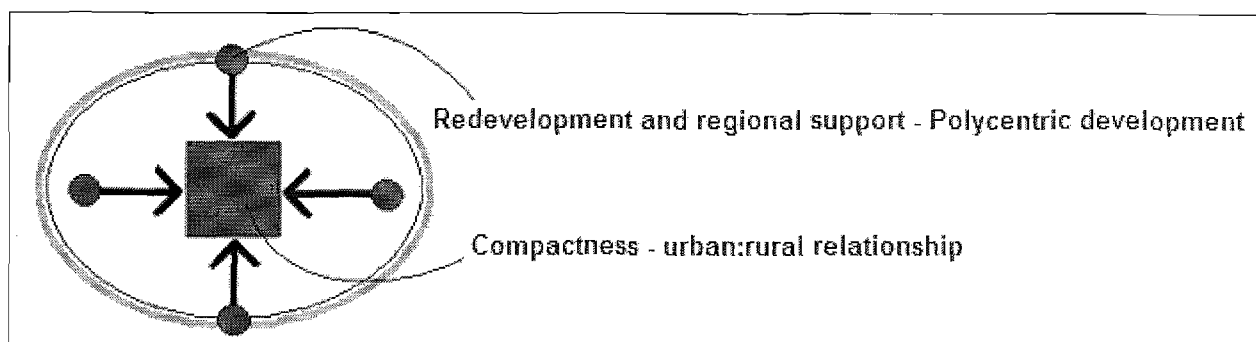


Figure 4: The way forward

Source: Own creation (2007)

Chapter 1

Introduction

"To change life, we must first change space"

- Henri Lefebvre, French writer -

1 Points of departure

Urbanisation and development is increasing in all the cities of the world. The most conservative projection suggests that the world population in 2020 will be a touch over 7,260,000,000 (Boys, 1997:3) and this growth must be accommodated via the future development trends. These development trends are responsible for the changes in our urban environments, for the increasing quantitative developments and decreasing qualitative environments. Over the past couple of years, very little has been done to address the existing dispersed spatial pattern, it has rather been reinforced by existing spatial planning practices placing untold pressures on existing engineering infrastructure, bulk services and public transport.

The sprawling cities of the developing world are vibrant hubs of economic growth, but they are also increasingly ecologically unsustainable and, for ordinary citizens, increasingly unliveable. The forces behind this process of accelerated urbanization seem to be irreversible. (Evans, 2002:ix). Furthermore, cities are at the same time globally connected and locally disconnected. It is the living conditions in the cities that determine the future of our livelihood. To change life, we must first change space.

It is widely accepted among urban restructuring advocacy groups and policy makers that the current local trends and the resulting spatial form have certain implications or consequences for the way in which our cities function. These consequences can be seen in settlement patterns that are grotesquely distorted, inconvenient and dysfunctional urban environments, the lack of efficient and viable public transportation, costly installation and maintenance of engineering services and the fact that cities have become hostile places to live in.

There is a need for a holistic view of the compact city. It is worth remembering that New York's explosive development at the beginning of the twentieth century took forms not imagined before, and it was seen as the 'new world'. The same is true of the rapid urbanisation and rise of the Mega-City in the new developing world today.

With 'hyper densities', vast populations, rapid development on the periphery, and a willingness to invest in mass transit provision, change is happening at a breathtaking pace. Change is also being proposed for South Africa, especially the Gauteng area, which is developing into a city region. All impacting elements and forces will be evaluated in this study in order to determine the sustainability of the future urban environment and to seek an approach towards ensuring the success of the Gauteng city region.

Developing the theories and ideas that will steer these current changes into the 'unimaginable', yet sustainable, urban form of the future will be one of the challenges of this research.

The main components mentioned above will be measured against the international standards and practices, and evaluated and implemented in the local planning phenomenon of Gauteng. From a spatial planning and development perspective, the impacts and forces that will occur in this area are of great importance. The three components that will be studied and applied in Gauteng are:

1. Urban Form: Comparing the garden city concepts, compact cities and the urban edge concept to find an ideal and sustainable urban form for metropolitan areas.
2. Spatial Planning: For purposes of this study, the focus is on urban environments and their related nodes of development: Working areas and living areas and their interaction.
3. Environmental Management: The focus will be on the location, the size, the quality, the effectiveness and the impact of open areas and their surrounding urban areas.

2 Problem statement and substantiation

Development in South Africa, and especially Gauteng, increased radically since 1994. Gauteng is the container of the greater Johannesburg and Tshwane areas, and therefore needs to address the current urban sprawl occurring between these two poles. An urban edge concept was identified for Gauteng in order to address the urban sprawl problems. Emphasis was placed on the critique regarding the use of the urban development boundary, and the success of implementation.

The Gauteng city region perspective was adopted during the May 2006 Premier's Coordinating Forum meeting. This in itself created new objectives and requirements for the Gauteng area. Developing a city region is both a short- and long-term process.

Gauteng has a new development vision: combining and integrating urban nodes within the greater area into one great holistic metropolitan area, an area that will be internationally competitive, sustainable and qualitative.

The economic potential, location and expertise that this metropolitan region consists of, justify the chance and efforts to rethink and re-plan the future of this area. To transform the current layout, pattern and networks into a sustainable city region in order to enhance the vision of the Urban Development Framework: *Cities and towns have been engines of growth and incubators of civilisation and have facilitated the evolution of knowledge, culture and tradition as well as industry and commerce. Urban settlements, properly planned and managed, hold the promise for human development and the protection of the world's natural resources through their ability to support large numbers of people while limiting their impact on the natural environment* (Department of Housing, 1997:v).

3 Research questions

The following central research question has been formulated to address the problem:

- Can urban form and urban development be sustainable by managing the spatial urban environment with a planning tool, the urban development boundary?

The study and data collection process will be guided by more specific questions:

1. How can sustainable development be realised in the spatial environment of the city region?
2. Is there an ideal sustainable urban form for city regions?
3. How is the urban form currently guided and managed?
4. What is the interface between environmental management and spatial planning?
5. Is there an interface with current policies including the IDP, SDF and legislation?
6. Are there linkages between the NSDP (2006), GSDP (2007) and the results of this study?
7. Will this concept integrate other sectors (transport, environment, and infrastructure)?
8. Is the urban edge an effective planning tool that can be used to guide urban development?
9. Can the urban edge concept be integrated into polycentric development initiatives?
10. Will the urban development boundary ensure a sustainable urban environment in Gauteng?
11. Can this concept be successfully implemented in the Gauteng city region?

4 Aims and objectives of this study

The aim of this study is to answer to the core research question and evaluate whether urban form and urban development can be sustainable and predetermined by managing the spatial environment with a planning tool, the urban development boundary. This will be based on the case study and local situation of the Gauteng city region. This goal will be divided into two core objectives:

- Sustainable urban form: Comparing the compact city concept (mono-centric development initiatives) with homogenous development trends (polycentric development initiatives) to create a sustainable urban form.
- The Gauteng city region: Developing a sustainable urban environment, a holistic urban area that is internationally competitive, integrated and planned. This will be in relation to a successful, sustainable development framework and spatial development policy.

5 The specific study aims

5.1 Research aims

The theoretical founding and literature research consist of various definitions and the status quo situation. Literature includes theories applicable to urban form, urban growth, spatial planning, environmental management, integration, current realities and policies guiding development and planning in South Africa.

The empirical research evaluates elements and forces that will impact on development and urban form, evaluates the current urban edge and effectiveness of this concept, evaluates the current reality of environmental management in the Gauteng area, evaluates the current reality of spatial planning in Gauteng area, integrates the environmental management and spatial planning concepts to develop the new urban form that can be applied in the Gauteng city region, evaluates the sustainable development perspective in Gauteng, answers to the current planning and development obstacles and compiles a future development perspective for this area.

The research aims are described as follows:

- Determine the interface between spatial planning and environmental management.
- Evaluate the concept of spatial planning in an international context.
- Evaluate the concept of environmental management in an international context.
- Integrate planning knowledge and abilities in order to answer to the planning questions.
- Interpret the problems of the urban environment, with the focus on an optimal solution.
- Plan the research method, data collection, and analysis in order to interpret it meaningfully
- Gain new knowledge in the research area.
- Keep in touch with current trends of technology and research techniques.
- Determine the relationship that exists in theory and practice.
- Integrate the above-mentioned, in benefit of the economy and the local people.
- Determine the function of the urban edge in relation to the urban form and sustainability.
- Determine the function of the urban development boundary in terms of urban form.
- Create an approach and stimulant of future development.
- Determine current problems of the urban environment.
- Determine the ideal sustainable urban form.
- Implement these concepts into the current Gauteng reality.

5.2 Hypothesis

The Gauteng city region has different urban demands from the current urban environment; therefore, it requires more integrated planning initiatives. This integrated planning approach will support the sustainable development concept. In order to achieve sustainable development, environmental management and spatial planning must be integrated and implemented within the urban edge concept. The urban edge is a planning tool that will enhance this interface and direct the way forward for development and planning in the Gauteng city region. Having briefly described the main objectives, the problem to be solved is formulated as follows:

- The Gauteng city region is in need of creative spatial development patterns and frameworks to support planning and development, as well as policies to guide implementation.
- The urban environments are currently characterised by unsustainable development, ineffective planning, fragmented urban form and a lack of integration between spheres and government authorities.
- An approach is needed towards a qualitative methodology or process that will provide a logical decision framework allowing co-ordinated decision-making, focussing on appropriate sustainable development principles and the city region urban development boundary.

5.3 Methodology applied in the research

The research subject, as well as the study area, is complex and dynamic. This created challenges in terms of the research methodology and enforceability of the research methodology. The methodology included a detailed study of the existing knowledge, compilation of relevant data and information from the local and international perspectives, conducting of surveys and gap analyses, evaluation of results, comparisons of the international and local situation and creating a way forward. Figure 5 illustrates the research methodology.

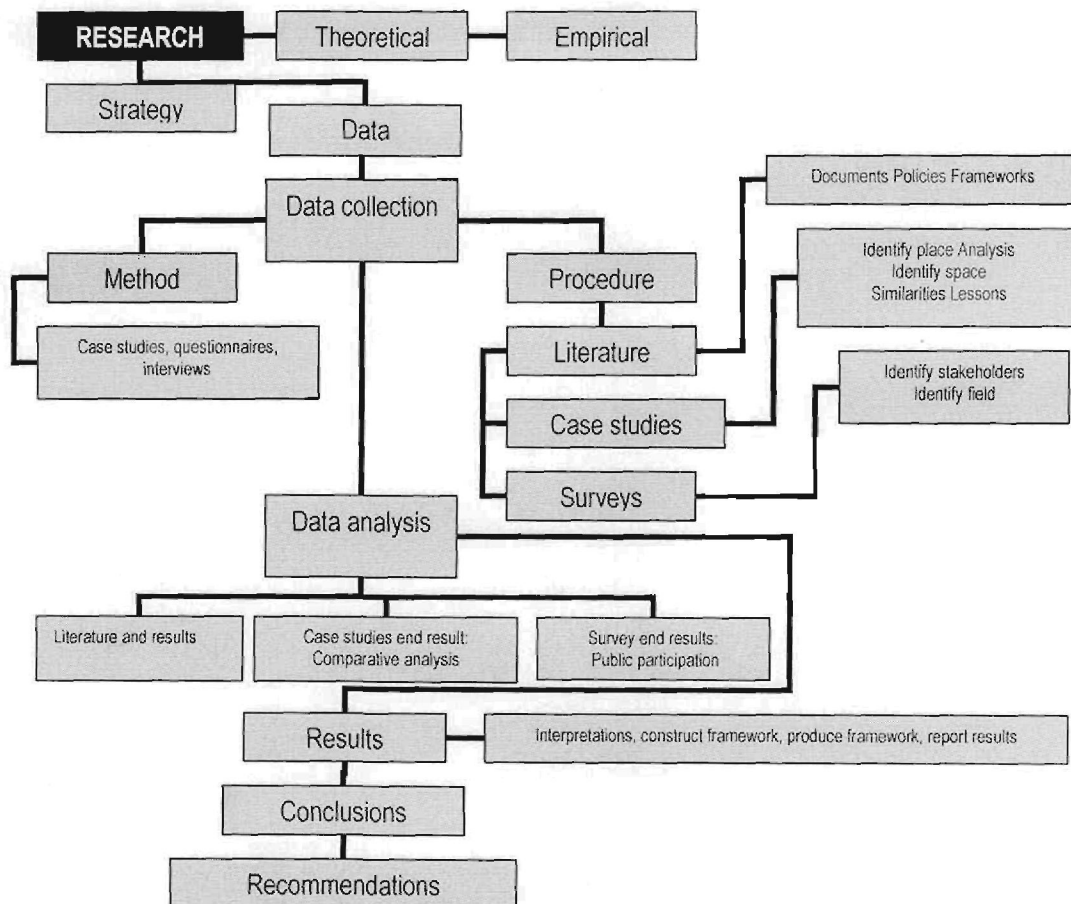


Figure 5: Conceptual model of the research process

Source: Own construction (2007)

5.3.1 Literature study

The points of departure will be formulated through globally-accepted spatial development and planning theories, policies, frameworks and guiding legislation. Desk studies will include the evaluation of relevant impacting spheres and elements, international planning documents, frameworks and articles. The aspects of the literature will be analysed in depth and used in a line of argument. The literature study will explain the concept of the urban environment, urban form, urban structure, urban planning and layout. It will explain why the urban environment is changing and discuss the impacting forces and elements.

The literature study will also describe the current reality of the Gauteng case study. In order to understand the complexity of the sustainable development concept, the literature study will focus on the international issues and best practices. This will be done from an environmental management and spatial planning approach. The urban development boundary concept will also be described in detail, evaluating international practices and the local Gauteng phenomenon. The literature study will explain the background and importance of the concepts and elements as they manifest within this research.

5.3.2 Case studies

International, national, as well as local case studies are essential to have a relevant comparison. Case studies were included to determine the lessons learnt and to obtain success stories, failures and urban approaches and considerations from other urban environments. The international case studies were focused on Europe (Netherlands), the United Kingdom and American perspectives. The approach and results of this study will be linked on a national level to the National Spatial Development Perspective (2006), the Development Facilitation Act, the PGDS, MDSP and the Housing Atlas 2005. On provincial level it will be linked with the Gauteng Spatial Development Perspective (2007), and policy documents guiding development and planning in the Gauteng area.

5.3.3 Interviews

A post-positivistic qualitative approach was followed. Interviews were scheduled with stakeholders that are familiar in this field of research and development. Structured, semi-structured and non-structured interviews were held. Interviews were conducted personally, telephonically and via email. Surveys were also conducted, in order to evaluate specific research issues and concepts. Based on the outputs received, the researcher was able to formulate research conclusions and recommendations.

5.3.4 Situation analysis and recommendations

An analysis was made to evaluate theory and current practices, to be able to formulate answers to the research questions. Chapter 8 attempts to provide a framework with strategies and recommendations to assist Gauteng and all South African cities in the unique difficulties that arise from the phenomenon of the urban development boundary as a planning tool that can be used to achieve sustainable urban form. Conclusions were drawn from the situation analysis. Recommendations were then formulated from the drawn conclusions, and this was the contribution of the researcher in terms of creating new knowledge within this specific research field. The research, conclusions and recommendations are applicable to all metropolitan areas in South Africa, as well as international situations.

6 Delineation of the Study Area

The focus of this study is to deliver a way forward for the Gauteng city region, in terms of urban form, sustainable future development and the integration of environmental management and spatial planning. Thus, although various international case studies were also evaluated and incorporated into this research, the main study area will remain the Gauteng city region. This is the greater Gauteng area, the metropolis that surrounds the province of Gauteng as described in Chapter 4.

6.1 Limitations of the research

It is important to note that this study was done within a specific reference framework, from an urban planning and development perspective, evaluating spatial planning concepts that will ensure sustainable urban form with emphasis on the urban development boundary of the Gauteng Province. This requirement necessitated that no primary research was done in respect of other impacting factors apart from spatial, environmental and land use management factors. Other impacting forces also contribute to the ideal urban form and sustainable development of metropolitan areas, but were not the main focus of this study and thus were analysed in general and not in detail. However, it did not lead to the non-recognition of such components in achieving the conclusions and recommendations. The results are primarily based on the spatial planning and development perspective as it currently occurs. Academic research on this subject is limited, especially for the South African situations. Latest publications, documents and frameworks were used. Due to submission dates, the 2008 LUMS were not incorporated.

7 Conclusion

The international comparison will identify and illustrate the elements and impacts of the urban edge concept, the spatial planning initiatives, as well as the environmental management implications and the impact it will have on sustainable development and creating a sustainable urban form. The result will be compared into the local approaches in order to optimise the current development and implementation trends in South Africa, especially the Gauteng city region, in order to guide the local situation towards future sustainable development within a proposed sustainable urban form. The aim of this study supports the vision of the urban development framework to create a sustainable urban development policy approach for effective urban reconstruction and development, to guide development policies, strategies and actions of all stakeholders in the urban development process and to steer them towards the achievement of a collective vision.

South Africa, as elsewhere in the world, will witness many changes during the next 25 years. A clear, positive and common vision of a desired future for South Africa's cities and towns is essential to ensure that they sustain and improve their role as centres of economic and social development and opportunity. Government is committed to ensure that its policies and programmes support the development of urban settlements that will be:

- Spatially and socio-economically integrated.
- Centres of economic and social opportunity, as well as vibrant urban governance.
- Environmentally sustainable.
- Integration and sustainability of urban environment.
- Integrated industrial, commercial, residential, information and educational centres financed by government subsidies, capital markets.

In order to achieve the vision for 2020, as set by the Urban Development Framework (Department of Housing, 1997:10) and overcome the current inefficiencies, the following goals must be pursued:

- Create efficient, productive cities through the growth and development of local economies.
- Reduce disparities by providing infrastructure and facilities to disadvantaged communities.
- Provide access to better housing and greater security of tenure for urban residents.
- Promoting urban densification in conjunction with more efficient public transportation.
- Integrating environmental concerns in development planning and urban management.
- Transform municipalities into effective and accountable institutions through capacity building.

Thus, the urban edge should be used more efficiently in order to guide the urban form towards sustainability. In order to enhance this function, the integration of environmental management and spatial planning should take priority. Development initiatives that will ensure integration of these two concepts will be explored and implemented. This also includes the urban development boundary concept that is concluded to be more efficient, comprehensive and effective, if implemented within urban development structures. These planning tools should be implemented within the current environment, in order to manage the urban spaces and ensure a sustainable urban form.

8 Structure of the document

The structure of the study as captured in this document is illustrated in the following figure:

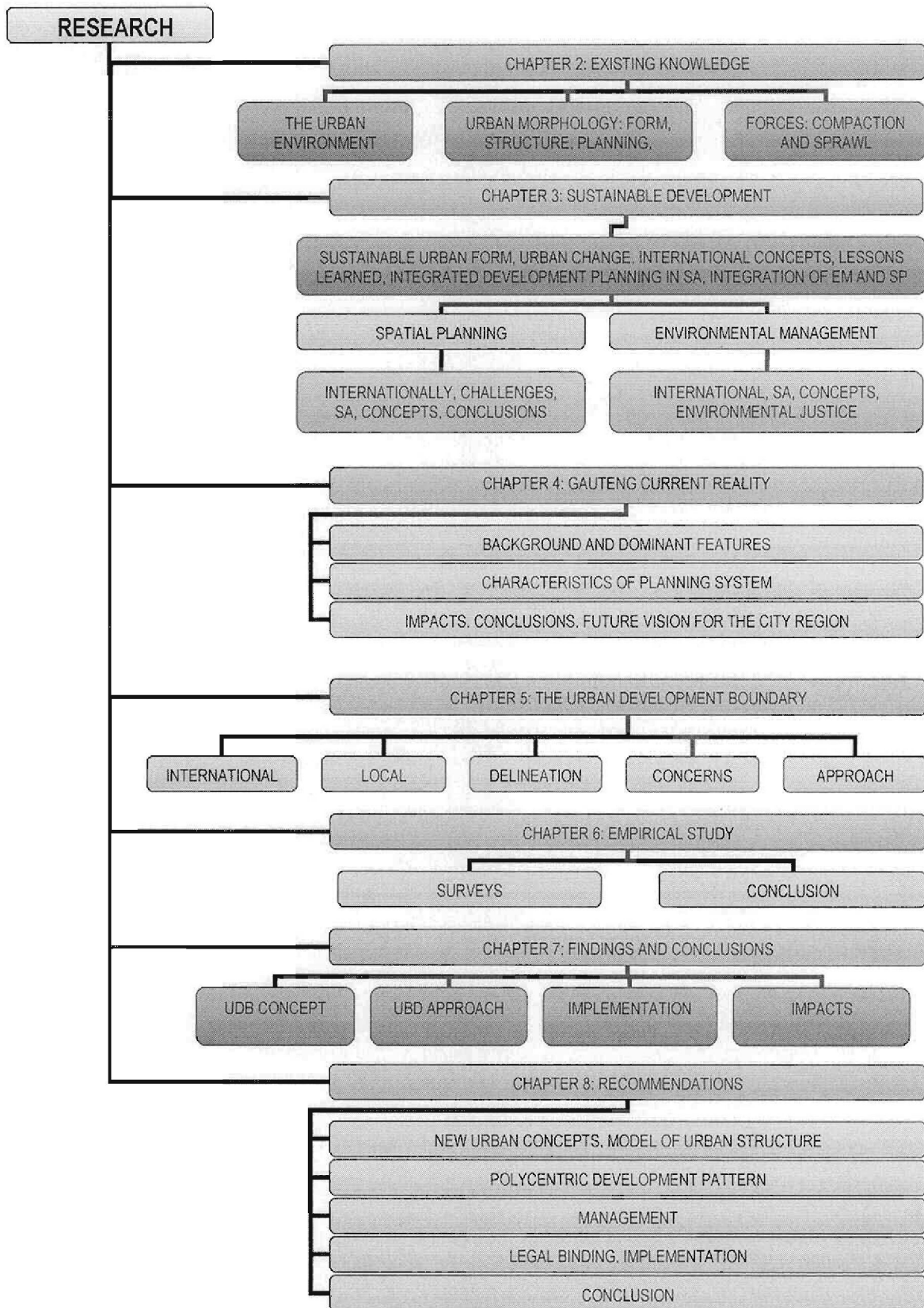


Figure 6: Structure of the document

Source: Own creation (2008)

The structure and remainder of this document, as illustrated in Figure 6, is summarised as follows:

Chapter 2 represents the existing knowledge, elements and practices within the urban environment. This includes the urban form and related mechanisms in the urban environment, such as the urban morphology, form, structure, urban planning, layout, and applicable urban forces. It describes the Gauteng urban reality and the South African planning perspectives.

Chapter 3 narrows the research focus to the specific objective of this study, sustainable development, the goal for urban environments. Detailed studies were done on international concepts and sustainable cities, to be able to compare it with the South African situation and implementations. This chapter describes sustainable development as the product of the integration of two concepts, spatial planning and environmental management. Therefore, these two concepts were analysed separately in terms of international concepts, the South African situation and the current guiding tools and policies for managing these concepts.

Chapter 4 focuses only on the Gauteng status quo and current reality. Thus, the features of urban planning, the future vision for Gauteng, the characteristics of the planning systems, the guiding legislations and impacts currently present in this environment. It sketches the Gauteng case study and the objectives, opportunities, obstacles and relevant elements in detail.

Chapter 5 brings the concept of the urban development boundary in relation with the literature in the previous chapters. This chapter describes the urban edge concept within this urban environment and objectives of sustainable development. It states the urban-rural objectives, international concepts and the Gauteng urban edge approach. It concludes with a way forward for the urban edge concept, as a planning tool for sustainable urban form.

Chapter 6 is a representation of the empirical research done for this study. This chapter consists of the three surveys that were compiled. The first is the urban edge survey, investigating the function, effectiveness and success of the current urban edge as a tool for sustainable development in the Gauteng area. It sets the basis for the development of a decision support model to support development applications. The second survey focuses on sustainable development, the perspectives, strengths, weaknesses, opportunities and threats that influence future planning. The third survey focuses on the future development perspective, comparing perspectives regarding polycentric and mono-centric development patterns.

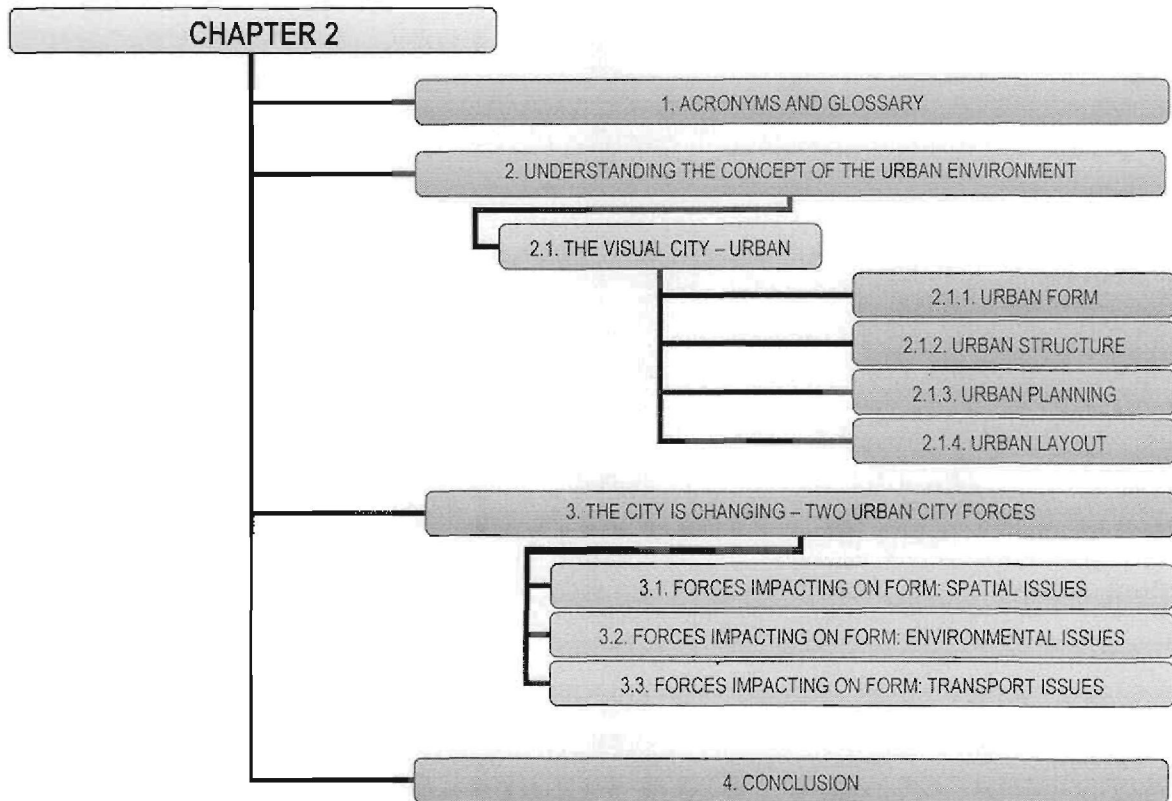
Chapter 7 presents the findings and conclusions of the surveys as mentioned in chapter 6. This chapter sets a goal for the Gauteng city region from the surveys and conclusions made. It illustrates the impacts inside and outside the urban edge of Gauteng, and proposes a tool for management of this development and regulating the growth in the area. It describes the SWOT-analysis and challenges for sustainable development applicable to this study area. It presents the benefits of this approach and sets an urban form policy as part of the recommendations and proposals. It focuses on the concept of good governance as the core element in ensuring the success of the proposed plans and policies.

Chapter 8 concludes with specific recommendations for the Gauteng city region. Models of urban structure are created to accommodate the future growth and changing city form according to the spatial lessons learnt. Specific impacts on the current reality are identified and addressed in the way forward. The multi-function urban edge is proposed, and the process of urban demarcation is refined. The decision support model is introduced, as well as a sustainable development plan for the Gauteng city region.

Section A: Literature Study and Theoretical Background

Chapter 2

Existing knowledge: Urban form and related mechanisms



1 Acronyms and glossary

The following are important definitions of applicable development and planning terminology that were used in this research document. These concepts are implemented within a spatial planning context, as their meanings will show. These definitions have been formulated to relate to the context of the Spatial Development Frameworks and the Integrated Development Plans. It refers to existing policy and legal frameworks applicable to the research.

Table 1: Acronyms

DACE	Gauteng Department of Agriculture, Conservation and Environment
DEAT	Department of Environmental Affairs and Tourism
DED	Gauteng Department of Economic Development
DWAF	Department of Water Affairs and Forestry
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EM	Environmental Management
EMP	Environmental Management Programme
GAUTRANS	Department of Public Transport, Roads and Works
GCR	Global City Region
GIS	Geographic Information Systems
GPG	Gauteng Provincial Government
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
MSDF	Metropolitan Spatial Development Framework
NEMA	National Environmental Management Act
NSDP	National Spatial Development Perspective
NSDS	National Sustainable Development Strategy
PGDS	Provincial Growth and Development Strategy
SD	Sustainable Development
SEA	Strategic Environmental Assessment
UDB	Urban Development Boundary
UE	Urban Edge
UN	United Nations
UNSCD	United Nations Commission on Sustainable Development
WSSD	The World Summit on Sustainable Development

Table 2 describes some of the important concepts within the context of this study.

Table 2: Glossary

Agenda 21	A programme of action for sustainable development, which was adopted by the General Assembly of the United Nations following the Earth Summit in Rio de Janeiro in 1992. The need to include the social and economic dimensions of development, in addition to concerns for the natural environment. This is the guiding principles of sustainable development, as illustrated in this study.
Compact	More people live in a smaller area and this higher density requires efficient provision of public transport, social and other services. The antithesis of a compact city is urban sprawl. This study will evaluate the efficiency of a compact city region in Gauteng.
Corridor	Strip of territory, giving access to somewhere. Examples are transportation corridors. The city region has various corridors currently shaping the development pattern.
Densification	Developing vacant land and allowing stands to be sub-divided to ensure the number of people living in more sparsely populated areas is increased. This is a way of giving more people access to land that is already serviced and increasing the efficiency of the city.
Density	Gross residential density is the overall number of dwelling units divided by the total size of the area. Net residential density expresses the number of dwelling units divided by the size of the area that is taken up by residential use only. Higher residential densities are encouraged along arterials and around nodes as they make the provision of services and public transport viable, as illustrated in this study.
Development	A process for improving human well-being through a reallocation of resources that involves some modification of the environment. It addresses basic needs, equity and the redistribution of wealth. Focus is on quality of life rather than quantity of economic activity.
Environmental management	The management of the environmental aspects and elements to enhance the qualities of the natural environment. This forms an integral part of the study, as the researcher will aim to integrate environmental management concepts and spatial planning concepts.
Environmental sustainability	Environmentally sustainable activities do not deplete environmental resources faster than they can be regenerated, or threaten the viability of ecological systems. It is the ability of an activity to continue indefinitely, at current and projected levels.
Fragmented development	Urban development that takes place in an <i>ad hoc</i> fashion without being integrated into, or related to, the surrounding areas. It results in a break in the urban fabric. This is illustrated in terms of the urban sprawl phenomenon in this study.

Functional integration	Linkages and coordination between different services, sectors or departments that ensure that a broader vision, strategy and programmes are established.
Growth management	A term that encompasses a whole range of policies designed to control, guide or mitigate the effects of growth. This concept is to be implemented in the Gauteng city region.
Hinterlands	Hinterlands refer to the areas surrounding urban centres that are not part of the urban settlement, but are economically, socially or functionally linked to the urban centre.
Integrated development	An integrated and holistic approach to the development planning process is of paramount importance. This implies that the interrelationship between economic activities and other development dimensions such as social, demographic, institutional, infrastructural, financial and environmental aspects should be carefully considered.
Integrated environmental management	A code of practice ensuring that environmental considerations are fully integrated into the management of all activities in order to achieve a desirable balance between conservation and development.
Linkages	Urban areas are usually linked to surrounding rural areas in ways that create inter-dependencies between urban and rural well-being.
Mixed-use development	Mixed-use development locates residential, commercial and industrial land-use in close proximity to one another. This makes the area more convenient for residents.
Nodes	A node is a place where both private and public investments tend to concentrate. Nodes are different in terms of size, the types of activity that occur within them, the size of the areas served and the significance within the city. For purposes of this study, nodes were created for environmental spheres, transport spheres, economic spheres and social spheres.
Rural character	Areas contain mature and natural landscapes with an informal placement of trees. The area is characterised by indigenous vegetation, and increasing agricultural activities.
Spatial development initiatives	Coordinated programmes involving multiple departments and all three spheres of government focusing on particular areas of the country with high development potential. These initiatives are to be implemented within the Gauteng city region.
Spatial development planning	A participatory process to integrate economic, sectoral, spatial, social, institutional, fiscal and environmental strategies in order to support the optimal allocation of scarce resources between sectors and geographic areas, and across the population, in a manner that promotes sustainable development, equity, and empowerment of poor and marginalised communities and groups.
Spatial integration	Spatial integration is a strategy for doing away with the expensive and exclusionary land-use patterns. It seeks to enhance the efficiency of the city by placing residential development closer to job opportunities, and reduce the costs of development by exploiting surplus bulk infrastructural capacity. Spatial integration also has a social dimension and can increase the access of low-income residents to facilities and opportunities in the city.
Sustainable development	Sustainable development implies economic growth together with the protection of environmental quality, each reinforcing the other. The essence of this form of development is a stable relationship between human activities and the natural world, which does not diminish the prospects for future generations to enjoy a quality of life at least as good as our own (Brundtland Commission, 1987:47).
Sustainable development indicators	Sustainable development is a concept that has often been viewed as being difficult to measure or even to understand in an operational sense. By using indicators, it is possible to identify specific signs, trends or warnings that enable monitoring and evaluation to take place.
Urban	A city, town or node of activity. Can be closely linked to the density of development and the nature of the services required for that development.
Urban edge	A demarcated line that serves to direct and control the outer limits of urban expansion. Outside the continuous urban development of the metropolitan core area, urban development should only be permitted within small towns and rural nodes, and in areas where the environment and agriculture are not compromised.
Urban development boundary	The transition between urban and rural areas. The point to where the development pressure of the urban environment stretches. The urban environment, containing all the forces of transport, environment, institutions and governments.
Urban sprawl	An undesirable situation in which the geographical size of the city keeps expanding to include development of new areas. The antithesis of a compact city.

Source: Own construction from existing policy and legal frameworks applicable to the research theme

The policy and legal framework, as applicable to planning and development, will be used as the directive principle for purposes of this study. Table 3 gives an overview of the applicable policies, legislation and guidelines. (See Annexure F for a comprehensive list).

Table 3: Legislation applicable to development in South Africa

Policy	Legislation	Guidelines
• Reconstruction and Development Plan (1994). • Growth, Economic and Redistribution Strategy (1996). • White Paper on South African Land Policy (1997). • Urban Development Framework (1997). • Rural Development Framework (1997). • Green Paper on Development and Planning (1999). • White Paper on National Transport Policy (1996). • Moving South Africa (1996). • White Paper on Local Government (1998). • Strategic Environmental Assessment in South Africa (2000). • National Integrated Rural Development Strategy (2000). • White Paper on Spatial Planning and Land Use Management (2001). • National Spatial Development Perspective (2003). • Mining Charter (2003). • Construction Charter (2004).	Existing Legislation • Municipal Systems Act, 2000 and Regulations on Municipal Planning and Performance, 2001 (Regulation R796). • Development Facilitation Act, 1995 – Chapter 1 Principles. • Gauteng Panning and Development Act (2003) and Draft Regulations. Future Legislation • Land Use Management Bill (2003). Other National Acts that must also be taken into consideration • Urban Transport Act. • Land Transport Transition Act. • Water Services Act. • Environment Conservation Act. • Housing Act. • National Land Transport Interim Arrangements Act. • National Environmental Management Act. • Municipal Structures Act. • National Heritage Resources Act (Act 27 of 1999). • National Transport Transition Act (Act 22 of 2000). • Municipal Finance Management Act (Act 56 of 2003).	IDP Manuals (Department of Provincial and Local Government) Resource Document on the Chapter 1 Principles of the Development Facilitation Act, 1995: (Development and Planning Commission, 1995) Strengthening Sustainability in the Integrated Development Planning Process: National Framework Document – Department of Environmental Affairs and Tourism, 2002 Strategic Environmental Assessment in South Africa: Guideline Document – Department of Environmental Affairs and Tourism, 2000 Green Paper on Development Planning: National Development and Planning Commission, Department of Land Affairs, May 1999 White Paper on Spatial Planning and Land Use Management (2003)

Source: Schoeman (2006:2)

The following matrices are a summary of the most important theoretical concepts as guided by applicable legislation that will influence this study in terms of spatial planning and environmental management in South Africa.

Table 4: Theoretical concepts guided by applicable legislation

Issue	Guiding	Type	Details
Good governance	Legislation	Constitution Republic of South Africa	The Constitution provides the legal framework in terms of which the national and provincial spheres can exercise law-making powers.
	Legislation	Municipal Structures Act No. 117 of 1998	To provide for the establishment of municipalities in accordance with the requirements relating to categories and types of municipality; to establish criteria for determining the category of municipality; to define the types of municipality.
	Legislation	Municipal Systems Act No. 32 of 2000	To define the legal nature of a municipality; to provide for the manner in which municipal powers and functions are performed; to provide for community participation; to establish a simple and enabling framework for the core processes of planning, performance and management.
	Policy	White Paper on Local Government. 1998	It places municipalities at the centre of planning. It emphasises integrated development planning as a tool for realising the vision of developmental local government.

Development	Legislation	Development Facilitation Act No. 67 of 1995	A "fast-track" approach to development. It resolves conflicts through "development tribunals" at provincial level. Facilitates development of settlements, discourages land invasions, promotes efficient and integrated land development, discourages urban sprawl, makes maximum use of resources and provides guidance and information to people.
	Policy	Green Paper on Development and Planning. April 1999	The emphasis is on co-operative governance between national, provincial and local spheres of government. The Commission emphasises the importance of establishing a shared vision and consistent direction for spatial development based on protecting the rights of people and the environment.
	Guidelines	Social housing policy. Jul 2003	Creates an enabling environment for the social housing sector to develop, grow, and deliver at scale. An overarching document focusing on the basic principles, framework and institutional parameters required in the sector to ensure that viable, robust housing institutions are established and are operating.
	Guidelines	Integrated Development Plans	A key tool for local government to cope with its developmental role. Integrated development planning is now seen as a function of municipal management, as part of an integrated system of planning and delivery. Guides decisions on issues such as municipal budgets, land management, promotion of local economic development and institutional transformation.
	Policy	Land Use Management Bill. 2003	Provides for the uniform regulation of land use management in South Africa, sets principles for spatial planning, land development and land use management, provides for spatial development frameworks, guides certain laws, provides for matters connected.
	Policy	National Spatial Development Perspective (NSDP) 2006	Endorsed by Cabinet in March 2003 to ensure: economic growth, government spending on fixed investment on localities of economic growth, future settlement and economic development channelled into activity corridors and nodes adjacent to the main growth centres, informs the respective development plans of the three spheres of government and gives support to government's national spatial development vision.
	Legislation	Housing Development Act 107 of 1997	Principles for the development of housing. Framework for operating in subsidy market. Defining roles of the key players in the sector.
	Guidelines	Gauteng Growth and Development Strategy 2005.	It is intended to build a sense of provincial unity and responsibility among all sectors of society towards reducing poverty and unemployment.
	Guidelines	Gauteng Global City Region Perspective 2006	Advocates the need to now pro-actively support and stimulate growth and development in Gauteng in order to strengthen the notion and ideal of establishing the Province as a city region.
	Guidelines	Gauteng Strategy for Sustainable Development 2006	Illustrates the desired state for sustainable development in the Province. Long-term development strategy that takes poverty and unemployment, intergovernmental co-operation, socio-economic sustainability and global competitiveness, environmental deterioration, population growth, and health issues, into account.
Rural development	Policy	Integrated Sustainable Rural Development Strategy (ISRDS). November 2000	The ISRDS is designed to realise a vision that will attain socially-cohesive and stable rural communities with viable institutions, sustainable economies and universal access to social amenities, able to attract and retain skilled and knowledgeable people, equipped to contribute to growth and development.
	Policy	Rural Development Framework 1997	Describes how government aims to achieve a rapid and sustainable reduction in absolute rural poverty.
Transport	Legislation	National Land Transport Transition Act No. 2000	To provide for the transformation and restructuring of the national land transport system of South Africa, and to provide for incidental matters.
	Policy	Moving South Africa. 1996	MSA was designed to produce a data-driven programme for strategic action that extends the short to medium-term policy formulation documented in the Transport White Paper, into a long-term strategic formulation embodying the sets of trade-offs and choices necessary to realise the vision as set in the White Paper.
	Guidelines	Gautrain Feasibility study	Alleviating the severe traffic congestion, stimulating economic development, and ensuring environmental advantages over other forms of transport.

Environmental	Legislation	National Environmental Management Act (Nema). No. 107 of 1998	The National Environmental Management Act provides co-operative, environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions; and to provide for matters connected therewith.
	Guidelines	Environmental Impact Assessment	A study of the environmental effects of a decision, project, undertaking or activity. It is used within an Integrated Environmental Management (IEM) planning process as a decision support tool to compare different options.
	Guidelines	Strategic Environmental Assessment	Relates primarily to the planning and programme level. SEA aims to ensure that environmental issues are addressed from an early stage in the process of formulating policies, plans and programmes, and incorporated throughout this process. It is a proactive management instrument.
Spatial Planning	Policy	Urban Development Framework. April 1997	Examines current dilemmas and realities facing South Africa's urban areas. It provides a positive and common vision of a desired future for South Africa's urban areas in the year 2020. Contains Government's vision for sustainable urban settlements, as well as guidelines and programmes for the achievement of the vision.
	Policy	Land Use Management Bill. 2003	Provides for the uniform regulation of land use management in South Africa, sets principles for spatial planning, land development and land use management, provides for spatial development frameworks, guides certain laws and provides for matters connected therewith.
	Policy	National Spatial Development Perspective (NSDP). 2006	Endorsed by Cabinet in March 2003 to ensure economic growth, government spending on fixed investment on localities of economic growth, future settlement and economic development channelled into activity corridors and nodes adjacent to the main growth centres: informs the respective development plans of the three spheres of government and gives support to government's national spatial development vision.
	Guidelines	Land Use Management Schemes	Land Use Management is the system of legal requirements and regulations that applies to land in order to achieve desirable and harmonious development of the built environment. The LUMS is the summary of these requirements for a specific area.
	Guidelines	Spatial Development Frameworks	The overall objective is to facilitate development within the local municipality in context to the metropolitan region within which it functions. It is also required to achieve economic, social and environmental sustainability related to the IDP development cycle.
	Guidelines	Town Planning Schemes	Town Planning Scheme describes the property zoning that is applicable and which determines such aspects as possible land use, floor area, coverage, building lines, parking provisions etc. There are presently different Town Planning Schemes for different areas of the city.
	Legislation	Gauteng Planning & Development Act, No 3 of 2003	A Municipality shall formulate and adopt a single zoning Scheme for all land within its municipal area (Section 45(1)). Provides for a single system of development, planning and land management in the Province and sets out principles for planning and development. Therefore to create a framework for the preparation of development plans and frameworks.

Source: Own creation from various sources (2008)

The concept of the urban development boundary as a planning tool to deliver sustainable urban form, is the primary focus of this study. Before evaluating the concept of the urban development boundary, the urban environment in which it must function, should be defined and understood, as well as the current urban morphology, current structure and current form. These elements will have an effect on the efficiency and implementation of the urban development boundary concept, as well as on the sustainability of the Gauteng urban area.

Metropolitan areas have certain characteristics that the urban development boundary must respond to. The urban development boundary must also adhere to the spatial planning and environmental management policies and initiatives that exist within the town planning schemes applicable within the urban development boundary area and by being a tool, and a catalyst, integrate these two concepts to direct growth, planning and layout to a sustainable urban form and future sustainable city region.

The theoretical foundation is therefore built on these concepts, their impacts on the urban environments, and the resulting urban forms that occur worldwide.

2 Understanding the concept of the urban environment

The urban environment is known as the city. What is a city? What is the function of the city? Is there an optimal city? These are the core underlying questions of the introductory part of this study. The aim to develop the ideal city is the origin of the town planning practice. Alongside organic communities, planned cities and towns have existed from ancient times. Often they followed a simple grid laid over the landscape, with houses placed side by side along straight streets. In the Renaissance (15th century), rulers of city-states aimed at achieving grand effects, with bold geometry and large public areas. In the Baroque era (17th century), this tendency grew and monumental architectural and landscape ensembles were designed and built. Examples include Louis XIV's Palace of Versailles (17th century) and Pierre L'Enfant's plan for Washington DC (18th century).

Belief in a new form of community with all the advantages but none of the disadvantages of town and country evident in an industrialising England in the 19th century, led Ebenezer Howard to develop his Garden City ideas. He published his influential book, *Tomorrow: a Peaceful Path to Reform*, in 1898. It was reissued as *Garden Cities of Tomorrow* in 1902.

Howard had many influences, and called his work a 'unique combination of proposals'. His design ideas were influenced by both dignified Georgian towns like Bath and Modern Park and community plans, including Frederick Law Olmsted's model suburb of Riverside (1869), near Chicago. Australia also inspired Howard. He included a sketch of the plan of Adelaide, designed in the 1830s by Colonel William Light in his book. Splitting the city into smaller sections surrounded by parklands was a major influence on the idea of the green belt.

Howard's Garden City ideas inspired the development of Letchworth in 1903. Located in Hertfordshire, outside London, it was Britain's first planned garden city. Its designers, Raymond Unwin and Barry Parker, also planned Hampstead Garden Suburb in London in 1907.

A city is thus a relative term that displays the needs of the people and residents. In order to understand what a city is, one needs to ask: What are the expectations of the city? Citizens expect a good quality of life. This means a good and safe environment, fresh water and clean air, food and accessibility. It can be summarised as the well-being of people. People are interested in enhancing their well-being. Citizens expect a high-quality life provided to them, by the city and urban environment.

The urban sector and urban environment are also characterized by certain issues as captured in the Urban Development Strategy, remaking South Africa's cities and towns (Ministry of the President, 1995):

- Size: There are four principal city size classes: large metropolitan areas (over 2 million); large cities (500,000 to 2 million); medium-sized cities (100,000 to 500,000); small cities and towns (up to 100,000).
- Service: There are stark contrasts in terms of well-serviced suburban neighbourhoods versus under-serviced lower-income neighbourhoods with few economic opportunities.
- Economy: Economic challenges like the need to diversify, as well as strengths, like concentrated and diversified economies, productive infrastructure on scale, and dynamic institutions and social networks.
- Links to rural areas and wider regional development realities: This means that urban development cannot be viewed in isolation from the wider national context.
- Opportunities: Urban growth does not necessarily mean greater problems, as it also offers many opportunities.

The city is thus the container and catalyst to deliver a qualitative well-being to the people. If seen from this perspective, the function and importance of the city must be placed on top of the priority list. The function and effectiveness of the city are determined through the urban structure, form, planning and layout and are therefore of great importance because of the impact it will have on the human well-being. Accordingly the typical urban structures and forms, planning and layout objectives will be analysed and evaluated in order to create the best development proposals in terms of sustainable development and sustainable urban form.

2.1 The visual city – urban morphology

Although Western Europe cannot claim to have produced the very first cities, it was the first world region to establish a true urban system and the first to experience urbanisation and *masse* (Stanley & Williams, 1993:85). The dominance of the European vision of compact cities as ideal places to live has been questioned by Jenks and Burgess (2000:11) in terms of sustainability. The terms “urban intensification” and “consolidation” was introduced, which relates to the range of processes that makes an area more compact and according to the European vision, more sustainable. A sustainable compact city requires denser forms of new development, and the intensification of existing urban areas. This also implies effective spatial planning and development that integrate all other spheres – transport, infrastructure, social aspects, services etc. (Breheny, 1992:241).

The urban morphology was shaped by various planning directions. These planning directions changed over time and moved the development focus from ideal industries, to improving legislation, to skyscraper cities, to cities built for cars, to shopping cities, to the current phenomenon of the megalopolis. This was seen in the simultaneously changing urban morphology. The core directions of planning are described in the following table.

Table 5: Impacts and new directions for planning

Ideal industries	The squalor of industrial slums motivated some enlightened British employers to create model villages and towns to provide better housing and living conditions for their workers. Soap manufacturer William Lever created Port Sunlight near Liverpool, England. These employers linked decent living conditions with industrial productivity, but their communities also provided design ideas for others to follow and improve upon.
Legislating improvement	Recognition that frameworks were needed to ensure the orderly development of towns and cities led to new planning laws. A variety of new rules covered issues such as land use zoning, population density and building height limitations. Along with these ‘statutory’ regulations came detailed city studies with strategic recommendations. Scottish planner Patrick Geddes is associated with the influential mantra of ‘survey-analysis plan’.
The skyscraper	Innovative construction methods changed the scale of urban development. The new methods allowed high-rise buildings supported by steel frames rather than load-bearing walls. The skyline of the central city changed dramatically. Futurists such as Swiss architect Le Corbusier envisaged entire new cities as tower blocks in parkland settings.
Cities built for cars	The motorcar also had a dramatic impact on the structure of modern cities and their planning. New philosophies of road design emerged in the United States and Britain in the early 20 th century. In 1906, the first limited access motorways appeared in New York with the Long Island Motor Parkway (1906–11) and the Bronx River Parkway (1906–23). In 1938, British policeman Alker Tripp refined the idea of the road hierarchy. The width and capacity of a street would be determined by its traffic function, industrial or residential traffic.

Drive-in shopping	The motor car's major impact was felt from the mid-1920s. In the United States, an economic boom led to major retailers building department stores in the new suburbs. In 1923, the Country Club Plaza, one of the first automobile-oriented shopping centres, opened in Kansas City. Another significant 20 th century development was the invention of the enclosed climate-controlled shopping mall. The first – Southdale Shopping Centre near Minneapolis – opened in 1956. These developments expanded the scale of planning and highlighted the interrelationship of land use and transport development.
The megalopolis emerges	In the 1930s, the powerful New York municipal official, Robert Moses, developed the Henry Hudson Parkway down the western side of Manhattan. As leisure parkways became urban freeways they helped to define a new dispersed and multi-centred urban form. Driven by rapid population growth after the Second World War, big cities sprawled and often interconnected with each other to form what geographer Jean Gottman dubbed 'megalopolis'. The growth pressures faced by western cities in the 20 th century are now being surpassed by Asian cities in the 21 st century.

Source: Own creation from various sources (2008)

Sustainability must be supported by the urban morphology, urban structure and urban form, because these concepts will have a vice versa effect on one another. The urban environment and its functions must be fully understood, in order to formulate a tool, within the urban structure, that will ensure sustainable urban form and the future developments.

For purposes of this study, the focus is limited towards metropolitan areas and its developmental issues and impacts, because the primary case study is done within the Gauteng city region. Metropolitan areas are defined by the Australia Bureau of Statistics (2003), as an area with a large population centre consisting of a large city and its adjacent zone of influence, or of several neighbouring cities or towns and adjoining areas, with one or more large cities serving as its hub or hubs. A metropolitan area usually combines an agglomeration with peripheral zones closely bound to the centre by employment or commerce. These zones are also sometimes known as a commuter belt, and may extend well beyond the urban periphery depending on the definition used (Berry, 1990:12). The Gauteng city region can therefore be compared to the international concepts and case studies of metropolitan areas.

A metropolis is properly the chief city, but not necessarily the capital, of a country, state, or region (Australia Bureau of Statistics, 2003). The metropolitan area is generally regarded as a central city and peripheral jurisdictions including all surrounding territory (urban and rural) integrated with the central city (Stanley and Williams, 1993:3). Urban morphology is the result of the urban structure, the urban form, the urban planning and urban layout. These concepts will be discussed in more detail as it forms an integral part of this study.

2.1.1 Urban Form

The horizontal and vertical dimensions of a city describe the city's morphology or form. One city may be linear, for example, because of its locations in a valley or along a river, while another may be compact and clustered. Population densities may be highest in city centres. Low densities of sprawling suburban or squatter settlements may be in fringe locations. The urban form is likely to change over time with increased population, improved transportation and additional functions (Stanley and Williams, 1993:4).

Urban form is about the shape of our cities and adjacent areas, not simply in terms of appearance, but more importantly in terms of the defining characteristics, thus, the design and structure, where development occurs, what type of developments are likely to be built, what types of public and green spaces are available, and how all the areas are connected to one other.

It is vital that the region has a good urban form. Good urban form requires good, coordinated planning. The urban form determines the effectiveness of a city, the accessibility it offers, the integration between spheres, the land-uses and possible layout plans. This is the interface between environmental management, spatial planning, development goals and the requirements set by the Agenda 21. According to the European vision, the compact city is the most optimal urban form. Future development and planning seems to be directed into bigger city centres, metropolitan regions, comprising of a much larger area, but still offering the positive elements of the compact city form.

Vale and Vale (1996) point out that a city is far more than a collection of buildings, and that the city should be considered as a series of interacting systems, of which the physical form is one. This would offer a foundation to among other things, consider the meaning of a sustainable urban form.

Richard Rogers maintains that a sustainable urban form is based on a series of interlinked compact nodes or neighbourhoods (See Figure 7). These neighbourhoods grow around centres of social and commercial activity located at public transport nodes. Together they make up the compact city, which can then be defined as a network of these neighbourhoods, each with its own parks and public spaces and accommodating a diversity of overlapping private and public activities (Rogers 1997:38).

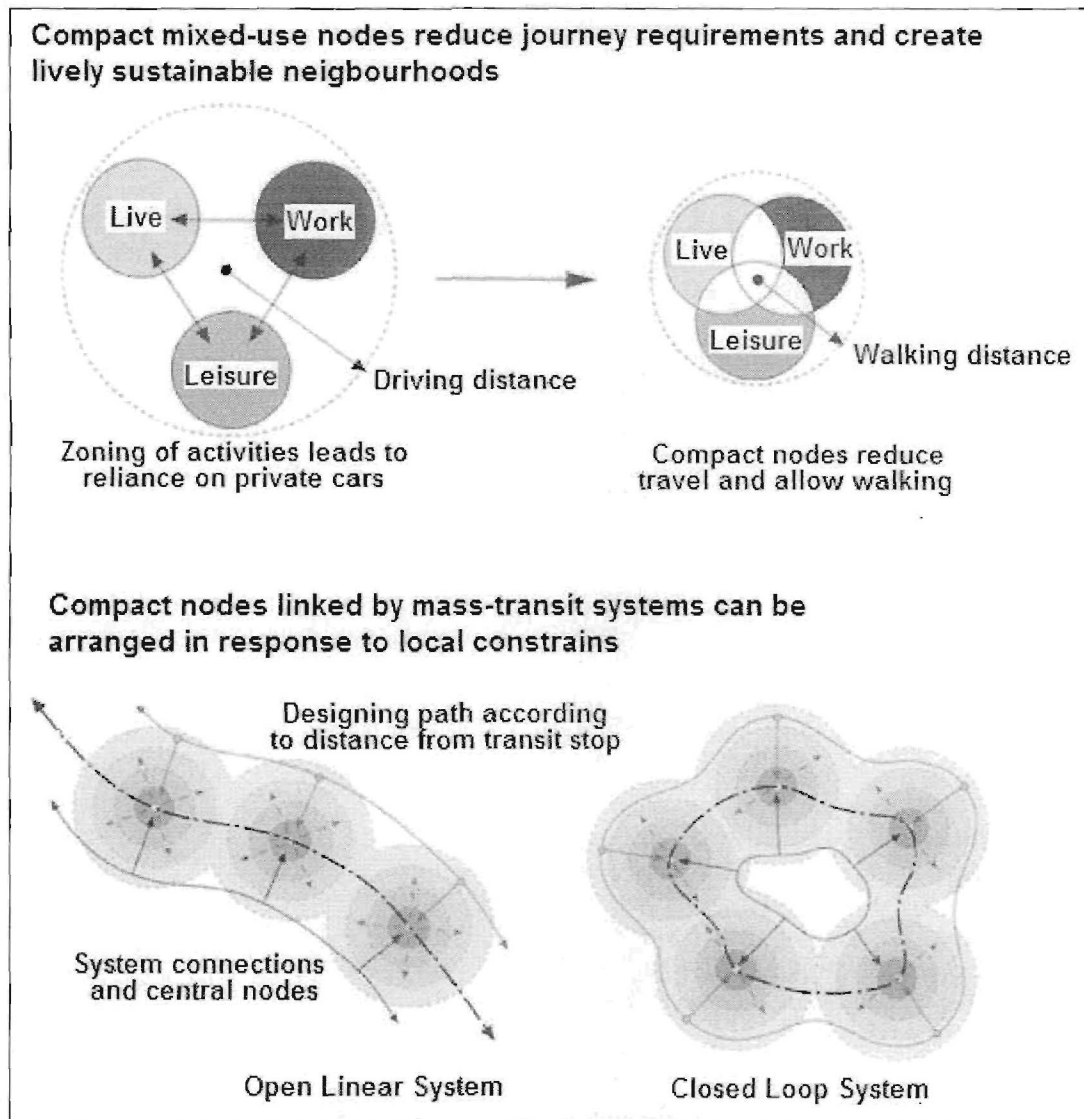


Figure 7: The compact sustainable city

Source: Rogers (1997:38)

Based on these interpretations of what a sustainable urban form should consist of, it would appear that various models of urban villages could be sustainable. The first approach advocates the creation of mixed-use neighbourhoods around accessible nodes and linked through activity spines and corridors. It emphasises pedestrian access and provides opportunities for public transport in many cases. In this way, it should improve accessibility and promote integration. The second approach is the closed-off villages or gated communities. Inside these areas, residents usually have access to improved quality environments, ample public space and amenities, multiple opportunities for social interaction and community building and even to basic services and some commercial activities as well, depending on the size of these 'urban villages'.

Much focus has been placed on the need for densification and urban compaction, but cognisance should be taken of the fact that urban form should never be monotonous. Monotony and uniformity is neither healthy nor sustainable, and hence, room must be left for variant development, especially in the South African context where land is seen to be available. It should, therefore, make provision for the entrepreneurs to create living environments that will attract them to live and invest in the area (Gauteng, 2007:34).

The detailed development within the urban form is known as the urban structure. Following are models of the core urban structures, as developed over the years.

2.1.2 Urban Structure

A variety of theories has been developed to describe the pattern of land uses within cities. The most-accepted theories that analyse the internal spatial structure of cities are summarised below in the following models of urban structure. This was analysed in order to be able to evaluate the current urban structure models.

Table 6: Urban structures

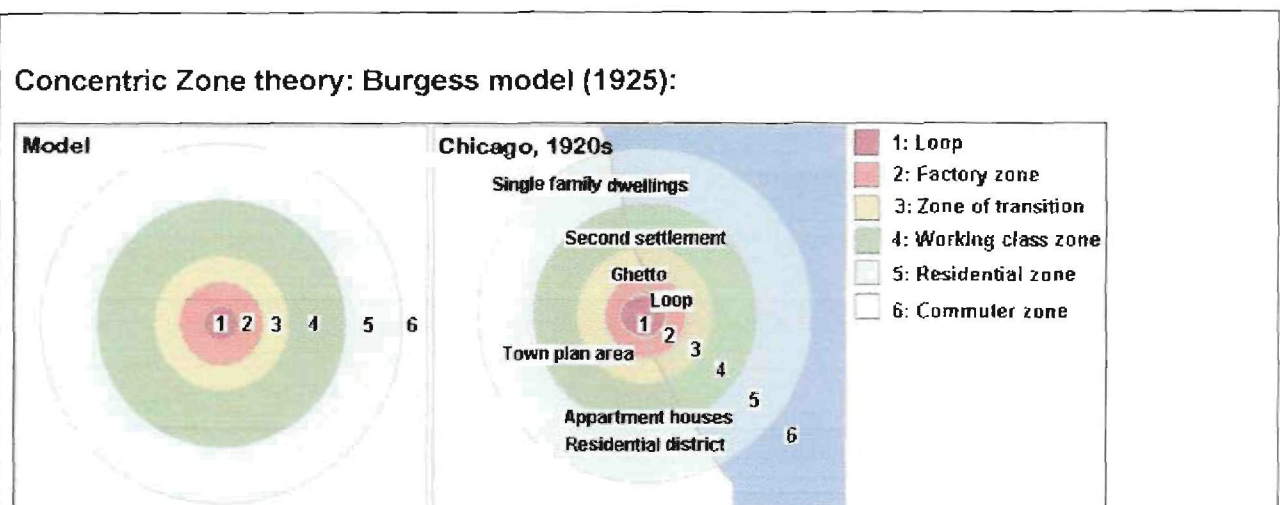


Figure 8: The Burgess model

Source: Rodrigue, Comtois, and Slack (2006)

Positive aspects	Negative aspects	Opinions	Study relevance
City grows from its expansion in the centre, outwards to create a series of concentric zones of different character.	Urban growth is thus a process of expansion and transformation of land uses. Urban sprawl is enhanced.	This representation was built from observations of a number of American cities. The structure of growth is one dimensional, where cities are complex, multi functional, with different elements and impacts.	Illustrating ways to optimise the urban core and zones of character, but seeking to limit the occurring urban sprawl.

The Sector theory: Hoyt model (1939):

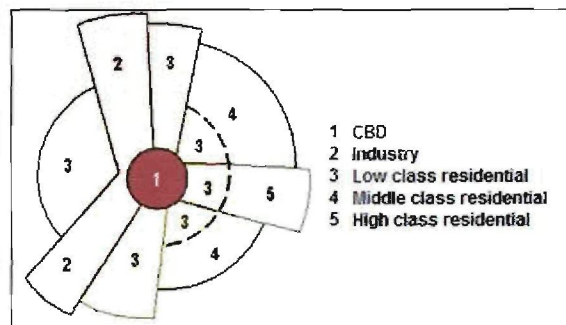


Figure 9: The Hoyt model

Resource: MacIntyre (2006:24)

Positive aspects	Negative aspects	Opinions	Study relevance
Illustrate the essence that if one sector of the city first develops as a high, medium, or low rental residential area, it will tend to retain that character for long distances as the sector is extended outward	The city develops in a series of sectors, not rings. Once a district with "high-class" housing is established, the most-expensive houses are built on the outer edge of that district.	Certain areas are more attractive for different activities. Fragmentation is enhanced and thus there is a need for greater integration.	The apartheid city developed in this way and therefore the researcher needs to evaluate these positive aspects in order to seek ways to transform the current South African cities by limiting the urban sprawl.

Multiple nuclei theory: Harris and Ullman model (1945):

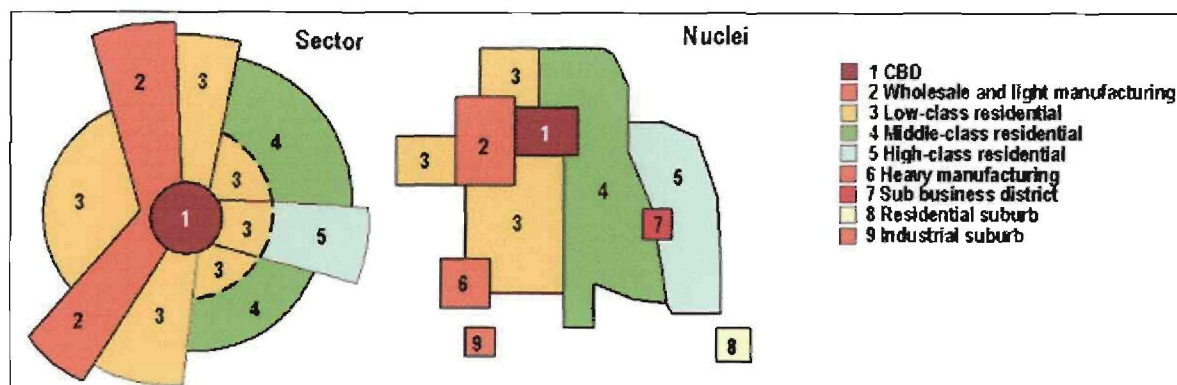


Figure 10: The Harris and Ullman model

Source: York University (2006)

Positive aspects	Negative aspects	Opinions	Study relevance
Described urban form in which the land-use pattern of a city grows around several nuclei, and not just one central core.	Communication axes, such as rail lines and major roads, are mainly responsible for the creation of sectors.	This model was the first to represent the fragmentation of urban areas, specialised functions as well as suburbanisation.	A city region needs to integrate all the nodes, corridors and growth points. This model can be implemented within the city region concept.

Source: Own creation (2008)

The above-mentioned models illustrate urban structures that developed differently, mainly because of different growth directions. These growth directions are shaped by density patterns. At this stage of the research, it is concluded that the urban structure is thus directly related to the density pattern, and vice versa.

The density zones that are responsible for the change in the urban structure are accordingly described in Table 7.

Table 7: The four key Density Zones

Concentration Zones	
Description	Pre-requisites:
Under this classification, reference is made to locales directly influenced by transportation or concentration of economic activity. • High Density Zones: Focus on high-density areas, medium to high-rise residential developments and nodes of metropolitan importance. Aim to integrate public and private transport network and to proactively manage the development in this zone, in order to create a legible and stimulating lattice of activities (Tshwane, 2005:18). • Transit Promotion Zones: Refer to nodes that are centred on transportation nodes or facilities. There exists a range of nodes differing in needs and scale, e.g. those playing a significant role in a provincial/regional scale and those that are limited to a metropolitan significance.	• Urban design qualities. • Upgrade engineering services. • Pedestrian/cycling facilities. • Inter-modal transfer facilities at train stations upgraded. • Mixed land uses. • Social and recreational facilities to support the increased residential population.
Linear Zones	
Description	Pre-requisites:
A distinction must be made between linear developments where there are limited access (high mobility function) and linear developments where there are high levels of access (high activity function). • Activity Spine: A major axis/transport route that runs through the city. A mix of public and private transport will be prevalent on such routes and a mix of land uses will be the dominant trend. This provides linkages between nodes and in so doing, it also attracts development (Tshwane, 2005:21). • Development Corridors: Signal the development occurring along a major transport route. Direct access to features lining the corridor is restricted with the number of stops of public transport further apart from each other. There is a stronger correlation between the development and its surrounding environment than there is with the corridor itself.	• High quality efficient public transport system and facilities. • Appropriate level of engineering services.

Suburban Densification Zones

Description	Pre-requisites:
Existing low-density areas where there is potential for moderate densification through subdivisions, second dwelling houses and cluster housing developments. Application in areas that are close to places of employment, major retail centres and prominent transport routes. Higher densities should be promoted around local nodes, social facilities and open spaces/recreation facilities (Tshwane, 2005:23).	• Set up public transport connections between suburbs. • Pedestrian and cycling access to local nodes. • Sufficient capacity of roads.

Low Density Zones

Description	Pre-requisites:
Typified by mono-functional suburbs, which play host to mostly high-income earners. Access to public transport is limited to that which serves domestic workers in the area. Privately owned motor vehicles constitute the major flow of traffic. Retail centres are often not in close proximity to such zones and there is little or no mix of land uses present. A typical location would be peripheral areas but could also include areas more centrally located but with special circumstances/characteristics.	• Provisions should be made to ensure that new large-scale developments in the periphery do not lead to low quality, monotonous environments.

Source: Own creation (2008)

The various density zones cannot be read in isolation of each other, but may in many cases be interlinked to each other (e.g. a concentration zone and a development corridor). It should also be considered that the city is a dynamic entity, with various areas changing their function and character over time. The density zones should therefore be demarcated in such a way that future change can be accommodated. Any type of development should not restrict the future dynamics in an area. The conceptual image illustrates the linkage between the density zones.

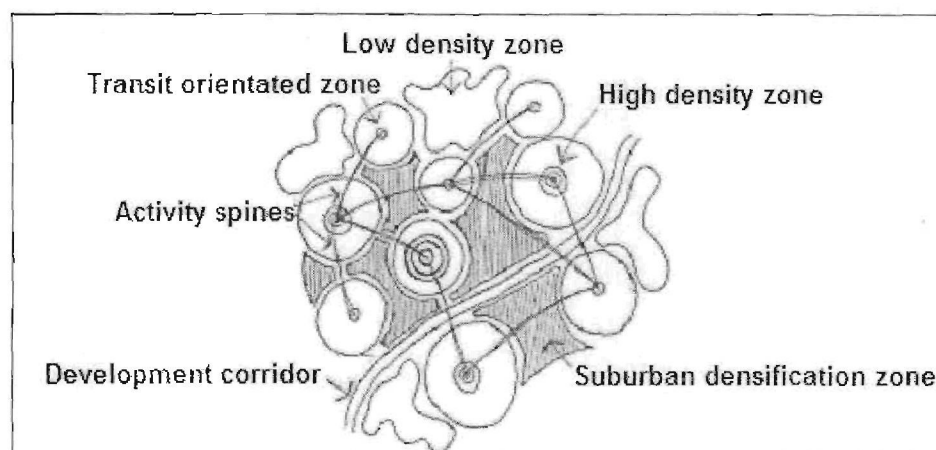


Figure 11: The concept of density zones

Source: Tshwane (2005:20)

Quality of life and resource efficiency are two elements of urban sustainability that are determined by the urban structure and form (Pavel, 2007:17). The urban form and urban structures therefore act as a point of departure for future development and planning. It illustrates models and concepts that were successful within the urban environment. It provides possible ways to think of the future developments and planning. Current urban planning and spatial development plans need to integrate these successful concepts within the current urban reality.

2.1.3 Urban Planning

The aim of urban planning, internationally and nationally, is to create ideal cities in terms of competitive environments, qualitative environments and sustainable environments. During the Urban Development Conference held in Johannesburg (28 and 29 September 2005), the following five approaches were suggested to ensure more competitive city policies and strategies (Wilson, 2005:5):

- 1) Cities must know their context better: Understand their market and demographic trends, such as patterns of migration, and recognise their assets and liabilities.
- 2) Cities must get the basics right: Good schools, safe streets, competitive services, good infrastructure, and a functioning land market.
- 3) Cities must build on their assets: Fixed institutions, universities, colleges, hospitals. Grow around employment clusters and economic sectors, and cultural institutions.
- 4) Cities must build on their family and community wealth: Be inclusive cities, not just productive. Income support, services, housing, and integration are critical.
- 5) Cities must look beyond their own boundaries: Metropolitan growth influenced by governance and decision-making across boundaries and between entities.

The establishment of urban settlements is a process and not a designed end-product (Behrens & Watson, 2000:iii). It is neither possible nor desirable, at any point in time, to 'design' an urban environment. Enriching urban environments are the result of collective and individual actions and reactions over time. The layout plan is thus a spatial framework where investments can be made over time, it is a tool to initiate and facilitate, rather than prescribe.

Behrens and Watson (2000:iv) developed six concerns that layout planning should address:

- Making of unique places and scaling of urban environments to human dimensions.
- Maximisation of access for the greatest number of people.
- Creation of economic activities to ensure efficient use of limited resources.
- Maximisation of choices available for communities.

Current South African layout guidelines, in the form of the 'blue', 'green' and 'red books', are based on inappropriate planning concepts imported from First World countries like the United States and Britain. Among other things, these concepts assume household incomes and levels of private car ownership that do not exist in lower income countries (Behrens & Watson, 2000:1). The other core factor is the lack of informed community participation in the South African approach. Different approaches have been developed at different scales and levels of abstraction. The following approaches illustrate broad shifts in the layout approach present in South African cities. The objectives in all of these approaches were summarised by Behrens and Watson (2000:13) and are listed below:

1. To create urban environments that improve the quality of life.
2. To facilitate the circulation of people, goods, services through the variety of transport modes.
3. To facilitate provision of public facilities by identifying appropriate locations and quantities.
4. To facilitate the provision of the full range of utility services by ensuring that the spatial and topographical requirements are met within the layout.

In essence, it is less about what infrastructure is provided, than about how the infrastructure that is provided is arranged in space that initiates the development of the urban environments of quality and future sustainable development. This will have a great impact in South Africa, as it differs from the current layout planning in the following ways:

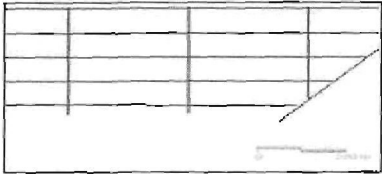
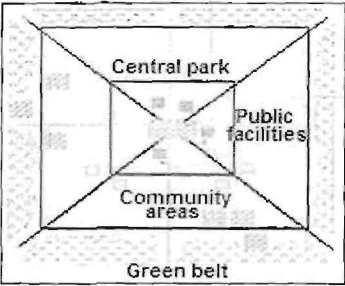
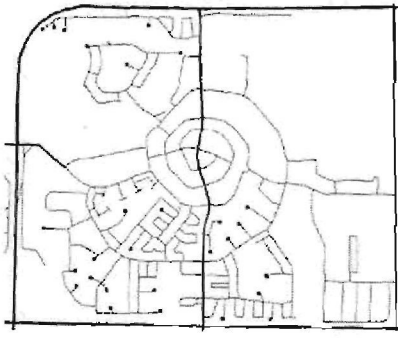
- Standardised layout planning must be transformed: development must respond to the cultural and natural features, promoting the creation of a sense of uniqueness.
- The functions of the road and infrastructure must be transformed: The primary movement function should change into a hierarchical network of public spaces, ordering the element of urban settlements.
- Closed car-orientated road geometries must be transformed: It should manifest as open, flexible road geometries within a multi-functional road network that promote public transport service and pedestrian access.

These principles and urban planning objectives were implemented into the reality of urban environments and accordingly different urban layouts arise. These urban layouts are described and evaluated next.

2.1.4 Urban Layout

The urban planning determines the vision and way forward for the urban environment. Urban layout needs to adhere to these set requirements and objectives. The urban layout is thus seen as the implementation of the urban planning vision. Table 8 is a summarised description of the most important urban layout models.

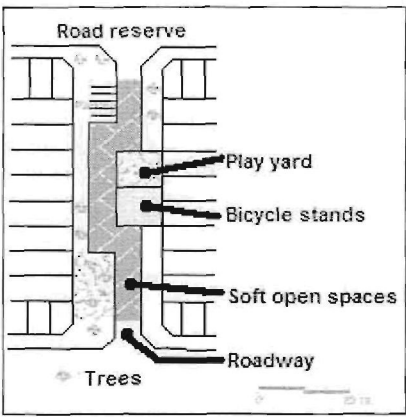
Table 8: Different urban layouts

Gridiron: Developed in early European settlements. Most common plan at the turn of the century. Adoption in most planned developments in the colonised world.		
Principle concern Greatest possible number of sites from a parcel of land. 	Characteristics - Open-road network. - Clearly defined hierarchy. - Facilitates circulation of pedestrians and public transit. 4-legged intersections. - Public facilities are located along intensive movement routes.	Criticism - Does not consider topography. - High costs of drainage and sewerage. - High traffic volumes in residential areas due to open road network. - Many intersections and accidents. - Traffic speeds on long roads. - Monotonous urban environments.
Garden City: The British Garden City movement emerged at the turn of the century, motivated by the writings of Ebenezer Howard (MacIntyre, 2006:39). It sought a balance between the best attributes of cities and countryside's.		
Principle concern Rural depopulation. 	Characteristics - Self-contained satellite towns. - Surrounded by green spaces. - Low residential densities. - Separation of land uses. - Open road networks. Radial roads, straight lengths of road. - Facilitate public transport services.	Criticism - Low density does not promote self containment. - Separation of land uses results in long and increased work and non-work trip lengths. - Inconvenient places to live. - Overcrowded and polluted housing.
Neighbourhood Unit: Developed in the United States in the 1920's by Clarence Perry. This concept emerged in response to the rapid urbanisation. It transformed the large metropolitan areas into neighbourhoods similar to the small rural towns.		
Principle concern Create independent social units. 	Characteristics - Low residential densities. - Large expansion of open space. - Required the support of an elementary school. - Fairly open road network. - Curvilinear street pattern. - Public facilities are located around a central public space.	Criticism - The concept oversimplifies the complex social relationships and interactions of community. - Demographic composition and sharing of facilities. - Segregate social classes into spatially-exclusive urban environments. - Car orientated, therefore difficult for pedestrians to access.

Radburn Super Block: The Radburn concept was developed by Clarence Stein in 1928 in New Jersey. This was similar to the neighbourhood unit, but accommodated vehicle and transport networks.

Principle concern	Characteristics	Criticism
Create identifiable community units. 	- Cul-de-sac layout. - Free from through-traffic. - Physical separation of pedestrian and vehicular movement. - Footpaths and service roads. - Public facilities are located within the super block. - Public transport is connected to the pedestrian network and arterial routes.	- Pedestrian and vehicular movements cannot be totally separated. - Not all destinations can be reached via foot.

Woonerf Concept: The Woonerf concept was developed by Niek de Boer in 1963 and adopted in the national legislation of the Netherlands in 1976 (Behrens & Watson, 2000:25). Transport and pedestrian networks were integrated, but transport networks were subject to the set of pedestrian rules. The local street was no longer designed for the motorcar, but for the pedestrian.

Principle concern	Characteristics	Criticism
Road safety. 	- Low speed limits (15-20km/h). - Tree planting and public furniture. - Changes in road direction of surfacing. - Defined parking spaces. - Open and closed road networks. - Reduction of through-traffic on residential roads. - Restoration of streets as the focal points for walking, recreational and social events.	- Shift traffic problem to other roads. - Expensive road surfacing, landscaping and public furniture. - Do not promote public transport usage.

Environmental Areas: The Environmental Area concept was developed in the United Kingdom by a working group on traffic. This approach was done from the 'inside out' – dividing cities into cellular environmental areas and managing traffic first within the individual cells and then throughout the larger urban areas. Interlacing highways enable the rapid distribution of traffic between cellular environments. This approach was also to reduce the large roads and high number of intersections, and then at the same time minimising the opportunities for conflict between vehicles and pedestrians and limiting accidents. This approach did not seek to reduce vehicular traffic, but rather to organise it more efficiently and safely (Behrens & Watson, 2000:24).

Principle concern	Characteristics	Criticism
- Safety and quality of urban environments. - Decline in the utility of motorcars due to congestion.	- Strict hierarchy. - Closed road network. - Surrounded by a highway network. - Limited access. - Corridor development forms.	- No social intention. - No community units. - Public transport promotion.

Source: Own creation (2008)

3 The city is changing – Two urban city forces

The above-mentioned concepts are the status quo of the current and existing urban structure, urban form, urban planning and layout applicable to the development of cities, metropolitan areas and city regions. These concepts, however, change over time and the result is seen in the simultaneously changing urban environment. The city form, structure, planning and layout are subject to two core forces that are responsible for this change in the urban environment:

- **Force of containment:** A centripetal force ensuring the compactness of the city. The force of containment is driven by more or better jobs within the urban core, accessibility, entertainment, social life etc. These drivers will be explored in more detail in chapter 7 and chapter 8 of this document.
- **Force of sprawl:** Centrifugal force resulting in the expansion of the city. The urban sprawl force is driven by costs of land, individual privacy, open spaces, corridor developments, and transportation means that are improving etc. These drivers will be explored in more detail in chapter 7 and chapter 8 of this document.

It is widely accepted that this form of dispersed urban growth has adverse financial, social and environmental impacts, and that it is not sustainable in the medium to longer term (Department of Provincial and Local Government, 2002:1).

In policy as well as in scientific literature it is argued that urbanisation and urban expansion, connected to the removal of spatial separation of social groups, form one of the biggest challenges of the new South Africa (Dewar, 1992:10).

The relation between political and policy changes on the one hand and on the other hand its spatial implication, require some study in terms of the dynamics in the urban fringe since the urban planning and city management seem to be running behind the facts (Vanneste *et al.* 2001).

For purposes of this study the focus will be on metropolitan growth, as this is the vision for the case study, the Gauteng city region. This area is much bigger than the current traditional city and this will be confronted with more impacting elements and greater forces. This enhances the need for planning, organising, controlling and managing of the urban area.

3.1 Forces impacting on this city form and vice versa: Spatial issues

International research and studies illustrate that urban compaction is an essential condition for improved urban performance. However, the compaction can only be a sufficient condition if it is accompanied by substantial urban restructuring and positive structural change. In many instances, disparities are widening. There are migrations from poor regions to areas of economic growth (Gauteng, 2004:1). Instead of accommodating the inward migration of people from rural surroundings using densification techniques, the urban expansion was enhanced by making more, less-expensive land available for development on the periphery of the city, particularly in efforts to house the urban poor. In the process, cities are growing larger in terms of surface area, but at relatively low-densities. These spatial issues influence the city form and vice versa. Certain development trends in the city can be seen as directly opposing the aims and objectives for compacting and densifying the city, and are some of the critical issues that need to be addressed. These include:

- An overemphasis on single erf-single house developments.
- Low coverage and low height restrictions.
- Too few functional and attractive communal open space and recreational facilities.
- Large parking areas around commercial developments that take up a lot of valuable land.
- Uncoordinated focus areas for development.
- Inefficient public transport system and pedestrian-unfriendly nodal areas.
- Perceptions that high-density housing cannot support a more affluent life-style.
- The provision of low-cost and social housing in outlying parts of the metropolitan area.

Urban compaction can be ensured if it is accompanied by substantial urban restructuring. The objectives of densification and compaction, as proposed for implementation in Tshwane are:

- Minimising or reducing the footprint of the city: Cities transform natural land and alter the ecosystems in which they are located in a magnitude of ways. This in itself warrants a concerted effort to limit the impact on affected areas, as well as the ecosystems involved.
- Prevention of destruction of agricultural land: The urban sprawl influences areas of high-value agricultural land. In many developing countries, urban agriculture also provides employment and food security to the urban poor.
- Improvement of the use of public transport: Improving the use of public transport by increasing residential densities in nodes and along public transport corridors, which has major implications for the way in which cities are being built and managed. The other is greater integration between the various entities involved in land-use and transport planning.

- Improvement of the efficiency of urban areas: Compact cities increase general accessibility, the level of convenience reduces costs in terms of time, money and opportunity, both for local government and for its citizens. Compact cities, in which infrastructure investment is planned, are more efficient than cities in which this is not the case.
- Reducing inequality: One of the objectives of intervening in the form and density of development of urban areas is to ensure greater access for all, especially the poor, to the benefits and opportunities of urban living.
- Increase of the marketability of the city: The physical urban environment of a city, including its quality and liveability, plays a major role in its competitiveness. In addition to this, the message that potential investors get from a city that seems under control and functions well, is that it is well planned and managed in an integrated way.
- To adhere to legislative directives: A wide range of acts and policies has been brought forward by national government urging local authorities to address the issue of sprawl and urban form. However, in practice, very little has been done to address these legislative directives (Tswane, 2005:28).

These objectives can be implemented within the urban environment to shape and form the urban form in a more sustainable way. The current urban form will however, also influence these objectives and thus have a vice versa effect.

3.2 Forces impacting on this city form and vice versa: Environmental issues

It is widely accepted among urban restructuring advocacy groups and policy makers that the current local trends and the resulting spatial form have certain implications or consequences for the environment, and this again influences the way in which the cities function. These consequences and impacts on the environment can be summarised as follows:

- Settlement patterns are grotesquely distorted with the poorest residents having to travel the longest distances, and wealthier people living closest to the most-desirable economic and social opportunities. This enhances urban sprawl and minimises the qualitative natural environment.
- Cities are inconvenient and dysfunctional for the majority of citizens as they generate movement with great costs in terms of time, money, energy and pollution (Tswane, 2005:8). This is not only increasing pollution, but also decreasing open spaces and structuring the urban form according to transport corridors and urban nodes.

- Provision of efficient and viable public transportation is almost impossible because of the low densities and the dispersed location of activities (Tshwane, 2005:8). Dispersed locations are making it difficult to introduce bicycle lanes and side walks.
- Large areas of land with agricultural and amenity potential have been destroyed and this tendency shows little prospect of coming to an end (Tshwane, 2005:8). Natural environmental areas are decreasing as a result of the developments and growth.
- Poverty and inequality have been worsened because of travelling costs and lack of opportunity and choice. This has a direct impact on the environmental quality, as areas of poverty are known to be areas of limited environmental value.
- For many, cities have become hostile places in which to live, offering few economic, social, cultural, environmental or recreational opportunities.

The environmental issue shapes the urban form. Hard and soft open spaces link the urban areas and ensure integration between spatial and environmental elements.

Thus, the function of the environmental issues within cities should not be underestimated, but should be enhanced to ensure an effective functioning urban form and urban area.

3.3 Forces impacting on this city form and vice versa: Transport issues

Opportunities to create sustainable, environmentally friendly communities are being missed because transport provision and funding are still too dislocated from the overall planning process (Rogers, 2005:13). It has become evident that transport has a major catalytic role to play to achieve urban reform, and that land-use and transportation planning are highly interlinked urban determinants (Gauteng, 2007:38).

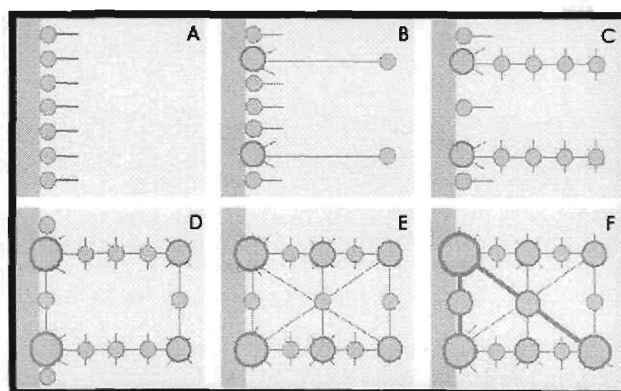
Transportation not only stimulates economic development but also helps structure space. The relationship between transport and spatial organisation can be considered from three major geographical scales: Global, Regional and Local scale (Rodrigue, Comtois & Slack, 2006).

- **Global Spatial Organisation:** It seeks to explain global differences in growth and accessibility. This basic representation assumes that the global spatial organisation favours a few core areas that grow faster than the periphery. Poles are identified and these poles are subject to centrifugal and centripetal forces that have favoured geographical concentration of some activities and the dispersion of others.

- **Regional Spatial Organisation:** Three conceptual categories can be observed. The first is that central place models try to find the relationships between the size and the geographic distribution of cities in a region. Many variations of the regional spatial structure have been investigated by the Central Place Theory. Transportation is particularly important as the organisation of central places is based on minimising the friction of distance. Secondly growth poles are the cause for economic development, and this leads towards structural change. Growth poles first initiate and then diffuse development. Growth is distributed spatially within a regional urban system, but this process is uneven with the core benefiting first and the periphery eventually becoming integrated in a system of flows. Transportation is a factor of accessibility that reinforces the importance of poles. Thirdly, transport corridors represent an accumulation of flows and infrastructures of various modes and their development is linked with economic, infrastructural and technological processes.
- **Local Spatial Organisation:** Important elements in shaping the local urban spatial organisation include employment zones and attraction zones. The growing dissociation between the workplace and the residence is largely due to the success of motorised transport, notably the private automobile.

Transport thus contributes to the local spatial organisation, however, it must also adapt to urban morphologies. Transport networks and urban centres complement and condition each other (Rodrigue, Comtois & Slack, 2006).

The development of transportation networks commonly leads to the creation of corridors. A model has been developed by Taaffe *et al.* (1963) to explain this process. The following six phases summarise the model.



- A: Small trade ports established along a line and connected to a wider network.
- B: Trade lines accessing the hinterland are constructed. Ports grow in proportion.
- C: The hinterland of penetrating lines is further expanded.
- D: The transport networks gradually become interconnected.
- E: Connectivity increases, traffic concentrates in the most connected ports.
- F: The regional transport system has thus reached a phase of maturity and the structure of the network is unlikely to change despite the significant economic or technological developments.

Figure 12: Corridor development

Source: Taaffe *et al.* (1963:510)

The centrifugal and centripetal forces of the global space, the regional space and the local space were taken together and integrated into a concept model. Government and private corporations have entered the picture to revitalise downtowns, to build townhouses and condominiums and to finance new towns and settlements, all in an attempt to create or recreate living spaces that are more liveable, as Figure 13 illustrates, within this contemporary and future metropolitan landscape (Zeigler, 1980:16).

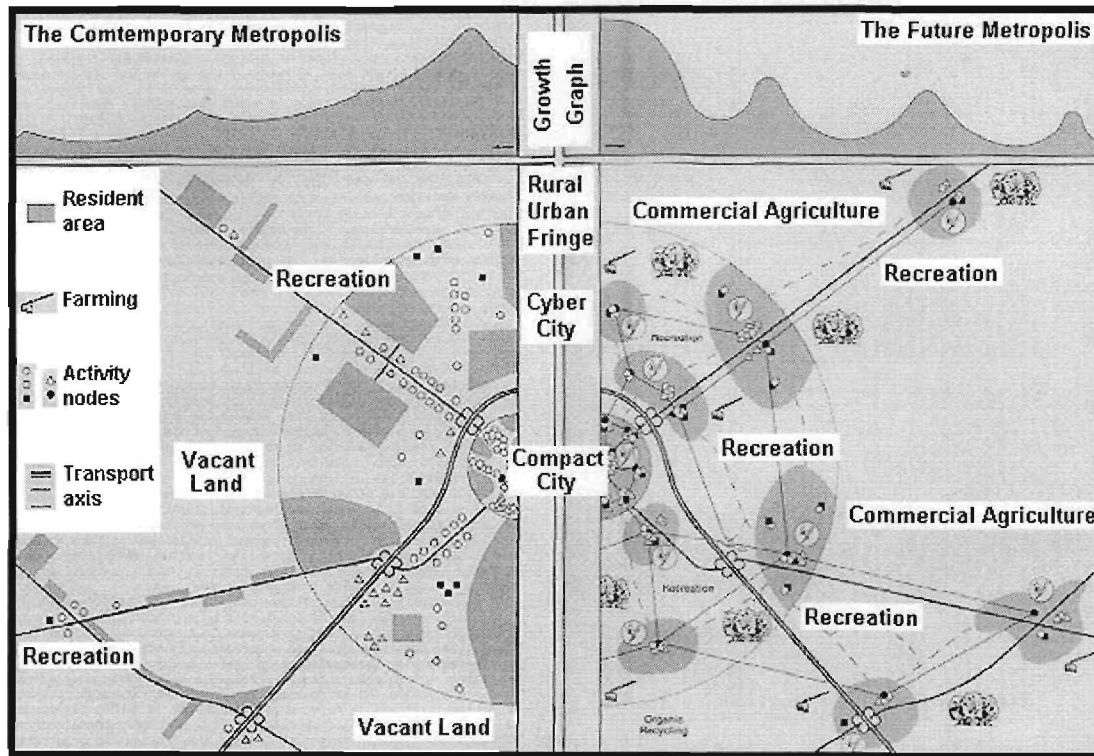


Figure 13: The contemporary and future metropolitan landscape

Source: Zeigler (1980:16)

4 Conclusion

Goals to integrate the cities and towns are summarised in the Urban Development Strategy of Gauteng. The goals include a special focus on rebuilding the townships through integrated development planning, by introducing environment-sensitive management of development (Gauteng, 2006:12). Further key elements and conclusions are:

- **Current urban land policy and the urban planning system:** Urban development is occurring without a clear vision of appropriate urban form (Behrens & Watson, 2000:37). Effective planning and development policies are needed to support the current urban planning system and guide integrated development planning.

- **Urban transportation:** A vehicular scale is dominating the human scale. Urban transportation systems, with regard to both people and goods, are in need of comprehensive reform. Reviewing of policies on public passenger transport is needed.
- **Environmental management:** Environmental management must be integrated into local authority functions. Environmental considerations also feature prominently in the development of new approaches to land-use planning. This should be supported by Agenda 21, open space planning, research and environmental education.

The following plan formulation process, as describe by Behrens and Watson (2000: 58) is used as a tool to guide urban planning and development.

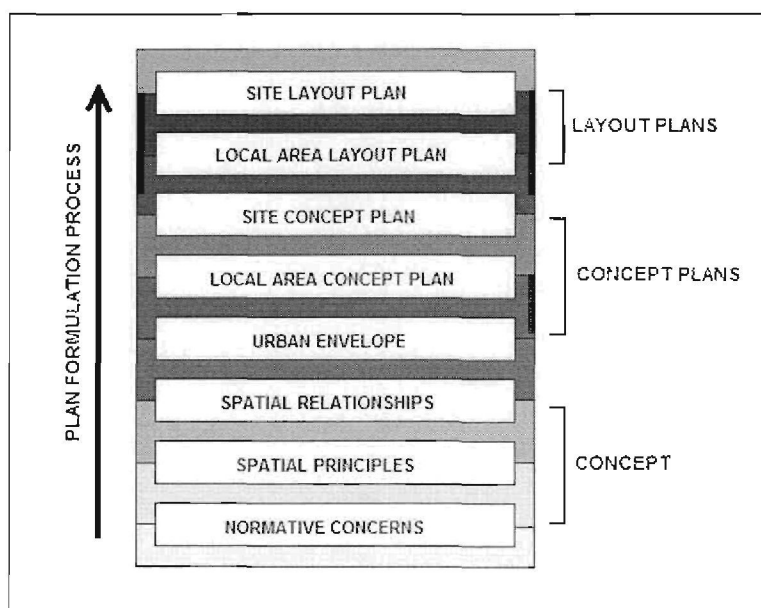


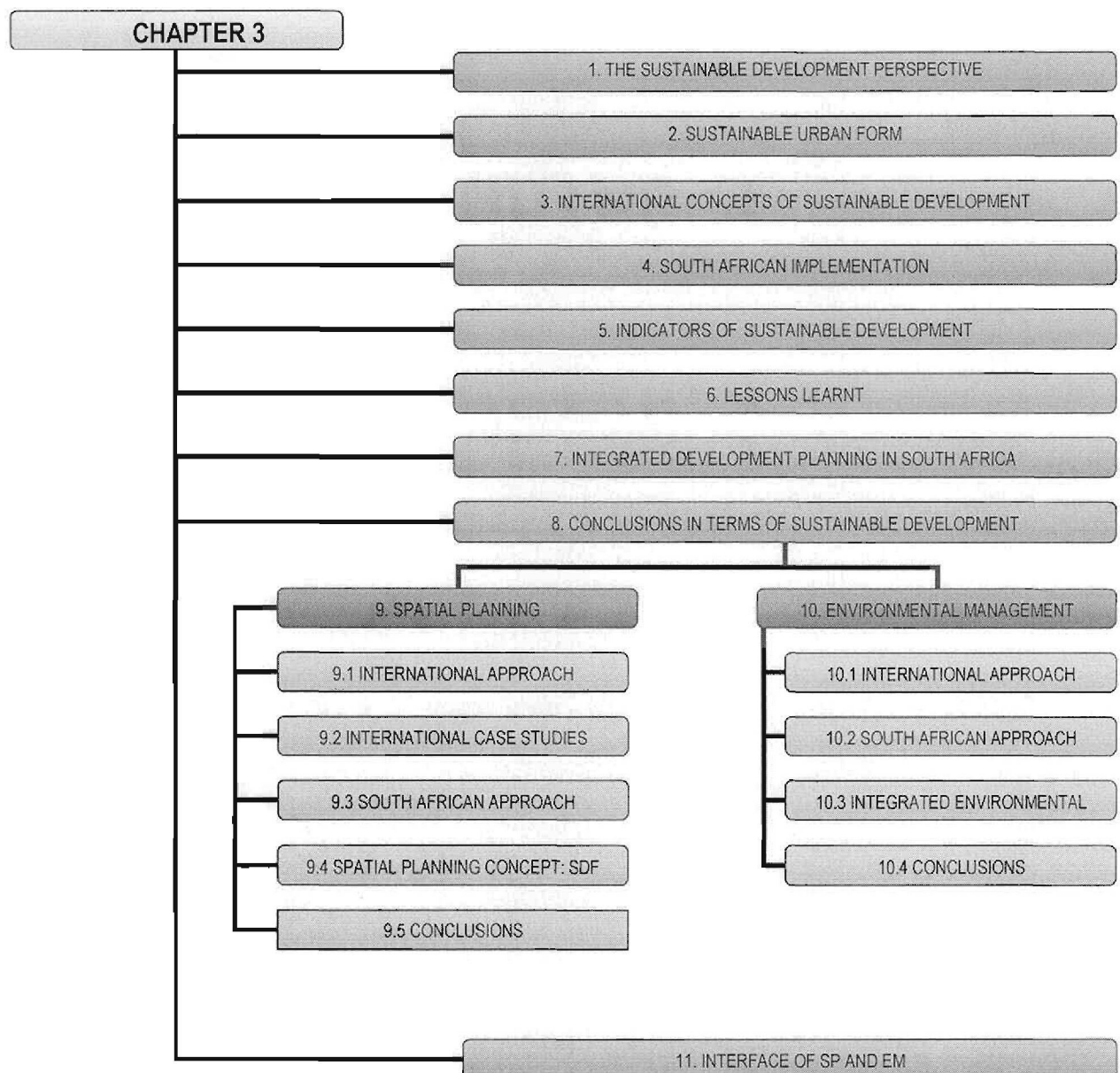
Figure 14: Stages in the plan formulation process

Source: Behrens and Watson (2000:58)

The plan formulation process is based on the normative concerns. Spatial principles must be applied to the current reality and guide the spatial relationships, the urban envelope and environment in which development will manifest. Concept plans must be formulated. These should include local area concept plans and more detailed site concept plans. Layout plans are then developed in order to ensure effective implementation of the concept plans. This whole process should be implemented and managed holistically and integrated, focusing on sustainability and community participation. The goals and objectives of the urban environment need to be set, subject to all influencing spatial-, environmental- and transportation factors. This will lead to sustainable urban environments, characterised by a balance between the built environment and open spaces, as well as a balance between consumption needs and renewable resources.

Chapter 3

Sustainable development



1 The sustainable development perspective

Sustainable development is one of the most fundamental challenges confronting humanity. In theory, development that is sustainable and not damaging to the planet is very possible. Of course, in reality there are many politics and challenges involved (Shah, 2007:1). While everybody agrees about the need for sustainable development, operationalising this consensus goal in public policy is extremely difficult because there is as yet no commonly accepted definition of the term (Paul, 2006:1). Sustainable development is a fine balancing act (Emmett, 1998:1).

The concept of sustainable development has existed for as long as the town planning concept has existed. In Greek antiquity, philosophers such as Plato (400 BC) described man's place in nature and his role in the depletion of the natural system. Plato pointed out that the forests in Attica were disappearing because of human intervention and that this had serious consequences for the people living there. He also paid attention to the size of the population, the availability of natural resources and the total area of fertile land. He added a strong sense of nature's usefulness. The idea that everything in nature has a purpose and that man is the ultimate goal in natural order has influenced the western world until today (Van Zon, 2006:2).

In order to evaluate the sustainable development concept, it is needed to understand the term "sustainable development" in the context of this study. The modern concept of sustainable development can be viewed from a global, continental and national perspective:

- **Global perspective:** The Brundtland Commission defined sustainable development as development that meets the needs of the present without compromising the ability of future generations to meet their needs and aspirations (WCED, 1987).
- **Regional perspective:** The Southern African Development Community (SADC, 2003) perspective consists of: Acceleration of economic growth with greater equity and self-reliance, the improvement of health, income and living conditions of the poor majority and ensuring equitable and sustainable use of the environment and natural resources for the benefit of present and future generations.
- **National perspective:** The South African National Environmental Management Act (NEMA, Act 107 of 1998) defines sustainable development as the integration of social, economic and environmental factors into planning, implementation and decision-making to ensure that development serves present and future generations. This definition builds upon the fundamental rights as contained in the South African Constitution (Act 108 of 1996).

Sustainable development is described from a comprehensive perspective as development without growth beyond environmental carrying capacity, where development means qualitative improvement and growth means quantitative increase (Ogbuigwe, 2007:47).

The idea of sustainable development grew from numerous environmental movements in earlier decades. Summits such as the Earth Summit in Rio, Brazil, 1992, were major international meetings to bring sustainable development to the mainstream (Shah, 2007:1).

The dimension of sustainable development can thus be described as an integrative and holistic process of maintaining and managing the dynamic balance between the needs and the demands of people for societal aspects such as equity, prosperity and quality of life, and the concurrent and subsequent ecological responses.

Within the development-planning sector, the notion of sustainable development can be translated into a physical ideal, directly related to human development and progressive land-use management.

Development should not only generate economic growth opportunities, but also ensure the benefits thereof to be distributed equitably. The environment and environmental resources should be utilised in an effective and socially profitable manner and communities should be empowered rather than marginalised (Gauteng, 2007:19).

There a number of key dimensions that should be addressed and managed to ensure proper and holistic sustainability:

- Sustainable urban economy – Work and wealth.
- Sustainable urban society – Social coherence and social solidarity.
- Sustainable urban shelter – Decent affordable housing for all.
- Sustainable urban environment – Stable ecosystems.
- Sustainable urban access – Resource conserving, integrated transport and urban planning.
- Sustainable urban life – Building the liveable city.
- Sustainable urban democracy – Good governance and empowered citizenry.

Sustainable development is not merely development that can be sustained, but development that would allow the achievement of a state of sustainability. Unlike sustainability, which is the goal, it is the process of maintaining a dynamic balance between the demands of the people and what is ecologically possible (Landman 2003:11).

Sustainable development requires a holistic approach, including appropriate planning measures, efforts, policies and legislation. Economic policy levers, technological development, information and voluntary commitments, should be mutually reinforcing (Swedish Ministry of Environment, 2003:21).

The term sustainable development goes beyond the boundaries of science and business development and trade to include human development, values, and differences in cultures. Cities have become the focal points of these components as major consumers and distributors of goods and services (Rees & Roseland, 1991:3).

For purposes of this study, it is necessary to bring sustainable development into perspective with sustainable communities. A sustainable community is one in which improvement in the quality of human life is achieved in harmony with improving and maintaining the health of the ecological systems; where a healthy economy's industrial base supports the quality of both human and ecological systems. Sustainable communities are therefore defined as towns and cities that have taken steps to remain healthy over the long term (Lujanen, 2007:10).

Sustainable communities have a strong sense of place. They have a vision that is embraced and actively promoted by all of the key sectors of society, including businesses, disadvantaged groups, environmentalists, civic associations, government agencies, and religious organisations. They are places that build on their assets and dare to be innovative. The cities of today are facing complex problems and challenges. In terms of the key components of sustainable development, the following are the core sectors that the city needs to adhere to:

- Social sector: Working versus living area distance.
- Economic sector: Costs of development, development and redevelopment of cities.
- Environmental sector: Improvement of green areas.

According to the Urban 21 Conference, held in Berlin (Richardson, 2000) at the regional environmental centre for Central and Eastern Europe, it was concluded that a city is only considered to be sustainable when:

- It follows a development path where the present progress does not take place at the expense of future generations.
- There is equilibrium between different issues. In other words, the goal is an across-the-board development, instead of handling issues one by one.

2 Sustainable urban form

Increasing numbers of people around the world are living and working in cities, and this is both beneficial-, and detrimental to the environment. Mega-cities with populations over 10 million people are becoming commonplace. The very size of these cities and high proportion of the world's population living within them will inevitably concentrate problems. Despite many problems, even the densest, fastest growing cities in developing countries have positive benefits for those living there. They can provide enhanced opportunities for millions of people and refuges from a stifling, restricted rural life that may no longer be economically sustainable. The sheer vitality and numbers of people and ideas tend to change attitudes and lifestyles, and lead to higher aspirations to improve standards of living. The need for spatial planning is thus increasing daily and certainly when aiming at sustainable development. The focus of all spatial planning processes, plans and spatial development initiatives worldwide is to enhance a sustainable urban form.

Sustainable urban form is influenced by various factors, including size, shape, density and compactness of cities, processes of intensification, land use, mixed uses, layout and building type, green and open spaces and decentralisation. For a decentralised system to work effectively, co-operation is required at the local level between formal governmental institutions and the range of less-formal, non-governmental organisations and community-based organisations (Department of Provincial and Local Government, 2000:11).

Richard Rogers believes that the well-designed, compact city is the only sustainable, urban environment (2005:1). The compact city, as described in the introduction, has always been considered as the most sustainable urban form. The reasons offered for making cities more compact have changed in the last 150 years. First it was for resource conservation, waste-minimization and efficiency, but it has moved over to sustainable urban form, economic, social and political issues. Contemporary compact city approaches are said to increase built-area and residential population densities, to intensify urban economic, social and cultural activities and to manipulate urban size, form, structure and settlement systems in pursuit of the environmental, social and global sustainability benefits derived from the concentration of urban functions (Jenks & Burgess, 2000:8).

What makes this current relationship between humanity, nature, society and space different from the past conditions is that they both manifest a sort of 'tantalisation' of human and environmental activities (Jenks, 2000:10).

As the problems associated with global environmental change and globalisation deepen, so too does the need for urban policy and professional practice to respond to them. Urban and regional planning and building must be developed and brought into line with sustainable development policy goals. Environmental quality goals should be developed. Higher quality building designs should be promoted. Construction and maintenance standards are to be developed. Inter-disciplinary research and study projects are therefore vital. Sweden is currently working to improve and develop new methods of calculating costs and environmental impacts in the building sector (Swedish Ministry of the Environment, 2003:19).

However, the international planning-belief is that the compact city offers various claimed benefits in response to high densities:

- Geographical spread is limited.
- Accommodation of more people on the same area and therefore greater social interaction.
- Journey trips become shorter, leading to lower fuel consumption and harmful emissions.
- Compact cities are more energy efficient.
- Governments are able to provide basic services more efficiently.

Ultimately, the compact city planning approach can contribute to the attainment of sustainable cities (Jenks *et al.*, 1996). It should be noted that the compact cities of developing countries have not been planned and they are not the result of some prescient ground design. Rather, their compactness has emerged spontaneously, if not chaotically (Jenks & Burgess, 2000:12). Although the compact city approach is seen to be the most-sustainable urban form, there are also some contradictive opinions regarding compact urban form. Compact urban form relates to high-density developments. High density, when uncontrolled, can lead to problems, through overcrowding, pollution, and lack of open spaces. Yet the effectiveness of the investment of human capital and self-regulation is apparent in the informal sectors, despite the problems and disadvantages.

A great deal of complexity was therefore found and questions were raised about the extent to which urban form could achieve sustainability (Jenks, 1996:12). Sustainable urban form will only be achievable if they are underpinned by a policy background that commits to global sustainability goals, but leaves room for local formation and implementation of solutions (Williams *et al.*, 2000).

There is no single sustainable urban form, but a variety of urban forms that are more sustainable than current development patterns. It can therefore be concluded that sustainable development relates to the way in which we balance development with the use of resources.

The urban form is created from the impacts present within the urban environment. The impacts will thus either direct urban form towards a sustainable form, or not. In order to promote sustainable urban change the various impacts within the urban environment need to be realized and the urban structure needs to respond accordingly. This is illustrated in Table 9, which provides a description of the European cities.

Table 9: Impacts that shape the urban form in Europe

SPRAWL CITY	COMPACT CITY
CONTINUED DISPERSAL AND SPRAWL: - Individual Household Based.	NODAL CENTRES OR URBAN VILLAGES: - Community Based.
Transportation	
• Cleaner cars, electric cars. • Electronic guidance on freeways. • Flexible buses supplementing car system.	• Electric heavy rail and electric light rail. • Bicycles and bicycle infrastructure. • Demand-responsive local buses.
Telecommunications	
• Household-based office technology.	• Community-based, sub-centre-based.
Technology	
• Large scale industry (prevents re-integration). • Large scale water management systems. • Household-based solid waste management.	• Small scale industry (reintegrates industry). • Community-based water management systems. • Community-based solid waste management.

Source: Newman (2005)

Table 10 is a similar presentation of the vision as currently seen in Finland. Two of the urban areas of the city region are compared. Helsinki is known as the smart city and illustrates a compact urban form, whereas Espoo is known as the sprawl city, because of the sprawling urban form. The concept of the city region will be discussed in detail later in this chapter. The focus here is to illustrate the different urban forms that are created from different impacts.

Table 10: Impacts and urban form in Finland

SMART CITY (HELSINKI)	SPRAWL CITY (ESPOO)
Compact city.	Spread out.
High density developments.	Low density developments.
Public transport orientated (335 cars/1000 people).	Private motorcar orientated.
Sustainable environment (40% green).	Privatised space.
Polycentric region.	Unconnected clusters.

Source: Gordon (2007:12)

These impacts as listed in Table 9 and Table 10, will either shape the urban environment to be compact, or will result in a sprawling urban environment. At this stage of the research, it is not possible to state that a compact urban form is more sustainable than other urban forms, although it is the international understanding. However, it is possible to conclude that policies, legislation and guidelines should guide all impacting forces within the urban environment, as these forces will be responsible for the resulting urban form. The policies, legislation and guidelines can thus guide urban development towards a sustainable urban form.

3 International concepts of sustainable development

Schoeman (2007:3) compiled a table containing an overview of the international events that redirected development thinking that led to the introduction of the concept of sustainable development. This is illustrated in Table 11.

Table 11: Key elements in the emergence of the concept of sustainable development

Event	Focus
'Earth Day', 1970 declared European Conservation Year.	Demonstrations against pollution.
UN conference on the Human Environment (Stockholm, 1972).	Lead to the United Nations Environment Programme (UNEP).
The Club of Rome (1972) published the 'Limits to Growth'.	Growth trends implied limits will be reached in 100 years.
UNEP and United Nations Conference on Trade and Development (1974).	International debate on the relationship between economic growth and natural resource base.
International Union for Conservation of Nature, World Wildlife Fund, UN produced the 'World Conservation Strategy' (1980).	First global attempt to link environment and development. Phrase 'sustainable development' is brought into the international debate.
Brundtland Commission report: Common Future (1987).	Definition of concept of sustainable.
UN Conference: Rio Earth Summit (1992).	Rio Declaration and Agenda 21.
Commission on Sustainable Development (CSD) (1992).	Follow up of the Earth Summit.
World Conference on Human Rights (1993).	Promotion and protection of human rights.
Conference on Population and Development (1994).	Programme of action relating to population growth, gender equality, migration and education.
World Summit for Social Development (1995).	Goals of eradicating poverty, social integration, equality. Acceleration of resource development of Africa.
UN Conference on Human Settlements (Habitat II) (1996).	Adequate shelter and sustainable human settlement development.
Earth Summit and Five (1997).	Review and appraisal of the implementation of Agenda 21.
Millennium Summit.	Millennium Declaration. Measurable time-bound goals and targets.
World Summit on Sustainable Development (WSSD) and the Johannesburg Plan of Implementation (2002).	Provided an opportunity to adopt concrete steps and identify quantifiable targets for improved implementation of Agenda 21.

Source: Schoeman (2007:3)

In a report prepared for the Ontario Round Table on Environment and Economy, strategies for sustainability or lack of sustainability were compared (Richardson, 2000). This is illustrated in Table 12.

Table 12: Characteristics of sustainability

More Sustainable Cities	Less Sustainable Cities
Compact forms of residential development.	Low-density, spread-out development.
Mixed land use in close proximity.	Segregation of land uses into concentrations.
Employment based primarily on education and skills.	Employment based on environment polluting or non-renewable resource based industry.
Movement on foot and by bicycle and transit.	Heavy dependence on private cars.
Wind and solar energy.	Thermal and nuclear energy.
Tertiary treatment of sewage; use of natural means of sewage treatment.	Discharge of sewage into water-courses untreated or with low level of treatment.
Protection and use of natural hydrologic systems.	Hard surfaces preventing infiltration, channelling.
Natural open space, protection of wetlands, etc., use of manure, compost, integrated pest management.	Destruction of natural landscape, "manicured" parkland with exotic species, heavy use of chemical fertilisers, herbicides, pesticides.
Reduction, recovery, re-use and recycling of waste.	Landfills, incinerators.

Source: Richardson (2000)

Table 12 describes the characteristics of the sustainable city, but it should be noted that these characteristics are also responsible for the forming of a sustainable urban form; the impact is thus vice versa. The sustainable city is further described as a city of many facets as captured in Table 13.

Table 13: The sustainable city

Just City	Where justice, food, shelter, education, health and hope are fairly distributed and where all people participate in government.
Beautiful City	Where art, architecture and landscape spark the imagination and move the spirit.
Creative City	Where open-mindedness and experimentation mobilise the full potential of its human resources and allows a fast response to change.
Ecological City	Minimises its ecological impact, where landscape and built form are balanced, where infrastructures are safe and resource-efficient.
City of Easy Contact	Where the public realm encourages community and mobility and where information is exchanged both face-to-face and electronically.
Compact, Polycentric City	This protects the countryside, focuses and integrated communities within neighbourhoods and maximises proximity.
Diverse City	Where a broad range of overlapping activities creates animation, inspiration and fosters a vital public life.

Source: Rogers and Power (2000)

Kaarin Taipale of the Helsinki University, School of Economics, presented a paper at the First Sustainable Communities Course (Bridging the Gap between Research and Action) and illustrated that cities can become drivers of sustainable development. There should be a transformation in terms of the mechanisms and processes present in the urban environments (Taipale, 2007:8). Proposed changes include:

- From an environmental approach to a sustainable approach.
- From technical plans to visions.
- From management to leadership.
- From projects to processes.
- From citizen to stakeholder.
- From public focus to private focus.
- From local goals to global goals.

Important tools were identified to support these drivers of the sustainable urban form:

- Sectoral integration. Overall goals in respective policy areas must be integrated, as in the case of environmental accountability.
- Environmental impact and sustainability assessments. Focusing on the use of sustainability assessments as strategic tools. Developed an impact assessment method.
- Dialogue and voluntary agreements. Covering areas of recycling, fuel and voluntary assumption of producer responsibility in the construction industry.
- Partnership. An important aim of partnerships is to integrate the enterprise sector and sustainable development work.
- Sustainability reports. These seek to identify the furthest detectable consequences of a given decision and determine whether it furthers the aims of sustainable development.
- Local investment programmes and investment programmes. Important tools for promoting investment and supporting sustainable development (Swedish Ministry of Environment, 2003:21).

4 The South African implementation of sustainable development

The environmental and spatial planning scene in South Africa underwent important process and format changes over the last decade that culminated in the policy and legislative frameworks applicable today. The single most important change in this regard included the focus brought about by the introduction of sustainability, integration and public participation as process requirements. Both environmental management and spatial planning systems aim to optimise the use of scarce resources and limited capacity in a strategic, holistic and integrative manner (Schoeman, 2006:2). The concepts of spatial planning and environmental management will therefore be evaluated later in this chapter; but first the concept of sustainable development should be understood and explored in terms of the South African context.

South Africa has thus adopted an integrated approach to sustainable development. The majority of policies introduced by the first democratic government has reflected the consensus on how sustainable development must be guided. The approach that has more recently been adopted by South Africa is to integrate sustainable development into the heart of the government planning cycle. Major efforts are being made in government to enhance cross-sectoral integration and co-ordination. South Africa is still lacking the National Sustainable Development Strategy, which by implication means that no overarching framework for guiding the development of Sustainable Development indicators exists.

Currently, the National Department of Environmental Affairs and Tourism acts as the focal point for the national coordination of Agenda 21 initiatives. However, by nature, the focus is more on environmental considerations than holistic socio-economic and environmental integration. The sustainability of development debate in South Africa has been taken up in various legal and policy documents such as (Schoeman, 2006:6):

- Development principles as contained in the Development Facilitation Act (Act 76 of 1995).
- Definition of local government (Department of Provincial and Local Government, 2001).
- Habitat and Local Agenda 21 initiatives driven by the National Department of Housing and the Department on Environmental Affairs and Tourism.
- The Green Paper on Development Planning (1999).
- National Environmental Management Act (Act 107 of 1998).

Based on the objectives of these policies, legislation, frameworks and guidelines, an urban area can be declared sustainable or not, depending on the interaction of four different patterns:

- The physical structure: Location within environment, response to topography, spatial relationship between the different parts and the form of the built environment.
- The use patterns: Which are formed by the way the settlements use their resources and are described by the infrastructure and services provided.
- The social patterns: How people live, learn and work in, and relate to, their settlement, as well as the opportunities provided by the settlement for meeting these social needs.
- The operational patterns: How the settlement functions and is managed.

5 Indicators of sustainable development

Our world is a very complex system. It is, therefore, difficult to analyse and make a decision based on simple information that is derived from observing the processes that occur throughout the world or in smaller systems. In order to make a right decision, it is imperative, firstly, to have the information on the scope of a problem or a process. Secondly, it is necessary to compare this information with the previous observations or standards. Thirdly, it is important to comprehend a cause-effect relationship between one process and another. The indicators help us to perform such an analysis and guide us towards the right decision.

Sustainable Development Indicators (SDI) are thus various statistical values that collectively measure the capacity to meet present and future needs. SDI will provide information crucial to decisions of national policy and to the general public. Generally, an indicator focuses on a small, manageable, tangible and telling piece of a system to get a sense of the bigger picture. It is difficult to analyse and make decisions based on simple information that is derived from processes that occur more widespread or in smaller systems (Schoeman, 2006:12).

The most powerful application of indicators is for monitoring and evaluation of systems and processes. In order to facilitate the process of choosing indicators and make the final set user-friendly, indicators are organised into frameworks. A framework is a way of organising indicators so that resulting information, including connections between different issues, are easily understood. There are a number of internationally-recognised indicator frameworks. There are a number of frameworks that are used by the international community in the monitoring and evaluation of Sustainable Development (Urban-Econ, 2005:10-11). The following indicator frameworks summarised in Table 14, are applicable to development:

Table 14: Indicator framework

Theme-based framework	It organises indicators according to basic dimensions of sustainability.
System-based framework	It specifies Input-Process-Output-Outcome indicators and is commonly used for project or programme evaluation.
Pressure-based framework	It highlights cause-effect relationships in terms of how exerted pressures of human activities affect the state of the environment, and what the response of humanity is.
Goal-based framework	It organises indicators according to goals that measure progress towards sustainable development.

Source: Urban-Econ (2005:12-25)

The sustainable development indicator frameworks were studied, as they are implemented in various countries. This was done to identify the core achievements, problems and issues faced and thus to learn from their lessons. In a systems view of sustainable development, six essential subsystems were distinguished (Bossel 1999:29). The interrelationships of these subsystems are illustrated in Figure 15.

- Individual development (human rights, equity, self-determination, health, right to work, social integration, participation, standard of living, qualification, specialisation, leisure, recreation).
- Social system (population development, ethnic composition, income distribution and class structure, social groups and organisations, social security, medical care, old age provisions).
- Government (public finances, taxes, political participation and democracy, conflict resolution human rights policy, immigration policy, legal system, international assistance policy).
- Infrastructure (settlements and cities, transportation and distribution, supply system, health services, communication and media, facilities for education and training, science, research).
- Economic system (production and consumption, money, commerce and trade, labour and employment, income, market, interregional trade).
- Resources and environment (natural resources, ecosystems, depletion of non-renewable resources, regeneration of renewable resources, pollution, degradation, carrying capacity).

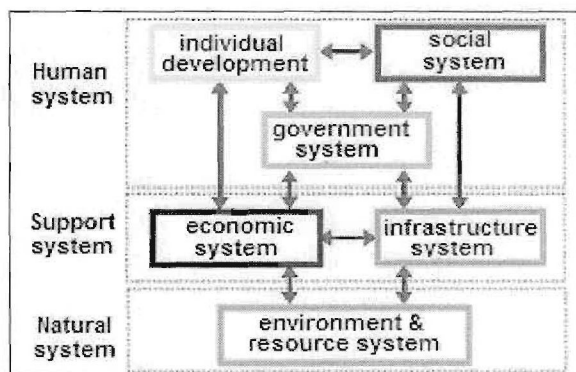


Figure 15: The six major systems and their relationships

Source: Bossel (1999:31)

6 Lessons learnt from the international sustainable development concept

It is important to note that the South African situation is unique and international concepts cannot be blue printed on the local environment. To be able to link the European vision with the South African situation, the focus needs to shift to the key concerns of South Africa. The local objectives, goals and outcomes should be integrated with the international framework. The local community, however, should place an emphasis on willingness to change, thus a mindset change of the local community. Many countries have tried to develop their own sets of sustainable development indicators to implement and measure sustainable development initiatives. The analysis of the best practices provided the following key lessons:

- A Sustainable Development strategy is needed to guide sustainability objectives.
- High-level support and strong political will are required for project implementation success.
- A well-structured public participation process is imperative in the promotion of the sustainable development concept, identifying main issues concerning selected indicators.
- Indicators should be simple, policy-relevant, understandable, widely usable, contain targets.
- The data for indicators should be accessible, qualitative and collectable at reasonable cost.

These conclusions are in line with the argument of Sairinen (2003:12), who states that good land-use planning will lead to sustainable urban development.

7 Integrated development planning in South Africa

The Municipal Systems Act (Act 32 of 2000) requires local governments to prepare an Integrated Development Plan (IDP), which provides a framework for the developmental role of local government. The central aim of an Integrated Development Plan is to develop a holistic, integrated and participatory strategic plan, guiding the work of the municipality. The Municipal Planning and Performance Management Regulations (Department of Provincial and Local Government, 2001), promulgated in terms of the Municipal Systems Act, state that the IDP must 'contain a strategic assessment of the environmental impact of the spatial development framework'. Integrated Development Planning is a process through which municipalities prepare a strategic development plan, for a five-year period (Department of Provincial and Local Government, 2001). The IDP is the principle strategic planning instrument, which guides and informs all planning, and development, and all decisions with regard to planning, management and development in the municipality (Municipal Systems Act No 32 of 2000).

The IDP is a legislated plan that supersedes all other plans that guide local development (Department of Provincial and Local Government, 2001). It aligns sustainable development as part of integrated development planning on all spheres of government (Figure 16).

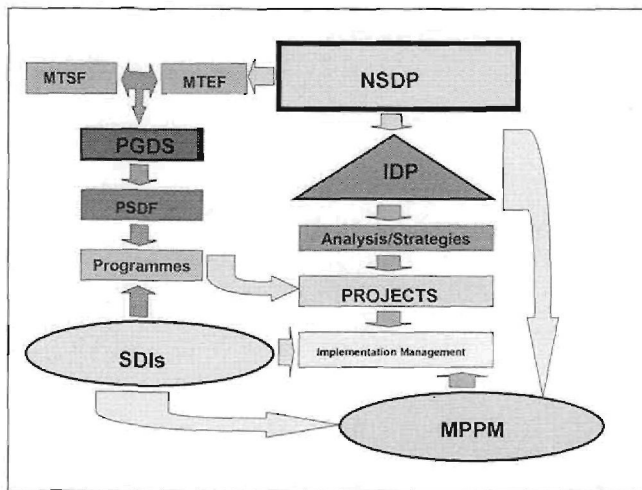


Figure 16: Planning Dimensions from a Sustainable Development Indicator Perspective

Source: Schoeman (2007:25)

8 Conclusion in terms of sustainable development

The introduction of sustainability within the South African environment transformed the environmental and spatial planning scene, as both underwent process and format changes that culminated in policy and legislative frameworks. Fragmentation, in terms of interface between environmental management and planning, is thus the result of the existing policy and legislative frameworks and the distribution of powers and functions in terms thereof (Schoeman, 2006:14).

Sustainable development is therefore subject to environmental management and spatial planning. In order for sustainable development to be realised and to be implemented effectively, these two concepts need to be integrated in terms of policy, legislation and guidelines. Environmental issues and developmental issues should not be in contrast with one another, but should enhance the qualitative elements of each other. For purposes of this study, the efficiency and effectiveness of sustainable development will be based on two factors, namely spatial planning and environmental management. Each of these concepts will be studied and evaluated individually and then brought into perspective when creating an interface and when integrating and implementing this concept into the current reality of the Gauteng city region. The remainder of this chapter describes the two core elements of sustainable development (spatial planning and environmental management) in detail, referring to the concept itself, as well as how it is implemented and manifested in the South African context.

9 Spatial Planning

Planning is a continuous process of anticipating and preparing for foreseeable future changes. City and Regional Planning, as a procedure to manage such change in spatial terms, makes arrangements for future use of land by public and private owners. There are different time horizons for demands on land use: from long-term sustainability to accommodating urgent housing programmes. Therefore, planning must safeguard flexibility towards future changes in material means and in value orientations, but it must also be capable of acting on short-term demands. This requires a broad spectrum of instruments for keeping open future options on the one hand and for transforming plans into reality on the other.

Spatial Planning is the management of change, a political process by which a balance is sought between all interests involved, public and private, to resolve conflicting demands on space. Present approaches to the desirable spatial form of urban expansion are based on a widely-accepted, but little tested, accumulation of assumptions about 'better' urban form, expressed in phrases such as 'compact city', 'densification' and 'urban corridors' (as evidenced in the Urban Development Framework and in the Development Facilitation Act). However, aspects of the dynamics of urban change are undercutting conventional wisdom about the costs and benefits of different spatial patterns of urban expansion.

There may be a widening gap between policies emerging for urban spatial form, and what is required for the economic development that will enable government to achieve its major objectives (Mabin, 1995:1).

Urban growth patterns, even in the smallest towns, have changed substantially in the last decade and spatial patterns will without doubt continue to change. A key reason is the changing location of work in urban places, related to changing organisation of work (Mabin & Smit, 1997:3).

It is worth remembering that New York's explosive development at the beginning of the twentieth century took forms not imagined before, and it was seen as the 'new world'. With 'hyper densities', vast populations, rapid development on the periphery, and a willingness to invest in mass transit provision, change is happening at a breathtaking pace. Developing the theories and ideas that will steer these changes into the 'unimaginable', yet sustainable, urban forms of the future is a great challenge.

9.1 International spatial planning approaches

Spatial planning refers to the methods used largely by the public sector to influence the future distribution of activities in space. It is undertaken with the aim of creating a more rational territorial organisation of land uses and the linkages between them, to balance demands for development with the need to protect the environment, and to achieve social and economic objectives. Spatial planning embraces measures to co-ordinate the spatial impacts of other sector policies, to achieve a more even distribution of economic development between regions than would otherwise be created by market forces, and to regulate the conversion of land and property uses (European Commission, 1997:24).

- **History of the development of European Spatial Planning:** In 1984, the Council of Europe prepared the Torremolinas Charter - the European Regional/Spatial Planning Charter. The Torremolinas Charter sought balanced socio-economic development of the regions within Europe, improvement of the quality of life, responsible management of natural resources and protection of the environment, and rational land use. It called for international co-operation to achieve "real European planning". The Single European Act of 1987 moved towards the Single Market Act of 1992 and increased European concern with patterns of regional development. In 1991, the European Commission published "Europe 2000: Views on the Development of the Territory of the Community". It analysed pressures on Europe's territory arising from socio-economic developments as well as from national and regional and community interventions. The report stressed the need to pay concerted attention to the balanced and harmonious development of the community's territory. "Europe 2000+: Co-operation for the Spatial Development of Europe" followed in 1994. It updated and extended the analysis in "Europe 2000", and made the case for co-operation in the field of spatial planning across Europe. In 1991, the Committee on Spatial Development was established. This brought together the spatial planning ministers from the member states. Also in 1991, the Dutch National Physical Planning Agency Report Perspectives in Europe developed the concept of supra-national spatial planning and argued that national planning should take account of this dimension. Today the focus is on a more-balanced and polycentric urban system, access to infrastructure, knowledge, wise management and sustainable development of Europe's natural and cultural heritage.

Finally, a European Spatial Development Perspective (ESDP) was compiled to guide spatial planning in Europe (ESDP, 1999:1). The European Spatial Development Perspective identified general principles for spatial planning and development. It included:

- Respect of sustainability goals by economic decisions with spatial implications.
- Need for Strategic Impact Assessment.
- Balance of social cohesion and sustainability through spatial development.
- Conservation of the rich territorial variety of Europe.
- Spatial planning contribution to local and global climate change control.

The ESDP was the first integrated view of the whole of the European continent. It used a spatial framework for coordinating a wide spectrum of policies and proactive approaches to planning. Social and cultural concerns are, however, present in this environment. The environmental concerns are of greater importance for the purposes of this study as transport networks are a threat of fragmentation to the European territory (ESDP, 1999:32). The contributions made to the local and global climate change efforts and commitments, in terms of policies, are thus fundamental. The ESDP also stressed the need for emphasis on clear and courageous policy formulation. The ESDP is a very positive European initiative, currently strongly supported and improved through a multi-level consultation process.

The ESDP has certain policy themes that are relevant to the current situation in South Africa, and is mentioned accordingly. It guides spatial planning in terms of the resulting urban forms seen within the international environment, and the way it was accomplished and strengthened. Specific themes to analyse and evaluate within the local South African situation include: (European Commission, 1997:20).

- Supporting polycentric and balanced spatial development.
- Promoting dynamic, attractive and competitive cities and urbanised areas.
- Strengthening urban-rural partnerships (European Commission, 1997:21).

In order to relate this European regional perspective to a local level, two case studies were evaluated. The two case studies were chosen based on their locality within the European territory, as well as their classification as city regions. The city region concept forms an integral part of this study, and in comparing other city regions with the local Gauteng situation, a better conclusion can be drawn as to the impacts, outcomes and effectiveness.

9.2 International spatial planning case studies

The international approach to spatial planning was analysed and evaluated by means of detailed research done on two case studies, as presented in Table 15.

- The first case study, Randstad in the Netherlands, was chosen because of its location within the European territory and its obligation to the above-mentioned ESDP objectives. Furthermore, the approach towards development (promoting developments) can be beneficial for the local Gauteng situation, and thus needed to be explored in detail.
- The second case study, Helsinki in Finland, was also chosen because of its location within the European territory and its obligations to the ESDP objectives. However, Helsinki was the first city to implement sustainable development objectives, and therefore had knowledge and experience to offer to this study.

Table 15: International spatial planning case studies

	Randstad (Netherlands)	Helsinki (Finland)
Relevance – Similarities	Randstad has four major city councils (Amsterdam, Rotterdam, The Hague and Utrecht) and 203 smaller municipalities. Despite the complexity, they co-operate on a joint vision and strategy. Gauteng can identify with this situation. Furthermore, the National Spatial Strategy has shifted the policy emphasis from “imposing restrictions” to “promoting developments”. Development is the central consideration (Ministry of Housing, 2001:11). Gauteng is currently experiencing a similar situation.	Helsinki is the world leader for cities in terms of sustainable development and setting objectives for the implementation of sustainable development objectives and realisation within the practice (Helsinki University of Technology, 2007:10). Helsinki was the first city in Europe to develop and implement the Agenda 21 objectives. South Africa can benefit from their experience and knowledge, and should aim especially at integrating sustainable development with current town-planning measures, as done in Helsinki.
Challenges	• Accessibility and balanced development. • Environmental management. • Need new dwellings during the period 2010-2030. • Public opinion that urban areas are less preferable places to live. • General perception that fewer urban areas offer more in terms of a better environment, lower levels of crime and a greater sense of community. • Variations between inner urban and outer urban. • The demands for space are to be accommodated. • Maintaining spatial quality at the same time. • Strategies: Intensify land use in urban areas, combine uses in rural areas, transforming spaces to meet demand (Ministry of Housing, 2001: 19).	• Congestion. • Efficiency in the region. • Transport system planning, regional public transport provision (Clark, 2006:19). • Greening of the city. • Environmental education. • Preventing segregation. • Enhancement participation and partnership. • International co-operation. • Maintain planned and functional urban structure. • Clean up contaminated land. • Reducing the ecological footprint. • Enhance environmental protection and sustainable development (Taipale, 2007:23).

	Randstad (Netherlands)	Helsinki (Finland)
Guiding legislation	• Law on spatial planning (Wet Ruimtelijke Ordening WRO) regulates the responsibilities and principles but gives no legal obligation to citizens. The law forms, since introduction in 1965, the legal basis for spatial development. The implementation of the strategic principles takes place at provincial level and local level by plans and guidelines. • The National Spatial Strategy guides spatial development. Urban development and infrastructure are subject to location policy and urban compaction policy. It deals with location aspects, transport and with particular projects of national importance (European Union, 1999). • Planning instrument at the municipal level is the local land use plan which is legally binding. It designates land use and regulates the development in the area (Faludi & Van der Valk, 1994:46).	• On regional level, the Helsinki Master Plan of 2002 guides development. It is the vision for the next 30 years. It is intended for professionals and pure planning measures. • On local level, the Helsinki City Structure guides development. This structure shows change, thus all new developments and plans. On municipal level, there is a Master Plan and an EIA is required. On local level, each town has its own plan, but no EIA is required. • Furthermore, Helsinki Sustainable Development Action Plan was developed in accordance with the Master Plan of 2002. This emphasises the need for integration and illustrates the success it will have, if it is planned holistically (Helsinki University of Technology, 2007:10).
Governance	• Utrecht, Amsterdam and Rotterdam form a polycentric city region (Clark, 2006:11). There is no city with overriding influence. • Central and decentralised forms of administration. • The council provides basic policy outlines, monitors the municipal executive. • The tasks of the council include representing the people in decision-making processes, determining budget, checking municipal annual accounts, the drawing-up and enactment of byelaws. • The most important task of the Ministry of Housing, Spatial Planning and the Environment (VROM) is to create a pleasant living environment, to continue a spatial planning policy and contribute to a sustainable development (Ministry of Housing, 2001:14).	• Four member municipalities are Helsinki, Espoo, Kauniainen and Vantaa (Clark, 2006:17). • The level of co-operation between the four municipalities in the region is different. • Municipalities compete among themselves. • In every field and area of expert municipal functions there are special committees regularly deciding upon co-ordination, running joint projects and tasks. • Highest decision-making organ is the City Council. • The Council makes financial decisions as well as those related to City administration. • Sustainable development concerns all the city's residents, neighbourhood organisations, NGO's and educational institutions as well as businesses, state and regional administration etc. (Helsinki University of Technology, 2007:5).
Impacts	• Great shortage of space. • Risk of a continuous, monotonous urban area. • Functional structure with proposed sub-centres. • Multifunctional urban area. • Well-laid out public space enhances spatial quality. • Concentration of functions and optimal accessibility. • Integral development vision. • Functions are concentrated in new city centres. • Quality and diversity of the urban environment.	• Metropolis characteristics. • Development of the polycentric region. • Plan-led development. • Development axis is introduced. • Support periphery. • Social housing concepts increasing. • Growth versus biodiversity. • Several municipalities, different visions. • Public transport versus car ownership.

	Randstad (Netherlands)	Helsinki (Finland)
Spatial planning	• Policies promoting urban living and working are foremost driven by spatial issues (pressure on space) and to a lesser degree by economic ones. • Mixed-use development, re-use of buildings and locations, and improving environmental quality, safety and accessibility are widespread measures to promote urban life (Clark, 2006:12). • Development planning is a method that makes the implementation of spatial plans, visions and projects the central consideration (Ministry of Housing, 2001:3). • The National Policy document introduces green and red contour lines. Green contour lines are drawn around green areas of national or regional importance. Red contour lines limit urban growth. The municipalities draw their contour lines together. • Emphasis on the development of open spaces. • Centralise where necessary, decentralise where possible.	The Helsinki action plan for sustainable development was set out in detail and guides spatial planning: • Guideline reports on sustainability/traffic planning. • Workshops on sustainability. • Proposal for implementation. • Interdisciplinary team for development of core indicators for sustainability. • Financial support for NGOs and citizen-initiated small-scale sustainability projects. • Green Area programmes. • Drafting of new master plan. • Publish report of core indicators for sustainability. • Publish annual environmental report. • Draft of sustainable action plan. • Long-term transport plan. • Draft Master Plan. • Regional Transport system. • Mid-term follow up and evaluation process. • Sustainability Action Plan.
Lessons learnt	• 30 points for action included in the Economic Strategy Randstad (ESR). • Strengthening of integration in the region. • Increased differentiation between the cities. • Implemented Randstad Rails. • Priority around major nodes and cities. • Increased share of professionally-educated people. • Spin-offs from research. • Forging links between the region and universities. • Encouraging investment (Clark, 2006:16).	• Approved the Helsinki Metropolitan Area Transport • New rail links between the major centres. • Water collection systems (Clark, 2006:21). • Helsinki is successful because it can accommodate change. 80% of Helsinki is public owned. The public decides what, when, how. It accommodates the actual needs of residents. • Key words are integration and coordination. • Everything is about planning. Transportation in accordance with spatial planning.

Source: Own creation (2008)

In evaluating spatial planning concepts, it is imperative that both national and international examples are explored to learn from and help identify 'best practice' models (Cape Town, 1999). From the above-mentioned it can be concluded that international best practice reveals a pro-active planning approach. Essential training supports this in order to understand the complexity of sustainable development. Thus, the focus should be on a multi-level consultation process.

9.3 South African spatial planning approaches

The major social and environmental consequences that stem from the structure and form of South African cities suggest that the current pattern of urban development is entirely unsustainable, and that urban compaction is an essential condition for improved urban performance. However, compaction in itself is not a sufficient condition. It needs to be accompanied by substantial urban restructuring. While settlements continue to sprawl outwards, urban unemployment and commercial opportunities have been slow to respond and to follow this pattern of growth. South African towns and cities have large parcels of strategically-located vacant land, which needed to be mobilised towards greater compaction in terms of spatial planning approaches (Dewar, 1992). However, the potential benefits of high densities have been negated by their mono-functionality, and have not led to a decrease in the need to travel by public or private transport.

The idea of a compact city therefore has serious obstacles in South Africa. These obstacles are the current survival strategies of the poor that necessitate lower building densities, the freedom and power afforded private landowners and developers within the capitalist market system, the lack of development control measures to ensure that development takes place at higher densities at central localities and with mixed uses, the subsidy regime for “RDP-housing”, the lack of exemplars of compact living and the advantages thereof within the existing city, and the anti-urban mindset of both rich and poor. This is influencing the current spatial planning reality. The combination of these forces has resulted in the three spatial characteristics of low-density, fragmentation and separation, which fundamentally describe South African cities and towns. These unsustainable urban forms should be transformed into sustainable urban forms. Sustainable urban forms, as illustrated in Table 16, should be created through proper spatial planning approaches.

Table 16: Spatial development objectives and outcomes

Sustainable urban environment	An accessible city	An efficient city
• Responsible use of resources. • Sustainable rates base. • Focused investment. • Safety and security. • Efficient transport system. • Sustainable neighbourhoods. • Cultural heritage. • Lower vehicle emissions. • Sustained economic growth.	• Physical city structure that promotes accessibility. • Equity in the urban system. • Integrated range of travel modes. • Diversity in the urban system. • Public transport.	• Form and structure that lead to greater efficiency. • Protection of existing investments. • Open Spaces system. • Focused activities and investment. • Infrastructure viability. • Managed growth.

Source: Own construction (2008)

Integrated development planning has emerged as a distinct approach to planning, and thus to transforming the unsustainable urban areas. These ideas of integrated planning in South Africa were further entrenched in the following core policy and legal documents: Growth, Employment and Redistribution Programme (1994), The Constitution (1996), White Paper on Local Government (1998), Green Paper on Development Planning (1999), Development Facilitation Act (1995), Local Government Transition Act (1996), Municipal Structures Act (1999), and the Municipal Systems Act of 2000 (Schoeman, 2006:6).

The current South African spatial planning approach, based on these policies, legislation and guidelines, is intended to create a more sustainable urban environment focusing on greater efficiencies, and better accessibility to services and opportunities. The elements that are emphasised in the spatial planning approach in South Africa include: (Johannesburg, 2004:290)

- An efficient movement system with strong viable nodes.
- Sustainable neighbourhoods and environmental management.
- Corridor development.
- Delineating and managing an urban development boundary.

In order to realise the spatial planning vision and implement these elements into the current reality, the spatial planning approach is supported by policies, legislation and guidelines, as described in Chapter 2. The spatial plan is an integrated planning approach, created according to movement systems, nodes, densification, corridor development and specific design guidelines. The investment framework and local plans will also influence the local spatial planning, and vice versa. This is illustrated in Figure 17.

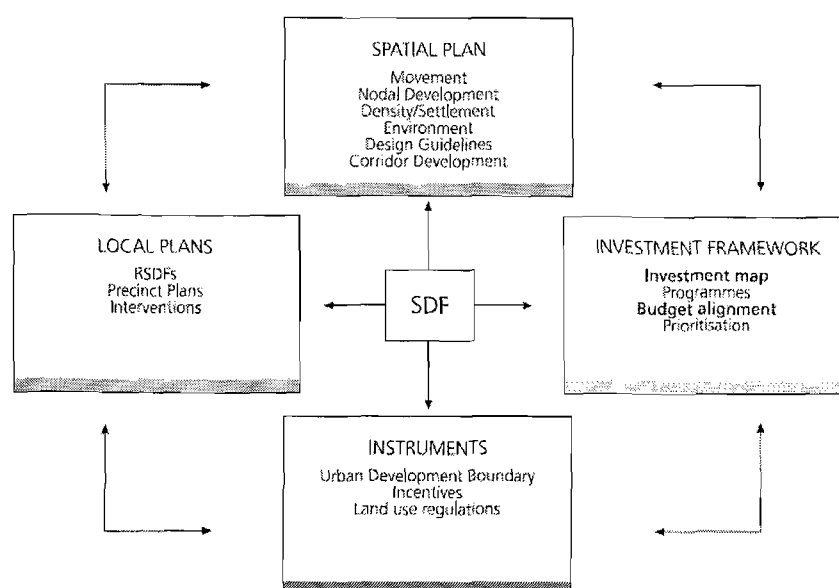


Figure 17: Spatial Plan

Source: Johannesburg (2004:291)

As concluded from the literature research and with reference to Figure 17, the instruments currently used to guide spatial planning in South Africa are: (Johannesburg, 2004:291)

- Incentives.
- Land-use regulations.
- Urban development boundary.

The focus of this study is to evaluate the urban development boundary as a tool to ensure a sustainable urban form, and therefore the details, objectives, strengths, weaknesses and outcomes of this urban development boundary concept will be described in detail in chapter 5. In terms of spatial planning practices in South Africa, the Spatial Development Framework needs to be emphasised and evaluated, as it is manifested as the principle document guiding the local spatial planning approach.

The municipal Spatial Development Framework is supported by the Environmental Management Plan, Strategic Environmental Assessment, Integrated Development Plan, Integrated Transport Plan, Urban Development Plan and other sectoral plans, and is vital for facilitating development and maintaining sustainable development. For purposes of this study, the Spatial Development Framework will be described accordingly.

9.4 South African spatial planning concepts: Spatial Development Framework

The extent of development, both existing and planned, has led to increasing pressure on land, natural resources and environment. The Spatial Development Framework (SDF) is the current policy managing spatial development in municipalities. Thus, answering to the current housing shortage, proper planning and decision-making obstacles.

The Spatial Development Framework (SDF) is a policy for the overall spatial distribution of development within a municipality. It is a framework for more-detailed land-use planning, illustrating the current realities, spatial plans, prioritisation of future projects and developments. It needs to consider the impacts of the provincial, district and neighbouring municipal SDF's, and at the same time ensure integration with the Integrated Development Plan (IDP). An integral part of a successful SDF is public and stakeholder participation. The SDF will thus guide and inform all decisions on spatial development and land-use management in the entire area of municipal jurisdiction.

The purpose of the SDF is to reflect spatially the development vision contained in the Integrated Development Plan, to reflect prioritised Integrated Development Plan projected needs and to integrate sector strategies.

The above-mentioned objectives are not present in the local South African urban environment and therefore it can be concluded that the implementation of the spatial planning concepts and methods are insufficient. This is probably why South African cities are still unsustainable – the policies, frameworks, legislation and guidelines meant to direct the urban area are not realised when implemented. If the Spatial Development Framework is to achieve the desired urban form (Johannesburg: 2004:290), it should:

- Link spatial objectives to clear implementation strategies.
- Ensure that infrastructure is carefully planned and managed.
- Put policy and institutional instruments in place.
- Manage growth appropriately.
- Ensure that all relevant sectors are aligned to the plan.
- This can be achieved by implementing an effective growth management approach that steers development to achieve the desired spatial and developmental outcomes.

9.5 Conclusions

Urban restructuring is at the forefront of all planning. Understanding that the low-density sprawling settlement pattern is unsustainable in the long term, has led urban planners to rethink the future of spatial and land-use planning (Gauteng, 2007:34). The current urban structure of the South African cities is known to be unsustainable. The impact of informal settlement subsidies and people migrating to the periphery are increasing the urban sprawl phenomenon. Thus, the South African spatial planning approach needs to seek ways to transform the current urban environment into a more sustainable urban form. Development should relate to the rural environment within which it is happening, ensuring that such development is sustainable and beneficial to the rural area. Given the urban status and the need for economic development to achieve the social responsibilities, it is important that rural development should be supportive of the urban area. The urban and rural area should be planned holistically, integrating all elements of sustainable development, as well as elements of spatial planning and development.

In order to address this unsustainable urban pattern, there needs to be functional development direction implemented within the spatial planning approach. The development direction should be integrated across all impacting spheres and sectors.

- In terms of the economic sector: The economic belt around the current urban core area needs to be supported by economic corridors crossing through the existing urban area.
- In terms of the environmental sector: Environmental elements are currently only present on the outer part of the urban area, and need to be integrated into the urban core area.
- In terms of sustainable development: Elements need to be integrated into the current urban form as illustrated in Figure 18.

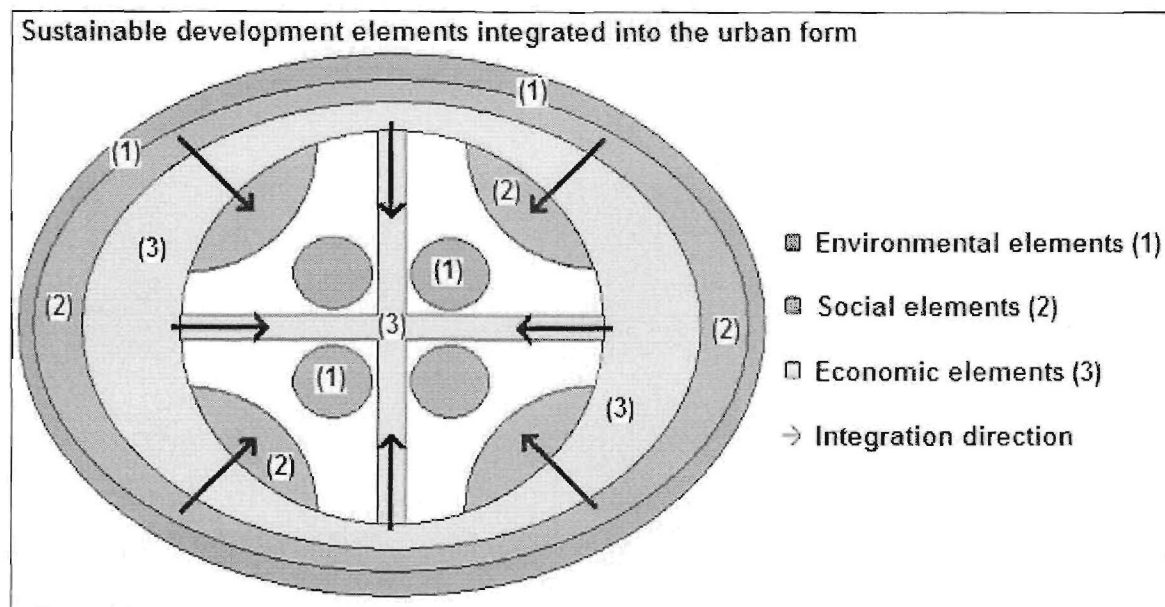


Figure 18: Integration of the sustainable development elements into the current urban form

Source: Own creation (2007)

10 Environmental Management

Our quality of life, health and well-being rely on clean land, water and air, productive soils, available minerals and water resources, natural coastal and fluvial systems, and processes. It also depends on distinctive and inspirational landscapes, a wealth of wildlife, vibrant communities, a healthy, well-managed countryside and open spaces accessible for everyone to enjoy (Tyldesley, 2005:5).

The priority is to integrate these objectives into the current urban environment and spatial planning approach. Thus, the need to protect the environment should be emphasised and the impacts of future climate change should also be taken into account (Tyldesley, 2005:5). Environmental management is subject to a plan-making system that is properly resourced, evidence based, visionary, inclusive, fully integrated, spatially variable, firm but flexible, rigorously tested, well delivered, adequately monitored and regularly reviewed (Tyldesley, 2005:8). This will ensure development to be:

- More sustainable in terms of built form and location.
- Respects the ability of the environment to accommodate change.
- Respects local distinctiveness and sense of place and is of high design quality.
- Reflects local needs and provides local benefits.

Furthermore, environmental protection is a right, not a privilege reserved for a few who can "vote with their feet" and escape environmental inequities. New tools that were developed to meet this challenge include Strategic Environment Assessment (which is aimed at including environmental considerations earlier in the process of formulating policies, plans and programmes) and environmental justice (which is aimed at promoting the fair and equitable distribution of environmental goods, services and resources). Environmental justice, in the modern sense, is synonymous with environmental management. The environmental justice framework incorporates all social movements that seek to eliminate harmful practices in housing, land use, industrial planning, health care, and sanitation services. To comply with the requirements of environmental justice, government must integrate environmental considerations with social, political and economic justice.

Policy, legal and institutional frameworks should emphasise the need for environmental management and in doing so, ensure environmental justice within the spatial planning and development approaches. Environmental management is a field that is rapidly growing in importance as a discipline of its own. It is 'the process of administering, supervising or handling the environment in order to achieve a desired outcome' (Fuggle & Rabie, 1996). In understanding the interface, the evolution patterns with regard to environmental management on international and national level should be noted (Schoeman, 2006:6).

10.1 International environmental management approach

Environmental management (EM) is the management of the environment that will result in a positive outcome for nature and future generations. Environmental considerations need to be incorporated in current development planning, implementation and evaluation to ensure the future of species, and natural balance of the planet. While global resource availability is likely to keep pace with increased general consumption, frequent local and regional shortages will continue to threaten human existence and challenge present governance and management systems (DEAT, 1997). How environmental management is practiced depends on what individuals and communities think of themselves and how they interact practically with their environment. The way a person perceives the environment (worldview) reflects that person's previous experience, education, life-style and interests (Hugo *et al.*, 1997:199).

Before 1998, the most-important environmental legislation was the Environment Conservation Act (ECA) 73 of 1989. The concept Environmental Impact Analysis (EIA) was developed in the USA in 1970 and consists of the evaluation of the effects likely to arise from project developments that will affect the natural and man-made environment. The EIA is the core regulating legislation in terms of environmental management. Conventional EIA was perceived as too limited in scope, reactive, anti-development, too separate from the planning process, and often the cause of costly delays, and therefore led to the publication of a document on integrated environmental management (IEM) in 1989. During the Sustainable Communities course held in Helsinki Finland during August 2007, Mr Mikael Hilden of the Finnish Environment Institute confirmed that the Finnish Land Use and Building Act (132/1999) requires EIA's to be performed on municipality level. The EIA is not, however, the best way to regulate planning because it is done on individual projects and not beneficial to the greater area. Planning must be integrated and viewed holistically and the EIA does not support such a vision (Hilden, 2007:1).

Objectives should lead the drafting of policies and proposals. They should flow from the vision and scoping of the plan or strategy (and from higher tier plans and policies) and should form the framework within which policies and proposals will fit (Tyldesley, 2005:14). Ageman and Tixworth (1996) introduced the changing face of environmental policy and practice in Britain. The international example of the United Kingdom illustrates how objectives should lead policies and proposals in terms of environmental management. This is illustrated in Figure 19.

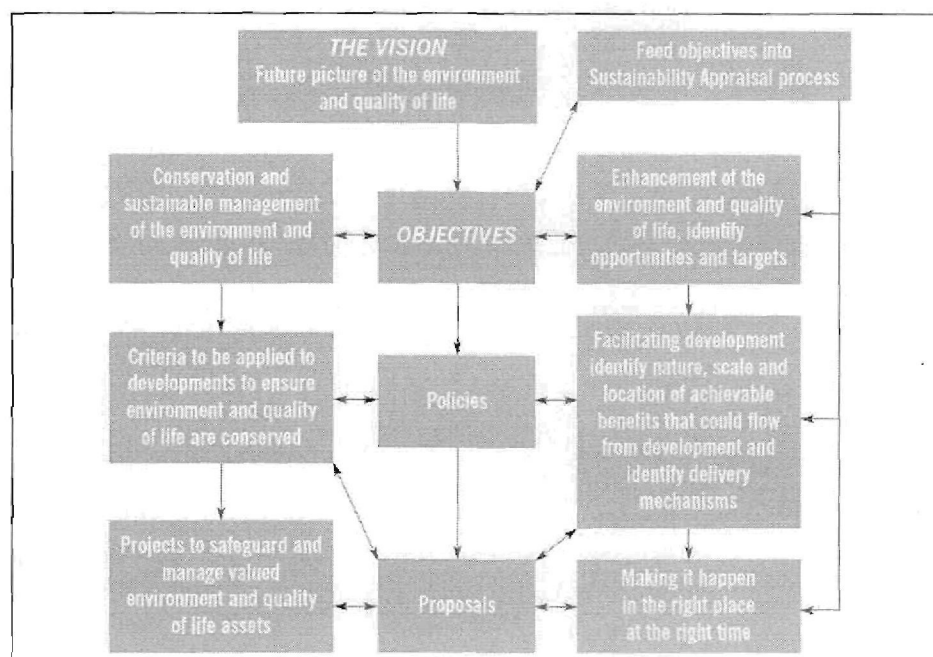


Figure 19: How objectives should lead policies and proposals

Source: Tyldesley (2005:15)

The United Kingdom implemented these objectives into the current spatial environment, and established a link between the relevant plans, policies, strategies and frameworks. The aim was to create visionary plans and strategies that are meaningful and not just vague aspirations. The vision was at the forefront of the plan and strategy, and shapes all its aspects. Objectives, policies and proposals flew from the vision and contributed to it. The vision was locally relevant, identifiable and attainable in terms of what the community wanted to achieve, set in the context of national, regional and sub-regional policies. The connecting plans and strategies, as implemented in the United Kingdom, are illustrated in Figure 20.

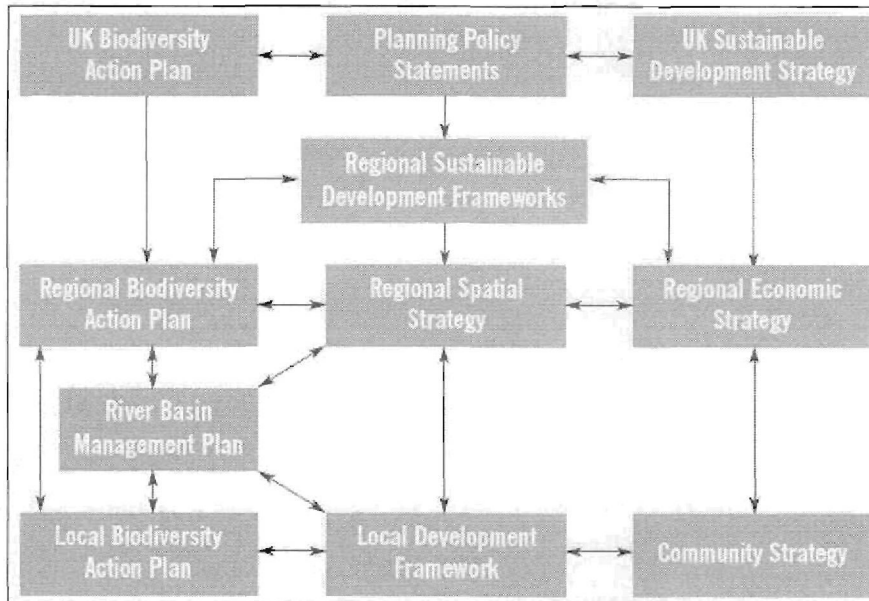


Figure 20: Connecting plans and strategies

Source: Tyldesley (2005:10)

The process to successful environmental management requires different levels of analysis and interpretation and includes quantitative data, qualitative data and public participation while change is still possible. In addition, it should be emphasised that the environment can not be separated from the urban areas. The aim is to find a win-win situation for the environment and urban areas. The urban area and environmental green areas are not in competition with one another, but should be planned together to ensure successful and sustainable development.

Suitable measures for environmental management can be grouped into three general categories as illustrated in Table 17:

Table 17: Measures for environmental management

Direct measures			Indirect measures		Supportive
These measures usually take the form of laws, regulations and directives prescribing behaviour. Direct measures can be proactive, or reactive.			These measures encourage people to change their behaviour in return for the benefits derived from SD.		Provide a setting for effective EM and SD
Pro-active measures:	Re-active regulatory measures:	Proactive reactive depending on:	Pro-active indirect measures:	Reactive indirect measures:	Proactive reactive depending on:
Register of hazardous processes.	Compensatory payments.	Monitor/record emissions at source.	Environmental management.	Compliance auditing.	Strategic environmental assessments.
Permitting conditions.	Responsibility for remediation.	Levels in air or water.	Market based instruments.	Minimum standards.	Environmental impact assessments.
Environmental charges and incentives.	Administrative controls.	Negotiation and mediation.	Agreements to improve EM standards.	Capacity building programmes.	Cost benefit analyses and risk assessment.
Integrated planning regulations.	Rehabilitation and mitigation programmes.	Environmental Management Programmes.	Achieve cleaner production.		Integrated environmental planning.

Source: Own creation (2007)

The direct, indirect and supportive categories are interrelated and the best results will come from an integrated approach based on an appropriate mix of measures from all three categories. The aim should be to find the best possible combination of measures to control and, where possible, minimise the environmental impacts of a particular activity. The criteria for determining the most-effective measures for exercising particular functions or responsibilities will be based on the policy principles and include:

- Effectiveness in ensuring environmental sustainability.
- The ability to secure participation by interested and affected parties.
- Constitutional rights and requirements for national supervision-, and cooperative governance.
- Existing capacity and the potential for developing capacity in the future.

10.2 South African approach towards environmental management

South Africa did not escape the environmental crisis and as political pressure mounted, international pressure for environmental change also mounted. Environmental legislation in South Africa reflected the main concerns of the environmental movement (Steyn, 2001:16). South Africa was slow to develop and institute formal procedures for environmental assessment. It was only with the enactment of the Environment Conservation Act (Act 73 of 1989) that provision was made to determine environmental policy to guide decision-making and to prepare environmental impact reports (Sowman & Gawith, 1994).

The publication of a document entitled Integrated Environmental Management (IEM) in South Africa marked the introduction of the concept of environmental management. IEM was an approach to integrate environmental considerations across all stages of the planning and development cycle, applicable to policies, programmes, plans and projects (Sowman & Gawith, 1994). A revised IEM-procedure and a series of guideline documents were published by the Department of Environment Affairs (1992). The evolution of IEM in South Africa has shown that during the 1990s the philosophy of IEM became well rooted in South African thinking. However, the implementation of IEM was largely focused on one tool: environmental impact assessment.

Regulations enforcing EIA were promulgated in September 1997 in terms of the Environment Conservation Act (Act 73 of 1998). Environmental considerations have become an integral part of developmental thinking and decision-making. The publication of the National Environmental Management Act (Act 107 of 1998) followed. The Act provided a framework for environmental governance and promoted the application of environmental assessment and management tools to ensure integrated environmental management of activities (Baloyi, 1999:29).

Environmental Impact Assessment (EIA) evolved into Strategic Environmental Assessment (SEA). Figure 21 illustrates the relationship between EIA's and SEA's. This evolution initiated further changes in both policy and legislative frameworks applicable to planning and development in South Africa. The initial approach was to shift the focus from physical planning to sustainable development. It became evident that there is a need to link Spatial Development Frameworks (SDF) and Environmental Management Plans (EMP) to fulfil the important role within the democratised planning systems applicable today.

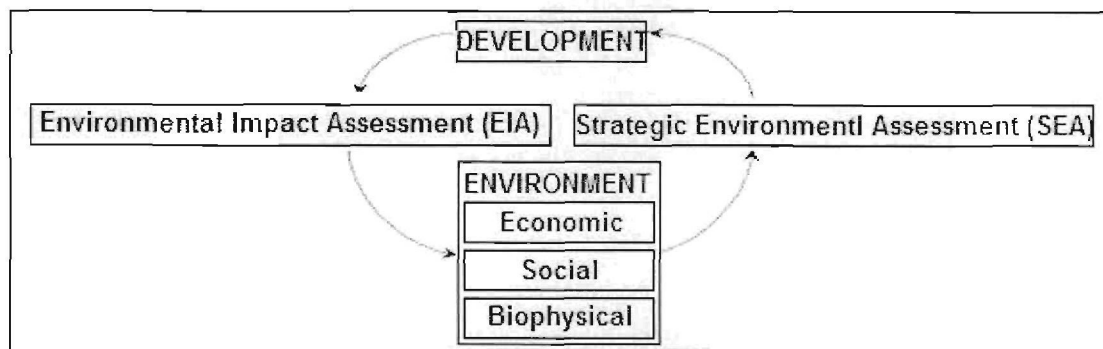


Figure 21: Relationship between EIAs and SEAs

Source: DEAT (2000:11)

The purpose of SEA is therefore to complement the planning process, by providing the information necessary to ensure that development maintains and enhances environmental resources. This is a practical means of implementing the concept of sustainability in planning (DEAT, 2001).

Rossouw and Wiseman (2004) stated that environmental functions are fragmented, within and between the three spheres of government. National as well as provincial spheres of government are empowered to enact environmental legislation that falls within their functional areas. Ngobese and Cock (1997) also highlighted these problems of duplication. They stated that the institutional framework for environmental policy in South Africa was not clearly defined.

A key challenge is to support sustainable development through the use of a wider range of environmental assessment and management tools across the full activity life cycle and by all sectors of society. South Africa needs to introduce sustainable development (cross-reference to the introduction of this chapter) in the context of environmental management and development in order to ensure the creation of wealth by improving the environment in order to raise productivity, thereby increasing the standard of living (Lindeque, 2003:8).

10.3 Integrated Environmental Management concepts

Environment management is guided by Integrated Environmental Management (IEM) and is defined as a combination of pre-active and preventive processes and procedures that maintain the environment in good condition for a variety of sustainable uses (DEAT, 1998b:14).

IEM aims to improve the way environmental resources are utilised. It provides a cost-effective procedure for ensuring that environmental concerns are carefully considered in all developments. The primary aim of IEM is to redirect and re-orientate the developing economy of South Africa from environmentally unsustainable development, towards environmental sustainability (DEAT, 1998b:14).

IEM will be a prerequisite for government approval of all activities with potentially adverse environmental impacts. The purpose of making IEM compulsory is to give decision makers at all levels adequate information on possible adverse environmental effects of the activity. This will enable them to make decisions on possible alternatives to mitigate impacts. The IEM process must provide for the participation of interested and affected parties in the planning, assessment and implementation of activities. In order to ensure sustainable development, environmental issues have to be integrated into all development processes at all levels of decision-making. The IEM principles reflect similar thinking to the Agenda 21 norm. The 1992 IEM principles appeared at the same time as Agenda 21 and were therefore not simply an implementation of Agenda 21. These IEM principles were developed before the Constitution (Act 108 of 1996) was promulgated.

IEM is a holistic approach to project management. Although IEM is a toolbox of different elements, it is essentially a philosophy and a formalised approach which acknowledges that all actions taken during the project development must be planned and should ensure that no consequences are overlooked or underestimated (Hugo *et al.*, 1997:201).

10.4 Conclusions

The South African society and economy are characterised by the inequitable distribution of wealth and resources. A minority enjoys high living standards, with sophisticated infrastructure and services, while the basic needs of the majority are not adequately met. The range from First to Third World lifestyles and circumstances creates particular problems for the protection of the environment and the promotion of sustainable development. In this situation, environmental policy must face the challenge of addressing both the basic needs and survival strategies of the poor and the impacts of the industrial consumer economy.

All elements of the environment are linked, and management must therefore take account of the connections between them. The integration of environmental concerns into every area of human activity is central to the achievement of sustainable development. Priority areas for environmental governance include the integration of environmental, social and economic considerations in development and land use planning processes and structures. This requires the assessment of environmental impacts at policy, planning, programme and project levels. Strategies and plans should identify opportunities to gain more proactively. Planning authorities should address how the location and design of essential new development could avoid harmful effects while bringing new benefits that would not otherwise occur. Generalised risk analysis is one of the best tools to determine this and to ensure sustainable development. The aim is to find an interface between spatial planning and environmental management.

There is a shift in the focus when the urban and rural areas are integrated. This includes the rebuilding of the townships, creating of more jobs, housing and urban amenities through integrated development planning, reducing commuting distances between the workplace and residential areas, facilitating better use of underutilised or vacant land, introducing environment-sensitive management of development and improving urban transport. Key elements to achieve this are to find an interface between spatial planning and environmental management through urban policies, the urban planning systems, transportation and management.

11 The interface between spatial planning and environmental management

The interface between spatial planning and environmental management can only be established through linking the relevant policies and applicable legislation, identifying the overlapping areas and creating innovative ways to integrate them into a holistic approach. Table 18 illustrates the South African national policy framework, applicable to environmental management and spatial planning, respectively.

Table 18: National policy framework applicable to environmental management and spatial planning

Environmental management	Spatial planning
• Integrated Environmental Management. • Guidelines Series (1992). • DEAT: An Environmental Policy for South Africa (Green Paper) (1996). • DEAT: Guideline Document: Strategic Environmental Assessment in South Africa (2000). • DEAT and CSIR: Strengthening Sustainability in the Integrated Development Planning Process (2001). • DEAT: State of the Environment Reporting: Draft Guidelines for Local Municipalities (2005).	• Reconstruction and Development Plan (1994). • Growth, Economic & Redistribution Strategy (1996). • White Paper on South African Land Policy (1997). • Urban Development Framework (1997). • Rural Development Framework (1997). • Green Paper on Development and Planning (1999). • White Paper on National Transport Policy (1996). • Moving South Africa (1996). • White Paper on Local Government (1998). • Strategic Environmental Assessment in SA (2000). • Integrated Rural Development Strategy (2000). • White Paper on Spatial Planning & Land Use (2001). • DPLG: IDP Guide Packs 1 to 6 (2001). • National Spatial Development Perspective (2003). • Mining Charter (2003). • Construction Charter (2004).

Source: Schoeman (2006:10)

In addition to the policies, the following legislation as contained in Table 19, influences the interface between environmental management and spatial planning.

Table 19: Legislative framework applicable to environmental management and spatial planning

Environmental management	Spatial planning
• Constitution of the Republic of South Africa (Act 108 of 1996). • Bill of Human Rights (contained in the Constitution). • The Development Facilitation Act (Act 67 Of 1995). • Water Services Act (Act 108 of 1997). • Environment Conservation Act No 73 of 1989, • National Environmental Management Act (Act 107 of 1998). • National Water Act (Act 36 of 1998). • National Heritage Resources Act (Act 25 of 1999). • World Heritage Convention Act (Act 49 of 1999). • National Environmental Management: Biodiversity Act (Act 10 of 2004).	• Constitution of the RSA (Act 108 Of 1996). • Bill of Human Rights (contained in the Constitution). • Urban Transport Act (Act 78 of 1977). • Local Government Transition Act (Act 209 of 1993). • Restitution of Land Rights Act (Act 22 of 1993). • Informal Land Rights Act (Act 76 of 1995). • The Development Facilitation Act (Act 67 Of 1995). • National Road Traffic Act (Act 93 of 1996). • National Transport Act (Act 45 of 1998). • RDP Act (Act 79 of 1998). • National Development Agency Act (Act 108 of 1998). • Municipal Structures Act (Act 117 of 1998). • Municipal Demarcation Act (Act 27 of 1998). • Municipal Systems Act (Act 31 of 2000). • National Transport Transition Act (Act 22 of 2000). • Land Use Management Bill (Final Draft 2003). • Municipal Finance Management Act (Act 56/ 2003). • Local Government: Municipal Planning and Performance Management Regulations (2001).

Source: Schoeman (2006:12)

The above-mentioned policies and legislation regulate spatial planning and environmental management with the help of certain tools and concepts as identified in the previous section. Accordingly, commonly-used tools in support of integrated environmental management are listed and described in Table 20. Only tools applicable to the interface between environmental management and spatial planning are contained (As adapted from DEAT, 2004):

Table 20: IEM tools applicable to the interface between environmental management and spatial planning

Tool	Description
Environmental Impact Assessment	Aims to predict both positive and negative environmental impacts of a proposed project. It finds ways to reduce adverse impacts and shape projects to suit the local environment. It is project-specific and site-specific, thus determining the spatial and temporal boundaries. It focuses the environmental assessment on key issues to be investigated. The results of the assessment are presented in an Environmental Impact Report. The EIA process includes stakeholder engagement.
Stakeholder Engaging	It is the process of engagement between stakeholders during the planning, assessment, implementation and management of proposals or activities. The level of stakeholder engagement is described by a spectrum of levels in the decision-making process.
Ecological & Environment Foot printing	Provides a measure of how much bio-productive area a population would require to be sustainable and produce all the resources it consumes. Calculating the geographical extent of the activities, products or services in the environment.
State of the Environment Reporting	Highlights changes in the environment, the causes of those changes, identifies appropriate responses. Reports provide a link between information that is often technical and the general public. It uses indicators to describe changes (Driving forces, pressures, state, impacts and responses).
Strategic Environmental Assessment	Determining environmental implications of decisions made at a policy, plan or programme level. It focuses on higher-level processes, SEA compliments and provides framework for project-level EIA. It aims at evaluating the opportunities and constraints that the environment places on development. It facilitates the move to sustainability and proactively considers the objectives of sustainability.
Environmental Management Systems	Provide guidance on how to manage the environmental impacts of activities, products, and services. Detail the organisational structure, responsibilities, practices, procedures, processes and resources for implementing and maintaining environmental management.
Environmental Policy	The environmental policy details an organisation's aims and principles of action with respect to the environment including compliance with all relevant regulatory requirements.
Environment Management Plan (EMP)	Forms part of an Environmental Management System and specifies how an activity is to be managed to minimise potential impacts on the environment and enhance benefits. Aims at ensuring that the conditions of authorisation associated with a project are fulfilled. Can be applied to the construction, establishment, operational or decommissioning phases of an activity.

Source: Adapted from DEAT (2004:11-14)

These tools can be mapped in terms of the hierarchy of activity and stage in the activity life cycle at which it could be applied. It should be noted that this mapping of tools is indicative and not absolute, as they are constantly evolving and finding new or varied applications. The potential hierarchical relationship between three IEM tools (SEA, EIA and EMP) and stages in the development cycle is shown in the following figure.

It is not intended that SEA should replace EIA, but rather that it should complement project level assessment, by providing an effective tool for environmental assessment at the plan and programme level. SEA can then form the context for lower levels of planning (DEAT, 2004).

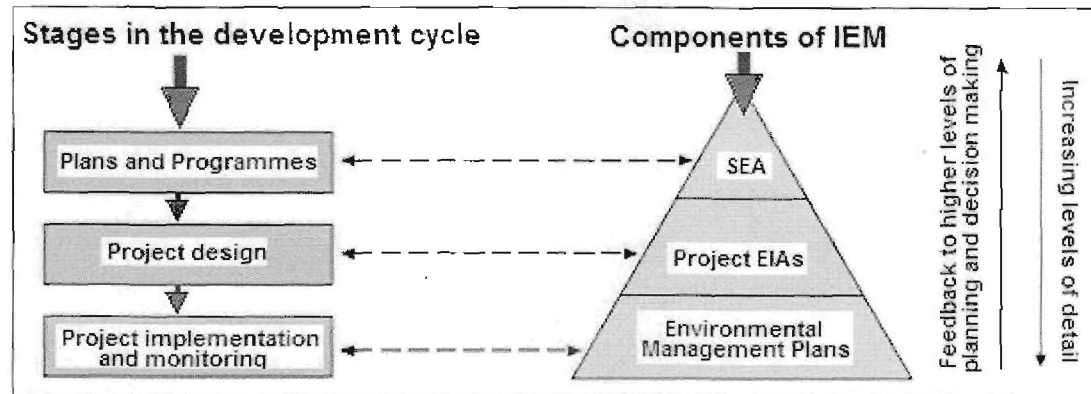


Figure 22: Example of a hierarchy of selected tools in relation to a typical development cycle

Source: DEAT (2004:15)

The spatial planning process is thus faced with the challenge to translate IEM (with its support tools) and IDPs (with its sectoral plans) into workable Land Use Management Systems (LUMS). Discussions and recent debates have not focussed on how to translate the broad vision statements of the IEM and IDP supported by its tools, instruments and sectoral plans to the detail level of Land Use Schemes (LUS) as required in terms of the Land Use Management Bill (2003). Khan, Jewell and Von Riesen (2001) were the first to attempt to address this important interface. Khan *et al.* (2001) stated that the assumption has always been there. It either will simply happen through a review of the existing Town Planning Scheme or because the legislation stated that such a plan had to be done.

The provincial ordinances and land-use control systems that enabled the preparation of Town Planning Schemes did not anticipate the need to include the strategic components of the IDP or input from the IEM into the land-use management scheme. Kahn *et al.* (2001) indicated that in the past, Town Planning Schemes in South Africa have concentrated on addressing urban development within the defined municipal boundaries. It did not address the rural land uses or the concerns of environmentalists. However, some provinces such as Gauteng has promulgated its own Development Planning Acts that will (once the regulations have been approved) enable the preparation of a land-use management scheme.

The principles and key elements as identified in this chapter should be integrated into current procedures for the formulation of policies, plans and programmes. This integration should assist in moving towards sustainability at the strategic level (DEAT, 2000:13).

Meeting the many challenges South Africa faces in achieving the goal of sustainable development requires co-operation between all spheres of government, community-based organisations, non-governmental organisations, researchers and academics, business, and environmental practitioners. Based on the research related to the interface between environmental management and spatial planning, the integration approach as contained in Figure 23 is proposed to enhance the alignment between these processes.

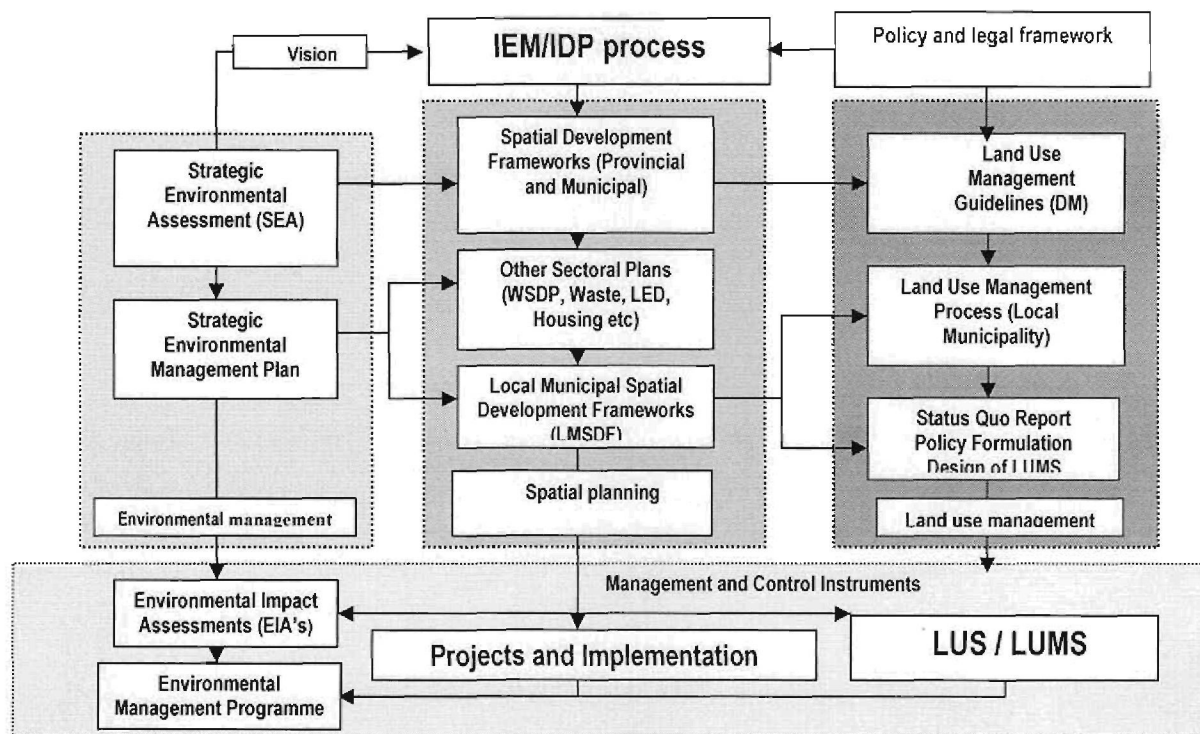
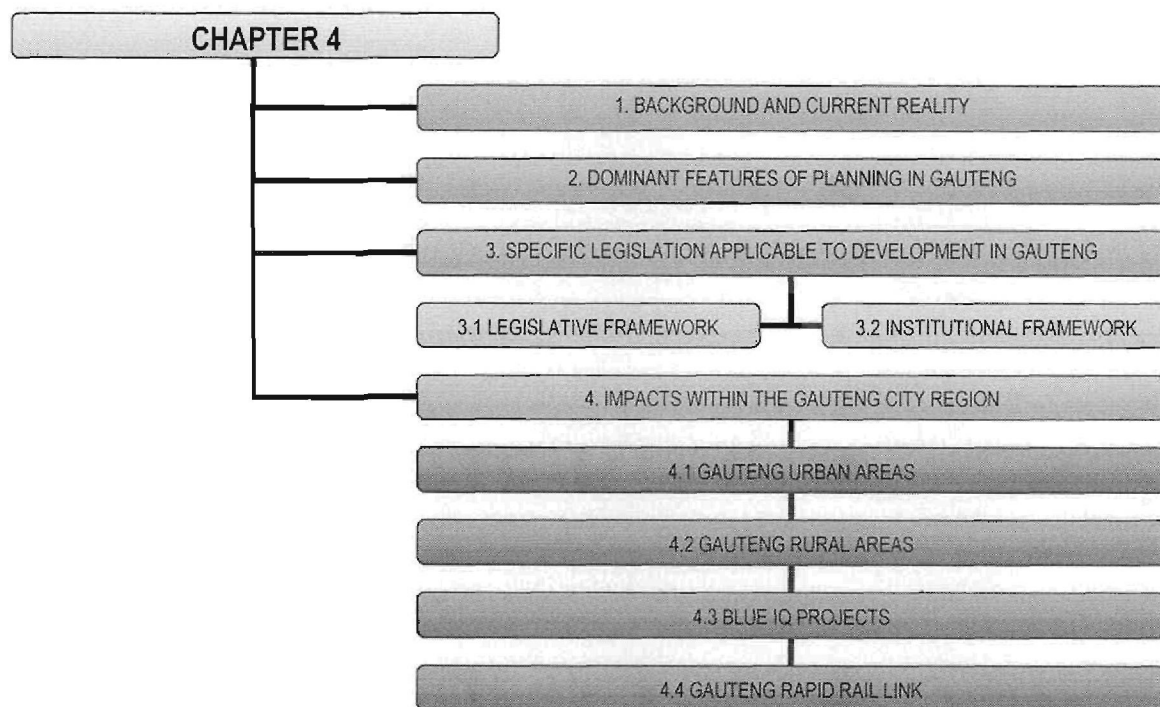


Figure 23: Interface between IDP, environmental management, spatial planning and land use management
Source: Schoeman (2006:39)

Chapter 4

Gauteng's current reality



1 Background and current reality

If sustainable cities were built with policy documents and vision statements alone, South African cities would have been model cities. However, due to the policies of separate development of the apartheid government, South African cities are seen as inefficient and unsustainable. Although these policies have changed, the unsustainable urban form is being perpetuated. If all the policy documents that support sustainable development are in place, why do unsustainable cities still occur? The current reality of the case study of Gauteng will be described in the following pages, in order to sketch the background and create an understanding of the urban environment and influencing forces and issues.

- **Municipalities:** The province is unique (in comparison to international case studies) in the sense that spatial planning left a legacy of apartheid-established townships. Gauteng faces a situation where three municipal districts of Sedibeng, Metsweding and West Rand are underdeveloped compared to Johannesburg, Tshwane and Ekurhuleni (Gauteng, 2007:10).
- **Population:** With a population of 9,5 million people, Gauteng is the most populous province in South Africa (Statistics South Africa, 2007). On current demographic projections, urban Gauteng will be home to 14,6 million people by 2015 and will rank among the largest metropolitan settlements in the world. Gauteng shares challenges such as rapid urbanisation, immigration, congestion and infrastructure needs with other global city regions like Randstad, Tokyo and London. Table 21 indicates that Gauteng should prepare for significant population growth and that the demand on housing will increase. Land and other resources will become increasingly scarce and competition between development and conservation will intensify.

Table 21: Population – Past and projected for Gauteng

Municipality	2001	%	2010	%	2025	%
Tshwane	1,987,654	21.2	2,466,975	21.6	2,829,120	21.9
Johannesburg	3,225,772	34.4	3,830,353	33.5	4,182,998	32.3
Ekurhuleni	2,478,132	26.4	3,019,673	26.4	3,429,181	26.5
Sedibeng	796,756	8.5	998,677	8.7	1,192,956	9.2
West Rand	744,159	7.9	906,989	7.9	1,038,275	8.0
Metsweding	158,207	1.7	203,614	1.8	270,693	2.1
GAUTENG	9,390,679	100	11,426,282	100	12,943,223	100

Source: Gauteng, 2007:11.

- **Spatial:** There is no culture of compact living in Gauteng. People want privacy, space, freedom and choice. Residential areas are thus located on the outer parts of the urban area, on the cheaper peripheral grounds. Businesses and industries moved out of the city core. These are the signals of a fundamental change in the way the city grew. Gauteng's 120-year horizontal urban sprawl is coming to an end.
- **Urban form:** The reality reveals a dispatched urban form. There are various urban nodes within the urban environment. These nodes developed spontaneously and were not planned. There are various impacts within the urban environment, including social and commercial impacts, transportation impacts and economic impacts. Although areas are mono-functional, they soon become mixed in terms of use (Schoonraad, 2000:1).

- **Travelling distances:** The locality of low-cost housing projects on the periphery resulted in long travelling distances for the poorest section of the population. This argument is based on the assumption that there are one or maybe two central places of employment and that most people are employed in the formal sector. This argument becomes less valid given the changes in the economy and the decentralisation of many facilities and activities.
- **Agriculture:** As a result of our high population growth, the legacy of mining and industrial developments and Gauteng's location at the confluence of a high number of freight movement routes, the province experiences a high level of environmental vulnerability. This, despite the fact that only 15% of Gauteng's 1.7 million hectares are developed. Gauteng's land cover of 1.7 million hectares includes over 700 000 hectares of agricultural land.
- **Governance:** The city is not shaped by a master plan but by the individual decisions taken by developers, investors and large landowners. The market forces have had a bigger impact in shaping cities than planners because private developers have powers and initiatives to build, while planners have mainly negative powers, including powers to refuse permission for development. Since the introduction of a democratic government, the goals of government and developers do not overlap. The Gauteng Spatial Development Perspective (2007) introduced the following issues as measures to assess the Provincial Government in terms of building sustainable communities:
 - Meet the basic needs of people.
 - Speed up delivery of services.
 - Promote an integrated and sustainable approach.
 - Accelerate housing delivery.
 - Access to amenities and upliftment of the conditions of the urban poor.
 - Build and rehabilitate public infrastructure.
 - Focus on Integrated Development Planning.
 - Address homelessness.
 - Develop an integrated public transport system.
 - Ensure a peaceful and secure environment in which people can live without fear and combat crime and corruption (Gauteng, 2007:1).

The core problems arising from the Gauteng environment, as seen in the current reality, are presented in Table 22.

Table 22: Current problems and reality in Gauteng

Consequences of economic growth	• Increasing agglomeration of activities in the urban poles. • Urban sprawl and increasing travel distances. • Increasing disparity with the rural regions. • Related adverse impacts on the environment.
Transport problems	• Enormous increase in private vehicle traffic. • Out-dated state of private cars and public transport modes. • Poor condition of roads; bottlenecks in road network. • Massive car parking problems in city centre. • Poor integration and development planning.
Environmental problems	• Pollution. • Limited green space in the city. • Decline of inner city, namely historical centre.
Poor governance	• Resistance, disinterest and lack of information. • Weak influence of the civil society. • Unapproved development and land-use planning. • Illegal construction and lack of regulations.

Source: Own construction (2008)

The current reality was analysed and evaluated according to a SWOT-analysis (Strengths, weaknesses, opportunities and threats) and summarised accordingly:

Table 23: SWOT analysis of the Gauteng current reality

Accessibility to major areas. Nodes of functionality established close to rural areas. Extension potential. Economic agglomeration forming the economic hub of South Africa. Knowledge agglomeration, thus agglomeration of educated people. Adequate infrastructure, services, basic transportation networks and integrated networks. STRENGTHS	Increased number of impacts. Engineering services backlog and lack of identity and uniqueness. Integration not optimised. Lack of integrated transport planning. Urban sprawl occurring and decay of the urban core. Poverty. Lack of quality environments and lack of open green spaces within the urban environment. WEAKNESSES
OPPORTUNITIES Sufficient space and scope for infill development. Upgrading of current transportation systems and networks. Adequate space for development and future nodes. Regulating and monitoring of urban development by guiding frameworks and policies. Parking areas can be developed. Qualitative focus.	THREATS Urbanisation, fragmentation and decreasing social security. Lack of sufficient public infrastructure for future needs. Inadequate budgets for development and planning. Cultural differences and variations of standards. Crime. Increasing travelling time. High-density developments and lack of open spaces.

Source: Own creation (2008)

The analysis concluded that Gauteng has certain settlement characteristics that are related to the characteristics of international city regions. The current reality and characteristics of the Gauteng environment, therefore initiated the proposed city region concept. Settlement characteristics of Gauteng include:

- A multi-nodal and spatially-fragmented structure.
- Attendant decentralisation and decline of the inner city and low density sprawl.
- Separation of functions and a car-dominated road and street network.
- Ribbon development along highways.
- Unbalanced city growth with most of the economic activity in the centre and south-east.
- Over-emphasis on low-density housing provision often peripherally located.
- Segregation and inequality.

The proposed metropolis, the Gauteng city region, will thus cluster the various urban environments and cities into a holistic development area. This vision for the Gauteng city region was described by Keppler (2007:2) and is illustrated in the following figure.

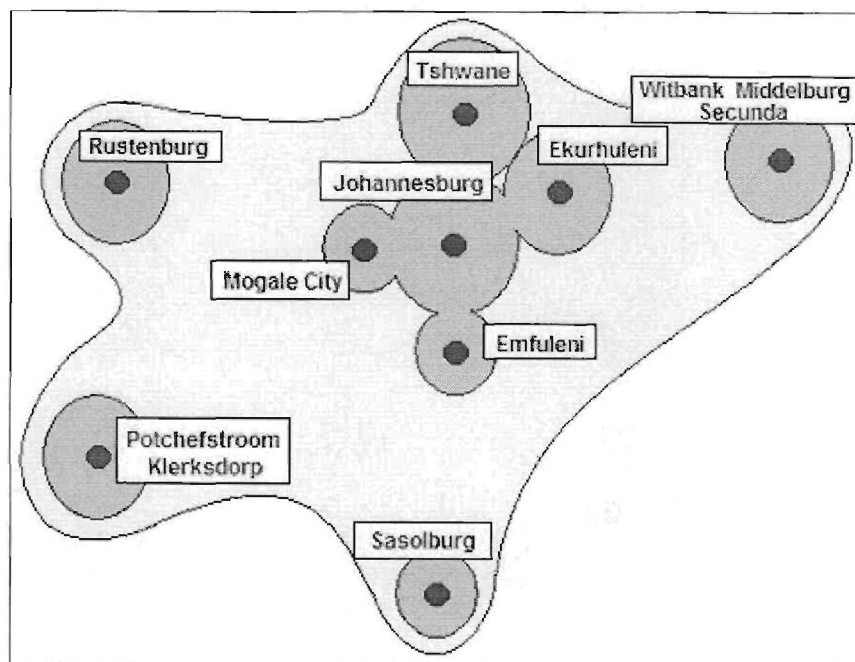


Figure 24: Gauteng international city region

Source: Keppler (2007:2)

These characteristics, of the proposed Gauteng city region, were evaluated and analysed in greater detail to be able to present a comprehensive planning framework of the urban environment of the Gauteng city region case study.

2 Dominant features of planning in Gauteng

The dominant features of planning in Gauteng are related to corridors and nodes. The Gauteng Spatial Development Framework of 2007 identified four key regional anchors. These are not nodes, but are agglomerated areas of intensive economic concentration that are important as regional structuring elements (Gauteng, 2007:48). The areas of provincial importance are:

- Greater Tshwane (including Tshwane CBD, Rosslyn and Wonderboom).
- Greater Johannesburg (urban area in western bypass, the CBD and industrial south).
- Ekurhuleni (Germiston, Alrode, OR Tambo Airport and Benoni).
- The Vanderbijlpark / Vereeniging commercial complex.

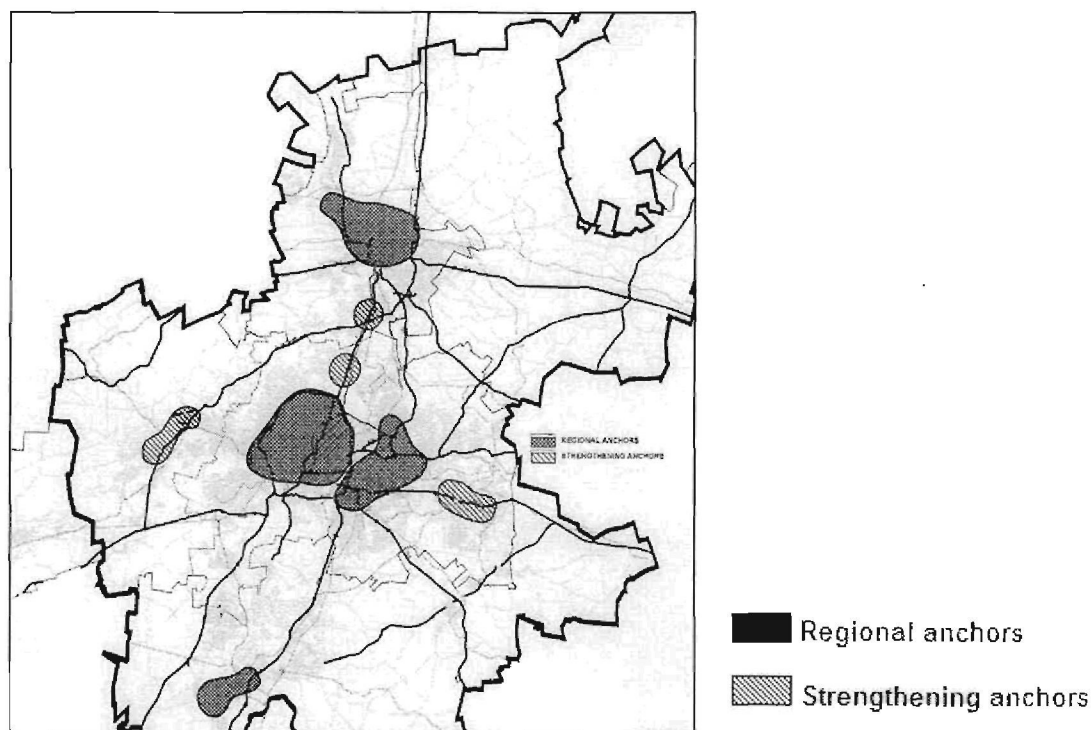


Figure 25: Key regional anchors of Gauteng

Source: Gauteng (2007:48)

The anchors are important in terms of existing and future investment, as they strengthen the economy and provide critical stability for future growth. In addition to the existing anchors, there are four regional anchors that are increasingly strengthening within the provincial context. These are Centurion, Midrand, Springs and Brakpan (as an entity), and Randfontein and Krugersdorp (as an entity).

These areas are meaningful in terms of their strategic location as they contribute towards the overall structuring of the Province.

Furthermore, the Gauteng Spatial Development Framework of 2007 identified four key regional corridors. The north-south and east-west corridor patterns relate to the physical characteristics of the Province. For the most part, the corridors are dual-serviced transport spines, including both road and rail infrastructure. This is vital for urban reform, as areas with good rail and road support can reform more easily than un-serviced or less-serviced areas. It is also important to note that these corridors do not only link important commercial and industrial areas, but also connect marginalised areas to the economic heartland of the Province. The key regional corridors are illustrated in Figure 26.

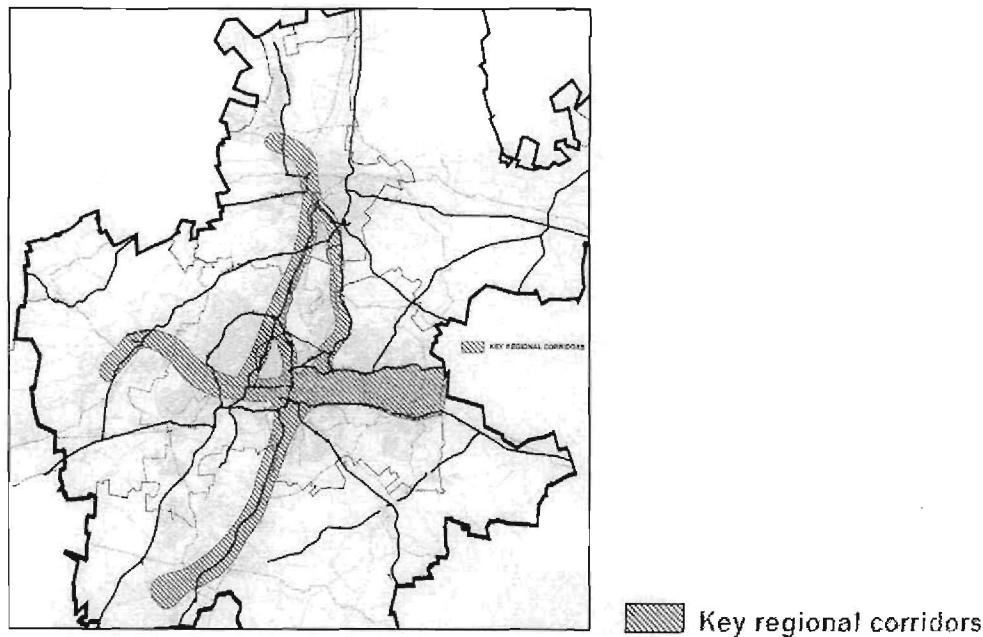


Figure 26: Key regional corridors

Source: Gauteng (2007:49)

Planning and development are subject to these nodes and corridors, supported by the current and proposed land uses. For purposes of this study two core elements were analysed and evaluated (with reference to all influencing factors and forces). The focus was on the residential sector and the business sector as the two primary sectors guiding land use, as these two sectors have the greatest impact on the land use and urban structure. These sectors were analysed in terms of functional area and functional density for the Gauteng area. Figure 27 and Figure 28 illustrate the functional population area and functional population density in relation to Figure 29 and Figure 30 that illustrate the functional employment area and functional employment densities in Gauteng. For purposes of this study it is not important to distinguish between the different types of population and employment areas, but to identify all relevant areas that are used for these (residential and employment) purposes, in order to understand the urban structure and development patterns.

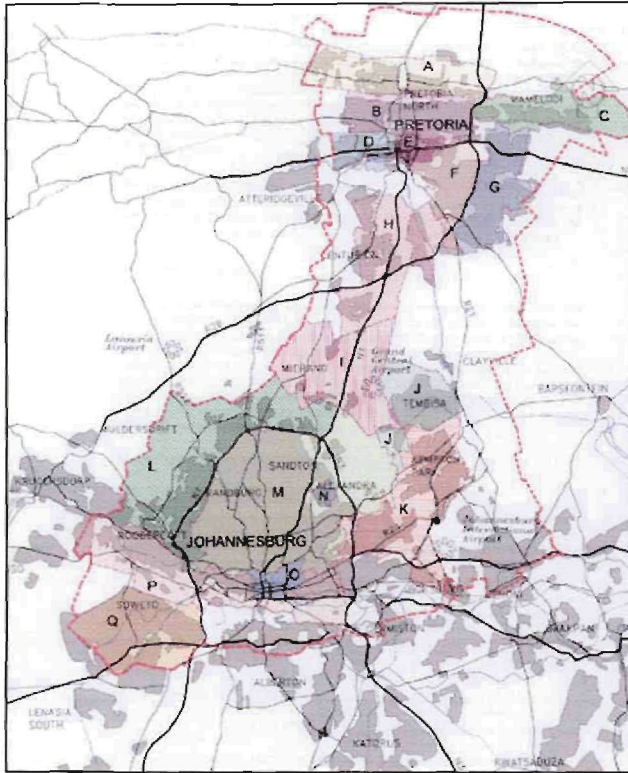


Figure 27: Functional population area
Source: Kriek (2007:11)

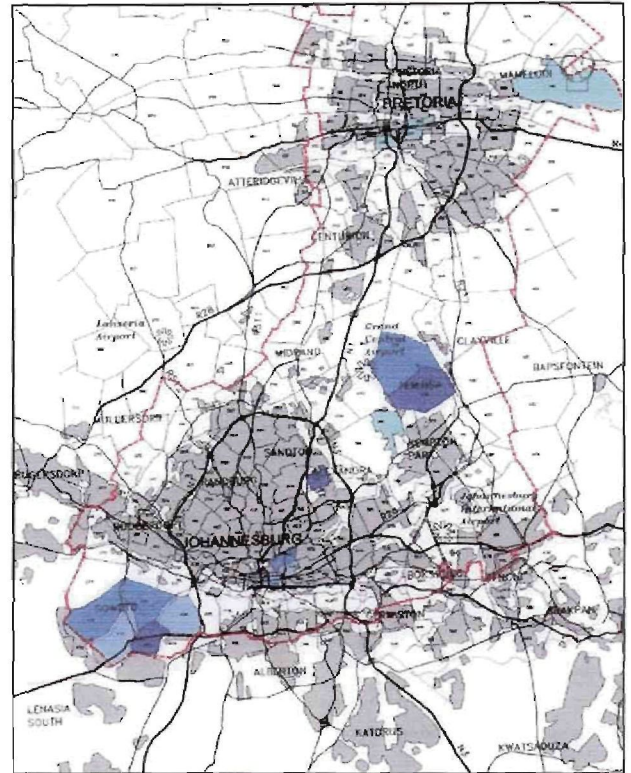


Figure 28: Functional population densities
Source: Kriek (2007:11)

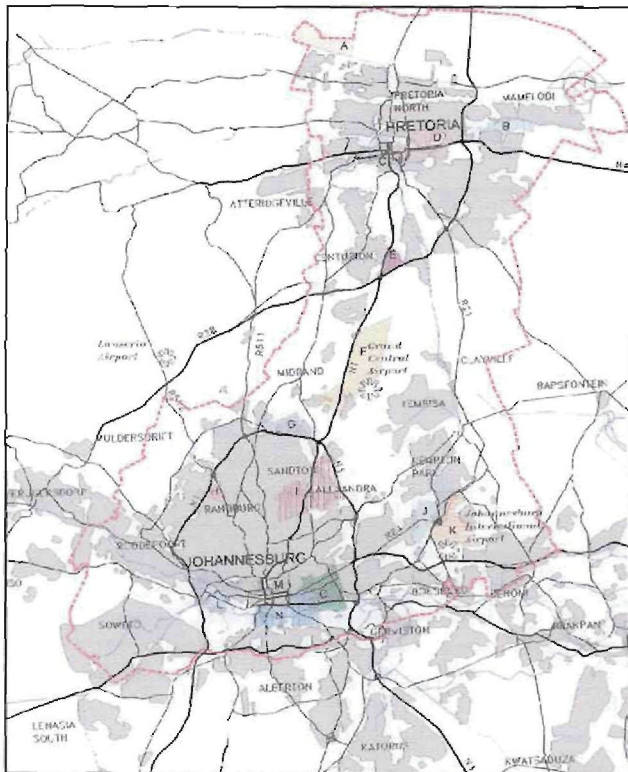


Figure 29: Functional employment areas
Source: Kriek (2007:13)



Figure 30: Functional employment densities
Source: Kriek (2007:13)

The State of the Environment Report (2000), as compiled for the Greater Johannesburg Metropolitan Council, evaluated the above-mentioned areas in relation to the environmental sensitive areas. This illustrated the current urban structure in terms of residential-, business- and environmental areas. The contrast between the built environment and the open green areas was emphasised. The analysis identified specific areas where development should not be allowed, known as the no-go areas. These no-go areas are a reflection of the current open spaces. This approach emphasised the need to, not only limit development in green areas, but also to protect the current green areas in the urban environment.

The urban structure and current reality, in terms of the functional population areas, functional employment areas, residential areas, business areas and environmental areas, were determined. Further detailed studies were required to evaluate impacting forces and elements, which could influence and change the land use.

The primary economic forces, which would have an impact on the identified residential, employment and environmental areas, were captured in the Gauteng Spatial Development Perspective (2006). It focused on the spatial location of economic activity, the economic activity per municipal area and the public sector investment trends. The conclusions as derived from the Gauteng Spatial Development Perspective are summarised as follows:

According to the Gauteng Spatial Development Perspective (2006), the areas of provincially-significant economic activity can be grouped into 56 spatial concentrations. Economic activity in Gauteng is spatially highly concentrated. The most-significant areas of current economic activity in the province cover only 8,4% of the provincial land area, but generate 86,5% of the total provincial Gross Value Added.

The following figure illustrates the economic activity and growth in terms of the spatial location of economic activity. These areas of economic activity are development nodes that shape the urban form and urban environment.

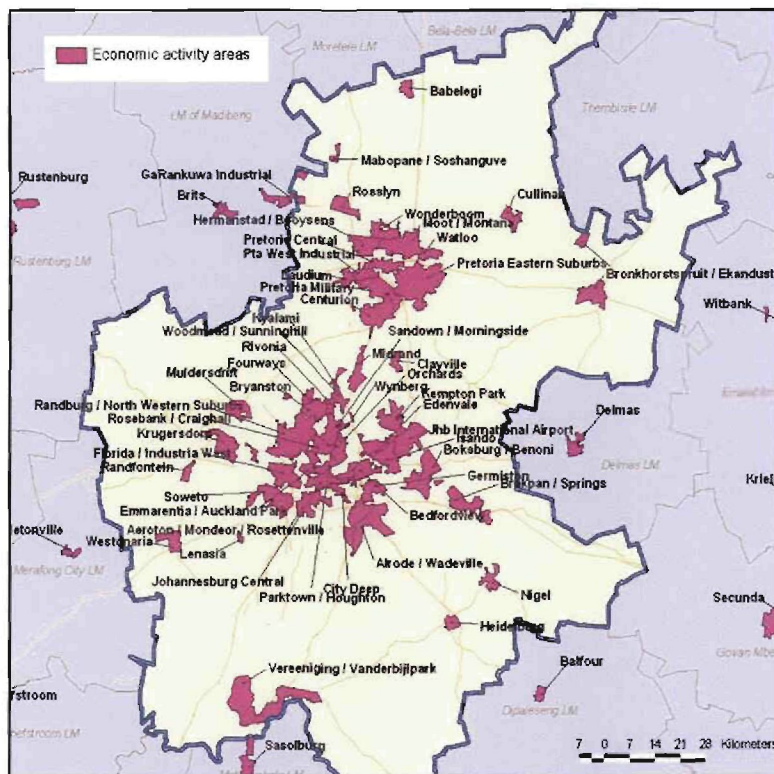


Figure 31: Spatial location of economic activity

Source: Gauteng [GSDP] (2006:17)

The central business districts of Johannesburg and Tshwane are the leading contributors to the economic activities in Gauteng. Labour-intensive industries tend to dominate areas surrounding the province. Figure 32 illustrates the economic activity per municipal area.

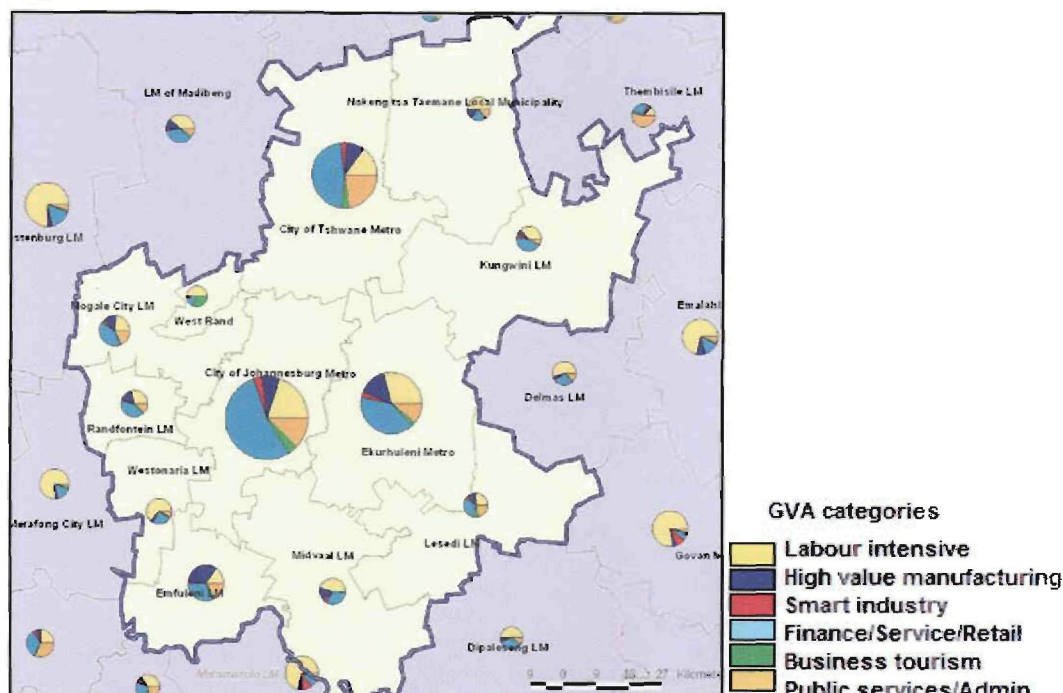


Figure 32: Economic activity per municipal area

Source: Gauteng [GSDP] (2006:19)

The highest intensity of economic activity occurs in the central areas of the province. Private sector investment trends followed the spatial distribution. Neither public sector investment, nor private sector investment trends correlate with existing economic activity areas. There were, however, various sector investments made in the economic activity areas, including the distribution of the Blue IQ projects. The majority of these investments occur in economic activity areas in the central parts of the province.

Spatially, the pattern of public sector development spending, has for the most part focused on poverty concentrations, which can be explained by the severe service and amenity backlogs that had to be addressed, as illustrated in Figure 33.

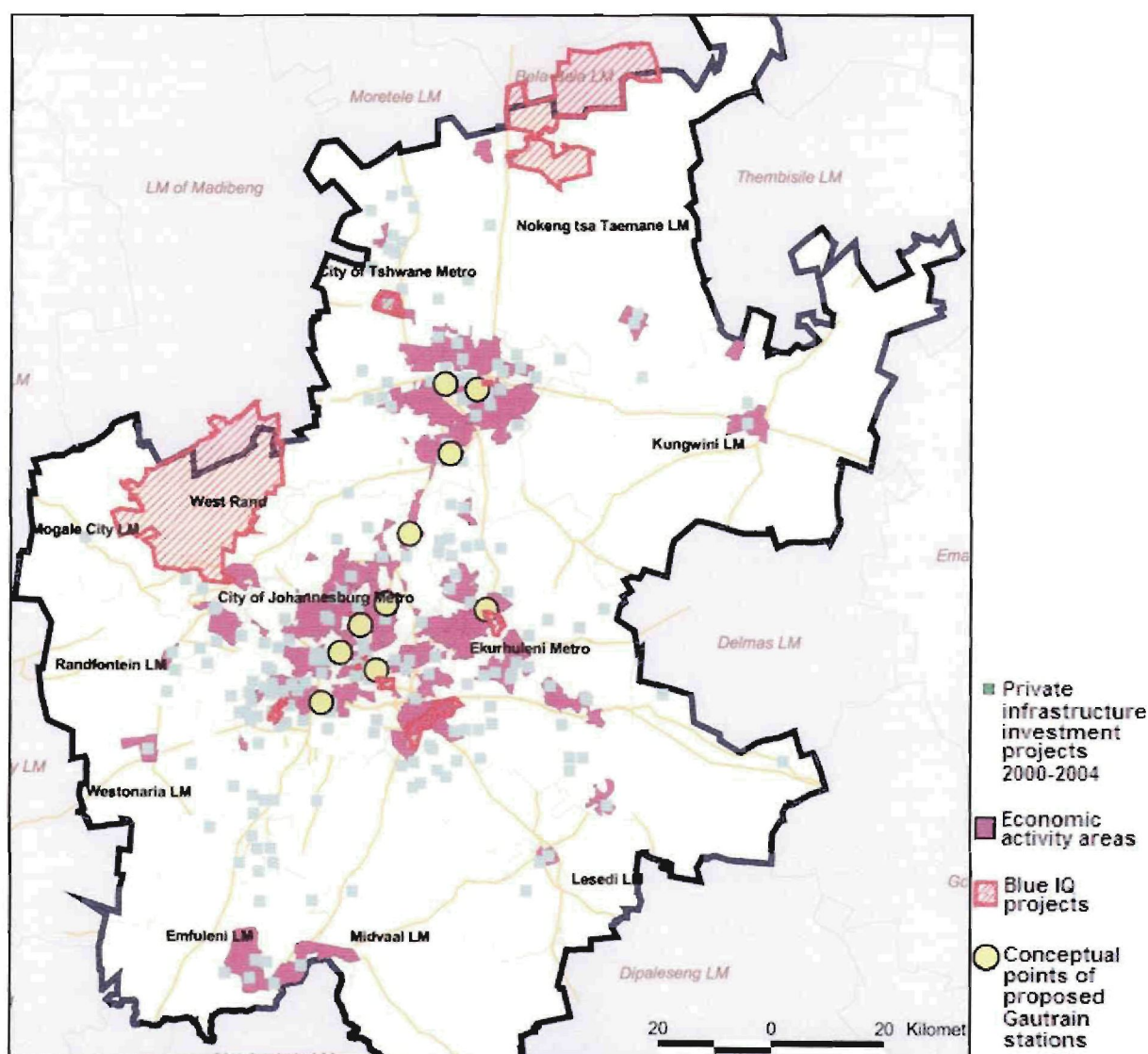


Figure 33: Public sector investment trends

Source: Gauteng [GSDP] (2006:26)

These economic nodes shape the urban form and urban structure. The Gauteng urban environment is primarily formed around these economic nodes. The urban environment needs to accommodate the pressures (private and public investments) and proposed projects (Blue IQ, and especially the Gautrain project) that will stimulate further economic growth in this area. This results in a certain development direction (Figure 34). This development direction is subject to the urban development boundary and development objectives. The development direction must seek to change the current spatial problems of urban sprawl, periphery developments and the dispersed urban form. It should further aim to answer to the needs and future spatial initiatives in terms of integrated land-use management, developing more nodes and corridors, enhancing the sustainable urban form and integrated public transport into the current planning and development concepts. Figure 34 illustrates the development direction in terms of the opportunity areas, development corridors and nodes, urban and movement linkages, and the current urban development boundary. The development direction is aimed towards quantitative and qualitative integration.

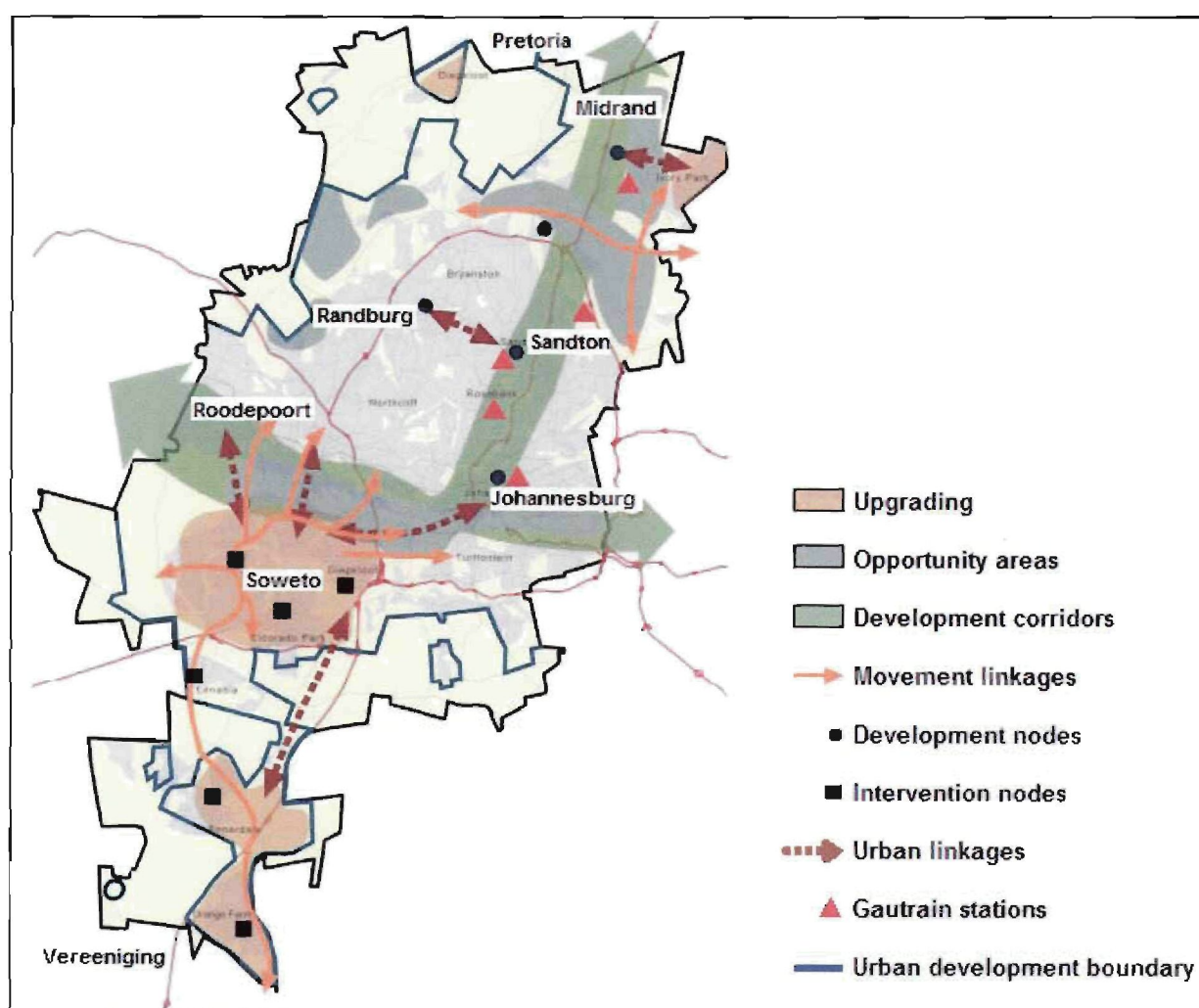


Figure 34: Development direction in central Gauteng

Source: Johannesburg (2004:13)

3 Specific legislation applicable to development in Gauteng

The policy and legal frameworks, as applicable to planning and development in Gauteng, are used as the directive principle guiding the development of the city region concept. Subsequently, the core policies, legislation and guidelines, applicable to the Gauteng area, are described in order to understand the limitations, objectives and details of the urban environment in which the Gauteng city region will function.

3.1 Legislative framework

There are several acts and policies from National and Provincial Government (cross reference to Chapter 2 of this document) stretching across a range of sectors that provide directives or guidelines for the spatial and functional restructuring of Gauteng. The key objectives in the existing and proposed legal and policy framework are to:

- Integrate urban areas and overcome apartheid-induced segregation.
- Integrate land-use and transport planning.
- Minimise urban sprawl and the adverse effects of development on the environment.
- Develop and strengthen public-transport-orientated activity corridors.
- Increase economic efficiency and productivity of urban form and functions.

Within the urban planning environment, two acts are particularly important when addressing the issue of compaction and densification in the Gauteng environment: the Development Facilitation Act (1995) and Gauteng Planning and Development Act (2003).

- **Development Facilitation Act, 1995:** Stipulates that policy, administrative practice and laws should promote efficient and integrated development to discourage the phenomenon of urban sprawl in urban areas and contributes to the development of more compact cities. The need to promote compaction and to combat sprawl suggests a number of actions, including the promotion of smaller site sizes and promoting various forms of infill policies.
- **Gauteng Planning and Development Act, 2003:** Provides for a single system of development, planning and land management in Gauteng. Sets out principles for planning and development and creates a framework for the preparation of development plans and frameworks to provide for the creation of land-use management plans. The Act is deemed very comprehensive in legislating planning tasks for provincial and municipal government in order to achieve better planning, and co-ordinated and integrated development. Provides a number of principles to promote spatial restructuring and development.

3.2 Institutional and policy framework

In order to ensure credibility, this study must be informed by current provincial and local strategic directives, such as the Gauteng Spatial Development Framework, the Gauteng Strategic Public Transport Network, the Gauteng Growth and Development Strategy of 2005, and the Gauteng Global City Region Perspective of 2006.

- **Gauteng Spatial Development Framework:** The Department of Development Planning and Local Government compiled the Gauteng Spatial Development Framework (GSDF) to direct the growth and development of Gauteng towards a sustainable and economically viable future settlement pattern (Gauteng, 2004:2). It covers aspects such as the space needed for activities, the area to be developed, sustainable and functional spatial inter-relationships between activities and provision for future growth (Gauteng, 2004:8). It is not the role of the GSDF to provide local-level planning, but rather for it to provide the necessary focus, overarching structure and binding principles, that are to be refined at a local level given local conditions and realities (Gauteng, 2007:4). It is regarded as one of the building blocks of an integrated development planning system to achieve economic growth, job creation and balanced development (Department of Provincial and Local Government, 2001:13). The Gauteng Spatial Development Framework identified the following five critical success factors for the successful development of Gauteng: (Gauteng Department of Economic Development, 2006:6):
 - Base economic development on existing resources.
 - Urban growth should be contained.
 - Urban growth should be redirected and infill development and densification promoted.
 - Rural development beyond the urban edge should be defined and controlled.
 - Mobility and accessibility should be supported by the existing urban structure.

The GSDF provides an indication of the most desirable settlement pattern for Gauteng Province. It gives an indication of growth and development poles and where they should be discouraged. It gives an indication of the most desirable form and nature of future growth and development and defines the way forward for the province. The GSDF is redressing the past spatial imbalances, while at the same time, guiding development towards a sustainable, equitable and economically viable future settlement pattern (Gauteng, 2007:8).

- Gauteng Strategic Public Transport Network:** The National Land Transport Strategy and Moving South Africa are the two core policies on which the Gauteng Strategic Public Transport network is based (Cross reference to Chapter 2). It is, however, also supported by the Gauteng Spatial Development Perspective (2006) and Metropolitan Spatial Development Perspective (2006). The Gauteng Department of Transport and Public Works has a legal mandate and obligation to plan, provide, manage, regulate and maintain public transport within the provincial boundaries in partnership with metropolitan and district municipalities. One of the key elements associated with the successful development of high density, mixed-use environments, is the provision of proper public transport services, as stipulated in the Gauteng Transport Framework Act. The focus is to provide a framework for the integrated planning and transport systems, and to prepare integrated transport plans (Gauteng, 2004:2). The Gauteng Strategic Public Transport Network thus supports the envisaged compact urban environment. The provision of public transport within the urban environment is a strong form-giving element (Gauteng, 2006). Figure 35 illustrates the Gauteng Strategic Public Transport Network, defined by the development nodes and corridors.

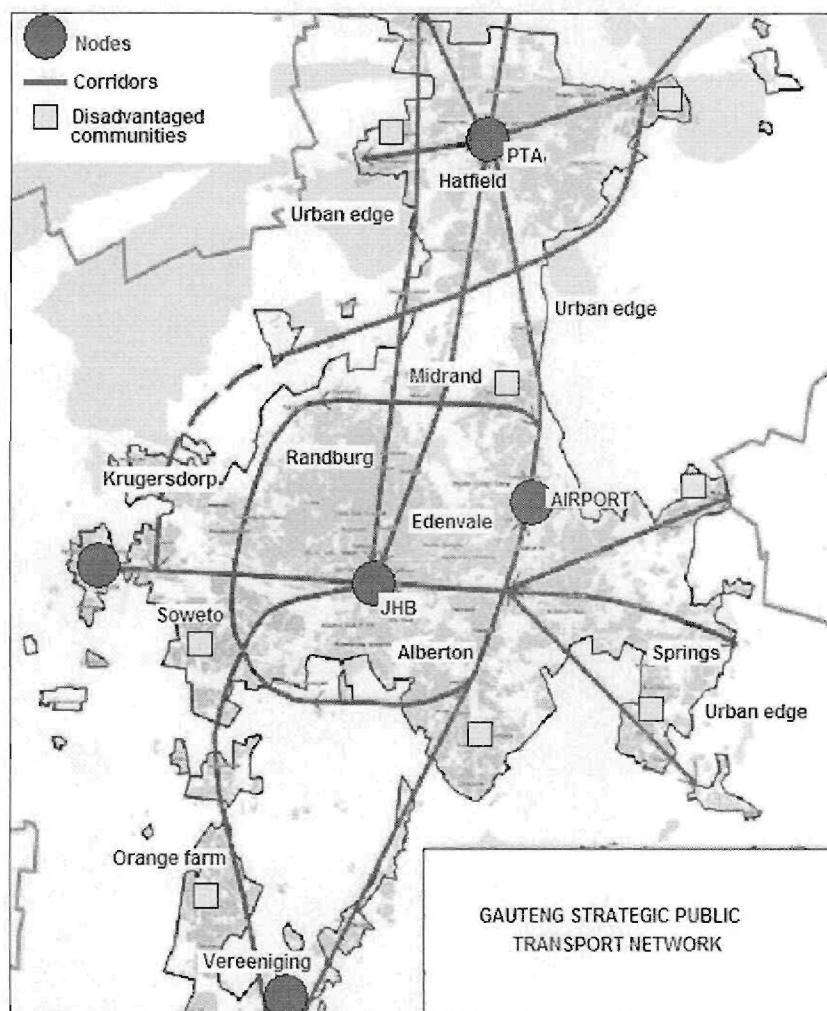


Figure 35: Gauteng Strategic Public Transport Network

Source: Gauteng Department of Public Transport, Roads and Works (2004)

- **Gauteng Growth and Development Strategy of 2005:** The Gauteng Growth and Development Strategy (Gauteng Department of Economic Development, 2005) is an action-oriented strategy and not a policy document. It is intended to build a sense of provincial unity and responsibility among all sectors of society towards reducing poverty and unemployment, creating jobs and ensuring socio-economic transformation in the Province. The focus is to build on the smart province concept, to direct development towards halving unemployment and halving poverty, and to create jobs and a better life for all at a provincial, national and continental level. Of greatest relevance to the GSDF and this study, is the proposal of an integrated city region strategy or global city region.
- **Gauteng Global City Region Perspective of 2006:** The idea of a global city region refers to city regions becoming active and dynamic spatial nodes as part of the global economy. This perspective focuses on a well-organised urban environment and on comparative competitive advantages, reducing the costs of factors such as labour, energy and transport. It provides an effective platform for clusters of industries to compete in their respective global markets. It focuses on the rapid movement of goods, people and services, and subsequent intense economic stimulation and progression and relies on strong strategies and mechanisms to be in place in order to facilitate continued and equitable growth and development on a local and global level. This perspective entails a common vision for Gauteng and the integration, alignment and harmonisation of the internal functioning of the area. The Gauteng Global City Region Perspective of 2006 aims at improving co-operation and streamlining government arrangements through the building of strong partnerships and spatial coalitions with a broad range of stakeholders. It will entail the common branding and marketing of Gauteng as a compact entity, and the subsequent building of appropriate human capital and knowledge.

4 Impacts within the Gauteng city region

The Gauteng city region is a multi-dimensional and multi-functional area, container of various elements and impacts. The Gauteng regional vision must therefore be planned and projected, to be able to create a sustainable future development framework, a guiding framework for integrated planning and development. All of these elements and impacts will shape the urban environment, and therefore it is necessary to determine the type of impact, and illustrate the consequences thereof. The impacts within the Gauteng city region will have different consequences according to their specific locations. Therefore, it is needed to understand the complexity of the urban, as well as rural environment in which the Gauteng city region will manifest.

4.1 Gauteng urban areas

The Gauteng urban area has not been delineated based on a possible urban edge, but on an intended growth management area. The area shown in Figure 36 is broader than the current built-up areas of the Province, but collectively shows the bulk of the urban areas of the Province. The broader delineation is a result of the global city region concept. A city region infers that globalisation, economic development and urban growth will not be confined to the existing urban core, but will have expanded impacts. At the same time, there is a need for urban transformation, which must include densification, compaction and new structure.

→ Inward focussed development
 Urban areas

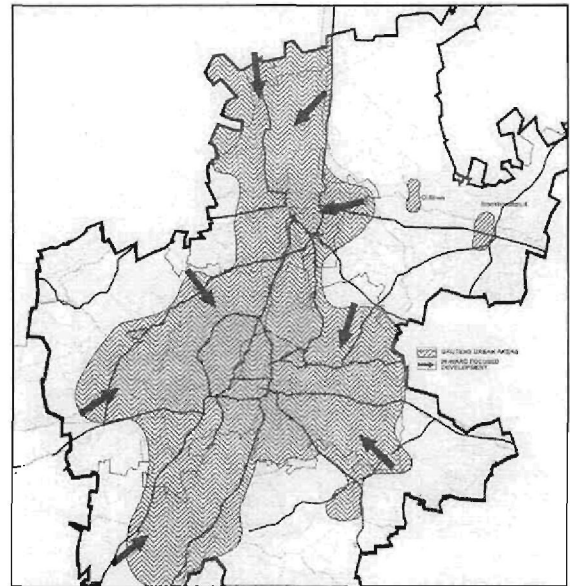


Figure 36: Urban areas of Gauteng

Source: Gauteng (2007:50)

4.2 Gauteng rural areas

The rural areas are the peripheral provincial areas (Figure 37). These areas are undeveloped and used for agricultural purposes. Given the urban status and need for economic development to achieve the social responsibilities, it is important that rural development should be supportive of the urban area. Development within the rural areas should be based on merit, and give regard to issues such as economic value, conservation, and sustainability.

Rural areas
 Protected areas
 Rural towns

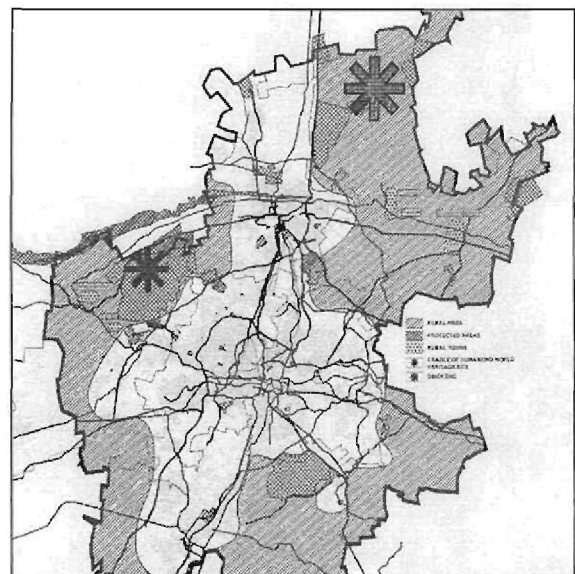


Figure 37: Rural areas of Gauteng

Source: Gauteng (2007:51)

4.3 Blue IQ projects

The Gauteng Provincial Government identified certain projects to be implemented in the Gauteng environment, in order to enhance the economic sector. These projects are known as the Blue IQ projects and are responsible for the greatest impacts within the Gauteng spatial environment. The Blue IQ projects aim to promote a strategy, with a particular focus on investing in strategic economic infrastructure. The Blue IQ projects have the core purpose of delivering strategic infrastructure that acts as a catalyst for market-driven growth.

Blue IQ projects include: The Constitution Hill Precinct, scheduled for completion in 2004, the Gauteng Automotive Cluster including the Automotive Industry Development Centres (AIDC) and Supplier Park in Pretoria, the Newtown Cultural Precinct, including the Mary Fitzgerald Square, the Metro Mall and the Nelson Mandela Bridge, which opened in July 2003, the Innovation Hub, the Gautrain Rapid Rail Link, the Wadeville-Alrode Corridor, the Johannesburg International Airport, the City Deep Logistics Hub, the Cradle of Humankind World Heritage Site, the Dinokeng "Africa in a Day" ecotourism destination, and the Kliptown Urban Renewal Project. The Gautrain rapid Rail Link is the project that claimed the most interest from authorities in terms of spatial planning, impacts and transformation of the urban environment, and will thus be evaluated in more detail.

4.4 Gautrain Rapid Rail Link

Transport development corridors contribute towards reconstruction of the urban environment. All aspects of the transport sphere must be well inter-connected by means of a good and efficient public transport system (Gauteng Department of Public Transport, Roads and Works, 2003:10).

Gauteng has well-established structures and road networks, supported by residential, commercial and business areas, acting as nodes and linked through development corridors. The Department of Public Transport, Roads and Works (2003) initiated the Gautrans Project. It is a rail network between the main urban cores in Gauteng. This concept has a great impact on the urban edge and urban containment as transport networks are not bound to the urban development boundary, and would thus transform the current urban environment. The Gautrain is a structuring element because it will set in motion a new urban form (Gauteng Department of Public Transport, Roads and Works, 2003). Gautrain is a spatial project initiative. Figure 38 illustrates the implementation of the Gautrain within the area of demarcation.

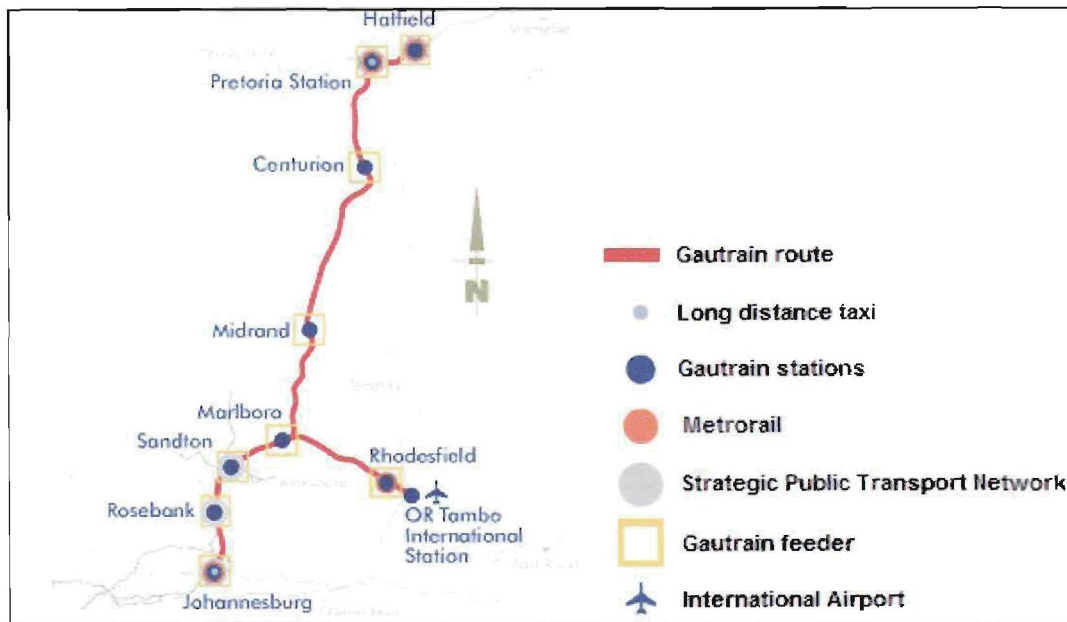


Figure 38: The study area and main nodes

Source: Gauteng Department of Public Transport, Road and Works (2003)

International best-practice procedures were followed in the Gautrain feasibility study. The report proved the great impact that the Gautrain will have on the urban area, in terms of technical-, financial-, economic-, socio-political and environmental feasibility. The development concept of the Gautrain is illustrated in Figure 39.

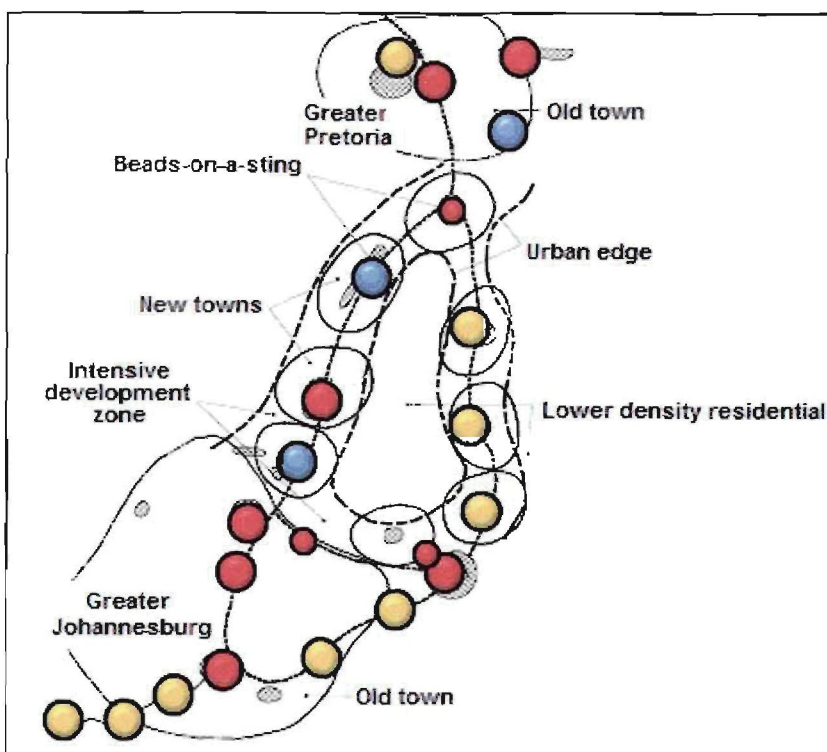


Figure 39: Gautrain spatial development concept

Source: Gauteng Department of Public Transport, Road and Works (2003)

Greater Johannesburg and Greater Tshwane are currently connected by the national and regional roads (N1 and R21). Along these major connecting roads, development is taking place to establish new, highly-accessible nodes. Mobility, accessibility and visibility are real economic variables that have influenced the location of industries and businesses, hence influencing spatial form. The Gautrain rail system will surely strengthen this development pattern, as it will enhance access, mobility and visibility. The rail will have a linear alignment and will therefore promote the creation of a linear urban form.

A high-intensity urban environment will be developed. Cognisance should be taken that the rail system will not and cannot replace the extensive road systems that exist, but the two should operate in support of one another. It is important to realise that it will, however, influence the urban form and shape it accordingly.

A linear railway corridor will be established and the nodes will act as "beads-on-string", as illustrated in Figure 40. Nodal development will radiate out in an oblong pattern. Where nodes meet, opportunities for new nodes and station development are created. It is reasoned that the stations may have a greater spatial role than the railway line because the stations are the point of contact between the train and the urban environment, and between the users and the transportation system. Nodal integration should therefore be enhanced.

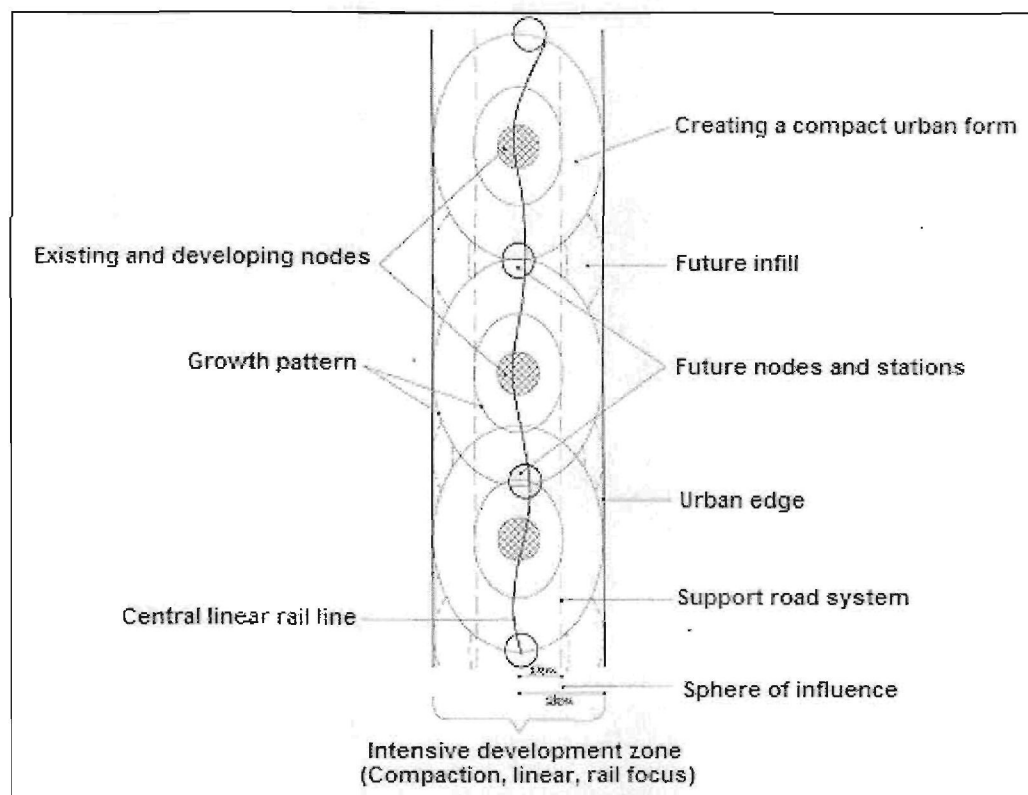


Figure 40: Corridor development as a result of the Gautrain

Source: Gauteng Department of Public Transport, Road and Works (2003)

There is no doubt that the Gautrain will be highly influential in shaping the future urban form in its proximity, as firstly it centres on the core economic area, secondly it brings with it many development opportunities that the private market is certain to identify and explore and thirdly density and land-use changes are inevitable. The urban form will centre on two key components of the Gautrain, the railway line and the stations (Figure 41), each having different developmental requirements and spatial impressions.

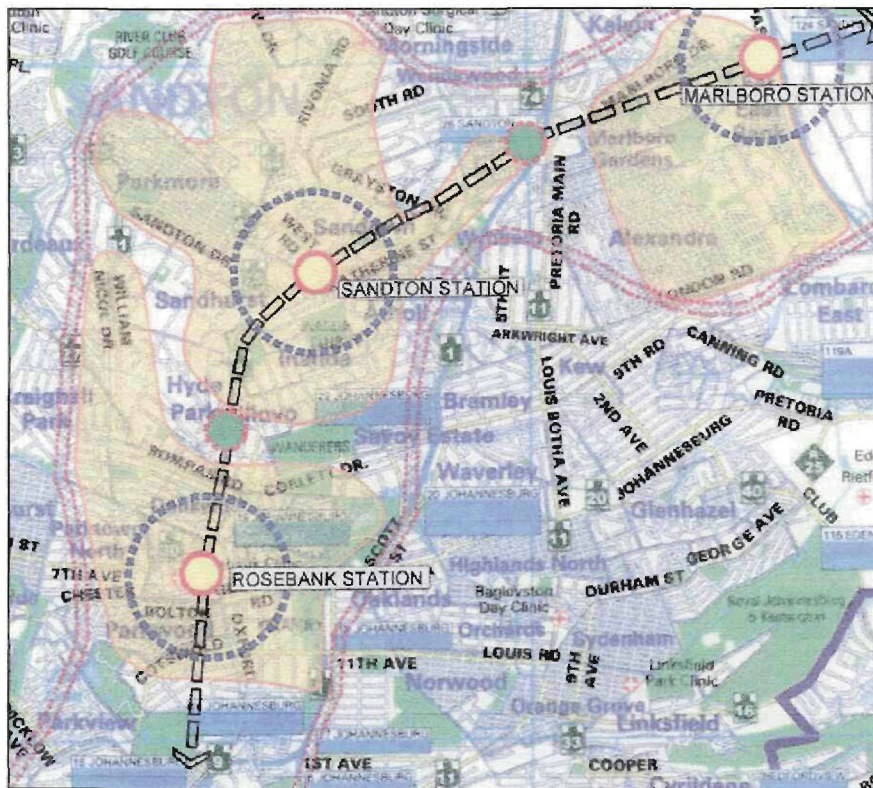


Figure 41: Current urban form and proposed stations creating a new urban form

Source: Gauteng Department of Public Transport, Road and Works (2003)

For purposes of this study, the focus is placed on the integration of the Gautrain within the spatial area, accommodating all the impacts and forces, adhering to the development nodes, corridor densification and objectives as set by the provincial government. The Gautrain will impact on, and shape the urban form. The Gautrain is in line with the fundamental spatial planning principles that underpin the Gauteng Spatial Development Perspective, and this system will expedite transformation of the old urban form to the new desired urban form (Gauteng, 2006:16). Critical conclusions to the Gautrain are:

- Rail alignment and station location is aligned with current planning.
- Densification around stations is a priority, and spatial and functional integration is essential.
- Primary function is linking people to jobs; the secondary function is long term sustainability.
- The Gautrain will direct density growth.

5 Conclusion

Significant urban growth will take place in the next two decades. This growth, coupled with economic expansion, will provide real opportunities to eradicate urban poverty and eliminate service backlogs. Developing into a successful global city region necessitates that all role players understand the specifications of the goal, so that at large, the region becomes externally competitive and internally co-operative, while retaining local autonomy.

The aim of the legislative directive for compaction and the curbing sprawl is not to convert urban areas into large, uniform, high density, compact zones, but rather to restructure the built environment in such a way that it becomes more efficient, more equitable and more convenient for its residents, while at the same time promoting high quality living environments.

Gauteng has officially been a global city region since 31 August 2006. Gauteng is set to become the world's 12th largest city region by 2015. Gauteng must bring together the three major metropolitan units of Johannesburg, Tshwane and Ekurhuleni as well as the smaller cities in the region to work together to create a globally-competitive region (Beavon, 2006:1). The future vision of Gauteng will be realised in three ways:

- Create an urban form that is sustainable: From the literature it is derived that compactness leads towards sustainability. There should be aimed for compactness and integration within the Gauteng city region.
- Develop a sustainable urban form: The ideal urban form will include the Johannesburg, Tshwane and Ekurhuleni nodes and must simultaneously adhere to the related forces, impacts and elements of these areas.
- Formalise a policy supporting development: The development policy should adhere to legislation and objectives as set out in the SDF and IDP for the relevant urban areas, integrated into a holistic development policy.

To build Gauteng as a globally-competitive city region entails a new way of thinking about development in the province. Development nodes for the Gauteng city region were identified in the Gauteng Spatial Development Framework, and are illustrated in Figure 42.

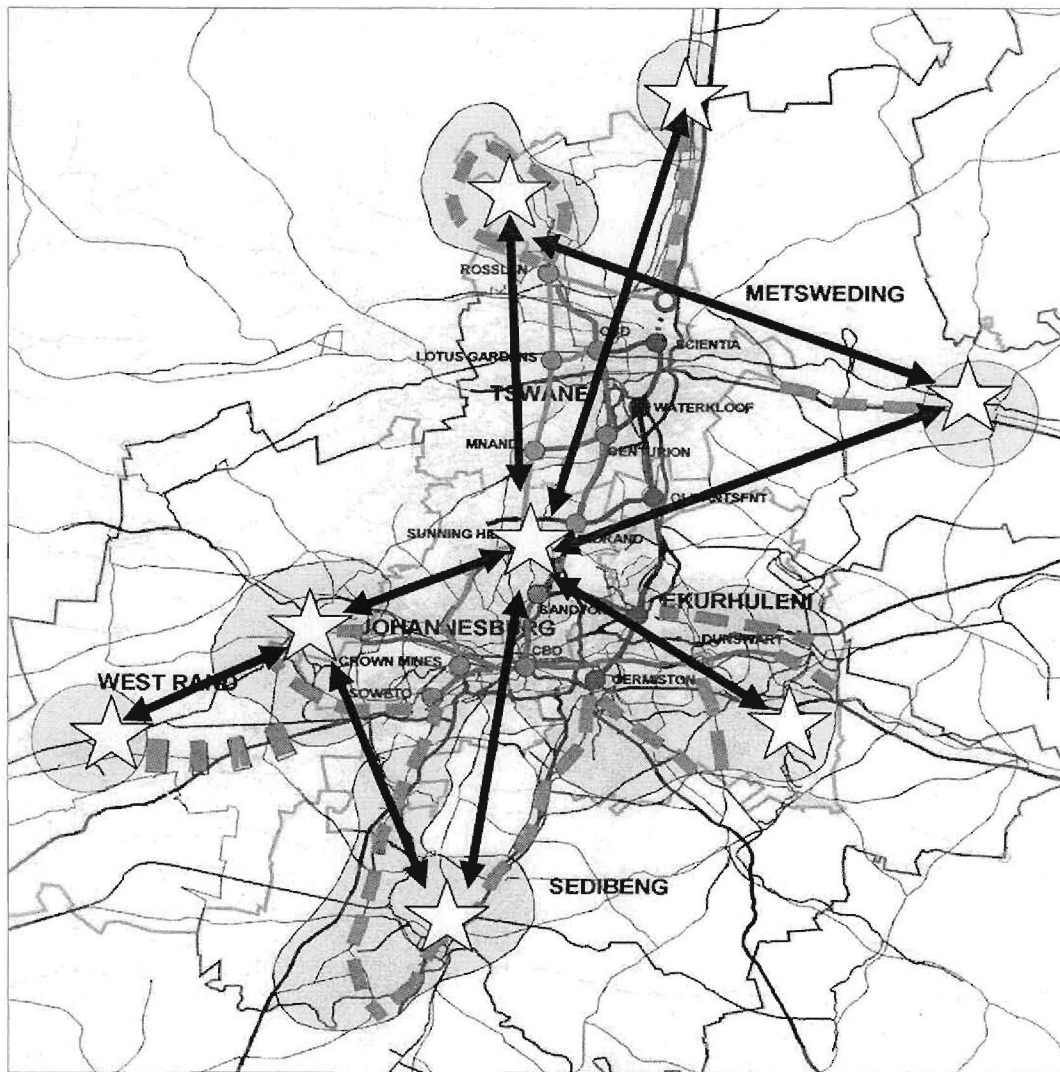


Figure 42: Future nodes and corridors

Source: Gauteng (2007:39)

The Gauteng planning system emerged as a consequence of influences and has a number of overriding characteristics, including fragmentation (along a number of lines, scales, race groups, ethnic lines, geographic areas, provinces, jurisdictional boundaries, sectoral uses, and jurisdictional instruments), control, and modernist influences focusing on embedded social facilities and the dominance of the private motorcar.

A successful Gauteng city region requires both strong local and provincial government. Thus, the aim is to develop managerial and leadership capacity within local municipalities as well as to facilitate the provision of the necessary technical skills. In addition, the success of the city region rests on the ability of local and provincial governments to integrate their plans.

Table 24 serves as a summary of the Gauteng Spatial Development Framework and its guidelines.

Table 24: Summation Table of the GSDF 2007

GSDF COMPONENT	GSDF SPATIAL GUIDELINES	GSDF STRATEGIC INVESTMENT RESPONSES
KEY REGIONAL ANCHORS: - Greater Tshwane. - Greater Johannesburg. - OR Tambo International Airport. - Vanderbijlpark / Vereeniging. Agglomerated areas of intensive economic concentration, important for regional structure; economic stability.	- Expand the economic core to encourage growth. - Provision of resources in core to support economic activity. - Identify/protect markets with provincial consensus. - Revisit urban development within the core areas. - Ensure good linkage between key regional anchors. - Strengthen the role of rail. - High-density development integrated with public transport. - Integrate development with rail.	- Blue IQ Projects/Gautrain. - Integrated infrastructure/transport solutions. - Services to fit needs of economic sectors. - Maintenance of high-quality environment. - Intensification and densification. - Limiting environmental impact/degradation. - Develop facilities and amenities for employees.
STRENGTHENING ANCHORS - Centurion. - Midrand. - Randfontein / Krugersdorp. - Brakpan / Springs. Progressively strengthening. All strategically located to accommodate growth/development, realign urban form.	- Plan for the continued strengthening of the anchors. - Should be polycentric to ensure distribution of resources. - Connectivity between anchors and key regional anchors. - Strengthen the role of rail. - Ensure high-density development integrated with service delivery and public transport. - Integrate development with rail to encourage rail-based freight transport.	- Major contribution of high-value manufacturing. - Infrastructure and transport solutions. - Services to fit needs of economic sectors. - Infrastructure and transport solutions. - Infrastructure and transport related investment to open up access to the area. - Services to support economic activity.
KEY REGIONAL CORRIDORS These are dual serviced transport spines that define the structure of the Province. - East/West: Springs to Randfontein. - North/South: Rosslyn to Vanderbijlpark Connect provincially important commercial and industrial areas.	- Guidelines apply to major and minor corridors. - Integrated land-use and transportation planning. - Encourage the revitalisation of rail. - Define land use around public transport corridors. - Prepare transport corridor plans which define the extent of the corridor, land-use mix and density profiles. - Motivate and plan for rail-based freight transport.	
ECONOMIC CORE Core has been expanded from the GSDF 2000 to include a larger area, because: - Economic activity should be shared - Extent investment opportunities, but keep it concentrated in the core area to achieve economies of scale.	- Manage urban growth and expansion through properly formulated growth management strategies, which define a system of nodes/corridors, define densification areas, define node hierarchy, focus on rail, plan public transport. - Promote economic development. - Government to play facilitative role – do what is needed in terms of service provision and institutional alignment.	- Initiatives: Blue IQ Projects/Gautrain. - Integrated infrastructure and transport. - Services to fit needs of economic sectors. - Maintenance of high quality environment. - Intensification and densification. - Develop facilities and amenities for employees to ensure continued attraction value.
GAUTENG URBAN AREAS The delineated area is larger than the current urban complex to allow for urban growth and expansion given projected population increases. It also illustrates that the global city region concept will not only affect the core, but will relate to the immediate periphery as well.	- Manage urban growth and expansion at local level through growth management strategies that delimit expansion, define densification areas, and define node hierarchy, integrated with public transport modes and plan for public transport. - Define urban nodes and corridors across the urban areas. - Revise land use controls, zoning codes, density etc. - Create liveable environments.	- Maintenance of services and infrastructure. - Maintenance of a good quality environment. - Take cognisance of the sensitive areas. - Detailed planning and design of infrastructure. - Expansions should be managed and structured. - Promote higher densities on well-located land. - Growth management policies and strategies.
RURAL AREAS Peripheral provincial areas outside the core urban areas. The hinterland is important: - For conservation and protection. - To support the urban areas to become a global city region. The rural areas cannot remain undeveloped or stagnant and have to respond to the needs.	- Maximise rural resources in support of the urban core. - Conserve and protect valuable natural resources. - Develop hinterland as a recreation and leisure resource. - Improve agricultural activities. - Allow for the establishment of rural support centres. - Use local opportunities to expand base of rural area. - Allow for country living outside the major urban areas. - High-quality environment to complement urban areas.	

Source: Gauteng (2007:80-84)

In conclusion, the Gauteng current reality is compared to the current reality, perspectives and objectives of two international city regions, the Randstad (city region in the Netherlands), and Helsinki (city region in Finland). Table 25 illustrates this comparison in terms of nodes, resources, functions, legislative bodies, management, challenges, implementation and impacts.

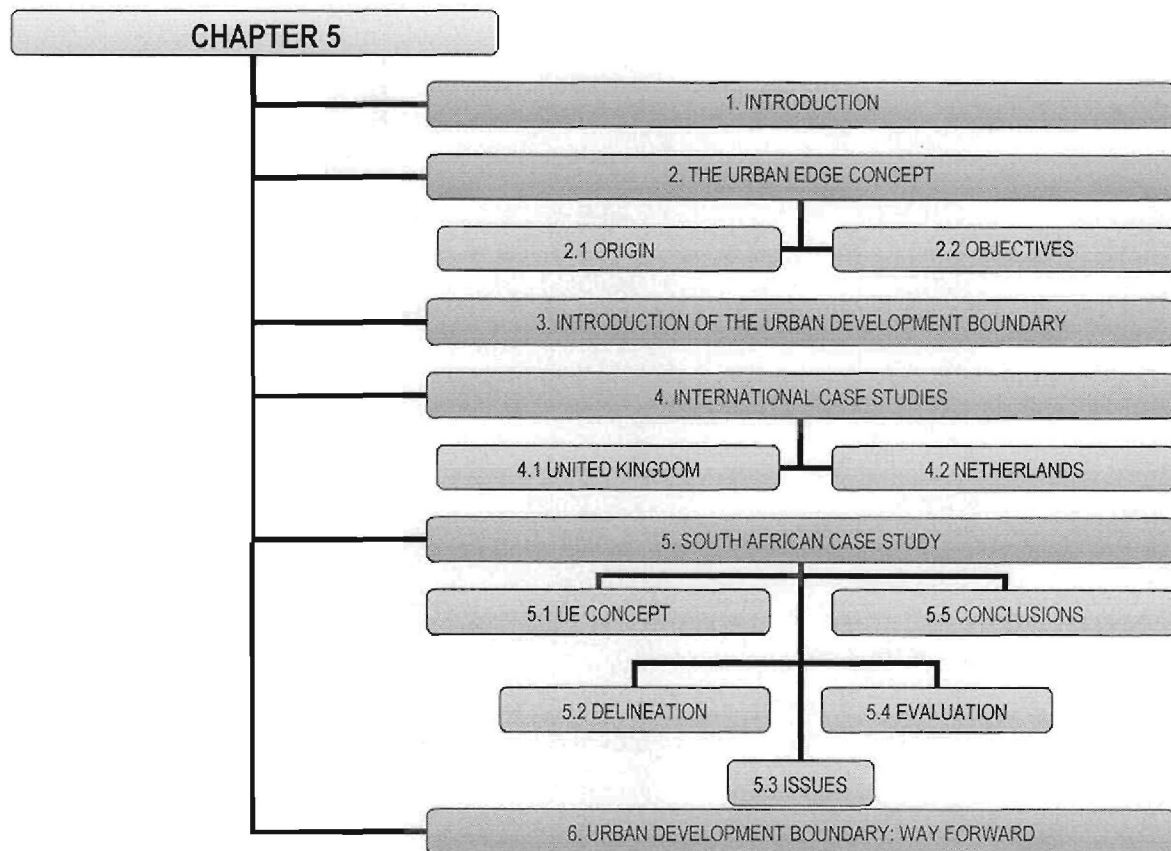
Table 25: Comparison of World City Regions

	Randstad	Helsinki	Gauteng
	Utrecht, Amsterdam and Rotterdam form a polycentric city region.	Four municipalities: Helsinki, Espoo, Kauniainen, Vantaa.	Smallest, wealthiest, most-populated province. Financial hub.
Intro	Evidence for the general success of the regional policy and decentralisation tendencies in employment opportunities.	The principal duties of the Helsinki Metropolitan Area Council comprise transport system planning and regional public transport provision.	It has a defined legal existence as a province, but aims to convert itself into a city region via the Gauteng Economic Development Agency.
Share source	Local and regional actors begin to open up to different forms of co-operation to share resources and expertise for regional approaches	Different level of co-operation between the four municipalities in the region. Municipalities continue to compete among themselves.	Resource sharing is not a major concern yet.
Power	There is no city with overriding influence.	Special committees decide upon co-ordination, running joint projects/tasks. Mixture of formal and informal structures.	Johannesburg is in a unique position as a regional power and the gateway to the continent.
Legislative body	- Central and decentralised admin. - The council provides policy outlines. - Tasks of council include decision-making, budget determining, and drawing-up/enactment of byelaws.	- The highest decision-making organ in Helsinki is the City Council. - The Council makes financial decisions as well as those related to City administration.	- The impetus for the city region project has come from the Region Premier, not the city. - The national government does not have any involvement.
Organise	The spatial development of the Randstad is considered an issue of national interest by the Dutch planning ministry. National government co-ordinates its policy and investment priorities.	The committee of the central state government and the municipalities of the Helsinki Metropolitan Area meet regularly with the aim of fostering mutual co-operation.	Policies, frameworks, legislation and guidelines are in place to support spatial development and environmental management.
Challenges	- Accessibility of the main ports. - A balanced development. - New dwellings during 2010-2030. - Unemployment is rising. - Productivity is low.	- Congestion. - Ownership is threatening efficiency in the region. - New rail links between the major centres in the region.	Shift from a long adherence to a mining-based economy. Increase the contribution of high value added manufacturing and tertiary sector activity to overall GDP.
Responses implemented	- Introduce spatial planning policy 30 points for action included in the Economic Strategy Randstad. - Strengthening of integration in the region, increased differentiation between the cities. - Implemented Randstad Rails. - Priority around major conurbations and cities. - Increased number of educated people. - Spin-offs from research. - Forging links between the region and universities. - Encouraging investment opportunities.	- Approved the Helsinki Metropolitan Area Transport System Plan PLJ 2002. - New rail links between the major centres are due by 2010. - Extensive water collection systems have been built to drain the waters from the landfill area to a municipal wastewater treatment plant.	The Strategic Plan for the city region specifies eight key areas in which efforts are to be focused: - NEPAD (Continental Development Strategy). - Black Economic Empowerment Framework. - SME Support. - New investment. - Knowledge based economy. - Sustainable development. - Addressing unemployment. - HIV-AIDS treatment. - Blue IQ projects.
Private sector	Private sector is taking an operational and management role, but not a decision-making role.	Decision-making power is exercised by the regional assembly. No private sector involvement in decision and policy making, or planning, but is present in fulfilling projects, through tendering and contracting.	Introduce the public-private partnership for the design and developments.

Source: Based on Clark (2006)

Chapter 5

Urban edge and urban development boundary



1 Introduction

Urban restructuring is at the forefront of all planning. Understanding that the low-density sprawling settlement pattern is unsustainable in the long term has led urban planners to rethink the future of spatial- and land-use planning. Mechanisms are sought to contain urban growth and compact the existing and developing urban form. Previously, much emphasis was placed on the role of the urban edge in achieving these goals. However, after years of implementation, it was evident that this alone was not enough to change the urban form (Gauteng, 2007:34).

The interpretation and implementation of the urban edge concept led to the ineffective role and failure to achieve compact urban form, managing growth and guiding development. Therefore, this study will shift the focus from 'the urban edge concept' to the concept of 'the urban development boundary'. In theory, these two concepts are almost similar, with the difference that the urban development boundary is focussed on the socio-economic and urban forces and thus guides spatial planning and development accordingly. It is more than a development edge, it is a development direction. For purposes of this study, it is important to understand where the concept of the urban edge came from, its implementations and failures, and why the urban development boundary will be a better approach.

2 The urban edge concept

An urban edge is a demarcated line to manage, direct and control the development around an urban area. The intention of the urban edge is to establish limits beyond which urban development should as a rule, not occur, and to promote urban and environmental efficiency, effectiveness and economy in the interest of all. Growth can be focused according to the environmental and social priorities of all spheres of government (Western Cape Department of Environmental Affairs and Development Planning, 2006:19).

The urban edge is not a rigid legislative imperative, but rather a policy statement that is seen as one of the many tools that government uses to achieve the principles of integration and compaction that are entrenched in the Development Facilitation Act. It guides and directs development patterns (Ekurhuleni Metropolitan Municipality, 2006:3). The aim is that by clearly demarcating an urban edge, speculation currently driving the urban land market on the edge, will be controlled.

2.1 Origin of the urban edge concept

Agricultural land is managed in terms of the Subdivision of Agricultural Land Act, 70 (Act 70 of 1970) and article 20 of the Town Planning Ordinance (Mtubatuba Municipality, 2006:89). Within the urban areas, the Town Planning Ordinance is used but in the rural areas the Subdivision of Agricultural Land Act, 70 (Act 70 of 1970) regulates development as this area is classified as high-intensity agricultural area. These two approaches created confusion in terms of applicability and implementation and therefore the need to establish the exact point between urban and rural areas were emphasised. This led to the creation of the urban edge concept.

2.2 Objectives of the urban edge concept

The creation of the urban edge was identified as a mechanism to manage developments and at the same time protect significant environments, agricultural land and resources. It was supposed to contain urban sprawl in order to rationalise service delivery through managing growth and densification. It aimed at providing for a more efficient use of land resources.

An urban edge is thus a growth management tool employed to curtail sprawl and unplanned peripheral expansion. As an initial mechanism, defined in the GSDF 2000, it achieved positive and negative responses. It made both government and the market sit up and take notice (Gauteng, 2007:28). Specific objectives were captured in an article 'City adopts urban edge studies', published in the Cape Business Newspaper of 28 September 2001, and included:

- Defining an ideal future urban development perimeter for the city.
- Creating an effective strategy to counter urban sprawl and protect the natural resources.
- Creating a unique character of different areas.
- Better management and land usage in the existing city metropolitan area.
- Market and enforce the idea that from pure necessity, future urban development must focus on higher urban densification to bring about a more efficient and environmentally sustainable living and working environment.
- Creating a model for future development within a defined urban edge.

However, its stringent application, owing largely to its delineation as a cadastral line, and conflict of alignment at local and provincial level, led to its demise as a likely tool to contain growth. It has since been understood that densification around public transport is probably the most proactive mechanism to curtail unwanted growth and densify the city. This has redirected the focus of growth management to a broader spectrum of mechanisms. Managing urban growth is about acting in line with the market, though bending and shaping it to achieve desirable outcomes (Gauteng, 2007:29).

The urban edge was intended to be a pro-active growth management tool to contain, control, direct or phase growth in order to promote more compact, contiguous urban development and to protect agricultural, biodiversity, heritage and other resources from development (Western Cape Department of Environmental Affairs and Development Planning, 2006:28). This is not the case, as the current reality emphasises through the still occurring urban sprawl, the lack of development management and the unsustainable urban form that exists. There is a need for a new and creative approach towards the urban edge concept.

3 Introduction of the urban development boundary

The urban development boundary (UDB) can be conceptualised as containing two elements (Miami-Dade, 2008): The 'urban development area' (UDA) and 'urban expansion area' (UEA).

- The urban development area (UDA) illustrates the current reality in terms of the areas where urban development may presently occur, from areas where it should not occur. It is defined by cadastral boundaries, contours etc. and is a single line. It is similar to the current concept of the urban edge.
- The urban expansion area (UEA) illustrates the future development direction in terms of the area located between the current urban development area (UDA) and the future development boundary. It is the area where current projections indicate that further urban development beyond the current urban development area (UDA) is likely to be warranted. Specific policies are required to control the impact of urban growth in this area.

The urban development boundary (UDB) is therefore the area between the urban development area (UDA) and the urban expansion area (UEA). Therefore the urban development boundary can also be seen as a development management zone. This is illustrated in the following concept figure, Figure 43.

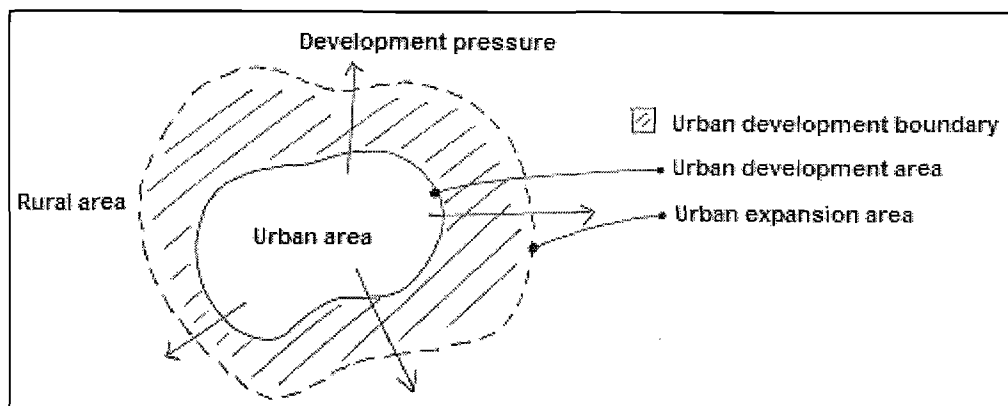


Figure 43: Concept of the urban development boundary

Source: Own creation (2008)

The function of the urban development boundary is thus to:

- Separate acceptable land uses.
- Focus resources primarily within the urban areas.
- Provide for designation of prime agricultural areas.
- Distinguish the significance in land-use planning (Miami-Dade, 2008).

In the document “Refinement of the Urban Development Boundary strategy and its implications for growth management”, the urban development boundary is further defined as a growth management tool that will: (Gauteng, 2007:22):

- Contain urban sprawl and promote a compact city.
- Ensure optimum utilisation of public resources.
- Provide strategic guidance to where the priorities for government investments should be.
- Correct spatial distortions of the apartheid past.

The urban development boundary brings with it a wide range of changes, and it is important to understand that the changes will be extensive and should best be planned on an ongoing basis and in an integrated manner. The boundary is therefore not only a mechanism to manage and direct developments patterns, but a tool to direct public spending towards changing the urban environment. Case studies from the international and local perspective were compiled in order to draw conclusions of the positive and negative issues regarding the urban development boundary.

4 International case studies of the urban development boundary

It is important to examine the urban development boundary in the perspective of international evolution. In growing cities, this pattern moves quickly in an outward direction, incorporating the inner side into the urban settlement and it then becomes absorbed by the urban body. Internationally, the phenomenon of the urban development boundary manifests in various different forms. South African cities do not historically follow European city models, but the European situations were studied because of the great success and sustainability these cities have achieved. A detailed study was done to determine the different forms and functions of the urban development boundary as it is implemented in the Netherlands, specifically Utrecht, Breda and Uden, as well as the United Kingdom, with reference to the case studies of Kentdowns and Havering.

4.1 The United Kingdom’s approach towards the urban development boundary

The urban development boundary can be compared to the green belt concept of the United Kingdom. Although their points of departure differ, the eventual objectives are the same. The green belt manifests in terms of strategic gaps, rural buffers and green wedges, all implemented within the urban environment. Table 26 illustrates the essential features of the green belt, which is similar to the urban development boundary concept.

Table 26: Essential features of the United Kingdom's approach to the urban development boundary

	Strategic Gaps	Rural Buffers	Green Wedges
Purposes	Protection of urban areas.	Protection of the countryside.	Shape growth of the city.
Location	Between urban areas.	Around/between major cities.	Penetrating into the city.
Size	Generally up to two miles wide.	Up to five miles wide.	Up to one mile wide.
Permanence	Same as the structure plan.	Revised at reviews of plan.	Same as the structure plan.
Development	Strict controls.	Allows small rural development.	Green Belt prescription.

Source: Communities and the local Government (2005)

General conclusions were drawn from the perspective and implementation of the green belt concept in the United Kingdom. This was formulated in a matrix and is presented in Table 27.

Table 27: Matrix of the United Kingdom's planning approach

Research issues	As manifested in the United Kingdom
Legislative framework	National authority set the planning framework. Each city defines a structure plan and this leads to the individual district and local plans.
Urban development boundary	Green belts focusing on environmental quality and containment of urban sprawl. Well defined. Known for its permanence. Urban areas contained successfully.
Significance of the concept	Metropolitan areas are confronted with growth forces and pressures to expand. The strict control of development is proven to be successful.
Spatial planning principles and spatial context	Spatial principles include positive land uses. The green belts shape patterns of urban development.
Social-economic objectives	Development and planning are more focussed on environmental protection than on social upliftment. There is public participation, but on a small scale.
Relevance to this study	Visual separation of areas is important. This can be obtained through defined, natural edges ensuring effectiveness and sustainability. The Green Belt ensures compactness of the urban environment, positive spatial implications such as minimising travel distances, maximising local infrastructure and enhancing of the surrounding quality. Focus on an integrated approach.

Source: Own creation (2005)

The United Kingdom's approach towards the urban development boundary is realised in terms of policies, legislation and frameworks, all implemented within the current reality. This is proven in the case studies done in Havering and Kentdowns. These areas were chosen based on their location within the United Kingdom. Furthermore, Kentdowns represents a rural area, and Havering represents an urban area. These two studies cover the principle issues inside and outside of the urban development boundary. Table 28 illustrates this current reality and implementation of the urban development boundary in Havering and Kentdowns.

Table 28: Matrix of the United Kingdom's case studies.

Spatial Issues	Kentdowns (Rural area)	Haverling (Urban area)
Spatial reality	Unique spatial character of natural beauty. It is situated within the green belt.	Urban node. Needs accessibility, upgrading of infrastructure, transport corridors.
Policy/Legislative frameworks	- Planning Policy Guidelines. - Local Development Framework.	- National Planning Policy Guidelines. - Haverling Unitary Development Plan 1993.
Connectivity corridors and mobility	Strict development control measures exist. Transport and infrastructure corridors to be developed for national interest, if no other sites are available. Environmental protection is more important than urban development.	The transport network is outstanding. This ensures optimal accessibility and mobility. Rail and underground transport corridors and freeways are connecting the regional places and urban cores.
Integration	Should not degrade the environmental quality.	Main corridor and connection to London city.
Urban development boundary	The Green Belt forms the urban development boundary. Natural boundaries due to the topography. Strict development control.	Green Belts ensure objectives similar to the urban development boundary concept. Create open areas around cities.
Objectives	- Environmental protection. - Quality enhancement in the total area.	- Limit outward sprawl. - Coalescence of towns.
Management	Strict development control frameworks. Any new development initiatives must prove to be sustainable and environmentally friendly.	Enhancement of the environment, but at the same time ensuring the efficiency of the connection corridor to London.
Successes	- Environmental management and beauty. - Environmental rights emphasised.	- Regional development and integration. - Holistic approach, permanence of belt.
Failures	- Environmental issues are more important than development and urban structure. - No social focus.	- Urban expansion into the open areas - The plans are guidelines, not legal, binding documents.
Spatial planning conclusions	The natural environment determines the spatial pattern and related context.	Connectivity with London overpowers the requirements set by the Green Belts.
Recommendations	Development should not degrade the current natural area. Develop holistically. Open areas, Green Belts, contain urban development.	Consider the area holistically. Economic, spatial and environmental issues must be in balance with one another.

Source: Own creation (2005) [Derived from: Kent Downs (2005) & Haverling (2005)]

4.2 The Netherlands' approach towards the urban development boundary

The international case study compiled in the Netherlands, focussed on the green structures concept, having similar objectives to the urban development boundary. Chapter 4 compared the Randstad (city region concept) to the Gauteng city region, and now this chapter focuses on the specific urban development boundary objectives, and implementation thereof. Green structures in the Netherlands are of great importance, because space is limited. All development initiatives are dependant on the land use, and parallel to this, are the open green structures.

The special national policy for green areas, called "Green in and around Cities", enhances the importance of this concept within the urban environment of the Netherlands. This Fifth National Policy document manages spatial planning in the Netherlands (reference to Chapter 2). It introduces the concept of 'green' and 'red' contour lines. Green contours are drawn around areas with special natural conservation values. The focus is preservation and protection, but the dynamics of landscape and nature are also given priority. A contribution is made towards the essential features and values of the area. Red contour lines limit urban growth and are therefore drawn around existing built-up areas. The objective is to locate new construction within these contours by transforming and intensifying land use. These concepts regulate development in the Netherlands, and therefore the green structures (urban development boundary concept as it manifest in the Netherlands) are subject to these concepts (Ministry of Housing, 2001). General conclusions and observations were drawn from the perspective and implementation of the urban development boundary, known as the green structure concept, in the Netherlands. This is presented in Table 29.

Table 29: Matrix of the Netherlands' planning approach

Important research issues	As manifested in the Netherlands
Legislative Framework	Spatial Planning Act guides development on national level, Regional Plan guides regional development and the Structure plan guides land use on local level.
Urban development boundary	Green structures ensure open areas within the limited space. Red and Green contours define this concept and distinguish areas for clustered deconcentration.
Significance of the concept	Pressure to expand is accommodated by identifying growth areas. Buffer zones are developed to ensure green cities.
Spatial planning principles and spatial context	Green open areas within the urban environment. Clustered deconcentration leads to structural urban development.
Social-economic objectives	Densities are very high because space is limited. There is a need for quality environments.
Relevance to this study	Space is limited, therefore cities are compact. This ensures positive spatial implications such as minimising travel distances and enhancing of quality. There must be less development control but more development planning.

Source: Own creation (2005)

The approach towards the urban development boundary is realised in terms of policies, legislation and frameworks, all implemented within the current reality. This is proven in the case studies done in Uden and Utrecht. These areas were chosen based on their location within the Netherlands. Furthermore, Uden represents a small urban area, and Utrecht represents a nodal urban area. These two studies thus cover the principle issues of different scale urban areas and their relation to the urban development boundary. Table 30 illustrates this current reality and implementation of the urban development boundary in Uden and Utrecht.

Table 30: Matrix of the Netherlands' case studies.

Spatial Issues	Utrecht (Urban node)	Uden (Small urban area)
Spatial reality	Utrecht is the centre of Netherlands and core node for development. It grew concentrically.	The boundaries were set by the railway and road networks.
Policy/Legislative frameworks	Master Plan, supported by a Vision Map and Green Structure Plan.	Provincial Spatial policy, Regional Plan, Structure Map and Action Plan.
Connectivity corridors	Development corridors to core nodes, integrate rural areas. Regional accessibility.	Connectivity and mobility corridors shaped the urban environment.
Integration	Infrastructure corridors create regional axes. Spatial-economic location within the region.	Situated in pentagon (Nijmegen, Den Bosch, Eindhoven). Enhance economic development.
Urban boundary	Green structure planning stimulates the red and green contours. Individual green areas.	Urban development boundary is naturally formed by the railway.
Objectives	- Place nature into core areas. - Integration of urban and rural areas. - Red-green contours implementation.	- Topography determines development. - Enhancement of areas with nature value. - Definite green structures are present.
Management	Green structure planning.	Detailed development plans.
Successes	- Integrate urban and rural area. - Identifying of nodal development points. - Corridors that integrate the region.	- Limiting urban sprawl. - Efficient land use, intensive development. - Upgrading the quality of the environment.
Failures	Regional axis not bound to the green structure principles. Regional integration does not contain the urban area. Traffic congestion.	Green structures are losing importance, because development is determined by other factors than the green open areas.
Spatial planning conclusions	The urban environment is defined by nodal points of development, connected via development and transport corridors.	The natural environment determines the future development initiatives. Nature is a form-giving element of the spatial structure.
Recommendations	Green structure planning places nature back into the urban area. Create a linked green network to be more efficient.	Natural environment co-ordinated with spatial planning and development. Natural edges ensure sustainable compact cities.

Source: Own creation (2005) [Derived from: Uden (2004) & Utrecht (1995)]

5 South African case study of the urban development boundary

The current spatial reality in South Africa testifies of apartheid planning that has brought about segregated spatial patterns, where the settlement of some communities was pushed to the periphery. Urban edges were introduced to redress this legacy, to manage and direct urban growth pro-actively, and to protect the environment. Some municipalities did not implement the urban edge concept from an economic necessity to boost their fiscal base. However, the reality is that existing boundaries irrationally divide settlements, and disempower municipalities that seek to plan and provide for the needs of communities within the integrated social and economic area of the settlement. To empower municipalities to operate effectively, the most appropriate geographical extent within which a municipality should exercise its particular powers

and functions has to be revisited. The concept of the urban edge did not succeed in terms of these aims and objectives, as it was supposed to. The inefficiency of the urban edge concept can be related back to the understanding of the concept, the delineation of the boundaries and the implementation that did not succeed. Accordingly, these issues will be described in terms of the case study compiled in the Gauteng area.

5.1 The urban edge concept as it was introduced in Gauteng

The urban edge concept for Gauteng Province was introduced as part of the Gauteng Spatial Development Framework (GSDF) of the year 2000. The urban edge received statutory status in May 2002 by means of adoption by the Provincial Cabinet and has since been implemented at Provincial and Municipal level (Gauteng Department of Economic Development, 2006:3). Following from the directives contained in the GSDF (2000), a specific process was undertaken during the first half of 2001 to delineate an urban edge for Gauteng at cadastral level. The methodology of the delineation of the urban edge was analysed and evaluated in order to determine whether the inefficiency of the urban edge concept can be related to the delineation approach of the urban edge.

5.2 Methodology towards delineation of the Gauteng urban edge

The methodology towards the delineation of the Gauteng urban edge consisted of various steps and processes. The point of departure was compiling a situation analysis. This was followed by a literature review and establishment of alternative delineation approaches. The methodology also consisted of consultation and participation of stakeholders in order to ensure a qualitative approach and end result. The details of the various steps are described as follows:

- Situation analysis: The documentation that was assessed included the GSDF, Gauteng Open Space Study, Gauteng Draft Development Planning Bill and the Development Facilitation Act (Act 67 of 1995). This ensured that the urban edge would form part of the larger rationale of urban restructuring applied in Gauteng.
- Literature review: International experience were analysed and it became evident that there are certain requirements and critical success factors towards the successful implementation of the urban edge. It emphasised the need for an integrated approach towards planning to achieve a desired spatial outcome (Gauteng Department of Economic Development, 2006:8).

- **Alternative delineation approaches:** The first alternative suggested that the urban edge should be “phased or contoured” based on a land-use budget for the next 20 years. The second alternative proposed the urban edge to be delineated along the current line of urban activity, which requires all future urban expansion beyond the edge only to be allowed following a formal application process that complies with certain criteria. The second approach was chosen as this was more restrictive in terms of the Development Facilitation Act and goal towards restructuring of the urban environment (Gauteng Department of Economic Development, 2006:9).
- **Consultation:** Meetings were held with stakeholders and major role-players at local, regional, metropolitan and provincial levels to discuss preliminary findings.

Criteria for implementation of the urban edge concept were formulated accordingly. The criteria included factors for delineation of the urban edge, land uses to be permitted, measures for implementation and management. Table 31 illustrates a summary of the criteria.

Table 31: Criteria for implementation of the urban edge

Criteria	Description
Delineation of the edge	• Existing border of urban activity, existing and approved development rights. • Natural features, local authority boundaries and functional boundaries. • Availability or lack of bulk infrastructure.
Land uses to be permitted	• Inside the urban edge all land uses are permitted that are in line with the local authority's IDP, spatial development framework, land-use management and town planning scheme. • Outside the urban edge, rural land uses are more desirable (agricultural, conservation etc.).
Measures for implementation and management	• Statutory measures: Included in the Gauteng Development Planning Bill (GDPB) (which has now been adopted as the Gauteng Planning Act, 2003) and subject to the Integrated Development Framework and Gauteng Spatial Development Framework. • Procedure: Joint responsibility of the provincial and local governments, but the approval/disapproval of an application would be the responsibility of the local authority.
Implementation methodology	• Phase 1 is the interim phase, determination of the urban edge by the Department of Development Planning and the adoption thereof by the Provincial Cabinet (May 2002). • The second phase would be to implement the urban edge through the municipal SDF's.

Source: Own creation compiled from data of Gauteng Department of Economic Development (2006:10)

Furthermore, procedures for development applications were formulated. This was compiled to guide development within and outside the urban edge. These procedures, in terms of development applications, are described in Table 32. (See annexure D and E).

Table 32: Procedures for development applications within and outside the urban edge

Application	Current procedures
Inside the urban edge	Normal procedures in line with legislation approved/disapproved by local authorities.
Outside the urban edge	Normal procedures in line with legislation approved/disapproved by local authorities.
Outside the urban edge not complying with the criteria	1. Submit additional motivation from the applicant clarifying the following: Reason for specific location, who will provide bulk services, impact of development on urban edge and on the environment, effect of existing transportation infrastructure and prove that there is no land available inside the edge for the development. 2. Submit the motivation to the relevant provincial departments (Annexure D/E). 3. Appeals can be made to the Gauteng Development Appeal Tribunal.
Areas constantly under pressure for development	1. Local authority may submit an application to the MEC for Development Planning and Local Government for the amendment of the urban edge. 2. The MEC may, or may not, in consultation with other provincial departments, approve the request then.

Source: Gauteng Department of Economic Development (2006:13-15)

From the evaluation of this approach a downfall was identified, namely the lack of a decision support model to facilitate the decision-making process of development implications. To ensure the efficiency of the implementation of this concept, the proposed decision support model should be in accordance with new national and provincial legislation and policies, such as the National Spatial Development Perspective, Gauteng Global City Region Perspective, and the Gauteng Planning and Development Act (Gauteng, 2003). Apart from this, there are also other issues of concern regarding the urban edge concept, as described below.

5.3 Issues and concerns regarding the current Gauteng urban edge

Further issues and concerns regarding the current urban edge approach was compiled from a detailed study and structured interview process with stakeholders, professional planners and authorities. This was intended to deepen the insights into the core issues of the Gauteng area, and identify areas of improvement. The issues and concerns (from a spatial perspective) of the current urban edge concept as viewed from the professional sector in Gauteng are as follows:

- By restricting land availability, growth boundaries can increase the price of land.
- Land speculation may increase and result in large pieces of land remaining undeveloped.
- Applications are not considered on merit, but on their location (Gauteng, 2006:9).
- The municipalities applied the concept strictly as a line and not part of the overall rationale.
- The provincial urban edge is in conflict with local municipal urban edge (Kriek, 2007).
- After introduction of the urban edge, nothing has changed within the Gauteng environment.
- One planning instrument cannot stop urban sprawl. The approach is too simplistic.

- The urban edge limits development. Investment must be welcomed in third-world countries.
- Transport systems can regulate increasing densities and changing urban form.
- The rural area needs a developmental approach, not a conservation approach.
- Identify “high agricultural land” and development accordingly around the identified sites.
- The urban edge should accommodate the growth rates of the society (Kriek, 2007).

Various meetings held with representatives from municipalities in Gauteng, clarified their experience, perception and difficulties with the implementation of the urban edge. These issues and concerns of the current urban edge concept, as viewed from the local authorities and municipalities in Gauteng, are described in the following table that provides an overview of the input received (Gauteng Department of Economic Development, 2006:20).

Table 33: Municipalities’ perspectives and input regarding the urban edge concept

Municipality	Issues identified
City of Johannesburg Metropolitan Municipality	○ GDACE’s position needs to be clarified. ○ Densities should be determined on merit. ○ Need for integrated approach to decision making. ○ Improved cooperation needed between municipalities. ○ Prefer an edge, but wants to manage it themselves.
City of Tshwane Metropolitan Municipality	○ Inconsistent application of the edge experienced with poor administration. ○ Applied the concept of a management zone. ○ Want to provide density choice based on location. ○ GDACE’s definition of “high agricultural land” is problematic.
Ekurhuleni Metropolitan Municipality	○ No support from GDACE. ○ Densification around corridors. ○ Supports urban edge but wants direct control over it.
Metsweding District Municipality	○ Lack of clearly defined roles at provincial level. ○ Need for re-alignment of urban edge. ○ Need stronger local decision-making powers. ○ Need decision-making tool on aspects such as urban expansion.
Sedibeng District Municipality	○ Do not agree with high densities prescribed by GDACE. ○ Integration of former separated areas needed.
West Rand District Municipality	○ Urban edge did not achieve desired restructuring of the urban environment. ○ Problems with GDACE in terms of densities. ○ Need to consider applications in terms of merit.
Westonaria Municipality	○ Urban edge restricts some of the only developable land. ○ Development pressure lacking support of economic base. ○ Conflict with Johannesburg in terms of expansion.
Randfontein Municipality	○ Informal settlements outside edge are difficult to upgrade. ○ Developable land is limited.

Source: Gauteng Department of Economic Development (2006:26)

From the input received from the professional sector and the local authorities, as well as the supporting literature, policies, legislation and guidelines, a table was constructed to illustrate the strengths and weaknesses of the Gauteng urban edge. This table is based on a similar table, compiled by the Gauteng Department of Economic Development.

Table 34: Strengths and weaknesses of the urban edge in Gauteng

Strengths	Weaknesses
○ Based on principles and norms. ○ Form part of larger perspective (GSDF). ○ International experience incorporated. ○ Concept urban form promoted. ○ Enhance importance of merit in applications. ○ Protect agriculture outside the Gauteng city region. ○ Enhance compact nodes and higher densities. ○ Enhancement of public transport.	○ Broader growth management strategy is lacking. ○ Applications only in terms of position to the line. ○ Inconsistently applied. ○ Implementation cycle never completed, resulting in two statutory edges at provincial and municipal level, causing confusion and conflict. ○ Complex areas all have the same guiding policies. ○ Municipal edges are not connected to each other.

Source: Gauteng Department of Economic Development (2006:19)

5.4 Evaluation of the Gauteng urban edge

Evaluation of the Gauteng urban edge is done via the specific arguments that were raised from relevant stakeholders, the public and private sectors, as well as managing authorities. Therefore arguments in favour of, and against, the concept of the urban edge as it currently manifests in Gauteng, are described in Table 35.

Table 35: Arguments in favour of, and against the concept of the urban edge

Arguments in favour of the urban edge	Arguments against the urban edge
• In general, the outcome and objectives of the urban edge are positive. • The urban edge concept is applied in accordance with approved provincial policy and specifically recommendations emanating from the Land Use Task Team. • The Conservation Plan, Open Space Plan and Agricultural Potential Assessment support the urban edge concept. • Municipalities favour the urban edge. Municipalities want to manage their own edge. • The urban edge facilitates the restructuring and compaction of the urban form.	• Implementation of the urban edge by the Gauteng Department of Agriculture, Conservation and Environment (GDACE) was a problem identified by several municipalities, developers and the development sector in general. • GDACE only uses the line and does not give consideration to the other components of the urban edge (Gauteng Department of Economic Development, 2006:26). • There are two statutory edges, causing confusion / conflict. • Lack of clearly-defined roles at provincial level. • Applications considered based on location and not on merit. • Little consideration is given to growth management. • Over-emphasis is placed on environmental aspects. • There is a lack of institutional capacity. • The urban edge inhibits social and economic development.

Source: Own creation (2008)

5.5 Conclusions regarding the Gauteng urban edge

From the literature overview, interviews and conducted studies, the following table was compiled and describes the spatial conclusions regarding the urban edge concept of Gauteng.

Table 36: Matrix of the Gauteng case study

Spatial Issues	The Gauteng approach
Spatial reality	The pro-planning approach, based on racial segregation, was scrapped and replaced with a pro-market approach focussing on the restructuring of the apartheid city. Principles are aimed at promoting a future compact city with full integration of services, facilities and communities, and thereby also correcting the spatial distortions.
Legislation	Development Facilitation Act, Gauteng Planning and Development Bill.
Policy	Gauteng Spatial Development Framework, Gauteng Strategic Public Transport Network.
Connectivity corridors and mobility	Transport corridors exist to all the core urban environments. Development occurred along these corridors and this resulted in urban sprawl. Rail and road networks form the basic connectivity and mobility corridors. The introduction of the Gautrain concept will enhance these corridors.
Regional integration	Municipalities within the region are integrated via the connectivity corridors. Regional integration is based on economical and transport modes.
Nature of the urban edge	The urban edge is delineated on a map, but the implementation of this concept needs a more-detailed approach in order to function effectively. The boundary is not only a mechanism to change development patterns, but is more so a tool to direct public spending towards changing the urban environment.
Principles related to the urban edge	• Development rights and local authority boundaries. • Natural features and the availability of bulk infrastructure and services.
Management	The current situation prescribes different land uses within and outside the urban edge. Development should adhere to the relevant legislative and policy frameworks. The urban edge sets the types and future development regulations for the area, and this determines the regional land-use patterns in the area. The urban edge impacts on the total inclusive area.
Successes	• Regional integration, compacting the urban environment, directing urban growth.
Failures	High-density residential developments are currently located on the periphery of the urban area, and this has great financial implications for residents in terms of travelling costs. Integration of green open areas needs to be a priority. Implementation of this concept needs a detailed approach. Importance of this concept needs to be realised. Planning and development needs to be transformed to limit current urban expansion and ensure compact urban environments.

Source: Own creation (2007)

Since the introduction of the urban edge concept in 2002, there have not been any significant changes in the urban environment regarding town establishment, subdivisions, and land-use management inside and outside of the urban edge. This is proof of the urban edge concept not being efficient and effective. It is important to remember that the urban edge still has important functions within the bigger picture, but due to misinterpretations and ineffective implementation, this concept is perceived as unsuccessful.

Today there are even more approaches impacting on the urban edge concept, including the National Spatial Development Perspective setting certain development objectives, the Gauteng Spatial Development Perspective identifying urban nodes and corridors to be integrated, the growing transport sector and supporting infrastructure and transport networks that are not subject to any development boundary, the need to improve accessibility, and socio-economic issues impacting on the development and spatial planning approaches. It is now time to rethink the future development direction and to create supporting measures and tools to ensure the development of a sustainable urban form and environment.

6 The urban development boundary as the way forward

The use of the urban edge by DACE in isolation of other policies when evaluating applications, resulted in a stringent application of the urban edge, leaving no scope for evaluation based on merit. Although the urban edge concept has various positive objectives to offer, it was proven to be insufficient and unsustainable in the South African context, due to various constraints and difficulties regarding the implementation thereof.

In order to address these issues, a new perspective towards this concept is needed. Based on literature studies and interviews it is proposed that the urban development boundary concept should be explored and evaluated against the South African urban environment. The introduction and implementation of the urban development boundary concept is proven to be more successful than the current urban edge approach. The urban development boundary does not rectify all the shortcomings of the urban edge concept, but by clarifying its interpretation and objectives, it enhances the important function of urban nodes and future development areas.

It is necessary to determine the impact that the proposed urban development boundary will have on the current Gauteng environment. When evaluating these impacts and outcomes the following guiding principles should be kept in mind:

- The urban development boundary needs to manifest in terms of a management zone to automatically incorporate supporting policies, frameworks and legislation. This will ensure development applications to be considered based on merit.
- In order for the urban development boundary to be truly effective and to streamline provincial objectives, it should be implemented universally and consistently, by all provincial departments and municipalities alike.
- The urban development boundary is defined by the existence of the urban edge.

- It needs to provide appropriate capacity for future growth and needs to identify strategically-located vacant land favourable for infill.
- The urban development boundary needs to be aligned with existing physical features, to prevent the creation of isolated land parcels with no development potential.
- While development within the urban development boundary will be encouraged, the City needs to allow appropriate non-urban development outside the boundary in accordance with specific policy requirements.
- The urban development boundary needs to focus on more detailed qualitative measures, such as compactness of the urban area and creating a sustainable environment.
- The urban development boundary will need to be complemented by proper-implemented growth management mechanisms.

As the area within the Gauteng urban edge becomes more developed, the boundary will play an increasingly significant role in achieving the urban restructuring objectives. In the short term, however, the urban development boundary will curb further urban sprawl and promote the efficient use of infrastructure (Johannesburg, 2004:88). The urban development boundary, if implemented and maintained correctly, will thus take the role of the following tools:

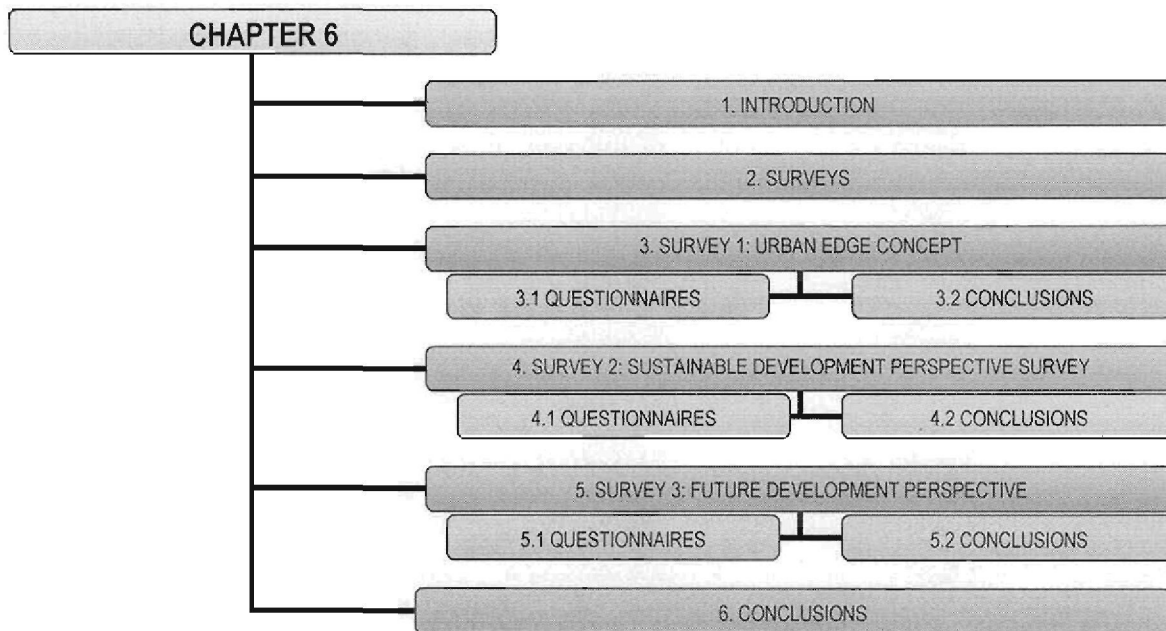
- Restructuring tool: Restructuring the urban areas and integrating the currently segregated social groups and urban uses into a holistic urban environment.
- Growth management tool: Used to limit sprawl and the outward growth of urban areas, in favour of densification and infill development via node development.
- Efficiency tool: Ensure the more efficient use of resources and land within the urban area as all are integrated and connected.
- Conservation tool: Used to exclude certain elements of the environment from the urban area, protect or preserve it by identifying green areas and creating development policies.

The Gauteng city region will be structured by the urban development boundary. After implementation of the urban development boundary into the Gauteng environment, another conflicting issue will arise. The Gauteng urban development boundary will act as the container of various urban areas (Tshwane, Johannesburg, Ekurhuleni etc.) and thus also be confronted with the urban edges of these urban nodes. It needs to be determined whether it is more beneficial for the Gauteng city region to have only one urban development boundary, and develop the whole area into an urban metropolitan core, or whether it is more beneficial for the area to maintain the current urban edges, implement a regional urban development boundary around all of them, but focus more on a polycentric development pattern where all the urban nodes are linked, but still function as individual entities.

Section B: Empirical Investigation

Chapter 6

Empirical investigation



1 Introduction

The empirical study consists of three core qualitative surveys as illustrated in Table 40. Note that these surveys were not based on a quantitative approach, but focussed on opinions and ideas from professionals, and thus conducted qualitatively. Qualitative surveys improve the quality of information that is required for intelligent decision-making (Marsland *et al.*, 1998:1). The term "qualitative" is not without potential problems and there is a variety of ways in which qualitative and quantitative methods may be combined to improve the trustworthiness of surveys (Marsland *et al.*, 1998:22). Thus, qualitative responses are incorporated in the questionnaires, by means of open-ended questions. Data collection strategies relied on observations, interviews and documents and were viewed triangularly, contributing towards reliability. Surveys were conducted in the Metro-, District- and Local Municipalities. The surveys were also conducted in adjacent provinces to compare the perspective and implementation of the concepts. Information was requested from professionals, specialists and authorities located in the following municipal areas and are captured in Table 37:

Table 37: Information requested as per municipal area in Gauteng

Metro Municipalities (3 of 3 municipalities responded)		
Municipality	Web address	Code
City of Johannesburg metropolitan municipality.	http://cityofjohannesburg.local.gov.za	JHB
City of Tshwane metropolitan municipality.	http://cityoftshwane.local.gov.za	TSH
Ekurhuleni metropolitan municipality.	http://ekurhuleni.local.gov.za	EKU
District Municipalities (1 of 3 municipalities responded)		
Municipality	Web address	Code
West Rand district municipality.	http://westrand.local.gov.za	DC48
Local Municipalities (4 of 8 municipalities responded)		
Municipality	Web address	Code
Emfuleni local municipality.	http://emfuleni.local.gov.za	GT421
Midvaal local municipality.	http://midvaal.local.gov.za	GT422
Mogale city local municipality.	http://mogalecity.local.gov.za	GT481
Randfontein local municipality.	http://randfontein.local.gov.za	GT482
Adjacent Municipalities (In adjacent provinces)		
Municipality	Location	
Free State province.	Southern side of Gauteng	
Mpumalanga.	Eastern side of Gauteng	
North West province.	Western side of Gauteng	

Source: Own creation (2008)

This is a qualitative survey, and therefore the purposeful samples (information selection) taken were based only on specific authorities, located in the above-mentioned municipal areas. The authorities from local and metro municipalities were not chosen because of the political sensitive environment, and to limit subjective data. This was not an exercise to analyse opinions, but to determine how practitioners experience the concept of the urban edge, and the functionality thereof.

Twenty-two (22) practitioners were contacted and sixteen (16) responded, thus 73%. The individual input was analysed in detail and summarised according to the statistical measures. The current reality, problems, opportunities and future vision of these authorities were compared and the best practice and core issues were identified. Table 38 describes the practitioners, specialists and authorities that completed the structured surveys, in relation to the specific municipal area, their profession and the location within the Gauteng area.

Table 38: Surveys completed by practitioners and specialists

Located within the metro municipal areas [Total respondents: 17*].			
Municipality	Name	Locality	Profession
City of Johannesburg metropolitan municipality.	E. Linde	Johannesburg, Linden	Private Town Planner
	N. Kriek	Johannesburg, Melrose	Private Town Planner
	W. Van Niekerk	Johannesburg, Randburg	Economic specialist
	C. Le Roux	Johannesburg, Randburg	Private Town Planner
City of Tshwane metropolitan municipality.	N. Van der Merwe	Tshwane CBD	Private Town Planner
	S. Cornelius	Tshwane CBD	Private Town Planner
	N. Zaayman	Tshwane CBD	Private Town Planner
	V. Smith	Witbank	Private Town Planner
Ekurhuleni metropolitan.	J. Verwey	Alberton	Planning Law
Located within the district municipal area.			
Municipality	Name	Locality	Profession
West Rand district municipality.	L. Hibbert	West Rand, Mogale City	District Authority
Located within the local municipal areas.			
Municipality	Name	Locality	Profession
Emfuleni local municipality.	D.J. Louw	Vanderbijlpark	Local Authority
Midvaal local municipality.	L. Cilliers	Vereeniging	Development specialist
Mogale city local municipality.	L. Hibbert	West Rand, Mogale City	District Authority
Randfontein local municipality.	No response	N/A	N/A
Located in municipal areas in adjacent provinces.			
Municipality	Name	Locality	Profession
Free State province.	J. Viviers	Kroonstad	Private Town Planner
Mpumalanga.	K. Loesher	Nkangala DM	Planning Expert
North West province.	B. Bautsch	Potchefstroom	Local Authority
	E. Venter	Klerksdorp	Town Planner

Source: Own construction (2008)

* This is a qualitative survey and therefore based on an informative small sample

For purposes of this study, these municipal areas were divided into urban nodes, according to their location and relation to one another, in order to simplify the analysis process, statistical evaluation and interpretation. The division of these areas is illustrated in Table 39. The Johannesburg area is, for purposes of this study, described as the centre node. The Tshwane area is described as the north node. Ekurhuleni and the West Rand were described as the west node, whereas Emfuleni was described as the south node.

Table 39: Division of the selected urban areas

Node	Representation	Practitioners / specialists	Municipal area
Centre	4 25 %	Linde, Kriek, Van Niekerk, Le Roux	City of Johannesburg
North	4 25 %	Vd Merwe, Cornelius, Zaayman, Smith	City of Tshwane
East	1 6 %	Verwey	Ekhuruleni
West	1 6 %	Hibbert	West Rand
South	2 12 %	Louw, Cilliers	Emfuleni
Adjacent	4 25 %	Bautsch, Loescher, Viviers, Venter	FS, Mpumalanga, NW

Source: Own creation (2008)

These urban nodes, as created for purposes of this study, are applicable to all three individual surveys and are illustrated on the following figure.

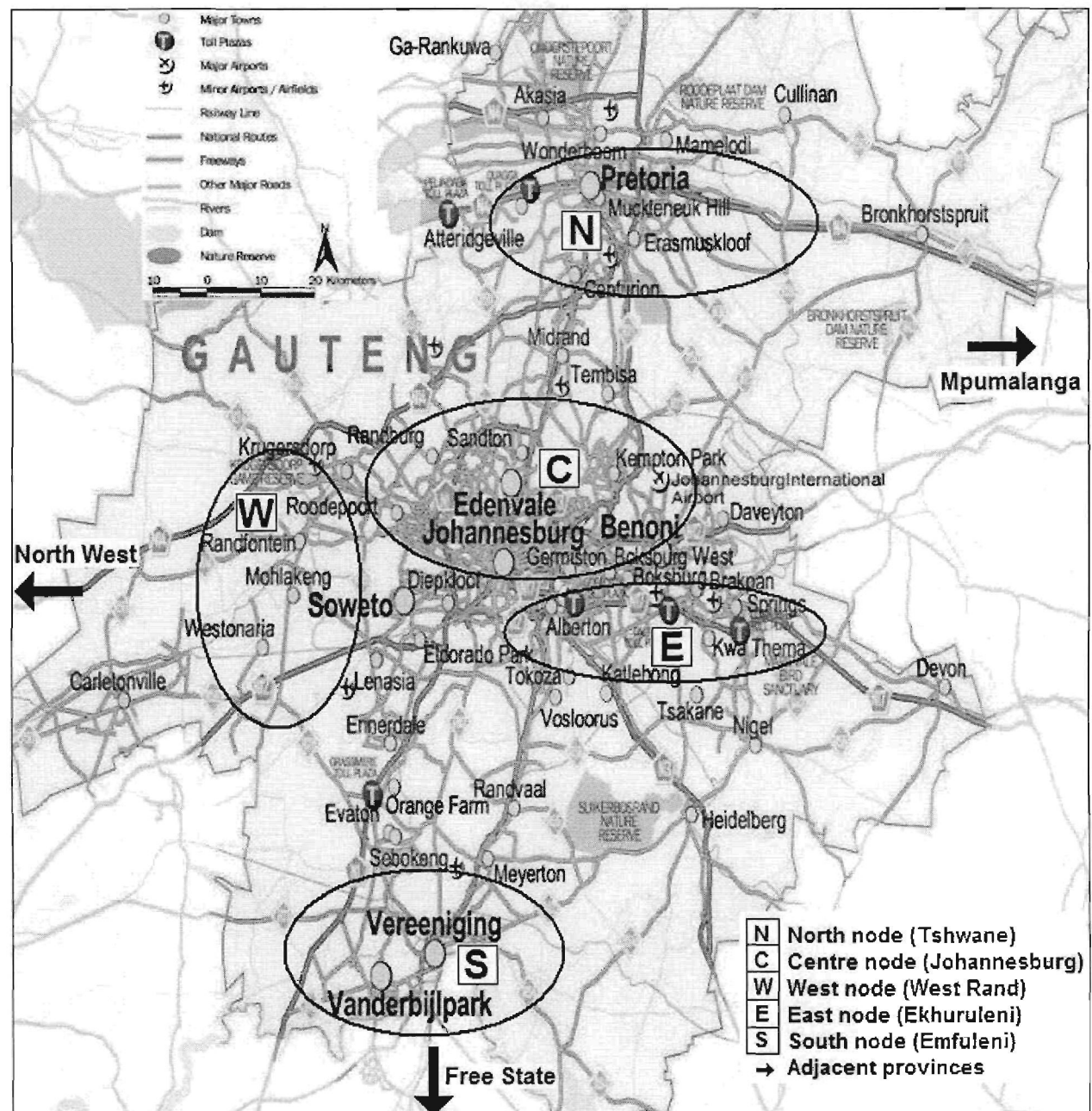


Figure 44: Spatial location of the identified nodes as identified for the surveys

Source: Own creation based on the Gauteng Map (2008)

2 Surveys

Three semi-structured surveys were compiled, according to specific issues related to the theme of research, submitted to the above-mentioned municipal areas, professional and local authorities.

The first survey covered the perceptions of the urban development boundary. This includes the function and issues of the urban development boundary concept. It further aimed to determine the failures and successes of the current urban development boundary concept in order to develop an edge management decision support model for implementation and management.

The second survey determined the sustainable development perspective from a private and governmental point of view. Strengths, weaknesses, opportunities and threats regarding the sustainable development concepts were determined and evaluated. The aim was to develop a direction towards planning and sustainable development.

The third survey determined the future development perspective. The aim was to determine whether the Gauteng region will be more effective when keeping all the current urban development boundaries and introducing an additional urban development boundary for the Gauteng city region that is still subject to the individual urban development boundaries of the urban nodes, and thus a polycentric approach; or whether it would be more beneficial for the region to only have one urban development boundary around the whole city region, regulating growth and development for the entire urban area, thus a mono-centric approach towards urban development. Table 40 describes the core components of the three surveys.

Table 40: Empirical research and conducted surveys

Case	Survey 1: Urban edge concept	Survey 2: Sustainable development perspective	Survey 3: Future development perspective
What	Determine function and success of the current urban edge concept to develop an edge management decision support model.	SWOT analysis of the sustainable development perspective to guide future planning and development in a sustainable way.	Polycentric versus mono-centric development as future planning initiative. Comparing positive and negative aspects.
Who	Government, public.	Private, public, governmental.	Private, Public, governmental.
How	Questionnaires and interviews.	Questionnaires and case studies.	Questionnaires and case-studies.

Source: Own creation (2007)

The remainder of this chapter is based on the description, analysis, findings and conclusions of each of these surveys.

3 Survey 1: Urban edge concept

The aim of this qualitative survey was to evaluate the concept of the urban edge as it is implemented in the Gauteng environment in terms of function and success. Initial research aimed to identify the critical urban-rural issues, determine urban development boundaries and buffers that are currently in place in the Gauteng environment, and identify the obstacles of implementation. It further aimed to determine what elements in the environment offer the most defensible buffer and growth boundaries and to suggest what would be the optimal edge management policy and standards for the Gauteng city region.

Field research was undertaken to get locally-related answers. This included semi-structured and structured interviews and surveys. Urban edge objectives, policies and implementation activities in pre-determined urban areas were studied. Urban areas were identified and chosen based on their location within the Gauteng city region, as described in the introductory section of this chapter. Profile and scenario assessments were compiled. The factors relating to the implementation of urban edge management policies were analysed, as well as the impact and issues thereof, and this led to certain findings. The objective to create an urban development boundary management decision-support model, using the most relevant elements that have an impact on the urban edge concept, was evaluated in the context of the Gauteng city region.

3.1 Questionnaires

The survey distributed is illustrated in Annexure A. This qualitative survey focussed on specific urban edge issues and this basic information included:

Table 41: Information needed for the purpose of this study

Information	Relevance to this study
Urban edge policies currently in place.	To determine the priority, the functionality and effectiveness as currently experienced.
Land use applications outside the urban edge.	To determine the measures in terms of land-use taken, to enhance the function of the urban edge.
Planning proposals outside the urban edge.	To determine the current pressures, development initiatives and impacts.
Policies to integrate the different market sector residential areas.	To determine the linkage between urban and rural areas, and whether the housing sector can be used as a catalyst to integrate the urban and rural areas more efficiently.

Source: Own creation (2008)

The first part of the survey covered the current reality issues, the current land-use applications, planning proposals and integration measures. It divided specific factors that have an impact of the urban edge according to high priority (2), low priority (1) or no priority (0). The second part of the survey focused on the urban edge concept and the impacting factors. The purpose was to conclude what the critical urban-rural issues were, as well as the function and effectiveness of the current urban edges in Gauteng and furthermore, to determine which elements in the environment offer the most defensible buffers and growth boundaries. The results from the survey and the various interviews were summarised according to the created urban nodes, and are presented in Table 42. A comprehensive conclusion was drawn from all of the findings in the individual urban nodes, and was captured in Table 43, illustrating the general perspectives, most common issues, the most appropriate and acknowledgeable planning approaches, and best practice solutions.

Table 42: Urban Development Boundary survey results per node

Urban development boundary issues	C (JHB)			N (PTA)			S (EM)			E (EK)			W (WR)			A (AD)		
	2	1	0	2	1	0	2	1	0	2	1	0	2	1	0	2	1	0
Does the municipality have an urban edge management policy in place?	x			x			x			x			x			x		
Are there currently land-use applications outside the urban edge area?	x			x			x			x			x			x		
Are there currently proposals for development outside the urban edge?	x			x						x	x			x				x
Are there policies in place to integrate different market sectors?		x		x						x	x					x	x	
Which of the following factors inform or should inform the urban edge?																		
• Prominent landform and character areas.		x		x				x		x			x				x	
• Valuable soils.		x		x			x			x			x			x		
• Hydrology (Surface and ground water features).		x				x	x					x	x			x		
• Ecological resources.		x		x			x					x	x			x		
• Protected areas (Conservation sites).	x			x	x		x			x			x			x		
• High intensity or potential agricultural resources.		x		x	x		x					x	x			x		
• Services infrastructure (Barrier effect).	x			x				x		x			x			x		
• Services infrastructure (Capacity and reach).	x			x				x		x						x	x	
• Vacant land in urban area.		x		x			x						x	x			x	
• Higher order roads, access roads, transport infrastructure.	x			x			x			x						x	x	
• Cadastral boundaries of adjoining land units.		x		x						x	x		x				x	
• Availability of developable land in urban area.		x		x			x						x	x			x	
• Growth requirements over 10-20 year period.	x			x	x		x			x			x			x		
• Land-use application for new development.	x			x	x					x	x		x					x
• Visual impact.		x		x				x					x			x		
• Cultural and heritage resource areas.		x				x				x	x		x			x		
• Ownership of land and existing land use rights.		x		x						x	x		x				x	
• Informal settlements.		x		x						x	x		x				x	
• Density policy for residential development in rural towns.		x		x						x			x			x		

Source: Own creation (2007)

The results as illustrated in Table 42 were summarised in a comprehensive form to be able to draw informed conclusions. The actual data and conclusive results are illustrated in Table 43.

Table 43: Conclusive results of survey 1

Urban edge issue	Yes				No	
	High priority		Low priority		No priority	
	Actual	%	Actual	%	Actual	%
Does the municipality have an urban edge management policy in place?	5	31.25	0	0	11	68.75
Are there currently any land-use applications outside the urban edge area?	0	0	10	62.5	6	37.5
Are there currently planning proposals for development outside the urban edge?	0	0	10	62.5	6	37.5
Are there policies in place to integrate different market sector residential areas?	7	43.8	0	0	9	56.2
Which of the following factors inform or should inform the urban edge?						
• Prominent landform and character areas.	10	62.5	2	12.5	4	25.0
• Valuable soils.	10	62.5	3	18.7	3	18.7
• Hydrology (Surface and ground water features).	6	37.5	9	56.2	1	6.3
• Ecological resources.	10	62.5	3	18.7	3	18.7
• Protected areas (Conservation sites).	11	69.7	4	25.1	1	16.2
• High intensity or potential agricultural resources.	11	69.7	2	12.5	3	18.8
• Services infrastructure (Barrier effect).	7	43.7	6	37.5	3	18.8
• Services infrastructure (Capacity and reach).	9	56.2	4	25.0	3	18.8
• Vacant land in urban area.	5	31.2	10	62.5	1	6.3
• Higher order roads, access roads and transport infrastructure.	7	43.7	3	18.7	6	37.6
• Cadastral boundaries of adjoining land units.	6	37.5	9	56.2	1	6.3
• Availability of developable land in urban area.	11	68.7	3	18.7	2	12.6
• Growth requirements over 10-20 year period.	13	81.2	2	12.5	1	6.3
• Land-use application for new development.	6	37.5	1	6.2	9	56.3
• Visual impact.	3	18.7	12	75.0	1	6.3
• Cultural and heritage resource areas.	7	43.7	3	18.7	6	37.6
• Ownership of land and existing land use rights.	6	37.6	9	56.2	1	6.2
• Informal settlements.	3	18.7	2	12.5	11	68.8
• Density policy for residential development in rural towns.	1	6.2	2	12.5	13	81.3

Source: Own creation (2007)

Furthermore, the specific issues, objectives, approaches and solutions were summarised according to the finding of the individual surveys as illustrated in Table 43. This detailed conclusion is presented in Table 44.

Table 44: Urban edge concept interview summary

Issue	Summary
Critical urban-rural issues.	• Management and quality control. • High potential agricultural land under pressure. • Basic infrastructure and pressure for town establishment. • Need for rural service points. • Informal settlements and uncontrolled developments.
Current urban development boundaries in place.	• Yes, but lack legal binding.
Obstacles of implementation.	• Governance and supporting policies. • Decision support models and holistic views. • Lack of capacity and informed decisions. • Delineation of the boundary.
Elements offering the most defensible buffer.	• Natural edges, nature reserves, national parks, heritage sites. • Land ownership and bulk infrastructure provision. • Carrying capacity and service infrastructure.
Optimal edge management policy and standards.	• Legal binding. • Reviewed frequently and adopt to circumstances. • Clear, user-friendly, flexible without being vague. • Address preferred densities and developments.

Source: Own creation (2008)

These findings and results were summarised (Table 45) and interpreted by the researcher for purposes of this study, in terms of the Gauteng current reality, in order to formulate an edge management decision support model.

Table 45: The urban edge study for the Gauteng city region

Conclusion	Current urban edge is unsustainable and lacks legal binding.
Motivation in support of the urban edge	International case studies proved to be successful.
Purpose of the urban edge	Containment of urban environments, enhancing node development.
Urban edge guideline process	More detail needed, sensitivity analysis, detailed development plans.
Challenges and opportunities	Implementing and governance on this planning tool.
Urban growth management	Within specified urban development nodes.
Nature of the urban edge	Holistic urban edge for Gauteng city region, with individual node edges.
Urban edge functions	Containment of the nodes, protection of the green open areas in between.
Urban edge determinants and criteria	Surrounding nodes, according to natural features and sensitivity analysis.
Edge determination	Done by municipalities, presented and workshopped with the public.
Edge management criteria	Decision support model needed for adequate and qualitative monitoring.
Spatial planning initiatives	Node development.
Decision-making process	Local municipalities presenting proposals to regional authorities.
Edge uses	Golf estates, farms, plantations, golf courses, recreation areas, parks.
Decision support model	Core function in terms of the success of the urban edge implementation.

Source: Own creation (2008)

3.2 Conclusions of the urban edge survey

The current urban edge concept is unsustainable, or not implemented due to lack of binding legislation and market pressure. International case studies (as stated in Chapter 5) prove that containment of urban environments will enhance the node development and therefore the implementation and management of the urban edges are essential. However, the Gauteng urban environment is confronted with various urban edges contained within the Gauteng urban development boundary, and has to adapt to the implications, impacts and forces of these individual nodes. A decision support model is needed for adequate and qualitative monitoring. The success of this concept is subject to effective implementation and management. Comprehensive development policies are needed inside the urban edge area, but also outside the urban edge area, and needs to be developed to support one another.

The policies applicable inside the urban edge area should accommodate homogenous development, infill development and planned development. The policies guiding development outside the urban edge area should enhance the functionality of the urban development boundary as a form-giving tool and set the contrast between the rural and urban areas.

The urban structure will be transformed by the urban edge concept, as concluded from the results of the survey, but further needs to meet the long-term urban development goals, strategic interventions and 5-year objectives, as illustrated in Table 46.

Table 46: Urban edge guiding the urban structure

Long-term goals	Strategic Interventions	5-year objectives
A city with an urban form that is efficient, sustainable and accessible.	▪ Clear structure of nodes. ▪ Integrated movement systems. ▪ Promote densification in strategic locations. ▪ Integrated public investment.	▪ Enhancing of well-functioning nodes. ▪ Transformation of declining nodes. ▪ Planned development of new nodes. ▪ Increase densities in nodes/along roads. ▪ Increase investor confidence.
Quality urban environments, integrated and sustainable settlements, well-designed spaces.	▪ Urban renewal projects. ▪ Good standards of urban design.	▪ Public investment to facilitate crowding in private sector spending. ▪ Safer communities. ▪ Effective urban places.

Source: Own creation from various sources (2007)

The spatial form and urban management must ensure the realisation of the development and planning vision: An efficient, sustainable and integrated city that empowers all citizens, especially the poor.

4 Survey 2: Sustainable development perspective survey

The aim of this qualitative survey was to determine what the perception regarding sustainable development within the Gauteng city region is. This was measured against the different urban types that exist within the Gauteng city region, as well as the dominant land uses and the general development trends.

The sustainability perspective was evaluated from a policy point of view, including general planning policy, programmes and partnerships, development initiatives and the relevant information toolkit that was used to support sustainable development in the urban area. The outcome was summarised, illustrating the scenario in each of the identified nodes and describing the most-important elements present. This information revealed the current reality within the Gauteng city region.

4.1 Questionnaires

The survey distributed is illustrated in Annexure B. This qualitative survey focussed on the perspective of sustainable development and focused on certain core issues, as illustrated in Table 47.

Table 47: Issues addressed in the survey

Information	Relevance to this study
Economic	Poverty areas, unemployment figures, commercial and industrial development and the impact on economic development, urban core deterioration, hierarchy of nodes and the current status of risk management.
Environmental	Green areas present, quality of the environment, rural and urban integration measures, current greenbelts and urban edges present, the scope for a green policy.
Social	Quality environments, equity, integration of spheres to enhance the social sector, community participation on local and provincial level, urban design to create sustainable living places.
Spatial	Integration of spheres and movement networks, urban expansion and experienced problems, housing development and the impact thereof, urban sprawl and measures to limit it and enhance sustainable urban development.

Source: Own creation (2008)

Questionnaires were distributed to authorities and professionals within the study area, as described in the first part of this chapter.

Specific questions were raised to relevant authorities, especially the local municipality and government authorities. According to the results of the survey a SWOT-analysis was done in terms of the sustainable development concept as it manifests within the urban areas of the Gauteng city region.

The first part of this survey was to determine the type of environment on which the relevant professional opinion was based. This was done by identifying the urban type, dominant land use and general development trends relevant to the specific area.

The second part of the survey focused on the specific issues present in the current environment. These included the housing development and urban sprawl experienced, commercial and industrial development, the current transport infrastructure, social change, community and public services, the utilities and other infrastructure present, agricultural change, forestry, pressure experienced from tourism and recreation facilities, the access to the countryside, landscape and environment issues and also cultural and natural heritage impacts.

The final part of the survey comprises a more-detailed approach in terms of the economic, environmental, social and spatial issues that were evaluated individually. This was followed by identifying the underlying forces and pressures. Policy initiatives were lastly evaluated in terms of general planning policy, programmes and partnerships, and development initiatives.

The results from the survey and interviews were summarised for all urban nodes (as compiled in Table 39) and are presented in Table 48. The second part of the survey describes the issues and concepts in greater detail, and is presented in Table 49.

Conclusions were drawn from the findings of this survey, and were captured in Table 50, illustrating the general perspective in terms of sustainable development in the Gauteng urban environment. Table 50 provides a comprehensive overview of the results of survey 2, in relation to the study area.

Table 48: Sustainable development survey results per node

Issues addressed in the survey	Central (JHB)	North (PTA)	West (WR)	East (EK)	South (EM)	Adjacent (AD)
CONTEXT: Issues of the urban environment						
1. Housing development & urban sprawl	y	y	y	y	n	y
2. Commercial & industrial development	y	n	n	y	n	y
3. Transport infrastructure	n	y	n	y	n	y
4. Social change, community & public services	y	n	y	y	n	y
5. Utilities & other infrastructure	n	n	n	n	n	y
6. Agricultural change & forestry	n	n	n	n	y	n
7. Pressure from tourism & recreation	n	y	y	n	n	y
8. Access to the countryside	n	n	y	n	n	y
9. Landscape and environment	n	y	y	y	n	y
10. Cultural & natural heritage	y	n	y	y	n	y
ECONOMIC ELEMENTS						
Poverty	y	y	y	y	y	y
Unemployment	y	y	y	y	y	y
Commercial and industrial development	y	y	n	y	y	y
Urban core deterioration	y	y	y	y	y	y
Hierarchy of nodes	y	n	-	y	y	y
Risk management	n	n	n	n	n	n
ENVIRONMENTAL ISSUES						
Green areas	y	y	y	y	y	y
Quality environment	y	n	y	y	n	y
Rural and urban integration	y	y	y	y	n	y
Greenbelts / urban edges	y	n	y	y	y	y
Green policy	y	n	n	n	n	y
SOCIAL ISSUES						
Quality environments	y	n	y	y	y	both
Equity	y	n	n	y	-	n
Integration	y	y	n	y	y	y
Beautiful environments	n	n	y	y	y	both
Community participation	y	y	n	y	y	y
Urban design	y	n	y	n	y	n
SPATIAL ISSUES						
Integration	y	y	y	y	y	n
Movement networks	y	y	n	y	y	y
Urban expansion	n	y	y	y	y	y
Housing development	y	y	y	y	y	y
Urban sprawl	y	y	y	y	y	y
UNDERLYING FORCES AND PRESSURES						
Driving forces behind the pressures on the countryside around towns:						
1. Housing & development	y	y	y	y	y	y
2. Urban decline / dereliction	n	n	y	n	n	n
3. Changes in mobility	n	n	y	y	n	n
4. Economic restructuring	y	y	y	n	y	n
5. Rural diversification	n	n	y	y	n	y
6. Land and property markets	n	y	y	y	n	y
7. Changing employment patterns	n	n	n	y	n	y
8. Demographic change	n	y	y	y	y	y
9. Public services decline / restructuring	n	n	y	n	n	y
10. In/out migration	y	n	y	n	n	y
11. Tourism & recreation	n	n	y	y	n	y
12. Agricultural practice	y	n	n	n	n	n
13. Landscape & ecological change	n	n	n	y	n	n
14. Industrial pollution	n	n	y	y	n	n

Table 49: Detailed results of the sustainable development survey

Issues addressed	Central (JHB)	North (PTA)	West (WR)	East (EK)	South (EM)	Adjacent (AD)
POLICY INITIATIVES						
What types of policy initiatives are undertaken around towns or urban fringe, and to what success?						
GENERAL PLANNING POLICY						
1. Environmental policy & restrictions	Yes, but limited	Yes, relatively successful	Not implemented consistently	Yes, relatively successful	Applications referred to GDACE	Based on action research practical goals
2. Spatial planning initiatives	Limited	Yes, relatively successful	Documented	SDF in place	SDF - effective	SDF in place; develop LUMS policies
3. Housing – capacity studies, needs.	Limited	Yes, successful	Insufficient	Limited	No policies	Backlog of 9000 households
4. Other urban fringe policy	Local pressure groups	None	Documented	Urban edge policy	None	Framework plan (Part of SDF and IDP)
PROGRAMMES & PARTNERSHIPS						
1. Rural development management	None aware of	Not really a high priority	Local Government	None	None	No significant initiatives
2. Community participation	Revision of SDF	Yes, its compulsory	Attempted: not fully realized	Attempted	IDP	Policy is in place
3. LED projects	None aware of	Yes, some successful	Few	Some	None	In place
DEVELOPMENT INITIATIVES						
1. Urban extensions	None	Yes, successful	Too many	Yes	None	40 township applications
2. New settlements & key villages	Yes	Yes, relatively successful	Upmarket and middle income	Yes	None	Machavie Village, west of Potchefstroom
3. Community planning initiatives	None aware of	Unsure	Don't know	None	None	IDP review annually.
4. Business development, diversification	Yes, Lanseria area	Yes, relatively successful	Recognised need, not yet implemented	Yes	None	Science Park, new shopping centre
5. Renewable energy initiatives	None aware of	Yes, still in initial stages	Not visible	Some	None	Transport Plan
INFORMATION TOOLKITS						
Are the following used to promote sustainable development?						
1. GIS & other information systems	y	y	Y	y	n	n
2. Sustainability indicator frameworks	n	n	N	n	n	n
3. Surveys/appraisals etc.	y	y	N	y	n	y
4. Community initiatives	n	y	Y	n	n	y

Source: Own construction (2007)

The results as illustrated in Table 48 and Table 49 were summarised in a comprehensive form to be able to make informed conclusions. The conclusions created a general perspective regarding sustainable development within the Gauteng area. These results are summarised and illustrated in Table 50.

Table 50: Summarised results of survey 2

Context	Survey conclusion		
The urban type found in the survey area is characterised mainly by mixed land uses and residential developments. The development trend is dominated by rapid growth in the survey area. The following issues were analysed to determine their dominance in terms of urban development and sustainability. The collective results of the nodes illustrate the importance of the issue for purposes of this study.			
Issues featuring in the urban area:	Dominant issue	Nodes illustrating this issue to be a strong issue	Importance
1. Housing development & urban sprawl	✓	5	83%
2. Commercial & industrial development	~	3	50%
3. Transport infrastructure	X	3	50%
4. Social change, community & public services	✓	4	66%
5. Utilities & other infrastructure	X	1	16%
6. Agricultural change & forestry	X	1	16%
7. Pressure from tourism & recreation	✓	3	50%
8. Access to the countryside	✓	2	33%
9. Landscape and environment	✓	4	66%
10. Cultural & natural heritage	✓	4	66%
Sustainable development elements within the local area:			
ECONOMIC ELEMENTS			
Poverty and unemployment	✓	6	100%
Commercial and industrial development	✓	5	83%
Urban core deterioration	✓	6	100%
Hierarchy of nodes	✓	4	66%
Risk management	X	0	0%
ENVIRONMENTAL ISSUES			
Green areas	✓	6	100%
Quality environment	✓	4	66%
Rural and urban integration	✓	5	83%
Greenbelts / urban edges	✓	5	83%
Green policy	X	2	33%
SOCIAL ISSUES			
Quality environments	✓	4	66%
Equity	X	2	33%
Integration	✓	5	83%
Beautiful environments	~	3	50%
Community participation	✓	5	83%
Urban design	~	3	50%
SPATIAL ISSUES			
Integration	✓	5	83%
Movement networks	✓	5	83%
Urban expansion	✓	5	83%
Housing development	✓	6	100%
Urban sprawl	✓	6	100%
UNDERLYING FORCES AND PRESSURES			
1. Housing & development	✓	6	100%
2. Urban decline / dereliction	X	1	16%
3. Changes in mobility	X	2	33%
4. Economic restructuring	X	5	83%
5. Rural diversification	~	3	50%
6. Land and property markets	✓	4	66%
7. Changing employment patterns	X	2	33%
8. Demographic change	✓	5	83%
9. Public services decline / restructuring	X	2	33%
10. In/out migration	~	3	50%
11. Tourism & recreation	~	3	50%
12. Agricultural practice	X	1	16%
13. Landscape & ecological change	X	1	16%
14. Industrial pollution,	X	2	33%

POLICIES		
Environmental	Moderate success	• Not implemented consistently • Based on action research • EIAs and Integrated Management Plans
Spatial planning	Moderate success	• SDF, IDP and LUMS
Housing	Negative effect	• Housing need • Pressure on open areas • No housing policy
Other urban edge policy	Not relevant	• As part of SDF and IDP
Rural management	Not relevant	• Resource constrains • No significant initiatives • Attempted by local government
Community participation	Moderate success	• Top-down approach attempted, not fully realised • Ward committees are functioning
LED	Negative effect	• Individual residential development • Local strategy needs to be compiled
Other	Not relevant	• Transportation plans needed • Disaster Management plans needed
Urban extension	Successful	• Various new developments within current urban area
New settlements	Not relevant	• Middle income areas
Community planning	Successful	• Good initiatives • IDP review annually
Business development	Successful	• Business nodes within the urban area • Local government to recognise need • Develop key nodes
Energy initiatives	Not relevant	• Solar energy concept to be implemented • Planting trees, eco-friendly environment

Source: Own construction (2007)

From the results and findings of the individual and comprehensive studies, the current reality within the Gauteng city region was revealed in terms of the sustainable development perspective. The conclusions drawn from the sustainable development survey were captured accordingly.

4.2 Conclusions of the sustainable development survey

The current reality and spatial planning situation of the Gauteng city region, as revealed in survey 2 (the sustainable development survey), described the strengths, opportunities, weaknesses and threats applicable to development in the urban environment.

These issues are impacting and influencing the sustainable development perspective in this area. A summary of the strengths and opportunities was compiled accordingly, followed by the threats and challenges of this environment, and thus the key issues to address in terms of future spatial planning.

Strengths and opportunities in terms of sustainable development included:

- Gauteng has noteworthy policy and legislative frameworks.
- There is awareness within government departments of sustainable development issues.
- A powerful, growing economy with potential to address equity and unemployment.
- Characterised by foreign direct investment and increasing diversification of the economy.
- Gauteng is perceived as a successful province and has a strong identity and pride.
- The size and diversity of the economy could enable growth of the environmental economy.
- Being the most globally and regionally accessible city in Africa.
- The 2010 Soccer World Cup is an opportunity for achievements in sustainable development.
- Opportunities to restructure Gauteng's transport network.

Unique challenges within the province have been identified through a review of the existing information and targeted consultation with key stakeholders in the province. The following threats to sustainable development have been highlighted:

- There is a continuing ad hoc approach to sustainable development issues.
- Lack of integrating environmental management and spatial planning.
- Limited intergovernmental communication and relations in decision-making processes.
- The lack of monitoring and evaluation of systems and legislation.
- Lack of integration of policies and initiatives.
- Implementation of initiatives not contributing to sustainable development.
- Uneven distribution of wealth, education, health care, energy, housing and water facilities.
- High level of informal settlement.
- Significant backlogs in basic service provision, housing and public amenities.
- High demand for water and future water resource limitations.
- Need to balance the demand for land by various land uses.
- Appropriate zoning and sustainability of use of land and buildings.
- Apartheid settlement patterns have not been significantly altered.
- New settlements continue to be built on the peripheries.
- Reliance on private modes of transport.
- Need to improve accessibility and affordable, integrated public transport systems.
- High rate of in-migration into Gauteng.
- High levels of unemployment and poverty.
- Financial constraints for the implementation of sustainable development initiatives.
- Understanding of the principle of sustainable development.

In terms of spatial planning and development towards a sustainable urban form, the following issues, as captured in Table 51, need to be incorporated into the future development vision and planning policies.

Table 51: Issues to be incorporated into planning visions and policies

Collaboration	Specialisation leads to division, and therefore there is a need for convergence. The focus should be to create linkages between nodes.
Integration	Integrated planning is a key concept for the compact transport prioritised city, and defining an appropriate scale of planning for human settlement.
Rate of change	The rate of urbanisation and the rate of technology change are being driven by the cost and quality over time and place.
Outcomes	What is to be achieved: The joy of the future. Sustainability

Source: Own creation (2008)

5 Survey 3: Future development perspective

The aim of this research was to determine the current reality and future development vision in terms of sustainability, as observed by the selected practitioners and specialists. Current lacks and issues to be addressed were enhanced by comparing the current reality with the future development vision. This analysis was also used to determine the best location for future urban developments. The best location for future urban developments was measured in terms of the economical perspective, social perspective, and environmental perspective.

- From the economic perspective the most sustainable urban area will be characterised by minimum travelling costs, availability of urban stands and lowest development cost.
- From the social perspective the most sustainable urban node will be characterised by minimum travelling time to work and social nodes, and quality of services provided.
- From an environmental perspective the most sustainable urban node will be characterised by the shortest walking distance from the residential areas to a green area, security and percentage planned open areas, compared to the vacant land.

The aim was to determine the best future development approach and location, in terms of the above-mentioned criteria. The captured issues reflect the current reality and desired reality for the areas inside of the urban edge (mainly urban area), as well as the areas outside the urban edge (mainly rural area). The positive and negative aspects of the urban and rural areas were then compared in order to identify issues and initiatives that can be incorporated into the future development perspective.

5.1 Questionnaires

The survey that was distributed is illustrated in Annexure C. The future development perspective survey focused on three areas: the economic perspective, the social perspective and the environmental perspective. The relevant issues are summarised in Table 52.

Table 52: Future development perspective survey information and relevance

Focus	Information	Relevance to this study
Economic	Modus of transport to work	Determine current transport infrastructure and needs.
	Average cost of transport to work per week	Determine accessibility in terms of financial aspects.
	Number of trips to work per week	Determine frequency and trips.
	Availability of residential sites	Determine class of environment (Urban versus rural).
	Availability of commercial sites	Determine class of environment (Urban versus rural).
	Average cost of living house in local area	Determine class of environment (Homogeneous).
	Months for development application approval	Transformation rate.
	Additional costs for bulk services	Determine bulk infrastructure impact.
Social	Time spent travelling per week	Determine congestion and social impact.
	Quality of mode of transport	Determine congestion and social impact.
	Comfort during trip	Determine congestion and social impact.
	Services available	Determine class of environment (Urban versus rural).
	Accessibility to medical facilities	Determine basic services and accessibility.
	Noise and air pollution	Determine basic needs.
Environmental	Green area within walking distance	Determine access to open spaces (Public).
	Private garden	Determine access to open spaces (Private).
	Play park and recreation area	Determine basic needs (Recreation).
	Security at the green area	Determine basic needs (Safety).
	Good visibility and lightning	Determine basic needs (Safety).
	% open spaces in neighbourhood	Determine vacant areas in terms of fields and parks.
	% planned green areas in neighbourhood	Determine planned open areas according to layout.
	% vacant land in neighbourhood	Determine current vacant areas.

Source: Own construction (2008)

Questionnaires were distributed within the survey areas as described in the beginning of this chapter. The questionnaire covered the aspects of the economic, social and environmental perspectives. The aim was to determine the most-sustainable location for urban development. Although this survey is only touching some of the most important development issues in terms of economic, social and environmental aspects, it was sufficient to determine a future development perspective, a way of thinking about the future development direction in relation to the current practice. The results of this survey were used to illustrate the basic needs within certain areas, and the critical points to address in future planning. The results from the survey were summarised and are presented in the following table.

Table 53: Conclusive results of survey 3

Future development perspective survey				
	Within the core urban area		Outside the core urban area	
	Reality	Desired reality	Reality	Desired reality
ECONOMIC PERSPECTIVE:				
Main modus of transport to work	Foot/Private	Public transport	Foot/Taxi	Public transport
Average cost of transport per week	R500	R300 (decrease)	R600	R300 (decrease)
Number of trips to work per week	>5	5 at most	>5	5 at most
Availability of residential sites	20%	30% (increase options)	60%	40% (decrease vacant land)
Availability of commercial sites	10%	20% (increase options)	5%	20% (increase options)
Average cost of house in local area	R1,000,000	Stabilise market	R300,000	Increase demand
Months for development application	>8	4 (increase transformation rate)	>8	4 (increase transformation rate)
Additional costs for bulk services	High	Standardise	High	Standardise
SOCIAL PERSPECTIVE:				
Time spent travelling per week	2 hours	Minimise	4 hours	Minimise
Quality of mode of transport	Average	Good	Bad	Good
Comfort during trip	Average	Good	Average	Good
Services available	Adequate	Good	Insufficient	Adequate
Accessibility to medical facilities	Good	Optimal	Bad	Improve time consumption
Noise and air pollution	Problematic	Minimise	High	Minimise
ENVIRONMENTAL PERSPECTIVE:				
Green area within walking distance	4 km	1 km	2 km	1 km
Private garden	Yes	Qualitative	Yes	Extension
Play park and recreation area	No	Integrated in neighbourhood	No	Services needed
Security at the green area	No	Policy needed	No	Policy needed
Good visibility and lightning	No	Lack infrastructure	No	Lack infrastructure
% open spaces in neighbourhood	5%	20% (increase green)	15%	30% (increase green)
% planned green areas	15%	30% (increase planned areas)	10%	30% (increase planned areas)
% vacant land in neighbourhood	20%	5% (decrease – safety reasons)	30%	10% (decrease – safety reasons)

Source: Own creation (2007)

The data as captured in this table was evaluated and analysed in order to answer to the set questions and survey objectives. This led to the compilation of certain conclusions regarding the future development perspective within the Gauteng city region.

5.2 Conclusions to the future development perspective survey

From the data captured in Table 33 (p. 115), it is evident that municipalities are in favour of the urban edge, but municipalities want to manage the urban edge locally. The future development perspective survey and related interviews with the professional sector (practitioners and specialists) illustrated the importance of urban edges to emphasise the urban function of areas, but also illustrated the need for greater control measures.

Furthermore, in a comparison between the urban core nodes and the periphery nodes the following were concluded with regard to sustainability and the future development perspective:

- In terms of the economic perspective, the following was concluded: There is a need to introduce an efficient and cost-effective public transport system serving the urban and rural areas. New residential and commercial sites should be planned in order to optimise choice and to minimise unsafe vacant land. The gap between costs of urban and rural residential developments should be minimised to enhance homogenous development. This should also be supported by efficient development processes and affordable bulk services. Homogeneous development will enhance equal economic growth in urban and rural areas and promote a compact urban form.
- In terms of the social perspective, the following was concluded: People residing in the urban core spend less time travelling. There is a need for an efficient and effective public transport system serving the urban and rural areas. This will minimise travelling time to social-, educational-, and economic nodes, and increase quality and comfort, thus enhancing the social perspective of urban living. Accessibility to medical facilities needs to be upgraded and noise and air pollution needs to be addressed.
- In terms of the environmental perspective, the following was concluded: Current green structures and open green spaces are not located within the preferred distance of 1 km from the residential areas. Although most people have their own private garden, it does not compromise for the lack of parks and recreational areas in close proximity to the residential areas. There is a need for a security policy to be developed specifically for open green spaces and parks. This should include the need for good visibility and lighting in these areas. The percentage vacant land in urban and rural areas should be decreased, or rather be transformed into planned green areas. This will enhance safety in the area and at the same time ensure efficient integration of green areas in the urban and rural nodes.

From the above findings, it can be concluded that a homogenous development pattern will address most of the mentioned obstacles and issues. A homogenous development pattern introduces more nodes into the current environment, thus minimising travelling distances, enhancing social issues and integrating environmental aspects in the direct surroundings. Homogeneous development results from a polycentric development pattern. This is supported by good management and control measures. In order to implement this future development perspective successfully in the current reality and urban environment, the focus needs to be on integration, equal development and compaction.

6 Conclusion

The urban edge is currently used as a tool to manage urban development. Implementation and management structures are currently straining the effectiveness and efficiency of this tool. There is a need for a development policy that will transform the current unsustainable urban environment. The urban environment should be sustainable in terms of economic, environmental and social structures. The proposed future sustainable development plan will manifest in terms of homogenous development, implemented through the polycentric development pattern. The following conclusions are made in terms of the sustainable development of the Gauteng city region:

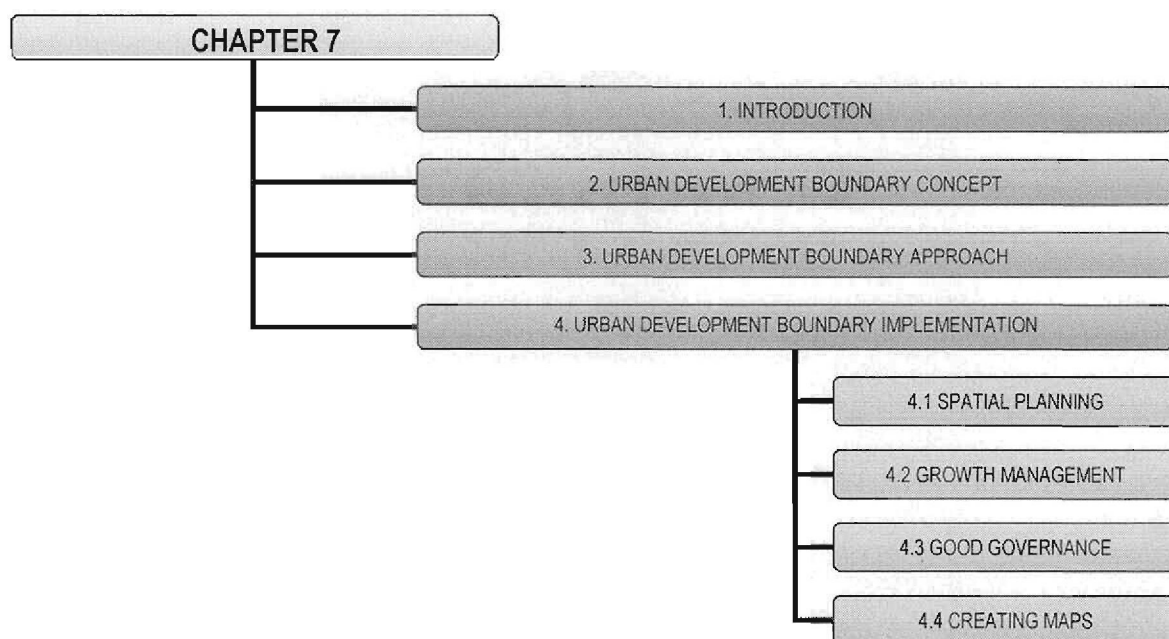
- Decentralisation, with strong independent representation at lower levels, is needed.
- Implementing of joined-up government, rather than big-government, is needed.
- The role of the province should be that of facilitator and co-ordinator of the new city region.
- The non-metro areas should not be neglected, but should assist in enhancing advantages.
- Municipalities in Gauteng must align their development plans.
- There needs to be more planned open space structure in the urban area.
- Allocation of space must fit into the broad Spatial Planning Framework.
- Planners should have the ability to summarise core issues and effectively plan for the future.

From the surveys, as well as theoretical studies and international best-practice, a sustainable development direction for Gauteng can be determined. The direction and implications will be discussed in Chapter 7.

Section C: Conclusions

Chapter 7

Findings and conclusions



1 Introduction

Gauteng is a global city region with a competitive edge based on its size, location, quality of life and economic competitiveness. The sustainable development vision of Gauteng for 2020 is to be an economically-productive, socially-just, globally-competitive region that manages and utilises resources in a sustainable manner. This chapter aims to integrate the perceptual study and theoretical findings of the previous chapter, and the international and national best practices into this study area in terms of concept, approach and implementation.

The following can be concluded as the core issues that the Gauteng city region will need to address in terms of spatial planning and development:

- **Urban decline:** Decline of the central area of cities is a contributing factor in creating pressure on the urban development boundary. A poor living environment will cause people to move away, typically to more suburban areas, thereby accelerating a reduction of urban amenities and adding to the desire to migrate outwards. Urban decline is also enhanced by the impact of informal settlements on neglected peripheral areas.
- **Separation of functions:** The expansion of urban areas is not only influenced by the process of increased suburbanisation but can also be considered a result of the separation of functions. Traditional urban structures were relatively well defined; however, as urban centres decline and functions such as work, housing and recreation become increasingly separated, it is clear that networks have an increasingly regional, rather than local, focus.
- **Access:** Access to the green structures is an important issue, addressed by the polycentric development pattern. Parks and open spaces are considered one of the most valued features of where people live. In terms of the environmental quality, city regions are known for their potentially-massive environmental disruption.
- **Policy:** Policy is one of the greatest challenges that a city region faces. The development policy must achieve world-class standards while proactively absorbing the poor, addressing crime without further fragmenting urban space and allowing the city region to grow while responding to infrastructure constraints.

The aim of this study is to develop a sustainable urban form for the Gauteng city region, subject to these issues, impacts and considerations.

Therefore, the conclusions that were drawn in terms of the urban development boundary concept is described accordingly, followed by the appropriate approach that will support the effective manifestation of this concept in Gauteng.

2 The urban development boundary concept

The urban development boundary is one of the tools available to manage growth, combat urban sprawl, create economies of urbanisation, focus on infill and redevelopment, ensure optimal use of existing resources, protect the natural environment and support efficient infrastructure provision.

It is concluded that there is still a need and merit for an urban development boundary in the Gauteng Province. However, in order for the urban development boundary to be successful, the Gauteng Department of Economic Development (2006:31) listed certain objectives that the urban development boundary needs to address. These include:

- Providing administrative support and detailed spatial frameworks.
- Indicating the intended systems of corridors and nodes to be strengthened.
- Highlighting opportunities for redevelopment and infill development.
- Accommodating speedy approval of applications within the edge area.
- Guaranteeing that further sprawl will not be allowed in terms of council policy.

The vision for the Gauteng city region is determined in terms of the surveys of the previous chapter. The vision is described in terms of three core aspects: globalisation, urbanisation and climate change. This is described in Table 54.

Table 54: The Gauteng city region vision

Globalisation	Urbanisation	Climate change
• Be internationally marketable. • Economic hub. • Transport hub. • Increase opportunities.	• Growth needs to be regulated. • Determine future growth areas. • Develop a sustainable liveable city. • Develop a sustainable footprint.	• Develop holistically. • Address changes in the region. • Impacts must support the vision. • Development measures needed.

Source: Own creation (2007)

The objectives as mentioned above enhance the need for the implementation of the urban development boundary concept. The vision as described in Table 54 enhances the desirability of the implementation of the urban development boundary concept.

This need and desirability to implement the urban development boundary concept effectively in the Gauteng city region require a certain approach towards ensuring the success thereof.

3 The urban development boundary approach

Urban edges limiting outward expansion of the urban area, were up to now a very one-dimensional approach. The advantages of using a mechanism such as a defined urban development boundary are evident, but it has the disadvantage of ineffective implementation and development applications not being considered according to the actual merits of the specific development proposal. Thus, when planning a city region, the focus needs to be wider and the approach more integrated and holistic. It is no longer only one urban edge that guides development, but various interrelated urban development boundaries that will structure the urban environment.

The entire urban area is actually filled with many little overlapping urban edges, all due to different factors. This polycentric approach testifies of a more homogenous development pattern, enhancing the elements of the economic perspective by distributing the economic sector across the urban area, enhancing elements of the environmental perspective by creating open green areas between the individual urban nodes, and enhancing the elements of the social perspective by minimising travel distances and introducing better social structures in all of the urban nodes. The urban development approach is therefore focussed on the concepts of sustainable development. The approach can only be successful once it has been implemented in the currently reality, and this emphasises the need for a comprehensive and effective implementation plan.

4 The urban development boundary implementation

The implementation of the urban development boundary concept is subject to the current urban sprawl patterns and the ability to create alternatives for the development direction and guidance of the spatial plan. Furthermore, it should be supported by growth management measures and good governance. All of these issues need to be integrated and illustrated on maps, to simplify the implementation process.

4.1 Spatial planning environment

The spatial planning of an environment will result in a certain urban form, but the urban form will also influence the spatial planning and development of an environment. Urban sprawl is concluded to be the core issue influencing spatial planning and urban form in terms of the effect that it has on the urban development boundary.

There are certain drivers of urban sprawl and urban compaction that the urban development boundary needs to address in order to shape the current urban form. These drivers of urban sprawl and compaction are listed in Table 55.

Table 55: Drivers of sprawl and compaction

Drivers of sprawl	Drivers of compactness
▪ Increase of private motor vehicles. ▪ Racial reasons. ▪ Open spaces in the current urban environment. ▪ Development not regulated by land-use. ▪ Growth nodes.	▪ Localised authorities. ▪ Power in land-use. ▪ Planning processes. ▪ Legislation.

Source: Helsinki University of Technology (2007)

The current urban sprawl pattern can only be addressed when alternatives to urban sprawl are introduced. The strategic elements that should guide the spatial plan towards efficiency are:

- **The movement system:** Ensuring that the mobility function of major roads is retained and enhanced and that the movement system directly links with strong, high-intensity, *mixed-use nodes and higher residential densities*.
- **Nodal development:** Clustering of activity, ensuring convenience and accessibility, activity mix, diversity of public facilities, density of development, pedestrian environment and public spaces.
- **Appropriate open spaces:** Accessible, quality, open spaces, able to meet local or regional needs, suitable for use by multiple generations and different cultures.
- **Corridor development:** Contribute to economies of urbanisation, to more efficient service provision, and better public transport.
- **Design guidelines:** Physical development supports the desired city, supports synergy between spaces and between buildings, and takes on a definite form that adds to urban character.

These elements need to be managed within the jurisdiction of the proposed urban development boundary, as it will stimulate the urban forces and impact on the future urban development boundary success. Growth management therefore forms an integral part of the implementation of the urban development boundary concept.

4.2 Growth management

Growth management is a multi-sectoral concept that should be reflected in an integrated management system that relies on the contributions of all service providers. At the same time, growth management in Gauteng must strike a balance between growth and development, on the one hand, and social responsibility and upliftment, on the other. In terms of managing growth, the aim is to:

- Shape the secondary and intervention areas in order to achieve a more-efficient urban form, by establishing appropriate densities and prioritising public transport.
- Promote opportunities for infill and densification in the primary areas. In these well-established areas, it will take much longer to reshape the established city structure.

Proposals for development within, and outside, the urban development boundary should be aligned with certain tools that will regulate the growth and development in the relevant sector of the urban development boundary. The surveys demonstrated the need for a holistic development measure in the Gauteng city region. The only way to manage growth inside the urban edge, as well as outside the urban edge, is to identify tools to regulate the growth within the whole area. From the survey, and based on the proposals of Dr. Edsel Sajor (2003) from the Asian Institute of Technology in Thailand, it was concluded that the following can be used as tools to regulate urban growth:

- **Major residential-development controls:** Residential-control zoning includes standards and guidelines for the development of residential subdivisions. If a proposed development will overload the support services or infrastructure in the region, controls to stop the development or introduce the development in phases may be put into place.
- **Growth controls:** Phased growth controls are guidelines that allow only one portion of a development at a time. This procedure is followed to support services and infrastructure in place for each phase of the project. These controls are called development scheduling.
- **Adequate facilities ordinance and concurrency.** Both of these tools deal with ensuring necessary infrastructure and facilities are in place before projects are approved and built.

It can be concluded that there is a need for a Growth Management Strategy that should form an integral part of the municipal Spatial Development Framework. The following growth management tools were identified:

- Comprehensive Plan: SDF and IDP.
- Threshold Public Service Standards: Level of public services to be provided.
- Fiscal Impact Analysis: Cost-Benefit Model.
- Land Use and Infrastructure Coordination: Develop areas already served by bulk services.
- Enterprise Zones / Revitalisation Areas: Economic development via tax incentives.
- Strategic Development Areas: Strategic location, guided through zoning restrictions.
- Focussed Economic Development in Growth Areas (Activity nodes).
- Zoning: Requirements and standards for permitted uses.
- Bulk Contributions: Cost assessment imposed against new development.
- Purchase Development Rights: Deflect growth, economic approach to maintain farming.
- Incentives: Attract new investments (Rates and Taxes incentives, finance).
- Tax Increment Financing: Property tax by private sector to finance engineering services.
- Transit Orientated Development: Unique mix of land uses located at a high density.
- Annexation Plans: Assesses future public land needs.

Growth management within the urban environment will therefore regulate and manage the urban development boundary. The urban form should be a consequence of the implementation of a myriad of actions, each contributing in their own way to reducing costs and maximising benefit within the context of sustainable development, where the social, economic and environmental realms are in balance. Growth management can only be successful when there is good governance.

4.3 Good governance

Good governance is the key to successful implementation of the urban development boundary. In terms of governance, the current approach towards spatial planning and the implementation of the urban development boundary concept needs to be simplified. There are currently various different policies, legislation and frameworks guiding these issues and this cause confusion and ineffective implementation of the urban development boundary concept. The current sustainable development initiatives must either be integrated into existing legislation, or all of the initiatives should be consolidated into a single sustainable development act (Baloyi, 1999:19).

- **Integrating sustainable development initiatives into existing and future legislation:** The changes that can be made to existing laws should be identified and implemented. Implementation of this option is difficult as it might pose the problem of misinterpretation.
- **Consolidation of all initiatives into a single sustainable development act:** This Act should define sustainable development principles. A single sustainable development Act should ensure that responsibilities and accountabilities lie with one government department.

It is proposed that relevant sections of existing legislation be integrated into a single sustainable development Act, guiding the urban development boundary concept accordingly. If well implemented, the act should ensure the attainment of sustainable development in all sectors. Good governance and a sustainable development Act will guide development inside and outside the urban edge towards a sustainable urban form.

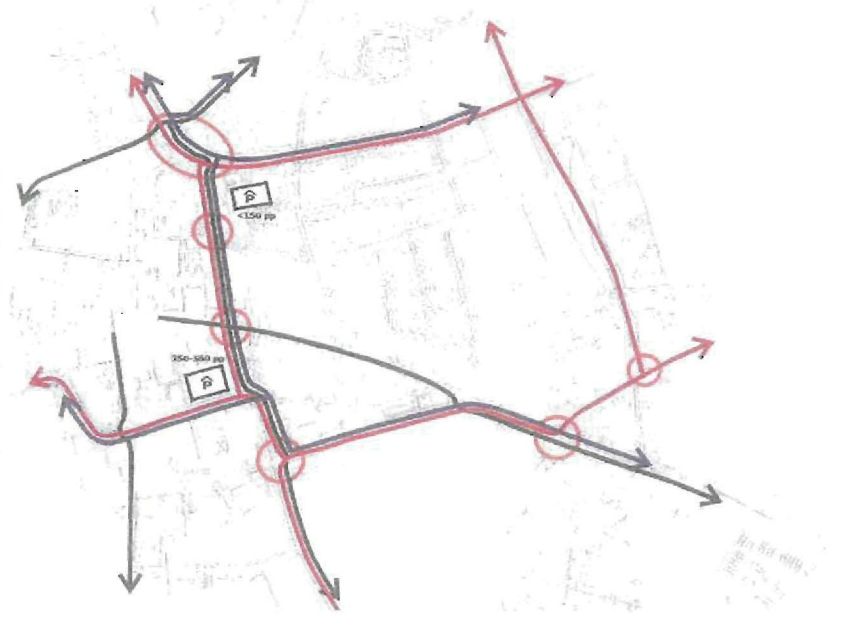
4.4 Visual illustration of data

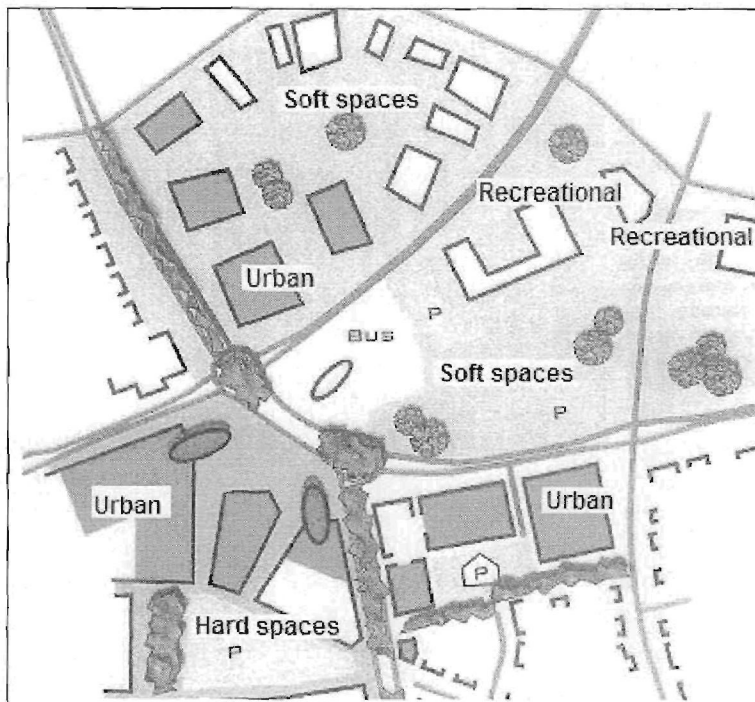
The implementation of the above-mentioned issues should be presented visually in order to ensure a simplified and effective implementation plan. The creation of integrated maps represents a visual illustration of the data. The sustainable development implementation act should guide the development and management of the urban development boundary in the current urban environment by means of integrated, comprehensive and understandable maps. These maps should:

- Indicate where public and private development should take place.
- Indicate desired development and land-use patterns for different areas.
- Indicate where development or land uses should be discouraged or restricted.

Conclusively, the concept of the implementation maps as currently used in the Netherlands can be adopted and transformed for the purposes of the local Gauteng environment. The implementation plan formulation consists of various steps and individual maps to determine the positive and negative aspects of the area and summarises it on an integrated map. The following table illustrates the different individual maps used to formulise the Uden Structure Vision for the east side of the city (Uden, 2004:8). This is only a concept to illustrate the process of creating integrated maps.

Table 56: Implementation maps

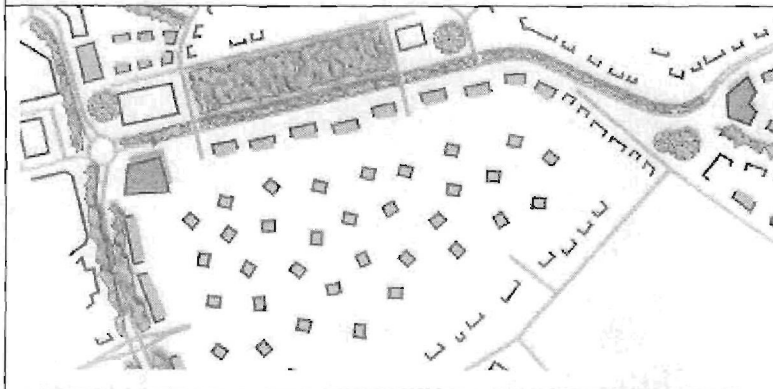
	Functional structure map This is a structure sketch identifying the important elements in the area in terms of sustainable development. It illustrates the different areas of importance (Uden, 2002:18). Node Legend - Urban - Green - Residential
	Network map This illustrated the various networks present in the urban environment and includes the transportation network, public and private vehicle networks, bicycle systems, infrastructure networks and development corridors (Uden, 2002:19). Network Legend - Primary - Secondary
	Environmental map This map illustrates all environmental aspects applicable, including water systems, open green areas, plants and trees, storm water systems, resources and the social network in terms of recreation areas, fields and sport parks (Uden, 2002:24).



Structure per area map

This map illustrates the detail of a certain area according to the data as captured in the above-mentioned maps. This map is therefore focused on a specific area, zooming in on the critical aspects and issues of sustainable development.

Node Legend	
	Urban
	Soft spaces
	Hard spaces
	Recreational



Structure per area map

This is another example of the structure per area map. The front view, as it will be experienced by the residents is also included to illustrate the actual impact and atmosphere that will be present.

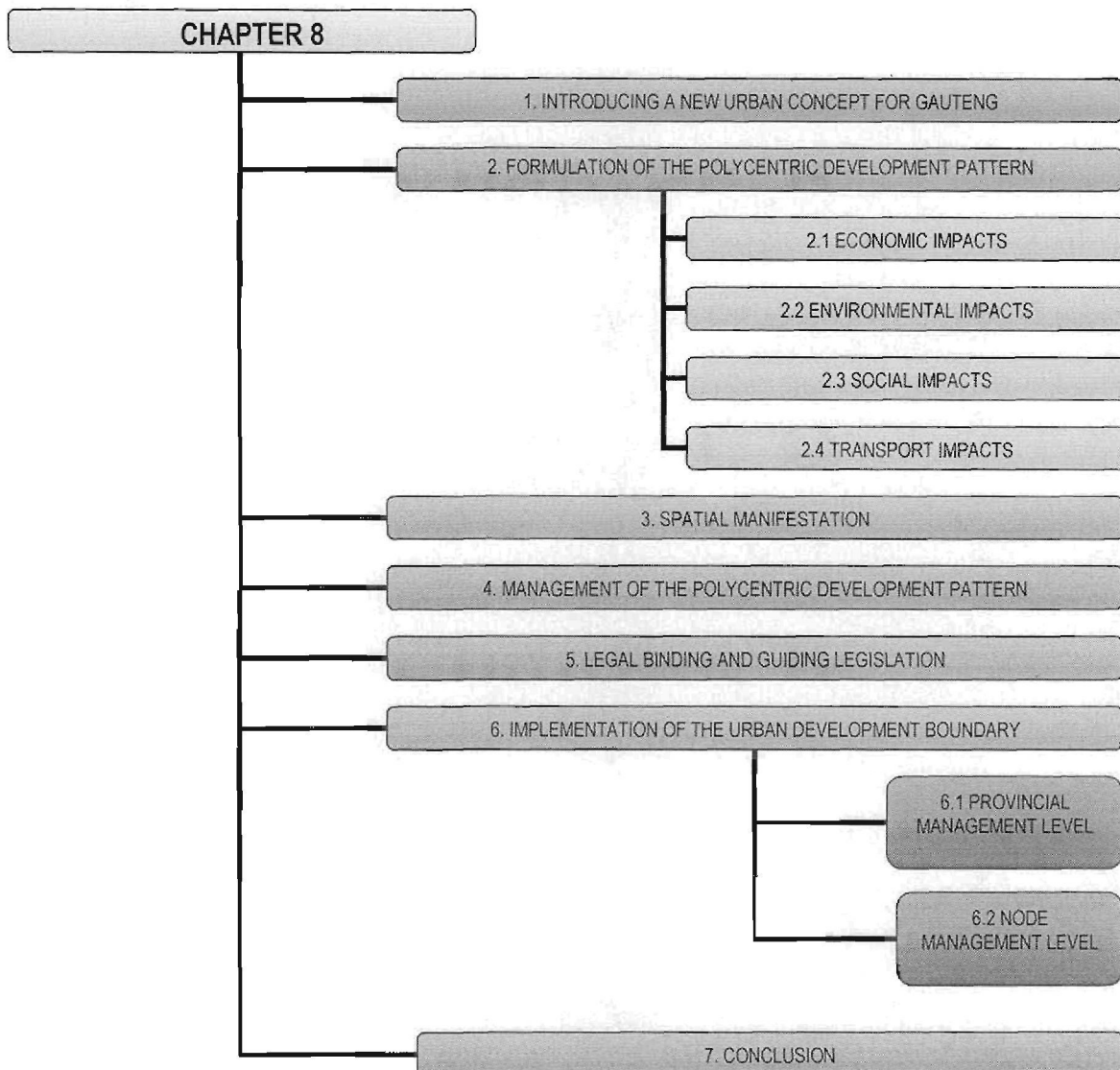
Source: Own creation (2008)

The sustainable development approach will focus on place-making and marketing. Place marketing suggests promoting and advertising the local area, so that people, businesses and industries see the area as a desirable place to visit, live in and work in. Chapter 8 will focus on the specific recommendation for the Gauteng city region in terms of the urban development boundary concept.

Section D: Recommendations

Chapter 8

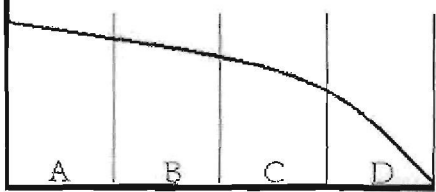
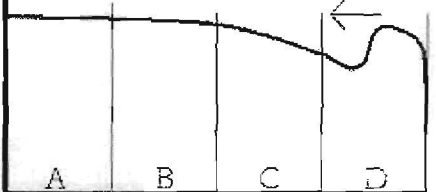
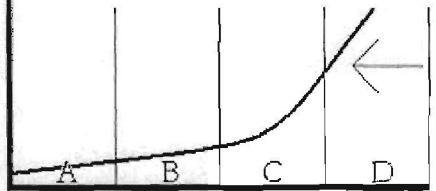
Recommendations



1 Introducing a new urban concept for Gauteng

The previous chapters illustrated and confirmed the importance of the urban development boundary as a planning tool used to ensure sustainable urban form. All the gathered data supports each of the three hypotheses stated in the first chapter. These recommendations in terms of the urban development boundary concept focus on integrating the positive aspects that the polycentric development pattern can offer to the urban environment. This is based on the literature study, the local and international perspectives, and best practice solutions. The polycentric development pattern in Gauteng will further strive to minimise urban sprawl, simultaneously enhancing the quality of the environment and ensuring sustainable and meaningful node development. This will be done by implementing the current urban edge concept around all of the identified nodes, thus enhancing a compact node approach, and containing these nodes within the provincial urban development boundary, thus addressing and regulating future growth within the Gauteng City Region. Table 57 describes the impact of the urban development boundary concept guiding polycentric development, evaluated in terms of economic delivery.

Table 57: Impact of the urban development boundary

 Economic activity in relation to the distance from the core.	Economic activity is highest in the core area. Polycentric development will increase the number of urban nodes, but will decrease the area of the urban core. This transition zone will ensure a smaller decline in the economic activity, thus enhancing the homogenous development in the whole Gauteng city region. The urban core is also characterised by high densities. Polycentric development enhances even distribution of people, resources and material and will ensure that economic activity is more evenly distributed between the urban nodes.
 Ground value in relation to the distance.	Declining the land-values realises as distance from the core increases. Area A has a high density, good infrastructure, and high land value. More nodes will ensure more areas of high ground value, to the benefit of the entire area.
 Forces of attraction towards the core.	Polycentric development will force development towards the different urban nodes and limit urban sprawl. The area between the nodes will be characterised as an open green area, surrounding and supporting the urban nodes.

Source: Own creation (2008)

The urban development boundary concept guiding polycentric development influences the spatial planning reality. Figure 45 illustrates the impact that the urban development boundary will have on the current spatial development pattern, when introducing and implementing the polycentric development pattern.

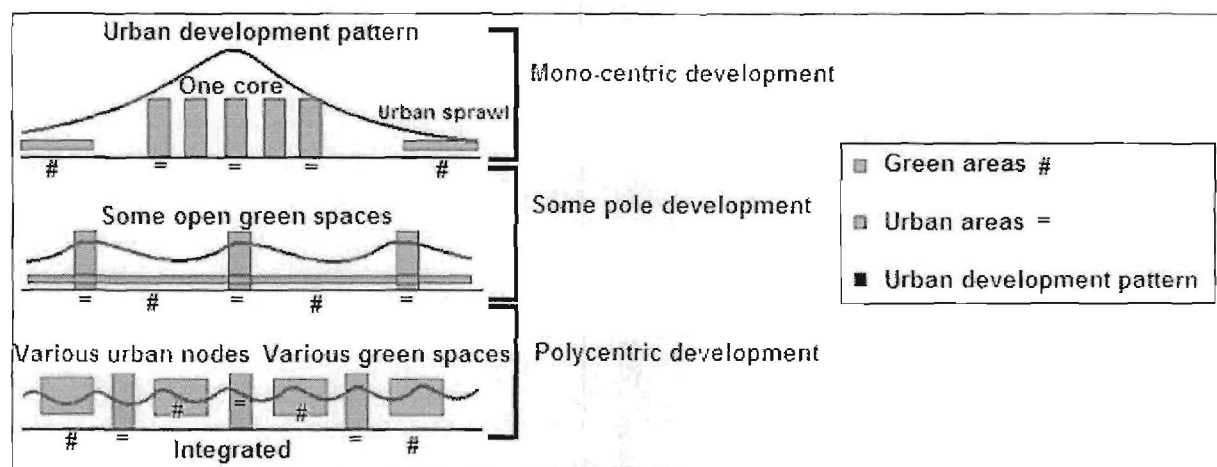


Figure 45: Spatial impact of polycentric development

Source: Own creation (2008)

The polycentric approach ensures homogenous development and thus needs to be integrated into the current reality in Gauteng in order to enhance the sustainable development vision as described in Chapter 7. Therefore, the urban development boundary will have a more definite role to play in terms of containing the economic forces, the social forces and the environmental forces. This will be done via polycentric development and will lead to a new urban form of spatial fragmentation and segregation through enclosed urban nodes. The urban nodes must be planned holistically, in an integrated manner, but will manifest individually, giving management control to the relevant local authorities of the specific urban node, structured within the polycentric development network.

At the same time, it should be noted that this concept illustrates the complexity of urban sustainability. The meaning of sustainable urban nodes can only be considered from a systemic point of view: balancing the needs of people (safety, security, privacy, space for cultivation, affordability) with that of an open urban form that could reduce the impact on the environment (integrated compact city) and allow for integrated urban governance as well.

Figure 46 illustrates the proposed concept of the polycentric development pattern, guided by the urban development boundary concept.

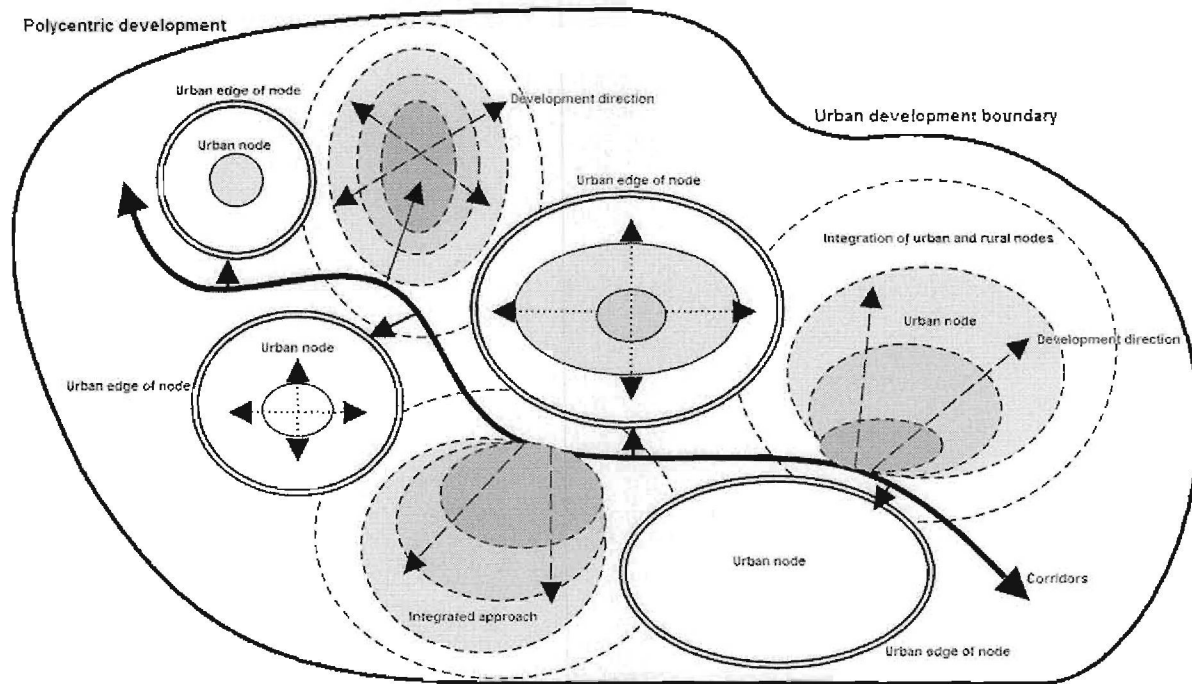


Figure 46: The proposed concept of polycentric development pattern

Source: Own creation (2008)

In order to clarify the difference between the urban edge and the urban development boundary (specifically for the metropolitan region) emphasis is placed on the different scales for planning. The urban edge is applicable to urban nodes, whereas the urban development boundary is applicable to urban regions or metropolitan regions (cf. Figure 43). This theoretical concept and proposed urban structure need to be implemented into the current reality of the Gauteng city region. The following maps and figures illustrate the practical implementation, realisation and obstacles that will be encountered within the Gauteng city region. From these maps and impacts an appropriate solution and management plan will be formulated in order to address these obstacles and enhance the positive elements of the urban development boundary.

2 Formulation of the polycentric development pattern

The polycentric development pattern will address and accommodate the impacts and forces as derived from the literature studies and surveys, as described in the previous chapters. The formulation and implementation of the polycentric development pattern can only be successful if it acknowledges all the impacts as described in the sustainable development perspective. The core issues that will influence the polycentric development pattern are economic impacts, environmental impacts, social impacts and transportation impacts and these are described accordingly.

2.1 Economic impacts

The most central area of the Gauteng province experienced the highest economic growth from 1996 to 2004. Economic decline was experienced in the peripheral areas. In correlation with the intensification of economic activity in central areas of the province, there has been a trend towards the intensification of employment in the central areas of the province. Gauteng shows a significant degree of spatial separation between poverty concentrations and economic activity.

These areas need to be developed as infrastructure nodes, supporting the current economic status of the area, while enhancing the quality of the environment. This will ensure that poverty concentrations in peripheral areas will experience significant growth. Therefore, the proposed economic nodes are located on the outer parts of the current high-growth economic areas, introducing economic growth in declining areas. Figure 47 illustrates the economic impacts and proposed economic development nodes.

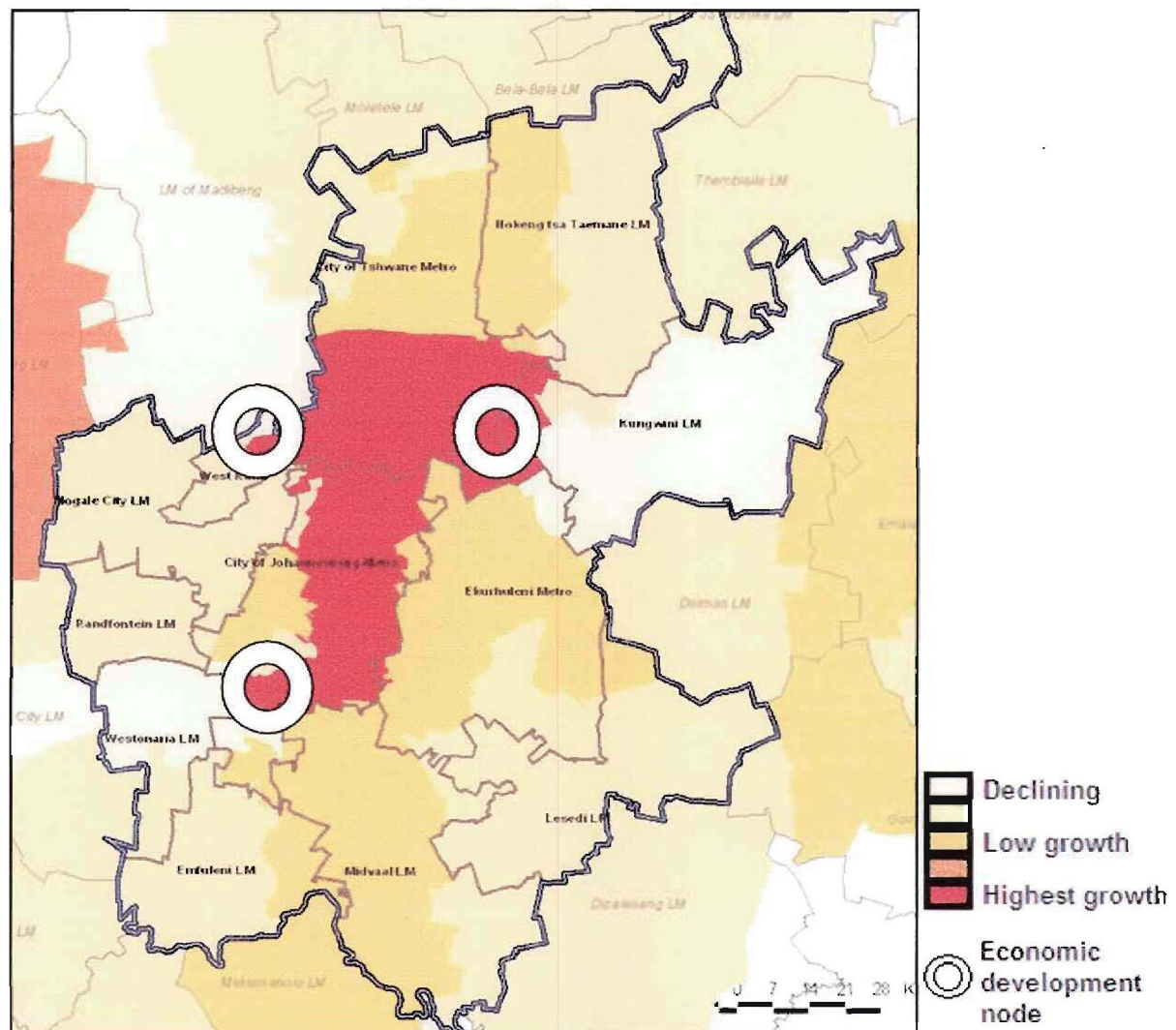


Figure 47: Intensity of economic activities

Source: Own construction (2008) [Based on GSDP, Gauteng (2006:23)]

2.2 Environmental impacts

A balanced environment is one of the key characteristics of successful city regions. Areas of natural and cultural significance are not only important from a conservation and a quality-of-living point of view, but can also be regarded as important regional amenities and attractions that are integrated into the economic fabric of the region.

The Gauteng Department of Agriculture, Conservation and Environmental Affairs has identified important areas for conservation from ecological as well as cultural perspectives. These areas with natural and cultural resources are identified in the following figure. These areas, should be protected from development, and therefore are significant to the implementation of the urban development boundary, as the proposed urban development boundary should guide conflicts between the protection of resources and the expansion of these areas, respectively. This is illustrated in Figure 48.

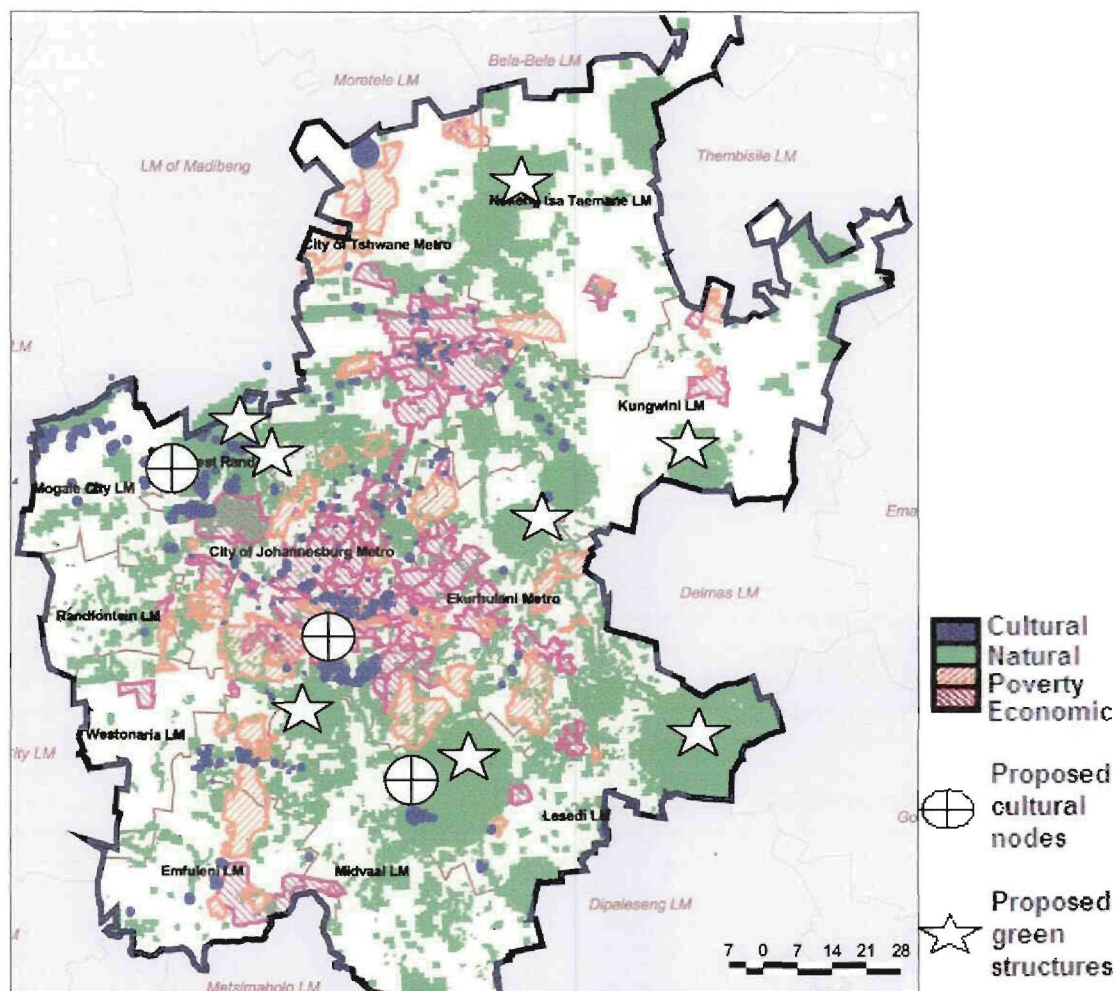


Figure 48: Protection of natural, cultural and heritage resources

Source: Own construction (2008) [Based on GSDP, Gauteng (2006:25)]

2.3 Social impacts

The urban development boundary is subject to certain social impacts. The social impacts can be measured in terms of ideal areas to develop and the physical suitability for growth. The suitability profile includes the views and perspectives from residents in terms of desirable locations to live and work, safe urban areas, and urban environments providing entertainment and social elements.

The following figure illustrates high economic activity areas in relation to the areas that are suitable for growth. The urban development boundary will be subject to these social impacts and nodes.

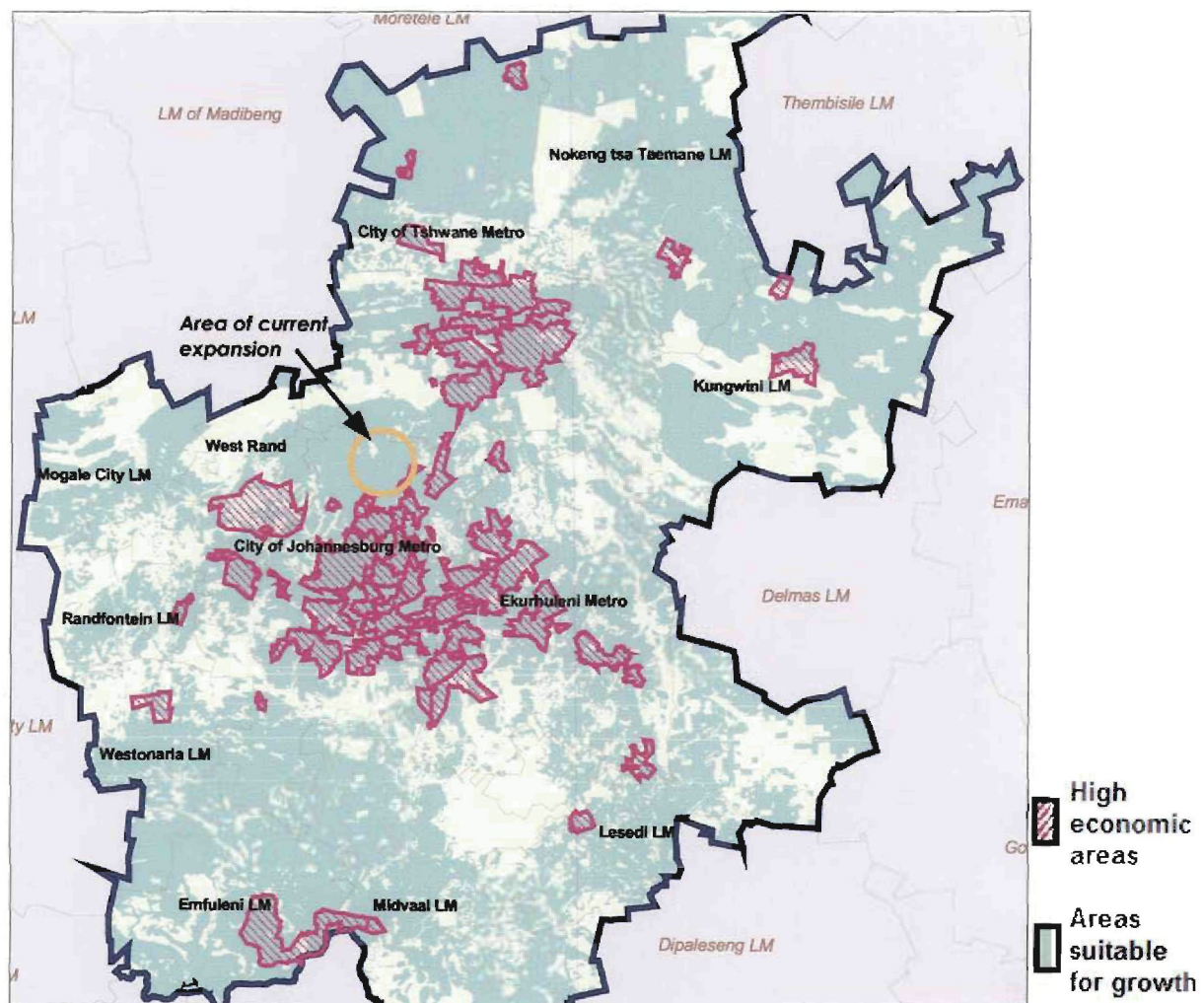


Figure 49: Areas suitable for development

Source: Gauteng (2006:27)

2.4 Transportation impacts

The central business areas are the main destination points and nodes are formed around these destination zones. Areas dominated by labour intensive activities or high-value manufacturing, attract the highest number of trips from poverty concentrations. Transportation impacts are thus interconnected with economic activity. Transportation influences the regional economy.

An analysis of existing flows from poverty concentrations to economic activity areas confirms the reliance of the provincial poor on the central economic core area. Significant flows also occur from the core urban areas to suburban areas. This is an indicator of high current interconnectedness. The number of traffic flows is illustrated in Figure 50, and focuses on the flows that result in urban nodes, from different economic areas. For purposes of this study, the origin of the flow is not as important as the flow direction and impact. The urban development boundary will be subject to these transportation flows and impacts.

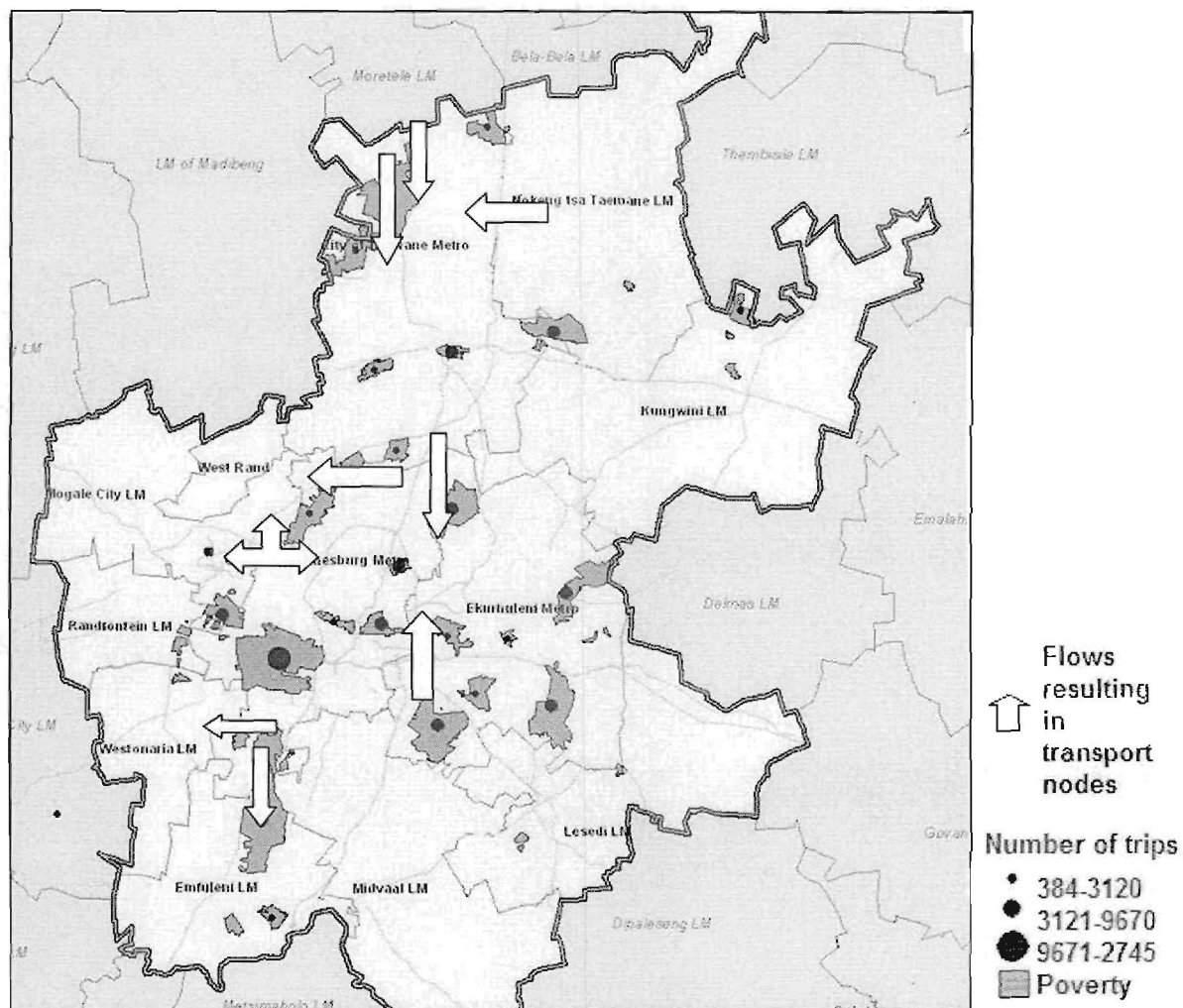


Figure 50: Traffic flows

Source: Own construction (2008) [Based on GSDP, Gauteng (2006:45)]

The economic, environmental, social and transportation impacts (Figures 47, 48, 49 and 50) resulted in the identification of economic development nodes, cultural nodes, green structures, and traffic nodes, all impacting on the spatial manifestation of the area. These nodes are thus, for purposes of this study, used as the core nodes to create a polycentric development pattern for the Gauteng city region. The polycentric development pattern that results from the structuring and linkage between these identified nodes, will transform the current urban environment of Gauteng into a more-sustainable urban form.

3 Spatial manifestation

The nodes as identified in terms of economic, cultural, environmental, social, and transport impacts, are the primary form-giving structures when creating a polycentric development pattern for the Gauteng city region. Each of these nodes will still have their own urban edge to manage, resulting in multiple urban edges contained within the Gauteng urban environment.

The urban development boundary as proposed for the Gauteng city region will, however, guide and direct the spatial planning and manifestation of these nodes, as the urban development boundary is used as the tool to implement polycentric development, and therefore create a sustainable urban form.

The current spatial reality of the Gauteng urban environment was taken into consideration with the creation of this proposal of the polycentric development pattern. This included the inner central business district area, the current urban areas, the current economic areas, areas with integration opportunity, areas with accessibility opportunity and areas with provincial spatial marginalisation.

Figure 51 illustrates the current reality and pre-defined areas in relation to the proposed polycentric nodes, as identified in section 2 of this chapter. This is brought into perspective with the previous chapters, illustrating the functionality of the polycentric development initiatives, and the success of implementation if these nodes are managed via an urban development boundary tool. Figure 51 illustrates the concept of the proposed nodes within the current Gauteng city region.

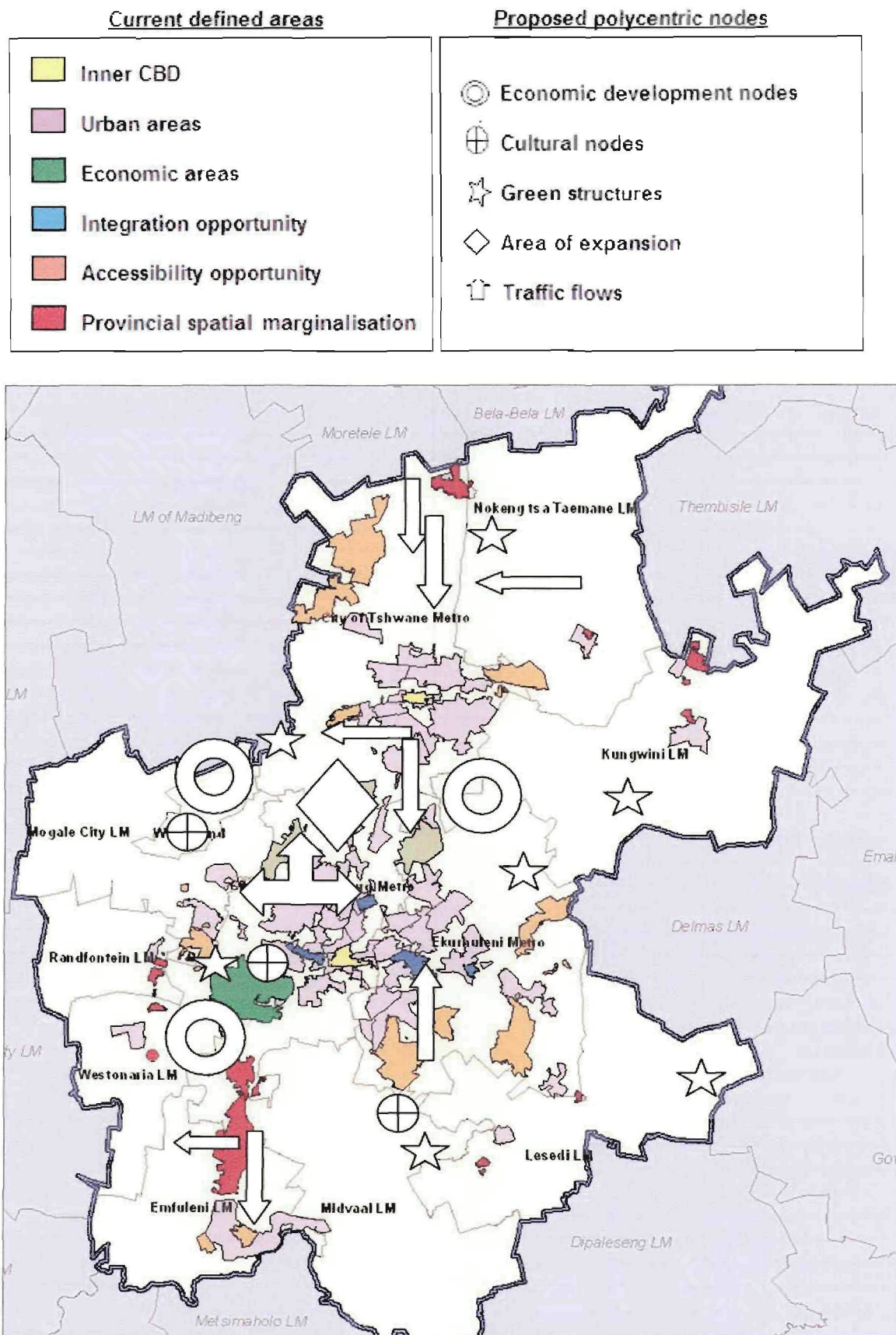


Figure 51: Polycentric node identification and implementation

Source: Own construction (2008) [Based on GSDP, Gauteng (2006:29)]

These nodes were structured into a polycentric development pattern, in order to enhance homogenous development and spatial equity, by ensuring qualitative nodes, individual nodes and effective nodes. The concept of the polycentric development pattern and the urban development boundary as proposed for the Gauteng city region is illustrated in Figure 52.

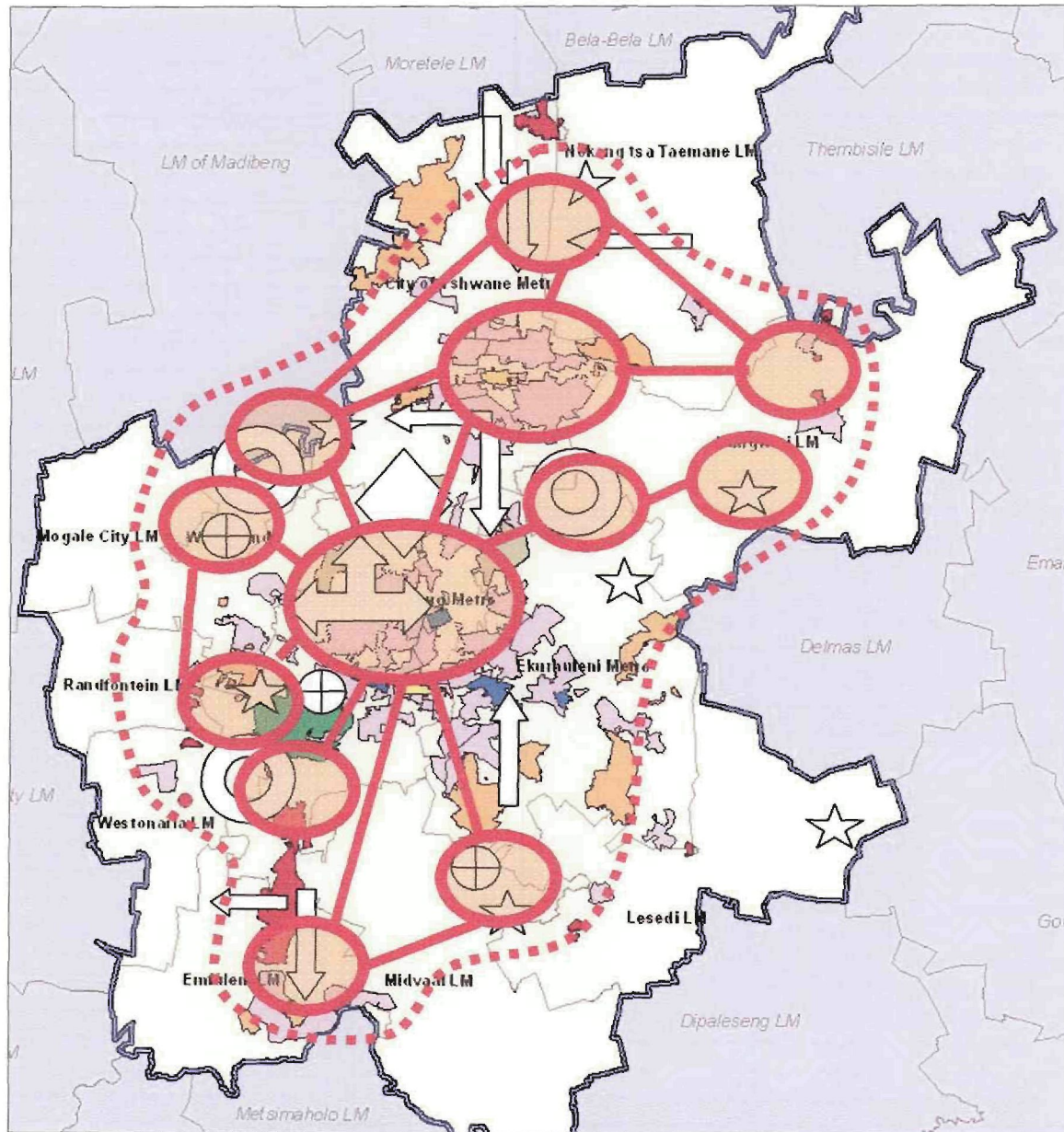


Figure 52: Node identification and implementation

Source: Own creation (2008)

By implementing these nodes, the Gauteng city region will accommodate the drivers of sprawl, and be a catalyst to the drivers of compactness, enhancing the functionality of the identified and developed nodes. The polycentric development pattern is concluded to be the optimal urban form for the Gauteng city region, as the variation in nodes and interaction between them will optimise the diversity and quality of the area in totality.

4 Management of the polycentric development pattern

Once the polycentric development pattern is approved and implemented, and the urban nodes are identified accordingly, the management and monitoring of these urban nodes need to be enhanced to ensure the success of this concept. To enhance the management of this concept, it is proposed that management should take place on two levels, as illustrated in Figure 53:

- **Provincial management level:** Managing the urban development boundary concept in terms of the entire Gauteng city region, including all relevant urban areas, contained urban nodes, and urban corridors. This is the metropolitan planning scale as referred to on page 158. It is a holistic provincial approach towards creating a sustainable urban form for the Gauteng city region.
- **Node management level:** Managing the urban edges of the individually identified urban nodes will enhance their functionality and compactness within the greater provincial concept. This is the urban node planning scale as referred to on page 158. It is an integrated approach towards the structuring of the polycentric development pattern. It will always be subject to the provincial management level (metropolitan planning scale) and the objectives of the Gauteng urban development boundary.

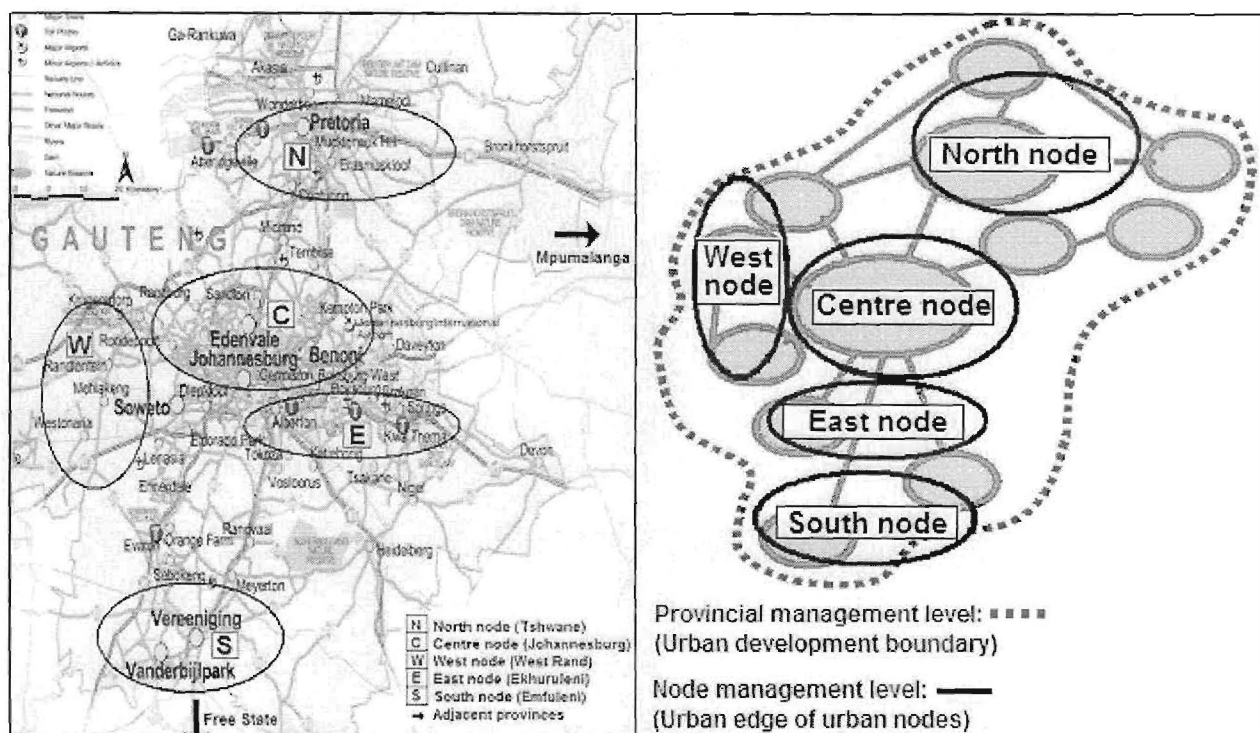


Figure 53: Levels of management

Source: Own creation (2008)

In terms of provincial management, the urban development boundary is the planning tool identified to ensure the development of a sustainable urban form in the Gauteng city region. Therefore, the urban development boundary will guide the development pattern of the whole Gauteng area. The Gauteng urban development boundary must be managed through one authorising committee known as the Gauteng Department of Development Planning.

The Gauteng Department of Development Planning committee will be a newly-established committee, manifesting on provincial level and focussing on sustainable development in the Gauteng city region, thus also aiming to create a sustainable urban development boundary. It is proposed that this committee should consist of at least two professionals from the following active departments of the Gauteng province: Department of Agriculture, Conservation and Environment, Department of Economic Development, Department of Social Development, Department of Public Transport, Roads and Works and the Department of Local Government, which should be represented by all the managing authorities of the centre, north, south, east and west nodes. The managing authorities are described in greater detail later in this chapter.

The urban development boundary will thus be subject to:

- Approval of the Department of Agriculture, Conservation and Environment, in terms of ensuring open spaces and limiting urban sprawl.
- Approval of the Department of Economic Development, ensuring the comprehensive focus of the city region on increasing economic activity.
- Approval of the Department of Social Development, ensuring qualitative living environments.
- Approval of the Department of Public Transport, Roads and Works, ensuring the functionality and effectiveness of the corridors and supporting infrastructure.
- Approval of the Department of Local Government, including the managing authorities of the different nodes, ensuring that all areas in the Gauteng city region will be aware of future development patterns, impacts and directions.

In terms of the node-management level, the current urban edge concept will be used as the planning tool to ensure compact nodes, efficient functioning and structuring of the polycentric development pattern. The urban edges of the identified nodes must be managed locally by the managing authorities. A sophisticated level of integrated and coordinated planning still remains a long way off (Harrison, 2001:191), and this will be a challenge for the identified municipalities, as described in Table 58.

Table 58: Managing authorities of the node management level

Node	Managing Authority	Informing Municipalities	Relevant areas
Centre Node	City of Johannesburg Metropolitan Municipality.	n/a.	Greater JHB, Northern JHB, Eastern JHB, Southern JHB, Western JHB, Edenvale, Modderfontein, Midrand, Rabie Ridge, Ivory Park, Khayalami.
North Node	City of Tshwane Metropolitan Municipality.	• Kungwini Local Municipality. • Metsweding District Municipality. • Nokeng Tsa Taemane.	Greater Pretoria, Pretoria, Centurion, Northern Pretoria, Hammanskraal, Pienaarsrivier, Crocodile River, Winterveld, Temba, Mabopane, Ga-Rankuwa, Eastern DC, Roodeplaat, Bronberg, Ekangala, High-veld DC, Cullinan, Rayton, Roodeplaat, Elands River, Bronkhorstspuit.
East Node	Ekurhuleni Metropolitan Municipality.	n/a	Kempton Park, Tembisa, Brakpan, Greater Germiston, Greater Nigel, Springs, Greater Benoni, Boksburg, Alberton, East Vaal, Eikenhof, Suikerbosrand, Randvaal, Blesbokspuit, Daveyton, Etwatwa.
South Node	Sedibeng District Municipality.	• Emfuleni Local Municipality. • Midvaal Local Municipality. • Lesedi Local Municipality.	Lekoa, Vaal, Vereeniging, Kopanong, Western Vaal, Heidelberg, De Deur, Walkerville, Devon, Impumelelo, Eikenhof, Randvaal, Vaal Marina, Blesbokspuit, Suikerbosrand, Vaal River, Vaal Oewer, Vischkuil.
West Node	West Rand District Municipality.	• Mogale City Local Municipality. • Randfontein Local Municipality. • Westonarea Local Municipality. • Merafong City Local Municipality.	Carletonville, Krugersdorp, Westonaria, Randfontein, Western Gauteng, Magaliesburg RC and TRC, Galsrant, Vaal River, Fochville, Wedela.

Source: Own construction (2008)

It is proposed that the managing authorities must be divided according to the core urban nodes as identified. These managing authorities already manifest as the Metropolitan and District Municipalities of the Gauteng Province. These municipal structures can be used, but need a development policy that will guide polycentric development, in order to set clear and concise development and spatial planning objectives, for the individual nodes, but also to enhance the impact of the specific urban nodes in terms of the Gauteng city region.

It is further proposed that Metsweding District Municipality falls under the jurisdiction of the Metropolitan municipality of the City of Tshwane. This will enhance management and control in the north node. The centre node will thus be under the jurisdiction of the Metropolitan Municipality of the City of Johannesburg, whereas the east node will be managed by Ekurhuleni Metropolitan Municipality. The south node will be managed by Sedibeng District Municipality and the west urban node by West Rand District Municipality. Table 58 gives an overview of the managing authorities of the node level management, as well as the informed municipalities per urban node, and the relevant areas considered.

The polycentric development pattern, initiated by the urban development boundary concept, needs to be supported by policies, legislation and frameworks describing the surrounding zonings and land-use management within the Gauteng city region.

5 Legal binding and guiding legislation

Spatial planning and development are currently primarily guided by the Land Use Management Bill, the National Spatial Development Perspective, and the Development Facilitation Act. On provincial level, spatial planning and development in Gauteng are primarily guided by the Gauteng Development and Planning Act, the Spatial Development Framework, the Integrated Development Plan, the Gauteng Spatial Development Perspective and supporting Land Use Management Schemes. However, these legislation and policies were not adequate insuring sustainable development within Gauteng. The need for an integrated and comprehensive guiding legislation is now even more emphasised by the city region concept.

It is proposed that a Sustainable Spatial Development Act should be formulated and promulgated. The Sustainable Spatial Development Act should stipulate the needs of the urban development boundary concept and identify specific objectives in terms of spatial planning and development. Current legislation and policies should be taken into consideration, but the formulation of this Act should focus on ensuring management of these concepts on provincial level, as well as node level, as described in the previous section. It should state that the Sustainable Spatial Development Act requires provincial management from the Gauteng Department of Development Planning committee in order to create a sustainable urban form for the Gauteng city region, and that it further requires node level management to manage the identified nodes of the polycentric development pattern of the Gauteng city region. The proposed Sustainable Spatial Development Act should inform the Gauteng Development and Planning Act. Figure 54 illustrates the current structures of the legislation and policies and the proposed introduction of the Sustainable Spatial Development Act.

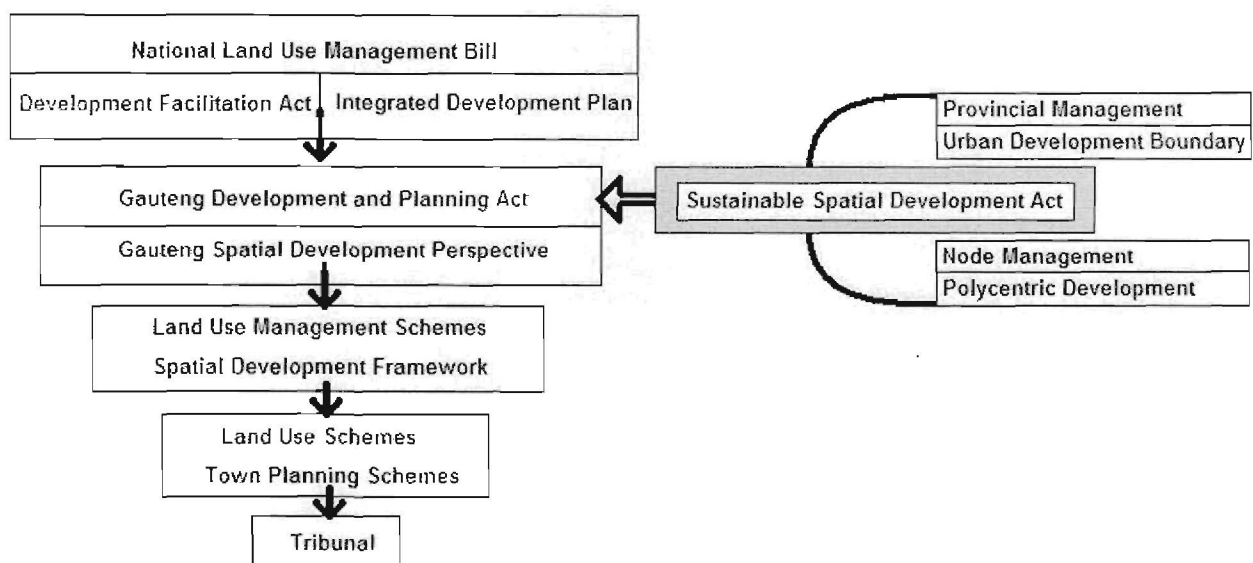


Figure 54: Sustainable Spatial Development Act

Source: Own creation (2008)

6 Implementation of the urban development boundary

The success of the urban development boundary will be determined from continuously monitoring and evaluating the impacts and outcomes in terms of development. Certain implementation tools are proposed to ensure the effective and successful implementation of the urban development boundary concept that will guide polycentric development patterns in the Gauteng city region and in doing so, creating a sustainable urban form. The implementation of this concept is the responsibility of the authorities as mentioned in section 4 of this chapter. Management will take place on two levels (Provincial management level - guiding the urban development boundary and Node management level - managing urban edges of the urban nodes locally) as Figure 53 illustrates, and it is therefore proposed that implementation tools be identified for both of these management levels.

The implementation approaches for both of these management levels are the same, but their implementation tools and objectives are different. The shared approach is based on the fact that there will always be the continuous opposing forces of conservation versus development. The implementation approach is thus to educate authorities to enable them to make appropriate informed decisions when considering development applications in the urban nodes that will influence the urban development boundary. Every development will have an impact on the urban nodes and the urban development boundary, and therefore authorities need to be aware of the “costs” of the implementation in terms of the urban environment.

Authorities making educated, informed decisions will enhance good planning and will lower the urban costs (in terms of sustainable development) in contrast to uninformed, unmanaged, and bad planning that will increase the costs of implementation in terms of the greater environment (Figure 55). To ensure the success and the sustainability of the Gauteng city region, the implementation approach is to lower the urban costs, by identifying implementation tools for authorities (on both management levels) to use when confronted with development applications.

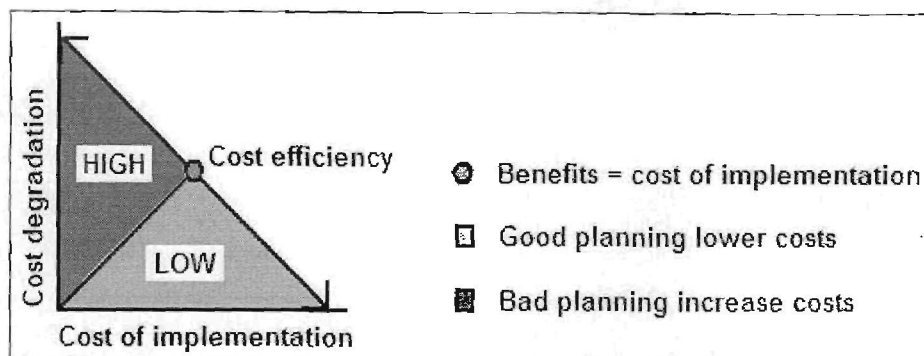


Figure 55: Implementation approach

Source: Own creation (2008) [Based on model of the Helsinki University of Technology, 2007]

According to the implementation approach, certain implementation tools are identified on both management levels (Provincial management level and Node management level) and will be discussed individually.

6.1 Provincial management level implementation tools

The Provincial management level, as described in section 4 of this chapter, focuses on managing the urban development boundary concept in terms of the Gauteng city region. This is a holistic provincial approach towards creating a sustainable urban form for the Gauteng city region. The managing authority as proposed in section 4 of this chapter, the Gauteng Department of Development Planning committee, needs an implementation tool that will ensure informed decision making when they are confronted with a specific development application that will have an impact on the urban development boundary.

It is proposed that all development applications that fall outside the urban edges of the identified urban nodes, be considered from a provincial perspective and should therefore be forwarded to the Gauteng Department of Development Planning. In order for the Gauteng Department of Development Planning committee to make an informed decision with regard to the development application, they need to evaluate the impact and outcome of the proposed development according to the objectives and vision of the urban development boundary concept, to create a sustainable urban form for the Gauteng city region.

The following application evaluation tool is proposed for the Provincial management level. It is a decision-making framework, helping authorities to determine whether the application will be aligned with the current spatial planning and development objectives of the city region and urban development boundary. This decision-making framework is based primarily on strategic decision-making and operational decision-making. Strategic decision-making is the first part of the decision-making process and focuses on the organising of activities through managerial control. The strategic decision-making framework evaluates the application in terms of three core functions:

- The descriptive function: Information describing the application and situation.
- The cognitive function: Information contributing to the understanding of the environment, the regional problems and the key factors.
- The normative function: Information of the improved actions, and known consequences of actions already taken.

Table 59 illustrates the strategic decision-making framework. The managing authority evaluates the application by ticking the appropriate boxes relevant to the information provided by the applicant. The total number of inappropriate issues is compared to the total number of appropriate issues in order to conclude whether the application will be approved, disapproved or suggested for amendment.

Table 59: Strategic decision-making framework for the provincial management level

Descriptive function	Inappropriate development	Appropriate development
Application	Speculation development	Sustainable development
Area type	Conservation area	Development area
Initiative	Similar development exists	New concept
Urban design	No	Yes
Function	Only urban	Preserve rural
Environmental impact	High	Low
Social impact	Low	High
Economic impact	Low	High
Transportation impact	High	Low
Cognitive function	Inappropriate development	Appropriate development
Direction	No regional vision	Polycentric pattern
Regional impact	Use urban reserves	Accommodate future growth
Outcome	Uncontrolled growth	Enhance corridors
Open spaces	Limit open spaces	Consider open spaces
Patterns	Change development patterns	Enhance current pattern
Function	Change adjacent node function	Enhance adjacent node function
Linkages	No linkages	Link adjacent nodes
Implementation	Change existing boundary	Within urban development boundary
Normative function	Inappropriate development	Appropriate development
Improved action	Urban sprawl	Compactness
Outcome	Create additional nodes	Guide development direction
Cost of actions	Separation of functions	Integration of spheres
Known consequences	Drive development initiatives away	Attract other development initiatives
Environmental	Sensitive area	Management area
Spatial planning	No value	Regional value
Sustainability	No	Yes
Supported by policy	No	Yes
Support	Opposition from adjacent nodes	Consent of adjacent nodes
TOTAL	Number of ✓	Number of ✓
CONCLUSION	Inappropriate	Appropriate

Source: Own creation (2008)

The strategic decision-making framework is therefore a simplified evaluation of a development application to determine whether it is appropriate or inappropriate in terms of the environment in which it will be developed. An alternative to this concept is illustrated in Figure 56. Firstly, it should be determined whether the application is applicable to an urban node (illustrated as A) or a rural node (illustrated as B). Secondly, it should be determined whether the development approach is development-orientated (illustrated by C) or conservation-orientated (illustrated by D).

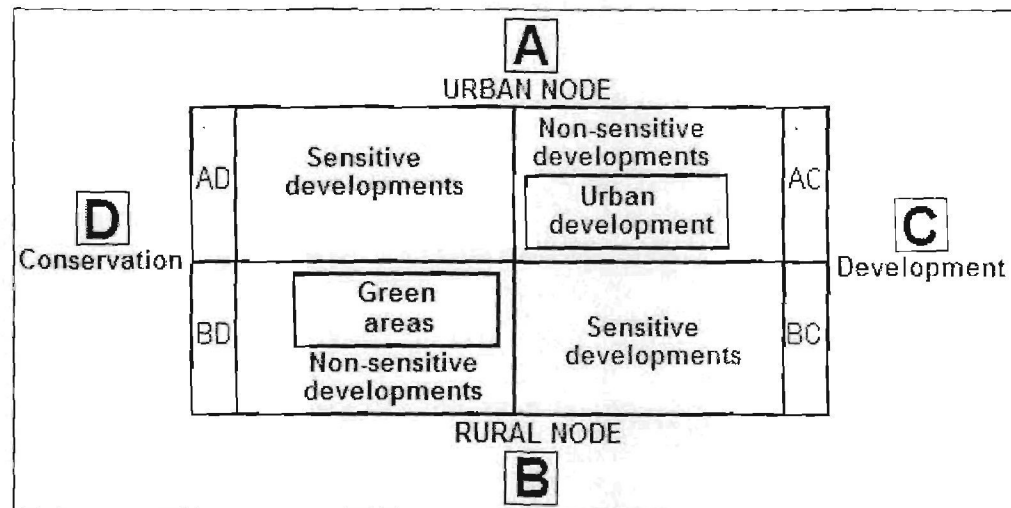


Figure 56: Determining appropriate development applications

Source: Own creation (2008)

If the application is conservation-orientated and falls within a rural node, it is appropriate, as it will enhance the green area. This is illustrated by sector BD. If the application is development-orientated and falls within an urban node, it is appropriate, as it will enhance urban development. This is illustrated by sector AC. Development applications falling in sectors AD and BC are inappropriate as these areas are sensitive areas. If an application is found to be inappropriate, it is immediately disapproved by the provincial authorities. If this application is concluded to be appropriate in terms of the strategic decision-making, with reference to the greater environment and polycentric development pattern, it will proceed to step 2, operational decision-making.

Operational decision-making evaluates development potential on merit, as development potential is measured not only by the impact and regional consequences as evaluated in the strategic decision-making framework, but is also influenced by the specific characteristics of the area, and the development concept itself. To this effect, an operational decision-making model is utilised, focusing on merit evaluations, and determining the sustainability thereof. The model is pragmatic and is based on the assignment of values to various specific location factors.

Firstly, the application is evaluated on a ten-point scale, with ten being the highest. Secondly, weights are attached to the factors, in order of importance (1 to 5, with 5 being the most important). These datasets are utilised to calculate an overall rating and comprehensive evaluation of the application in terms of sustainability. The operational decision-making model is illustrated in Table 60. Imaginary figures are used to illustrate and explain the process more comprehensively.

Table 60: Operational decision-making framework for the provincial management level

Specific application location factors	Grade 1-10	Weight 1-5	Points
Sustainable development approach.	7	5	35
Enhancing the environmental function of the area.	8	5	40
Enhancing the economic function of the area.	9	4	36
Accessibility.	7	2	14
Urban design features.	7	5	35
Future expansion potential.	9	4	36
Better integration than fragmentation.	5	4	20
Qualitative development.	5	5	25
Support from adjacent urban nodes.	8	2	16
Enhancing polycentric patterns.	8	3	24
Support urban development boundary form.	8	3	24
Total points			305
Maximum points			420
Score			72.61%

Source: Own creation (2008)

The assessment of the application indicates an overall rating of 72.61%, which can be interpreted as a high potential development in terms of the sustainable development objectives. Thus, even though the application falls outside the identified urban nodes, it was concluded according to the strategic decision-making model to be appropriate, and according to the operational decision-making model to be sustainable. Provincial authorities will therefore approve this application.

The Provincial management level should at all times be focused on the objectives of the urban development boundary, and identified areas should only be brought into the urban growth boundary if it can accommodate future growth. The managing authorities should clearly state where there are urban reserves, as this will provide certainty to land owners, developers and stakeholders as to where future development of land could occur and where it could not.

Furthermore, the Geographical System (GIS) has created a large field of opportunity for development of new approaches to computer processing of geographically-referenced data, which adds a new dimension to the management, analysis and presentation of large volumes of information required in decision-making process.

The use of GIS has enhanced the rationality of the decision-making process by improving data accuracy and accessibility and as a consequence, leads to better decision. GIS provides the facilities to deal with the data and information requirements as needed in the decision-making framework and therefore needs to be incorporated in the provincial management level.

6.2 Node management level implementation tools

The Node management level, as described in section 4 of this chapter, focuses on managing the urban edges of the individually identified urban nodes to enhance their functionality and compactness within the greater provincial concept. This is an integrated approach towards structuring the polycentric development pattern.

The managing authorities, as proposed in section 4 of this chapter, need an implementation tool that will ensure informed decision-making when they are confronted with a specific development application that will have an impact on the urban node and vice versa impact on the urban development boundary.

It is proposed that all development applications that fall inside the urban edge of the specific identified urban nodes, be considered from a local perspective and be managed by the local authority as described in Table 61, comprising the relevant metropolitan municipalities and district municipalities. In order for these municipalities, acting as the management authority, to make an informed decision with regard to the development application, they need to evaluate the impact and outcome of the application according to the objectives and functions of the specific urban node, and determine the spatial impact that it will have on the urban development boundary of the Gauteng city region.

The following application evaluation tool is proposed for the Node management level. It is a decision-making framework, helping local authorities to determine whether the application will be in line with the current spatial planning and development objectives of the specific urban node and polycentric development pattern. It is a tool used to compare the various costs, options and trade-offs in order to make more informed location decisions.

Figure 57 illustrates the process of decision-making for the Node management level. It will guide decisions with regard to applications for amendment of a current urban edge around the identified urban nodes, or with regard to applications that will have an impact on the polycentric development pattern and urban development boundary of the Gauteng city region.

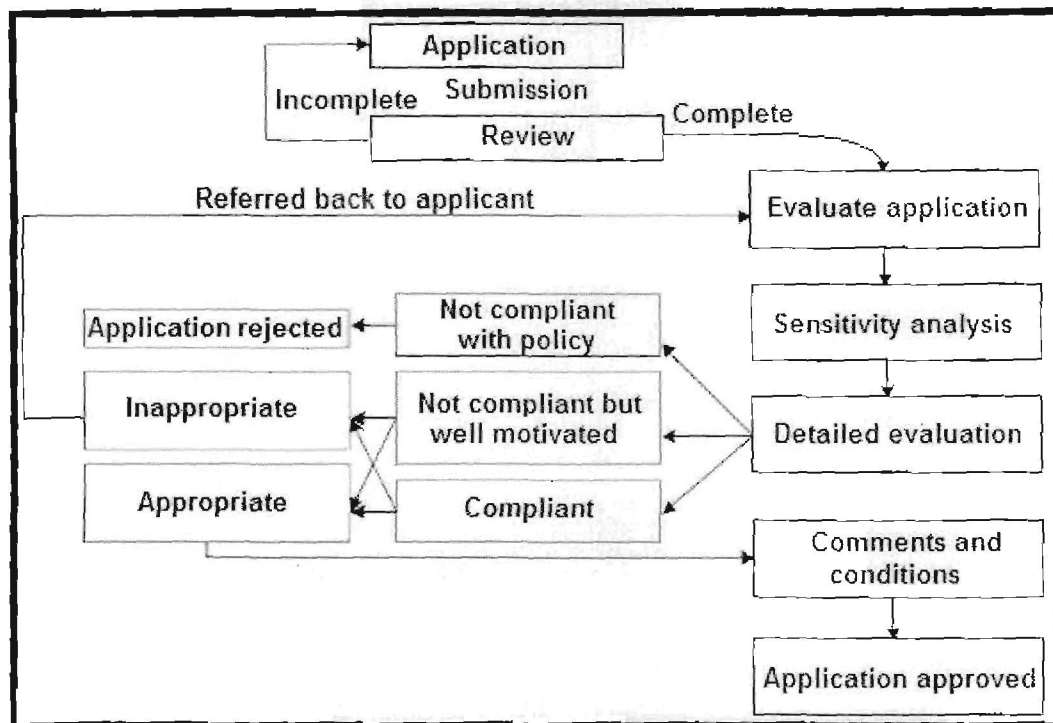


Figure 57: Decision-making process

Source: Own creation (2008)

The application is interpreted by the local authorities in terms of the policy and motivation. The evaluation is done in terms of environmental issues, cultural, historical and heritage issues, visual and place elements, as well as engineering issues. After the evaluation, a sensitivity analysis is done. This is based on the normative position, in terms of location and the specific site characteristics, with regards to structuring elements that will create uniqueness and promote sustainability (Refer to Annexure G).

The edge management decision support model follows a simple checklist approach. It creates awareness about the questions that need to be asked and assessments that need to be done, before a decision is made in terms of development within the urban nodes. Evaluation of the application is done in terms of low, medium or high impact, and the result of the evaluation will guide the approving or disapproving of the application. It will be measured in terms of:

- Low impact result: The edge can be adjusted, thus flexible approval of the application.
- Medium impact result: Edge only to be adjusted if sufficient need is proven.
- High impact result: Edge will not be adjusted until all other options are exhausted.

Table 61 illustrates the decision support model to be used by local managing authorities when confronted with a development application, in terms of the Node management level, within the Gauteng city region. The goal is to determine if it is a low, medium or high impact development.

Table 61: Decision support model for the Node management level

Purpose / Issues	Criteria considerations	Impact		
		High	Medium	Low
Purpose	Enhance the function of the node			
Urban form	Architectural design			
	Fences, enclosures, other compaction			
	Enhance polycentric development			
	Expansion towards other urban areas			
	Infill opportunities			
	Boundary delineation measures			
Economic	Enhance economic activity			
	Agglomeration benefits			
	Forces of compaction			
	Access to the resource for heavy vehicles			
Environmental	Integrated open green spaces			
	Protect agricultural land			
	Initiate recreational areas			
	Introduction of green buffers			
	Environmental management approach			
Social	Integration of rural use into the urban area			
	Adequate storm water management system			
	Wide buffers to allow natural functioning			
	Open access to the network			
	Cultural or heritage resource			
	Meaningful experience of the resource			
	Ensure qualitative environment			
Transport	Corridors for development			
	Access restrictions			
	Public transport service available			
	Services being used to the best potential			
Urban design	Buffer to allow meaningful experience of the environment			
	Form and design of adjacent development			
	Scenic route (tourism)			
	Space for landscaping			
Implementation	Alternative development options			
	Ideal density in terms of spatial framework			
Growth requirement (5 year)	Proposed uses compatible with the existing rights			
	Management plan			
	Has alternative development land been used?			
	Opportunities			
Growth requirement (10 year)	Has alternative development land been used?			
	Opportunities			
Management	Bulk services			
	Proposal comply with the SDF			
	Best possible use – maximizing opportunities			
Conclusive impact		%	%	%

Source: Own creation (2008)

If the application is concluded to be a high-impact development, the local authorities will reject the application. If it is concluded to be a medium impact development, authorities can either proceed to a detailed evaluation approach, similar to the operational decision-making framework for the provincial level management, or forward the application to the provincial authorities for evaluation. If the application is considered a low-impact development, it will be approved.

The decision support model for the Node management level will therefore manage the urban edges of the individually identified urban nodes and aim to enhance their functionality and compactness within the polycentric development pattern of the Gauteng city region.

7 Conclusion

Good governance is the key issue throughout this process in terms of evaluation and monitoring. The following table concludes with the key concepts of this research (sustainable development, environmental management, spatial planning, governance, social issues and the implementation of the concepts), brought into relation with the current reality of the Gauteng city region concept.

These initiatives will answer to the following spatial problems currently experienced:

- Lack of coherence.
- Inconsistency and time variations in application processing.
- Variations of land-use rights and definitions.
- Inconsistent policy application.

It is proposed that these initiatives be implemented in the current policies and frameworks, and further enhance the need for a land-use management plan, a transport management plan, an integrated development pattern, an implementation plan, an investment plan, a monitoring and evaluation plan and a sustainable development plan for the Gauteng city region.

Conclusions for the proposed urban development boundary concept and how it will structure the urban form of the Gauteng city region are drawn and summarized in Table 62, as well as the proposed urban edges and the objectives for containing the identified urban nodes of the polycentric development pattern. These conclusions and recommendations can be applied to all metropolitan areas in South Africa, as well as international situations.

Table 62: Comparison of the proposed development initiatives

	Element	Current reality: Gauteng city region	Urban Development Boundary: Provincial management	Urban edge concept: Node management
Sustainable development	Environment	No protection measures, degrading of the urban core.	Polycentric development with green linkages.	Contain urban node, enhance open areas between nodes.
	Open spaces	Green areas non-existent in urban core.	Planning of open spaces.	Transition between urban and rural areas.
	Transport	Transport ignores development boundaries.	Planned transportation network for holistic area.	Transport network link various urban nodes.
	Economy	Core urban areas are moving to the periphery.	Restrict development outside the boundary.	Contain urban core and thus economic core.
	Social	No social component in core.	Develop social nodes.	Contain urban/social core.
	Success	No sustainable development.	Yes, develop holistically.	Integrating spheres.
Environmental Management	Management	No statutory value.	Sustainable spatial development act.	Urban edge policies and decision-making tools.
	Objective	Development more important than conservation.	No development in environmental areas.	Limited development in environmental areas.
	SEA, EMP (Policies)	Implemented but not effective.	Integrated into act.	Requirement.
	Success	No management.	Yes, Provincial management.	Yes, Node management.
Spatial Planning	Land use management	Not implemented effectively.	Requirement.	Inside urban edge applicable.
	Development	Not controlled. Urban sprawl.	Polycentric development.	Inside urban edge controlled.
	Regulations	Town Planning Schemes.	Sustainable spatial development act. Decision-making tools.	Urban edge policies and decision-making tools.
	Degrading of urban core	High.	Low.	Low.
	Nodes	Unplanned disparity.	Polycentric development.	Urban nodes with urban edge.
	Success	Unsuccessful.	Yes, holistic approach.	Yes, integrated inside node.
Government	Structure	Local, District, Metropolitan Municipality.	Gauteng Department of Development Planning.	District and Metropolitan municipalities.
	Roles	Not clear.	Development control.	Development management.
	Responsibility	Economic hub.	Guide pole development.	Enhance node function.
	Success	Inefficient.	Effective provincial level.	Effective Local level.
Social	Distance work and home	Increasing.	Limited.	Containment of urban core.
	Urban design	Not good.	Enhanced.	Objective.
	Zones	Not integrated.	Integrated pole development.	Urban core is social hub.
	Success	No.	Yes.	Yes.
Implementation	Authority	Municipal manager.	Gauteng Department of Development Planning.	District and Metropolitan municipalities.
	Development measures	Uncontrolled.	Guide urban form.	Ensure compaction.
	Monitoring	No.	Decision-making frameworks.	Decision-making frameworks.
	Development response	Urban sprawl.	Create new node.	Increase densities.
	Effectiveness	Not implemented optimal.	High.	High.
	Containment	Limited.	Metropolitan.	Urban nodes.

Source: Own creation (2008)

The urban edge concept should be implemented on local node management level to ensure the containment of the identified urban nodes, creating a well-established polycentric development pattern. The urban development boundary should act as the container of this polycentric development pattern, regulating urban development in the Gauteng city region. The sum of the controlled development of nodes inside the urban development boundary, and the management and monitoring of the urban development boundary in terms of the city region, will result in a sustainable urban form for the Gauteng urban environment.

It is concluded that the planning tool, namely the urban development boundary, can be used by the relevant role players to guide development towards a sustainable urban form, because the urban development boundary initiates applicable development patterns of polycentric development and urban node containment, as proved by this study.

The future of our world will not ultimately depend on technological innovation or on the global economy. It will be the outcome of what we, the people – the urban people – do about it, through our projects and through our conflicts (Evans, 2002:xi).

Chapter 9

Summary of new knowledge and contribution

The specific contribution to the development of new knowledge and skills in the field of specialisation, as derived from this study, is summarised as follows:

- There is a need and merit for an urban development boundary in the Gauteng Province.
- Current approaches are one-dimensional and the implementation thereof is ineffective.
- Urban sprawl is the core issue influencing spatial planning and urban form in terms of the effect that it has on the urban development boundary.
- Growth management is subject to good governance and simplistic implementation measures.
- The polycentric development pattern is concluded to be the optimal urban form for the Gauteng city region, as the variation in nodes and interaction between them will optimise the diversity and quality of the area in totality.
- The polycentric approach will deliver wider, integrated and homogenous development.
- The nodes are identified in terms of economic, cultural, environmental, social, and transport flows and were accordingly structured into a polycentric development pattern.
- Each of these nodes will have their own urban edge to manage, resulting in multiple urban edges contained within the Gauteng urban environment.
- The output should be illustrated on integrated, comprehensive and understandable maps.
- A need to formulate a single spatial sustainable development Act to regulate these concepts.
- Proposed polycentric development patterns and the urban development boundary for the Gauteng city region, as illustrated in Figure 52.
- The impact of the urban development boundary, as illustrated in Table 57.
- Comparison of the proposed development initiatives (urban edge and urban development boundary) in terms of the Gauteng city region, as illustrated in Table 62.
- It is concluded that the planning tool, namely, the urban development boundary, can be used by the relevant role players to guide development towards a sustainable urban form, because the urban development boundary initiates applicable development patterns of polycentric development and urban node containment.

The proposed management and control measures, implementation and expected outcomes, are summarised accordingly:

Table 63: Summary of the proposed management and control measures

Management	Provincial management level	Node management level
Goal	Managing the urban development boundary.	Manage urban edges of individual urban nodes.
Applicable	Applications that falls outside the urban edges of the identified urban nodes.	Inside the urban edge of the specific identified urban nodes.
Focus	Gauteng city region.	Enhance functionality and compactness.
Tool	Urban development boundary.	Urban edges of urban nodes.
Objective	Guide the development pattern, ensure compact nodes, efficient functioning and structuring of polycentric development.	Containment of the identified urban nodes, creating a well established polycentric development pattern.
Authority	One authorising committee: the Gauteng Department of Development Planning.	Centre node: Metropolitan Municipality of JHB. East node: Ekurhuleni Metropolitan Municipality. South node: Sedibeng District Municipality. West node: West Rand District Municipality.
Implementation	Sustainable Spatial Development Act (informing Gauteng Development and Planning Act).	Sustainable Spatial Development Act (Informing Gauteng Development and Planning Act).
Tools	This decision-making framework is based primarily on strategic decision-making (Appropriate and inappropriate developments) [Table 59] and operational decision-making. (Evaluated on merit). [Table 60].	It is a decision-making framework, to compare the various costs, options and trade-offs to make more informed location decisions. Follows a checklist approach. Evaluation in terms of low/medium/high impact. [Table 61].
Exceptions	Accommodate future growth.	Forward to Provincial Authorities.

Source: Own creation (2008)

A further contribution to the development of new knowledge in terms of the urban development boundary concept arises in the descriptive definition and explanation of the concept. The issues of the urban development boundary concept are presented as the final conclusion.

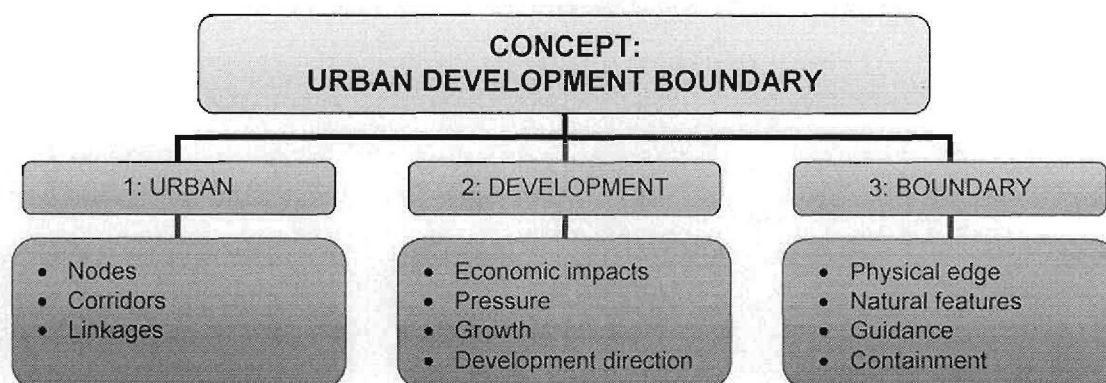


Figure 58: Urban development boundary issues

Source: Own creation (2008)

The urban development boundary concept (Figure 58) consists of three core issues:

1. **Urban:** The focus is on the urban areas, containing all urban nodes and corridors. Specific urban nodes are identified to structure the polycentric development pattern, while the corridors create linkages and support to the urban environment and thereby creating a certain urban form.
2. **Development:** The urban area is primarily confronted with development pressure resulting in urban sprawl and unplanned development. Development should only be allowed if it enhances the function of the identified node, and contributes to the greater provincial and city region visions. The development should accommodate all impacts and pressures and use it to transform the urban environment into a sustainable hub.
3. **Boundary:** This implies the physical edge, the division between urban and rural, more than a development and growth boundary, but rather a conservation tool, protecting rural areas and open green spaces surrounding the urban environment.

These three core issues need to be integrated and function accordingly, to ensure the development of a sustainable urban form by managing the urban nodes of the polycentric development pattern, accommodating impacts and pressures within the set growth boundary, in order to enhance the function of the current urban edge concept that is implemented to protect the rural areas from unwanted urban sprawl and deterioration.

The urban development boundary is thus a planning tool that will guide the development of a sustainable urban form. This is illustrated in the final figure.

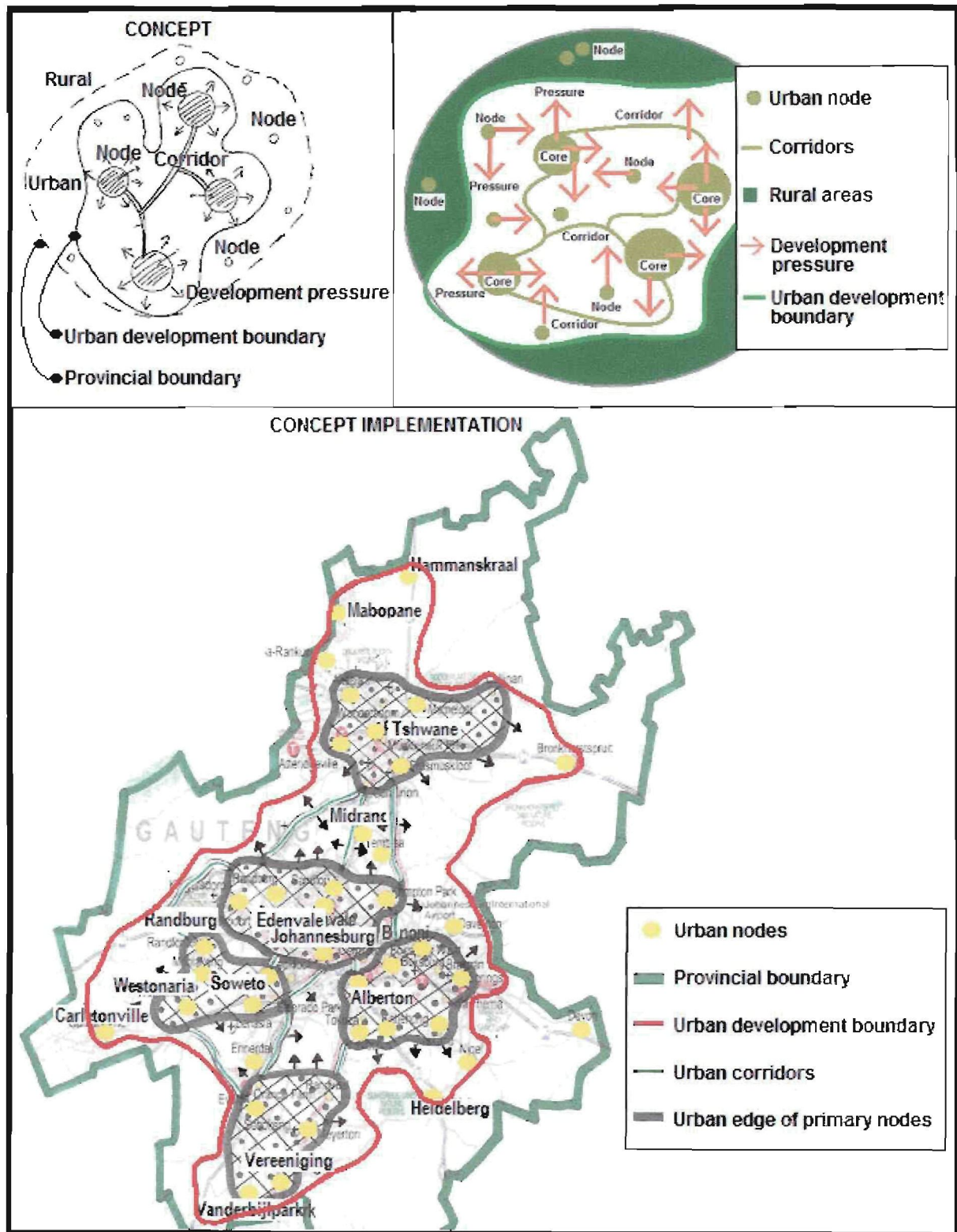


Figure 59: Final conclusions

Source: Own creation (2008)

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Annexure

The annexure includes:

- A: Survey of the urban development boundary concept.
- B: Survey of the sustainable development perspective.
- C: Survey of the future development perspective.
- D: GDACE exemption application.
- E: GDACE notice of intent.
- F: Legislation affecting local government.
- G: Sensitivity analysis: Cape Town urban development boundary approach.

Annexure A

Survey of the urban development boundary concept

Table A: Survey of the urban edge concept

URBAN EDGE ISSUE	YES		NO
	High priority	Low priority	
Does the municipality have an urban edge management policy in place?			
Are there currently any land-use applications outside the urban edge area?			
Are there currently any planning proposals for development outside the urban edge?			
Are there policies in place to integrate the different market sector residential areas?			
Which of the following factors inform or should inform the urban edge?			
▪ Prominent landform and character areas			
▪ Valuable soils			
▪ Hydrology (Surface and ground water features)			
▪ Ecological resources			
▪ Protected areas (Conservation sites)			
▪ High intensity or potential agricultural resources			
▪ Services infrastructure (Barrier effect)			
▪ Services infrastructure (Capacity and reach)			
▪ Vacant land in urban area			
▪ Higher order roads, access roads and transport infrastructure			
▪ Cadastral boundaries of adjoining land units			
▪ Availability of developable land in urban area			
▪ Growth requirements over 10-20 year period			
▪ Land-use application for new development			
▪ Visual impact			
▪ Cultural and heritage resource areas			
▪ Ownership of land and existing land use rights			
▪ Informal settlements			
▪ Density policy for residential development in rural towns			

Source: Own creation (2007)

Table B: Expert opinion to specific urban development boundary questions

1: What are the critical urban-rural issues?
2: Are there urban edges and buffers currently in place in the Gauteng environment?
3: What are the obstacles of implementation of the urban edge concept?
4: What elements in the environment offer the most defensible buffer and growth boundaries?
5: What would be the optimal edge-management policy and standards?

Source: Own creation (2007)

Annexure B

Survey of the sustainable development perspective

Table C: Sustainable development perspective survey

CONTEXT		
Which of these best describes the types of settlement, dominant land use, and development trends in your area?		
1: Urban type	☐ 1. Metropolitan ☐ 2. Non-metropolitan ☐ 3. Resort/retirement ☐ 4. Mixed ☐ 5. Other (please specify)	
2: Dominant land use	☐ 1. Residential ☐ 2. Business ☐ 3. Commercial ☐ 4. Urban green spaces ☐ 5. Other (please specify)	
3: General development trends	☐ 1. Rapid growth ☐ 2. Slow growth ☐ 3. Stable ☐ 4. Declining ☐ 5. Restructuring	
Do the following issues feature strong in the countryside around the towns or the urban fringe in your area?		
1. Housing development & urban sprawl	YES ☐	NO ☐
2. Commercial & industrial development	YES ☐	NO ☐
3. Transport infrastructure	YES ☐	NO ☐
4. Social change, community & public services	YES ☐	NO ☐
5. Utilities & other infrastructure	YES ☐	NO ☐
6. Agricultural change & forestry	YES ☐	NO ☐
7. Pressure from tourism & recreation	YES ☐	NO ☐
8. Access to the countryside	YES ☐	NO ☐
9. Landscape and environment	YES ☐	NO ☐
10. Cultural & natural heritage	YES ☐	NO ☐
Do the following sustainable development elements exist within the local area?		
ECONOMICAL ELEMENTS		
Poverty	YES ☐	NO ☐
Unemployment	YES ☐	NO ☐
Commercial and industrial development	YES ☐	NO ☐
Urban core deterioration	YES ☐	NO ☐
Hierarchy of nodes	YES ☐	NO ☐
Risk management	YES ☐	NO ☐
ENVIRONMENTAL ISSUES		
Green areas	YES ☐	NO ☐
Quality environment	YES ☐	NO ☐
Rural and urban integration	YES ☐	NO ☐
Greenbelts / urban edges	YES ☐	NO ☐
Green policy	YES ☐	NO ☐

SOCIAL ISSUES		
Quality environments	YES ☐	NO ☐
Equity	YES ☐	NO ☐
Integration	YES ☐	NO ☐
Beautiful environments	YES ☐	NO ☐
Community participation	YES ☐	NO ☐
Urban design	YES ☐	NO ☐
SPATIAL ISSUES		
Integration	YES ☐	NO ☐
Movement networks	YES ☐	NO ☐
Urban expansion	YES ☐	NO ☐
Housing development	YES ☐	NO ☐
Urban sprawl	YES ☐	NO ☐
UNDERLYING FORCES AND PRESSURES		
Do you consider the following driving forces behind the pressures on the countryside around towns in your area to be the most important, from a sustainable development perspective?		
1. Housing & development	YES ☐	NO ☐
2. Urban decline / dereliction	YES ☐	NO ☐
3. Changes in mobility	YES ☐	NO ☐
4. Economic restructuring	YES ☐	NO ☐
5. Rural diversification	YES ☐	NO ☐
6. Land and property markets	YES ☐	NO ☐
7. Changing employment patterns	YES ☐	NO ☐
8. Demographic change	YES ☐	NO ☐
9. Public services decline / restructuring	YES ☐	NO ☐
10. In/out migration	YES ☐	NO ☐
11. Tourism & recreation	YES ☐	NO ☐
12. Agricultural practice	YES ☐	NO ☐
13. Landscape & ecological change	YES ☐	NO ☐
14. Industrial pollution,	YES ☐	NO ☐
POLICY INITIATIVES		
What types of policy initiatives are undertaken around towns or urban fringe in your area, and to what success?		
GENERAL PLANNING POLICY		
1. Environmental policy & other restrictions		
2. Spatial planning initiatives		
3. Housing – capacity studies, needs etc		
4. Other urban fringe policy		
PROGRAMMES & PARTNERSHIPS		
1. Rural development management		
2. Community participation		
3. LED projects		
4. Other		
DEVELOPMENT INITIATIVES		
1. Urban extensions		
2. New settlements & key villages		
3. Community planning initiatives		
4. Business development, diversification		
5. Renewable energy initiatives		
INFORMATION TOOLKITS		
Are the following used to promote sustainable development around towns or the urban fringe in your area?		
1. GIS & other information systems	YES ☐	NO ☐
2. Sustainability indicator frameworks	YES ☐	NO ☐
3. Surveys/appraisals etc.	YES ☐	NO ☐
4. Community initiatives	YES ☐	NO ☐

Source: Own creation (2007)

Annexure C

Survey of the future development perspective

Table D: Future development perspective survey

ECONOMICAL PERSPECTIVE: Please provide answers according to your personal situation.						
Modus of transport to work	Foot	Bike	Bus	Train	Taxi	Car
Average cost of transport to work per week	>R10	>R50	>R100	>R200	>R500	>R1000
Number of trips to work per week	1	2	3	4	5	>5
Availability of residential sites	5%	10%	20%	30%	40%	50%
Availability of commercial sites	5%	10%	20%	30%	40%	50%
Average cost of living house in local area	R50K	R90K	R250K	R500K	R1M	>R1.5M
Months for development application approval	1	2	4	6	8	>8
Additional costs for bulk services	None	Some	Minimal	Low	Ave	High
SOCIAL PERSPECTIVE: Please provide answers according to your personal situation.						
Time spent in car per week	1h	2h	4h	6h	8h	>10h
Quality of mode of transport	Very poor	Poor	Standard	Acceptable	Good	Very good
Comfort during trip	Very poor	Poor	Standard	Acceptable	Good	Very good
Services available	Water	Light	Sewage	Waste	Roads	Telephone
Accessibility to medical facilities	Very poor	Poor	Standard	Acceptable	Good	Very good
Noise and air pollution	Very poor	Poor	Standard	Acceptable	Some	None
ENVIRONMENTAL PERSPECTIVE: Please provide answers according to your personal situation.						
Green area within walking distance	100m	200m	500m	1km	2km	>3km
Private garden	YES			NO		
Play park and recreation area	YES			NO		
Security at the green area	YES			NO		
Good visibility and lightning	YES			NO		
% open spaces in neighbourhood	1%	5%	10%	15%	30%	50%
% planned green areas	1%	5%	10%	15%	30%	50%
% vacant land in neighbourhood	1%	5%	10%	15%	30%	50%

Source: Own construction (2007)

Annexure D

GDACE exemption application



Gauteng Department of Agriculture, Conservation and Environment

Application for exemption in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (as amended) and the Environmental Impact Assessment Regulations, 2006 (Version 1)

Kindly note that:

1. This application form must be completed if the applicant wishes to apply for exemption from complying with certain provisions of the regulations.
2. This application form is current as of 21 June 2006. It is the responsibility of the EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.
3. The application must be typed within the spaces provided in the form. The sizes of the spaces provided are not necessarily indicative of the amount of information to be provided. It is in the form of a table that can extend itself as each space is filled with typing.
4. Selected boxes must be indicated by a cross and, when the form is completed electronically, must also be highlighted
5. Incomplete applications may be returned to the applicant for revision.
6. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.
7. Three copies of this form and attachments must be handed in at the offices of the relevant competent authority as determined by each authority.
8. No faxed or e-mailed applications will be accepted. Only hand delivered or posted applications will be accepted.
9. Unless protected by law, and clearly indicated as such, all information filled in on this application will become public information on receipt by the competent authority. The applicant/EAP must provide any interested and affected party with the information contained in this application on request, during any stage of the application process.
10. Attachments, where applicable, to this document are to be ordered in the following prescribed manner

Annexure - A	Locality map
Annexure - B	Land owner consent form
Annexure - C	Landowner list
Annexure - D	Local authorities list
Annexure - E	Property description list

Annexure - F	Towns/District list
Annexure - G	Current land use zonings list
Annexure - H	Supporting exemption info
Annexure - I	Other

DEPARTMENTAL DETAILS

Gauteng Department of Agriculture Conservation and Environment
Attention: Administrative Unit of the Sustainable Utilisation of the Environment (SUE) Branch
P.O. Box 8769
Johannesburg
2000

Administrative Unit of the Sustainable Utilisation of the Environment (SUE) Branch
18th floor Glen Cairn Building
73 Market Street, Johannesburg

Admin Unit telephone number: (011) 355 1345
Department central telephone number: (011) 355 1900

1. PROJECT ADMINISTRATIVE DETAILS

Project GDACE Reference No.

(To only be completed when a GDACE reference number has already been issued for this project)

Detail what process has already been undertaken with regards to the EIA Regulations, 2006 (e.g notification of intent, application etc)

Has this project or a substantial similar project which has been previously submitted by the applicant been denied authorisation by the relevant authority in the last three years	YES	NO
If yes will the application contain new or additional material not submitted previously	YES	NO

To be noted that Regulation 78 of EIA Regulations, 2006 states that no applicant may resubmit an application which is substantially similar to an application denied authorisation by the relevant authority unless 3 years has lapsed or new material is to be presented

2. PROJECT DETAILS

Project title:
To be noted that the project will be registered under this title. This title must therefore be duplicated throughout the application life of the project
Local authority(ies) in whose jurisdiction the proposed application will fall:

Activities to Be/Have Been Applied for

An application may be made for more than one listed or specified activity that, together, make up one development proposal. All the listed activities that make up this application must be listed.

Indicate the number and date of the relevant Government Notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity:

Please note that any authorisation that may result out of this application will only cover activities applied for. Omissions may render any authorisation that is based on incomplete information to be null and void.

3. BACKGROUND INFORMATION

Project applicant:	
Trading name (if any):	
Contact person:	
Physical address:	
Postal address:	
Postal code:	
Telephone:	Cell:
E-mail:	Fax:

Project Environmental Assessment Practitioner:

Contact person:	
Postal address:	
Postal code:	
Telephone:	Cell:
E-mail:	Fax:

Landowner:

Contact person:	
Postal address:	
Postal code:	
Telephone:	Cell:
E-mail:	Fax:

In instances where there is more than one landowner, please attach a list of landowners with their contact details to this application.

In instances where the landowner is not the applicant, attached the landowner consent form

List of landowners is attached ☐
Landowner consent form attached ☐

Local authority in whose jurisdiction the proposed activity will fall:

Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

In instances where there is more than one local authority involved, please attach a list of local authorities with their contact details to this application.

List of local authorities is attached ☐

Property description:

(Farm name, portion etc.) Where a large number of properties are involved (e.g. linear activities), please attach a list of property details to this application.

List of properties is attached ☐

Town(s) or district(s):

Street/Physical address:

In instances where there is more than one town or district involved, please attach a list of towns or districts to this application.

List of towns or districts is attached ☐

Current land-use zoning:

In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

List of current land use zonings is attached ☐

Locality map:

A locality map must be attached to the back of this document, as Annexure A. The scale of the locality map must be between 1:10 000 and 1:50 000. The scale must be indicated on the map. The map must indicate the following:

- an accurate indication of the project site position as well as the positions of the alternative sites,
- road access from all major roads in the area;
- road names or numbers of all major roads as well as the roads that provide access to the site(s);
- all roads within a 1km radius of the site or alternative sites; and
- all rivers within a 1km radius of the site or alternative sites
- a north arrow.

4. EXEMPTION DETAILS

1. Please list the relevant provision(s) of the regulations for which exemption is being applied for.

Regulation number	Description

2. Please provide the reasons for each provision for which exemption is being applied for: (Please provide any applicable supporting documentation for your exemption application as Annexure H)

Regulation number	Reasons

3. Was the application for exemption included in a public participation process?

YES NO

Note: This question does not mean that public participation for exemption should occur upfront. This question is to cover situations such as when the need for exemptions was discussed at a public meeting during the scoping process

If yes, provide details of the public participation process followed

4. Will the rights and interests of other parties be adversely affected?

YES NO

4.(a) If Yes to above question, explain in detail how the rights and interests of other parties will be adversely affected

4.(b) If No to the above question, explain in detail why the rights and interests of other parties will not be adversely affected

5. DECLARATIONS

The independent Environmental Assessment Practitioner

I, _____, declare under oath that I –

- act as the independent environmental practitioner in this application for "[insert project title]" ;
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2006;
- have no and will have no vested interest in the proposed activity proceeding;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- undertake to disclose, to the competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006;
- will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;
- will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the competent authority in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the competent authority may be attached to the report without further amendment to the report;
- will keep a register of all interested and affected parties that participated in a public participation process; and
- will provide the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

Signature of the Environmental Assessment Practitioner:
Name of company:
Date:

Signature of the Commissioner of Oaths:
Date:
Designation:
Commissioner of Oaths Official stamp (below)

The Applicant

I, _____, declare under oath that I –

- Am, or have been duly appointed to legally represent, the applicant in this application for "[insert project title]" ;
- appointed the Environmental Assessment Practitioner as indicated under point 5 above to act as the independent Environmental Assessment Practitioner for this application;
- will provide the Environmental Assessment Practitioner and the competent authority with access to all information at my disposal that is relevant to the application;
- will be responsible for the costs incurred in complying with the Environmental Impact Assessment Regulations, 2006, including but not limited to –
 - costs incurred in connection with the appointment of the Environmental Assessment Practitioner or any person contracted by the Environmental Assessment Practitioner;
 - costs incurred in respect of the undertaking of any process required in terms of the regulations;
 - costs in respect of any fee prescribed by the Minister or MEC in respect of the regulations;
 - costs in respect of specialist reviews, if the competent authority decides to recover costs; and
 - the provision of security to ensure compliance with conditions attached to an environmental authorisation, should it be required by the competent authority;
- will ensure that the Environmental Assessment Practitioner is competent to comply with the requirements of these regulations;
- am responsible for complying with the conditions of any environmental authorisation issued by the competent authority;
- hereby indemnify, the government of the Republic, the competent authority and all its officers, agents and employees, from any liability arising out of the content of any report, any procedure or any action for which the applicant or environmental assessment practitioner is responsible in terms of these regulations; and
- will not hold the competent authority responsible for any costs that may be incurred by the applicant in proceeding with an activity prior to an appeal being decided in terms of these regulations.

Signature of the applicant:
Name of company:
Date:

Signature of the Commissioner of Oaths:
Date:
Designation:
Commissioner of Oaths Official stamp (below)

Annexure E

GDACE notice of intent



Gauteng Department of Agriculture, Conservation and Environment

Application for exemption in terms of the National Environmental Management Act, 1998 (Act 107 of 1998) (as amended) and the Environmental Impact Assessment Regulations, 2006 (Version 1)

Kindly note that:

11. The purpose of this form is to notify the Department of the intent to submit an application for Basic Assessment.
12. This application form is current as of 21 June 2006. It is the responsibility of the EAP to ascertain whether subsequent versions of the form have been published or produced by the competent authority.
13. The application must be typed within the spaces provided in the form. The sizes of the spaces provided are not necessarily indicative of the amount of information to be provided. It is in the form of a table that can extend itself as each space is filled with typing.
14. Selected boxes must be indicated by a cross and, when the form is completed electronically, must also be highlighted.
15. Incomplete applications may be returned to the applicant for revision.
16. The use of "not applicable" in the report must be done with circumspection because if it is used in respect of material information that is required by the competent authority for assessing the application, it may result in the rejection of the application as provided for in the regulations.
17. Three copies of this form and the attachments must be handed in at the Department's offices as detailed below.
18. No faxed or e-mailed applications will be accepted. Only hand delivered or posted applications will be accepted.
19. Unless protected by law, and clearly indicated as such, all information filled in on this application will become public information on receipt by the competent authority. The applicant/EAP must provide any interested and affected party with the information contained in this application on request, during any stage of the application process.

DEPARTMENTAL DETAILS

Gauteng Department of Agriculture Conservation and Environment
Attention: Administrative Unit of the Sustainable Utilisation of the Environment (SUE) Branch
P.O. Box 8769
Johannesburg
2000

Administrative Unit of the Sustainable Utilisation of the Environment (SUE) Branch
18th floor Glen Cairn Building
73 Market Street, Johannesburg

Admin Unit telephone number: (011) 355 1345
Department central telephone number: (011) 355 1900

1. PROJECT ADMINISTRATIVE DETAILS

Project title:	
Note that the project will be registered under this title and this title as detailed here must be duplicated through the application life of the project	
Local authority(ies) in whose jurisdiction the proposed application will fall:	

2. ACTIVITIES INTENDED TO BE APPLIED FOR

An application may be made for more than one listed or specified activity that, together, make up one development proposal. All the listed activities that make up this application must be listed.

Indicate the number and date of the relevant Government Notice:	Activity No (s) (in terms of the relevant notice) :	Describe each listed activity: as it is written on the regulations

Please note that any authorisation that may result out of an application will only cover activities applied for. Omissions may render any authorisation that is based on incomplete information to be null and void.

3. BACKGROUND INFORMATION

Project applicant:	
Trading name (if any):	
Contact person:	
Physical address:	
Postal address:	
Postal code:	
Telephone:	
E-mail:	
	Cell:
	Fax:

Project Environmental Assessment Practitioner:	
Contact person:	
Postal address:	
Postal code:	
Telephone:	
E-mail:	
	Cell:
	Fax:

Property Description:	
(Farm name, portions, holdings etc) Where a large number of properties are involved (e.g. linear activities), attach a list of property descriptions to this form.	

List of property descriptions is attached ☐

Street /physical address:	
Where applicable	
Town(s) or district(s):	

In instances where there is more than one town or district involved, please attach a list of towns or districts to this form.

List of town/districts is attached ☐

4. DECLARATIONS

Signature of the applicant:
Name of company:
Date:

Signature of the Commissioner of Oaths:
Date:
Designation:
Commissioner of Oaths Official stamp (below)

Annexure F

Legislation affecting Local Government

Acts

- Abattoir Hygiene Act 121/1992
- Abolition of Racially Based Land Measures Act 108/1991
- Advertising on Roads and Ribbon Development Act 21/1940
- Arbitration Act 42/1965
- Assessment of Damages Act 9/1969
- Atmospheric Pollution Prevention Act 45/1965
- Auditor-General Act 12/1995
- Basic Conditions of Employment Act 75/1997
- Betheldorp Settlement Act 34/1921
- Black Administration Act 38/1927 and Proclamation R110 of 1975
- Black Authorities Act 68/1951
- Black Communities Development Act 4/1984
- Borrowing Powers of Provincial Governments Act 48/1996
- Businesses Act 71/1991
- Cannon Island Settlement Management Act 15/1939
- Cape Town Forshore Act 26/1950
- Carnarvon Outer Commonage Settlement Act 19/1913
- Carnarvon Outer Commonage Subdivision Act 17/1926
- Church Square, Pretoria, Development Act 53/1972
- City of Cape Town (Muizenberg Beach) Improvement Act 17/1925
- Civil Protection Act 67/1977
- Commission on the Remuneration of Representatives Act 37/1994
- Commonages Act (Natal) 35/1904
- Commonages (Cape of Good Hope) Act 17/1919
- Communal Property Associations Act 28/1996
- Community Development Act 3/1966
- Community Welfare Act (House of Rep) 104/1987
- Companies Act 61/1973
- Compensation for Occupational Injuries and Diseases Act 130/1993
- Constitution of the Republic of South Africa Act 108/1996
- Control of Access to Public Premises and Vehicles Act 53/1985
- Corruption Act 94/1992
- Deeds Registry Act 47/1937
- Development Act (House of Rep) 3/1987
- Development and Housing Act 103/1985
- Development Facilitation Act 67/1995
- Discriminatory Legislation Regarding Public Amenities Repeal Act 100/1990
- Durban Borough (Extension of Area) Act 12/1927
- Ebenezer (Van Rhyndorp) Exchange of Land Act 14/1925
- Electoral Commission Act 51/1996
- Electricity Act 41/1987
- Engineering Profession of SA Act 114/1990
- Environment Conservation Act 73/1989
- Expropriation Act 63/1975
- Expropriation of Mining Rights (Townships) Act 96/1969
- Extension of Security of Tenure Act 62/1997
- Finance and Financial Adjustments Acts Consolidation Act 11/1977
- Financial and Fiscal Commission Act 99/1997
- Fire Brigade Services Act 99/1987
- Foodstuffs, Cosmetics and Disinfectants Act 54/1972
- Fund-raising Act 107/1978
- Government Villages Act 44/1973
- Hazardous Substances Act 15/1973
- Health Act 63/1977
- Housing Act (House of Representatives) 2/1987
- Housing Act 4/1966
- Housing Arrangements Act 155/1993
- Housing Development Act (House of Delegates) 4/1987
- Housing Development Schemes for Retired Persons Act 65/1988
- Human Rights Commission Act 54/1994
- Income Tax Act 58/1962
- Intergovernmental Fiscal Relations Act 97/1997
- Interim Protection of Informal Land Rights Act 31/1996
- Jan Kempdorp Act 40/1964
- Klipdrift Settlement Act 23/1947
- Koppies Irrigation Settlement Act 38/1935
- Kwazulu and Natal Joint Services Act 84/1990
- Labour Relations Act 66/1995
- Land Administration Act 2/1995
- Land Reform (Labour Tenants) Act 3/1996
- Land Survey Act 8/1997
- Legal Succession to the SA Services Act 9/1989
- Lekoa City Council Dissolution Act 61/1991
- Less Formal Township Establishment Act 113/1991
- Limitation of Legal Proceedings (Provincial and Local Authorities) Act 94/1970
- Liquor Act 27/1989
- Local Authorities Loans Fund Repeal Act 98/1997
- Local Councils Act (House of Assembly) 94/1987
- Local Government Affairs Council Act (House of Assembly) 84/1989
- Local Government Training Act 41/1985
- Local Government Transition Act 209/1993
- Manpower Training Act 56/1981
- Mapochs Gronden Water and Commonage Act 40/1916
- Marburg Immigration Settlement (Local Board of Management) Act 43/1927
- Marburg Immigration Settlement Regulation Act 50/1971
- Medical, Dental and Supplementary Health Service Professions Act 56/1974
- Mier Rural Area Act (House of Rep) 90/1990
- Mine Health and Safety Act 29/1996
- Mineral Act 50/1991
- Mining Titles Registration Act 16/1967
- Mool River Township Lands Act 5/1926
- Municipal Accountants Act 21/1988
- Municipal Lands (Muizenberg) Act 9/1941
- National Archives of South Africa Act 43/1996
- National Building Regulations and Building Standards Act 103/1977
- National Economic, Development and Labour Council Act 35/1994
- National Emergency Telephone Service Act 143/1993
- National Welfare Act 100/1978
- North Barrow and Weenen Commonages Amendment Act 29/1913
- North-West Commissions Act 18/1994
- Northern Vyfhoek Settlement Adjustment Act 75/1963
- Nursing Act 50/1978
- Occupational Health and Safety Act 85/1993
- Orlighstad Settlement Act 6/1933
- Organised Local Government Act 52/1997
- Pension Benefits for Councillors of Local Authorities Act 105/1987
- Physical Planning Act 125/1991
- Physical Planning Act 88/1967
- Prescription Act 68/1969
- Prevention of Illegal Squatting Act 52/1951
- Prevention of Public Violence and Intimidation Act 139/1991
- Promotion of Local Government Affairs Act 91/1983
- Public Holidays Act 36/1994
- Public Investment Commissioners Act 45/1984
- Public Protector Act 23/1994
- Rating of State Property Act 79/1984
- Regional Services Councils Act 109/1985
- Regulation of Gatherings Act 205/1993
- Removal of Restrictions Act 84/1967
- Rent Control Act 80/1976
- Repeal of Local Government Laws Act 42/1997
- Restitution of Land Rights Act 22/1994
- Road Traffic Act 29/1989
- Road Transportation Act 74/1977
- Roodepoort and Weltevreden Agricultural Settlements Adjustment Act 53/1966
- Rural Areas Act (House of Rep) 9/1987
- SA Qualifications Authority Act 58/1995
- Sea-Shore Act 21/1935
- Settlements (Committee of Management) Act 21/1925
- Skanskop Settlement Act 24/1947
- Slums Act 76/1979
- South African Abattoir Corporation Act 120/1992
- South African Police Service Act 68/1995
- State Land Disposal Act 48/1961
- State President's Committee on National Priorities Act 119/1984
- Subdivision of Agricultural Land Act 70/1970
- Sundays River Settlements Administration Act 15/1925
- Tobacco Products Control Act 83/1993
- Town and Regional Planners Act 19/1984
- Unemployment Insurance Act 30/1966
- United Municipal Executive (Pensions) Act 12/1958
- Urban Transport Act 78/1977
- Validation of Certain By-laws Act (House of Assembly) 48/1990
- Value-added Tax Act 89/1991
- Valuers' Act 23/1982
- Vanwyksvlei Settlement (Local Board of Management) Act 10/1929
- Vanwyksvlei Settlement Regulation Act 68/1970
- Vyfhoek Management Act 39/1935
- Wage Act 5/1957
- Water Act 54/1956
- Water Services Act 108/1997
- Winterton Irrigation Settlement (Local Board of Management) Act 16/1926

Other National Legislation

- Betterment Areas Proclamation, 1967 (Proclamation No. R. 196 of 1967)
- Black Areas Land Regulations (Proclamation R.188 of 1969)
- Licensing and Control of Dogs Proclamation (Transvaal), 1960 (Proclamation No. R.419 of 1960)
- Proclamation R.96 of 1958 - Section 12 bis
- Proclamation concerning Payment by Blacks of Rentals for Arable and Residential Allotments and of Fees for Grazing Stock on certain Land owned by the South African Development Trust, 1968 (Proclamation No. R. 300 of 1968)
- Regulations concerning Land Tenure in Towns (Proclamation R.29 of 1988)
- Regulations for the Control of the Residence on and Occupation of Privately- or Tribally-owned Land in Black Areas, 1967 (Proclamation No. R.192 of 1967)
- Regulations relating to Community Services in Black Areas (Proclamation No. R.199 of 1967)
- Regulations relating to Township Establishment and Land Use (GN R.1897 of 1986)
- Sanitary Regulations - Rural Black Areas (Proclamation No. R.269 of 1968)
- Township Regulations (Proclamation No. R.293 of 1962)

Provincial laws

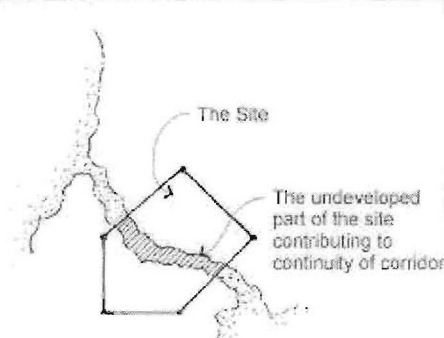
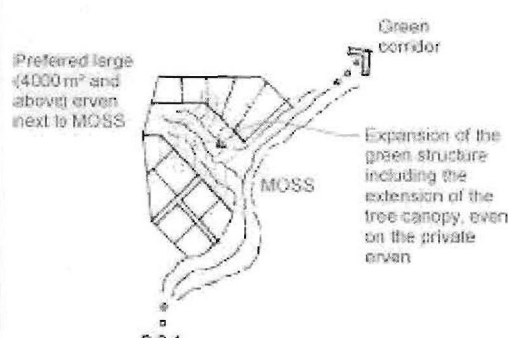
- Bethulie Town Lands Sale Private Ordinance, 1914 (Ordinance No. 9 of 1914) (Orange Free State)
- Boroughs Ordinance, 1924 (Ordinance No. 19 of 1924) (Natal)
- Burial Place Ordinance, 1952 (Ordinance No. 4 of 1952) (Orange Free State)
- By-Laws and Regulations Ordinance, 1922 (Ordinance No. 5 of 1922) (Natal)
- Cape Local Authorities Gas Ordinance, 1912 (Ordinance No. 7 of 1912) (Cape)
- Cemeteries and Crematoria Ordinance, 1969 (Ordinance No. 39 of 1969) (Natal)
- Cemetery Ordinance, 1932 (Ordinance No. 8 of 1932) (Transvaal)
- City of Bloemfontein Ordinance, 1945 (Ordinance No. 5 of 1945) (Orange Free State)
- Civil Defence Ordinance, 1978 (Ordinance No. 5 of 1978) (Natal)
- Civil Defence Ordinance, 1977 (Ordinance No. 20 of 1977) (Transvaal)
- Civil Protection Ordinance, 1977 (Ordinance No. 10 of 1977) (Orange Free State)
- Coloured and Indian Management Committees Ordinance, 1984 (Ordinance No. 4 of 1984) (Transvaal)
- Commissions of Enquiry Ordinance, 1960 (Ordinance No. 9 of 1960) (Transvaal)
- Commissions Ordinance, 1945 (Ordinance No. 1 of 1945) (Cape)
- Commissions Ordinance, 1954 (Ordinance No. 5 of 1954) (Orange Free State)
- Committees of Inquiry Ordinance, 1978 (Ordinance No. 13 of 1978) (Cape)
- Continuation of Local Authorities' By-laws and Regulations Ordinance, 1948 (Ordinance No. 19 of 1948) (Transvaal)
- Control of Dancing Ordinance, 1957 (Ordinance No. 12 of 1957) (Orange Free State)
- Crematorium Ordinance, 1965 (Ordinance No. 18 of 1965) (Transvaal)
- Delegation of Powers Ordinance, 1945 (Ordinance No. 20 of 1945) (Transvaal)
- Delegation of Powers Ordinance, 1965 (Ordinance No. 13 of 1965) (Cape)
- Delegation of Powers Ordinance, 1970 (Ordinance No. 4 of 1970) (Orange Free State)
- Development and Services Board Amendment and Interpretation Ordinance, 1975 (Ordinance No. 11 of 1975) (Natal)
- Development and Services Board Designation Ordinance, 1974 (Ordinance No. 14 of 1974) (Natal)
- Development and Services Board Ordinance, 1941 (Ordinance No. 20 of 1941) (Natal)
- Division of Land Ordinance, 1986 (Ordinance No. 20 of 1986) (Transvaal)
- Divisional Councils Ordinance, 1976 (Ordinance No. 18 of 1976) (Cape)
- Dog Tax Ordinance, 1978 (Ordinance No. 19 of 1978) (Cape)
- Drive-in Theatres Ordinance, 1960 (Ordinance No. 22 of 1960) (Transvaal)
- Drive-in Theatres Ordinance, 1960 (Ordinance No. 8 of 1960) (Orange Free State)
- Dwelling Loans Guarantee Ordinance, 1959 (Ordinance No. 3 of 1959) (Natal)
- Dwelling Loans Guarantee Ordinance, 1959 (Ordinance No. 4 of 1959) (Orange Free State)
- Extra-territorial Assistance Ordinance, 1978 (Ordinance No. 8 of 1978) (Transvaal)
- Gauteng City Improvement Districts Act, 1997 (Act No. 12 of 1997) (Gauteng)
- Gauteng Removal of Restrictions Act, 1996 (Act No. 3 of 1996) (Gauteng)
- Horse Racing and Betting Ordinance, 1968 (Ordinance No. 34 of 1968) (Transvaal)
- Horse Racing and Betting Ordinance, 1978 (Ordinance No. 24 of 1978) (Transvaal)
- Horse-racing and Betting Ordinance, 1977 (Ordinance No. 8 of 1977) (Orange Free State)
- Hospitals Ordinance, 1958 (Ordinance No. 14 of 1958) (Transvaal)
- Incorporated Area Rates Adjustment Ordinance, 1958 (Ordinance No. 5 of 1958) (Natal)
- Ladybrand Erven Amalgamation Amendment Ordinance, 1918 (Ordinance No. 5 of 1918) (Orange Free State)
- Land Use Planning Ordinance, 1985 (Ordinance No. 15 of 1985) (Cape)
- Licences and Business Hours Ordinance, 1973 (Ordinance No. 11 of 1973) (Natal)
- Licensing and Control of Dogs Ordinance, 1933 (Ordinance No. 18 of 1933) (Transvaal)
- Licensing and Control of Dogs Ordinance, 1942 (Ordinance No. 10 of 1942) (Natal)
- Licensing and Control of Dogs Ordinance, 1968 (Ordinance No. 10 of 1968) (Orange Free State)
- Local Authorities (Audit) Ordinance, 1938 (Ordinance No. 17 of 1938) (Cape)
- Local Authorities (Development According to Community) Ordinance, 1963 (Ordinance No. 6 of 1963) (Cape)
- Local Authorities (Investment of Funds) Ordinance, 1935 (Ordinance No. 23 of 1935) (Cape)
- Local Authorities Capital Development Fund Ordinance, 1978 (Ordinance No. 9 of 1978) (Transvaal)
- Local Authorities Capital Development Fund Ordinance, 1978 (Ordinance No. 9 of 1978) (Transvaal)
- Local Authorities Ordinance, 1974 (Ordinance No. 25 of 1974) (Natal)
- Local Authorities Rating Ordinance, 1977 (Ordinance No. 11 of 1977) (Transvaal)
- Local Authorities Roads Ordinance, 1904 (Ordinance No. 44 of 1904) (Transvaal)
- Local Authorities (War Service) Ordinance, 1940 (Ordinance No. 17 of 1940) (Natal)
- Local Government (Administration and Elections) Ordinance, 1960 (Ordinance No. 40 of 1960) (Transvaal)
- Local Government (Extension of Powers) Ordinance, 1962 (Ordinance No. 22 of 1962) (Transvaal)
- Local Government Control Ordinance, 1958 (Ordinance No. 21 of 1958) (Transvaal)
- Local Government Ordinance (Coloureds and Free Settlement Areas), 1963 (Ordinance No. 12 of 1963) (Orange Free State)
- Local Government Ordinance, 1939 (Ordinance No. 17 of 1939) (Transvaal)
- Local Government Ordinance, 1962 (Ordinance No. 8 of 1962) (Orange Free State)
- Local Government Superannuation Ordinance, 1973 (Ordinance No. 24 of 1973) (Natal)
- Markets Ordinance, 1961 (Ordinance No. 21 of 1961) (Transvaal)
- Municipal Consolidated Loans Fund Ordinance, 1952 (Ordinance No. 9 of 1952) (Transvaal)
- Municipal Corporation Ordinance, 1903 (Ordinance No. 58 of 1903) (Transvaal)
- Municipal Elections Ordinance, 1970 (Ordinance No. 16 of 1970) (Transvaal)
- Municipal Ordinance, 1974 (Ordinance No. 20 of 1974) (Cape)
- Municipal Ordinance, 1918 (Ordinance No. 11 of 1918) (Natal)
- Natal Joint Municipal Pension Fund (Retirement) Ordinance, 1974 (Ordinance No. 27 of 1974) (Natal)
- Pound Ordinance, 1952 (Ordinance No. 18 of 1952) (Orange Free State)
- Pounds Ordinance, 1972 (Ordinance No. 13 of 1972) (Transvaal)
- Prescription (Local Authorities) Ordinance, 1964 (Ordinance No. 16 of 1964) (Cape)
- Prohibition of Dog Race - meetings Ordinance, 1976 (Ordinance No. 11 of 1976) (Orange Free State)
- Prohibition of the Dumping of Rubbish Ordinance, 1976 (Ordinance No. 8 of 1976) (Orange Free State)
- Public Bodies (Language) Ordinance, 1958 (Ordinance No. 13 of 1958) (Transvaal)
- Public Resorts Ordinance, 1969 (Ordinance No. 18 of 1969) (Transvaal)
- Recovery of Payments by Statutory Bodies Ordinance, 1977 (Ordinance No. 15 of 1977) (Cape)
- Recreational Facilities Ordinance, 1972 (Ordinance No. 24 of 1972) (Natal)
- Regulations relating to the Establishment and Amendment of Town Planning Schemes for the Province of the Cape of Good Hope (PN.733 of 1989) (Cape of Good Hope)
- Removal of Graves and Dead Bodies Ordinance, 1925 (Ordinance No. 7 of 1925) (Transvaal)
- Roads Ordinance, 1957 (Ordinance No. 22 of 1957) (Transvaal)
- Roads Ordinance, 1968 (Ordinance No. 4 of 1968) (Orange Free State)
- Shop Hours Ordinance, 1986 (Ordinance No. 8 of 1986) (Transvaal)
- Shop Hours Ordinance, 1976 (Ordinance No. 16 of 1976) (Cape)

Annexure G

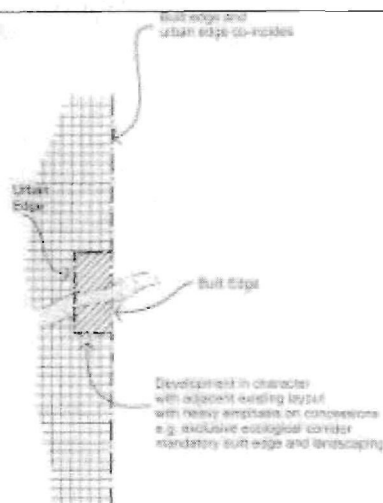
Sensitivity analysis: Cape Town urban edge approach

The urban edge delineation in Cape Town was done via a sensitivity analysis and aimed at emphasizing the awareness of the planner, to sensitive issues as emerging from the normative position, which should be kept in mind when undertaking the detailed evaluation.

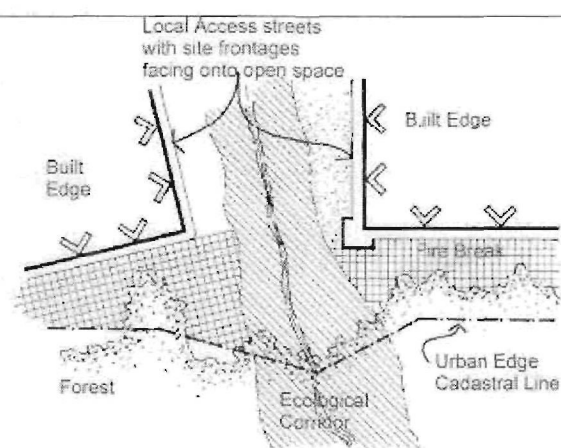
Table 64: Sensitivity analysis of the urban edge in Cape Town

Comments	Illustration
The proposed development should contribute to the continuity and sustainability of ecological corridors.	 The Site The undeveloped part of the site contributing to continuity of corridor
When a site is adjacent to a "green corridor", it is important that the development responds appropriately, and where possible, contributes towards and expands the green structure.	 Preferred large (4000 m² and above) even next to MOSS Green corridor MOSS Expansion of the green structure including the extension of the tree canopy, even on the private even

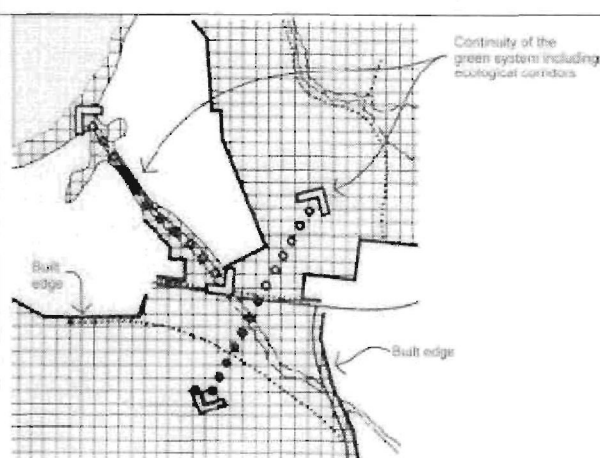
Amendment of the current urban edge: Where applications outside the edge are approved, this should only be done where major concessions to the natural environment can be made, including inter alia, the completion of ecological corridors and open space systems. The nature of the built form in such instances must reflect the logic of the decision to amend the edge and must comply with the other applicable considerations in this document.



Development potential: The Local Authority is responsible for ensuring short-term and long-term safety issues are adequately addressed. In this regard, it is important to ensure that the ecological limits of the natural environment are respected.



Sustainability: The Local Authority is responsible for ensuring long-term sustainability issues, including downstream and upstream impacts are adequately addressed. In this regard, it is important to ensure that the ecological limits of the natural environment are respected. Issues such as flood lines and water levels should be taken cognizance of. Subdivision applications that divide corridors or protected natural environments should therefore be carefully assessed.



Source: Cape Town (2004)