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# The Urban Development Boundary as a Planning Tool for Sustainable Urban Form: The South African Situation

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***Abstract*—**It is the living conditions in the cities that determine the future of our livelihood. "To change life, we must first change space"- Henri Lefebvre.

Sustainable development is a utopian aspiration for South African cities (especially the case study of the Gauteng City Region), which are currently characterized by unplanned growth and increasing urban sprawl. While the reasons for poor environmental quality and living conditions 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 article seeks a solution to the problem of sustainability, from a spatial planning perspective. The spatial planning tool, the urban development boundary, is introduced as the concept that will ensure empty talk being translated into a sustainable vision. The urban development boundary is a spatial planning tool that can be used and implemented to direct urban growth towards a more sustainable form. The urban development boundary aims to ensure planned urban areas, in contrast to the current unplanned areas characterized by urban sprawl and insufficient infrastructure.

However, the success of the urban development boundary concept is subject to effective implementation measures, as well as adequate and efficient management. The concept of sustainable development can function as a driving force underlying societal change and transformation, but the interface between spatial planning and environmental management needs to be established (as this is the core aspects underlying sustainable development), and authorities needs to understand and implement this interface consecutively. This interface can, however, realize in terms of the objectives of the planning tool – the urban development boundary.

The case study, the Gauteng City Region, is depicted as a site of economic growth and innovation, but there is a lack of good urban and regional governance, impacting on the design (layout) and function of urban areas and land use, as current authorities make uninformed decisions in terms of development applications, leading to unsustainable urban forms and unsustainable nodes. Place and space concepts are thus critical matters applicable to planning of the Gauteng City Region. The urban development boundary are thus explored as a planning tool to guide decision-making, and create a sustainable urban form, leading to better environmental and living conditions, and continuous sustainability.

***Keywords*—**Urban planning, sustainable urban form, urban development boundary, planning tool.

## I. Introduction

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 [1]. This article propose an alternative, more appropriate approach which is likely to produce spatial layout and development plans with the ability to initiate urban environments of quality and sustainability. The aim is to transform the empty talk into sustainable vision. This study is a guide and stimulus, providing suggestions and ways for South African cities to address the current spatial problems by means of development proposals that will enhance urban sustainability and ensure a sustainable urban form, based on the case study for the Gauteng city region. Good urban form requires 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. 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 [4].

### *A. A Sustainable Approach*

The policy and legal framework in South Africa are the core basis underlying planning and development, and thus guiding sustainable urban form. The core sustainable development issues guided by legislation include spatial planning, environmental management and the concept of compactness. Accordingly the South Africa interpretation of these concepts is given:

Spatial planning: Concentrating urban functions offers considerable advantages when it comes to developing powerful urban networks, however, 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 [2]. The differences between the concepts of compact urban form for Europe and Africa manifest in the availability of space. South African cities have adequate space for any kind of development, whereas European cities are mostly planning space-effective, because of the limitation of expansion. Therefore spatial planning in the South African context needs a different approach. Space needs to be at the premium within the city centres.

Environmental Management: Environmental management is one of the core elements driving sustainable development, but ironically there is currently no interface between spatial

planning and environmental management. Living within the environment implies achieving equity and social justice, and inclusiveness in decision-making processes. In a developing country like South Africa, there is an enormous range of people, cultures and economies, therefore the size of the problem is immense and growing fast, even faster than in European cities.

Compactness: Compactness appears to be an aspiration and a hoped-for solution to the problems of the explosive growth of urban areas, especially in terms of the intensification of many sub-centres within a metropolitan region. As mentioned South African cities have adequate space for development, these cities have large parcels of strategically-located vacant land, which needed to be mobilised towards greater compaction in terms of spatial planning approaches [3]. Compactness in this sense 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.

## II. Methods and Materials

### A. How the Study was Undertaken

Two core issues directed this research. Firstly, the gap between literature and practice and secondly the implementation of the planning tools itself. These issues were evaluated and tested within the Gauteng City Region case study.

In regards to the gap between the literature and practise: 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 Gauteng illustrates that literature does not meet practise. The maps are not an illustration of the current reality, or rather, the actual development is not in line with the layout planning, frameworks and policies. This is the result of lack of knowledge, poor management and control structures.

In regards to the implementation of the planning tool itself: 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 unsuccessful implementation, it was evident that this alone was not enough to change the urban form [7]. There is a need for a simplistic approach and implementable tool. Furthermore, the spatial planning tool need to be understood by the relevant authorities, and managed accordingly, in order to be implemented successfully. Then only will urban development be guided towards sustainability, as the urban form will be structured and planned as a holistic unit.

### B. Gauteng Case Study

All issues and research questions were based on the finding of the Gauteng City Region case study. 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 and Gauteng must bring together the three major metropolitan units of Johannesburg, Tshwane and Ekurhuleni to work together to create a globally-competitive region [5]. 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. Spatial planning characteristics include:

1) A multi-nodal and spatially-fragmented structure
2) Decentralisation and decline of the inner city
3) Low density sprawl
4) Separation of functions
5) Car-dominated road and street network
6) Ribbon development along highways
7) Unbalanced city growth
8) Segregation and inequality

To transform Gauteng into a globally-competitive city region entails a new way of thinking about development in the province. 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 [6].

## III. Results

### A. The Urban Edge Concept

The urban edge concept was implemented into the South African urban environment to address these objectives of unplanned urban areas, urban sprawl and insufficient urban areas. 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.

However, 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.

The failure of the concept can be drawn to the fact that 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 only guides and directs development

patterns [8].

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. 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 [7].

The evaluation of the Gauteng urban edge was done via the specific arguments that were raised from relevant stakeholders, the public and private sectors, as well as managing authorities. These arguments were either in favour of, or against the current urban edge concept.

Arguments in favour of the urban edge included: The outcome and objectives of the urban edge are positive, it is applied in accordance with approved provincial policy, it is supported by the Conservation Plan, the Open Space Plan and the Agricultural Potential Assessment, municipalities favour the urban edge, however they want to manage the edge locally.

Arguments against the urban edge included: Implementation of the urban edge by the Gauteng Department of Agriculture, Conservation and Environment (GDACE) was unsuccessful, GDACE only uses the rigid line and does not give consideration to the other components [9], there is a lack of clearly-defined roles at provincial level, applications were 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 and the urban edge inhibits social and economic development.

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 [10]. This is not the case, as the current reality emphasises through the occurring urban sprawl, the lack of development management and the unsustainable urban form that exists.

### *B. The Urban Development Boundary Concept*

The urban development boundary is proposed as the spatial planning tool that will be able to address the current urban problems and lacks of the urban edge concept. The urban development boundary was internationally conceptualised as containing two elements [11]: The urban development area (UDA) and the urban expansion area (UEA).

1) The urban development area (UDA) represents the areas where urban development may presently occur, from areas where it is prohibited. It is defined by cadastral boundaries and contours as a single line. It is similar to the South African concept of the urban edge.
2) The urban expansion area (UEA) represents the future development boundary. It is the area demarcated for future growth outside the urban development area (UDA). 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.

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 and distinguish the significance in land-use planning [11].

The urban development boundary is not set to be the ultimate spatial planning tool, or the answer to all spatial problems in South African cities, but it is a step in the right direction, as its approach is towards planned development and holistic management.

The urban development boundary is a practical implementation approach of the urban edge concept. The urban development boundary will guide the transition from urban to rural via a polycentric development pattern. It will protect the rural area and enhance the effectiveness of the urban area. 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.

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. Figure 1 illustrates the impact that the urban development boundary will have on the current spatial development pattern, when introducing and implementing the polycentric development pattern.

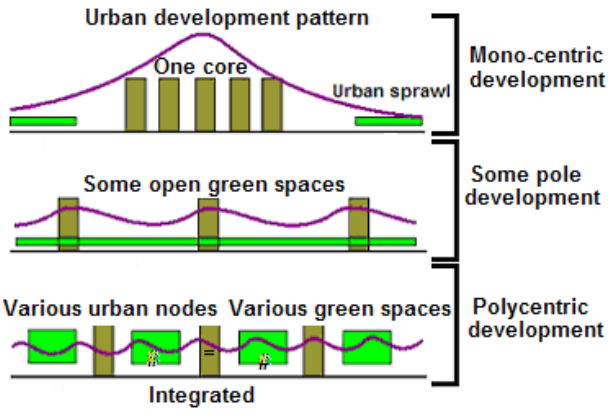


Fig. 1 Spatial impact of polycentric development

Furthermore, 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 [12]. The urban development boundary, if implemented and maintained correctly, will thus take the role of the following tools:

1) Restructuring tool: Restructure the urban areas and integrating the currently segregated social groups and urban uses into a holistic urban environment.

2) Growth management tool: Used to limit sprawl and the outward growth of urban areas, in favour of densification and infill development via node development.

3) Efficiency tool: Integrate and connect the more efficient use of resources and land within the urban area.

4) Conservation tool: Divide the green environment from the urban area, protect or preserve it by identifying green areas and creating development nodes.

The economic impact of the urban development boundary is illustrated in the following figures.

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. The urban development boundary will ensure a smaller decline in the economic activity, by enhancing homogenous development in the whole Gauteng region. Polycentric development enhances even distribution of people, resources and material and will ensure that economic activity is more evenly distributed between the urban nodes.

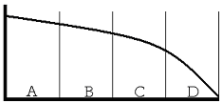


Fig. 2 Economic activity in relation to the distance from the core

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

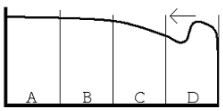


Fig. 3 Ground value in relation to the distance

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.

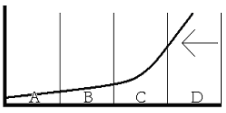


Fig. 4 Forces of attraction towards the core

This concept illustrates the complexity of urban sustainability. The urban development boundary requires development management within the urban core (urban development area), as well as outside the urban core (urban expansion area).

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.

## IV. Discussion

The success of the urban development boundary concept is subject to an implementation and management strategy.

### *A. Implementation Strategy*

The implementation of the urban development boundary concept should be supported by growth management measures and good governance.

The Municipal Systems Act (Act 32 of 2000) requires local governments to prepare an Integrated Development Plan (IDP), which provides a framework for holistic development, integrated and participatory strategic planning, and municipal guidance. The Municipal Planning and Performance Management Regulations [13], 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'. Therefore an interface between environmental management and spatial planning is enhanced.

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. The spatial planning process is thus faced with the challenge to translate integrated environmental management and integrated development plans into workable Land Use Management Systems (LUMS). Khan, Jewell and Von Riesen [14] were the first to attempt to address this important interface. Khan [14] stated a review of the existing Town Planning Scheme is needed in order to address this interface.

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. Therefore the need for an integrated land-use management scheme (addressing spatial planning and environmental management issues) are of

critical importance.

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 Fig. 5 [15] is proposed to enhance the alignment between these processes.

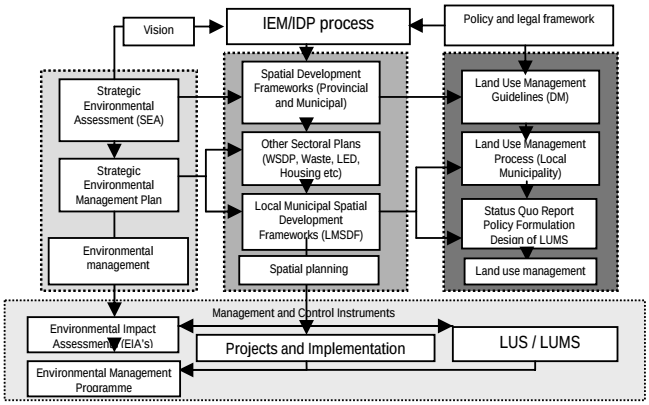


Fig. 5 Interface between IDP, environmental management, spatial planning and land use management

### *B. Management*

The need for a Growth Management Strategy that should form an integral part of the municipal Spatial Development Framework is enhanced. The following growth management tools should be incorporated:

1) Comprehensive Plan integrating initiatives of the SDF and IDP and integrating the urban development boundary objectives.
2) Activity node development for strategic development and growth guided through zoning restrictions.

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.

### *C. Why the Results is Significant*

There are key lessons for all developing countries to guide spatial planning in urban environments. This includes:

Good governance is the key to successful implementation of the urban development boundary. 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.

Simplified legislation leads to successful implementation. 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 success of urban development rests on the ability of local and provincial governments to integrate their plans. There is a need for an interface between spatial planning and environmental management.

## V. Conclusion

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 creating places in the urban spaces.

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. The urban development boundary will have similar objectives as the current urban edge phenomenon, but the approach and understanding of the concept will be the cardinal difference between these two concept, and most likely the reason why the urban development boundary will be implemented successfully and managed accordingly.

Furthermore, layout planning should incorporate the elements of the urban development boundary, and plan differently for the urban development area, and the urban expansion area. Layout planning should be structured around these concepts, and ensure integration, but also compaction of these different, but supporting functions.

Land use should be managed according to the layout planning. Authorities need to be informed in order to make strategic decisions regarding the spatial planning and development of the urban areas and surrounding rural areas. The urban development boundary requires certain land uses in and around the boundary, in order to structure an urban form that will be sustainable. However, adequate decision-making structures will be critical in ensuring the successful manifestation of the urban development boundary concept in South African cities.

The urban development boundary are thus a planning tool used to guide decision-making, and create a sustainable urban form, leading to better environmental and living conditions, and continuous sustainability. This is illustrated in the final figure.

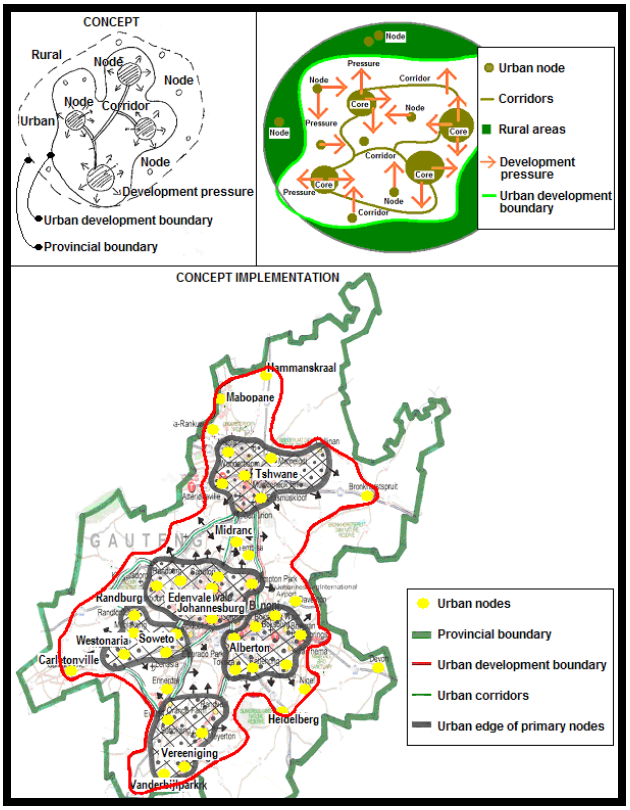


Fig. 6 Practical implementation

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