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Smart Cities and Infrastructure Development: A Case Study of the Gauteng City Region in South Africa

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1 ABSTRACT

Infrastructure development is a critical enabler of socio-economic development and contributes to raising the quality of life through the creation of social amenities and consequently contribute to macro-economic stability. Smart city has recently become a buzz concept that leads the way to an inclusive and democratic urban future planning and urban growth. In South Africa, generally, the communities are in search of urban prospects and as a result are disadvantaged as an unintended consequence. This is primarily due to a lack of bulk infrastructure services such as sanitation and water treatment, which is unable to cope thereof, necessitating Smart City to become a high-impact, compact, complex, mixed-use urban development that is designed to deliver urban prospects to a more marginalized periphery. Whilst various components and processes which play a vital role in developing or creating smart cities have been discussed in detail over the years, there is still a need to demonstrate the role and interventions towards the economic development of the City of Johannesburg, particularly in urban areas in the Global South. Consequently, this paper explores the impact of Smart City initiatives on socio-economic development in the greater Gauteng City Region, South Africa. The work adopts a phenological case study research design and a qualitative approach to gather data through a series of desktop research and literature reviews. The data was analyzed using thematic analysis as a research method to reveal themes on inclusivity and access and Excel software package was applied to obtain descriptive statistical results. Also, a systematic review of the literature to analyze Smart City strategies embedded in the spatial development framework. Findings reveal the crucial role of effective urban development planning in the economic infrastructure value chain. Successful Smart City implementation contributes significantly to economic growth, diversification, and improved access to modern technology. The paper concludes further that smart city initiatives and state investment in infrastructure contribute largely to economic growth as a benefit, as well as diversification of the economy, thereby providing access to modern technology. The study recommends an inclusive and integrated policy framework for resource allocation aligned with growth and development in Smart City initiatives, ensuring a cohesive approach.

Keywords: Economic Growth Investment, Infrastructure Development, Smart Cities, Social Amenities, Spatial and Urban Planning

2 INTRODUCTION AND BACKGROUND

The global population today continues to shift towards urban areas and expand rapidly in developing countries and catalyzes significant economic and social development and transformation, hence modernization of infrastructure is significant for future economic competitiveness and play a very pivotal role in accommodating the expanding population in the urbanizing environment. Literature research study shows that smart cities provide comfort to the people as they migrate from rural to urban cities, hence Ahad, Casalino & Bhushan (2023) argue that smart cities gives practical solutions to the myriad of challenges that the communities are faced with thereby providing some benefits such as clearer and better coordinated, integrated planning and development. Furthermore, to ensure that the cities are able to effectively use its energy renewable and green technology and building. Smart cities would need to become the drivers of rapid, inclusive, and sustainable economic growth and transform spatial inequities, thus Vinod (2022) views smart city as constantly evolving with innovation and creativity, as well as citizen engagements through city integrated development planning. The notion of infrastructure development is consistent with international best practices for sustainable and robust economic development based on an alternative growth path and has immense capacity and potential to propel and create new impetus to grow the economy, and all these entails improving planning, sanitation waste-water management and other social amenities (Chatterjee et al. 2023).

This is especially true for countries that were severely devastated and constrained by the history of various forms of urban and spatial planning inequalities. In the South African perspective, infrastructure development is linked to the social economic context, this therefore denotes that inequalities, poverty, and unemployment have a direct impact on the sustainability of smart cities and urban populations, as well as people's behavioral patterns which is a phenomenon that is becoming prevalent in the global south. Although the (National Development Plan 2030) provides a clearer vision of how South Africa intends to eliminate poverty and reduce these inequalities, it further guides on a set of normative principles that will create a conducive space, livable environment and sustainable to support economic opportunities, as well as social cohesion. The concept of a smart city has evolved and has gained much more global popularity as a fundamental mechanism to address urbanization, environmental concerns, as well as economic growth, particularly with the technological demand as technology advances., hence according to Adriano et al. (2021) becoming innovative and creative cities is important to ensure that cities are able to address its challenges of providing services to its citizens.

In view hereof, it is imperative to take into cognizance that a smart city is not necessarily an information and communication technology conceptualization of a modern city, it is however based on principles that underpin a truly sustainable approach to nation and city building, as well as the need for social, economic and cultural inclusivity, although according to McKenna (2021), Information technology, access to public data are critical element that contributes to the making of smart cities, as results a city that is divided along economic, ethnic, and cultural diversity cannot be sustainable, hence the notion of a smart city requires many dimensions of a city building, and not just a city operating of a comprehensive enabled information and communication technology platform. This paper has therefore explored frameworks that are used to guide the development of smart cities and identified relevant literature and systematically reviewed such for relevance to gain meaningful insight into the data.

3 CONTEXTUAL FRAMEWORK

3.1 Smart City – Origins

The introduction of information communication technology infrastructure necessitated the need to originate the concept of smart cities in the early 1990's with cities starting to regard themselves as cities with smart collaborations and focused on infrastructure-based services using ICT and drive their smart city agenda which often in support of their market expansion strategies (Department of Corporative Governance, 2021).

The ICT investment is based on digital, transition and economy in which citizens have access to knowledge based and sophisticated, information communication technology. In South Africa, in particular the Gauteng City Region, spheres of government have partnered with private sectors and universities to impart digital skills and build centre of excellence in the innovation eco-system with most households, in Gauteng having access to internet connectivity and consequently impact positively in their lives (SACN. 2016). In this regard, the development of smart cities results in various challenges and according to Das (2013) these modelling challenges includes lack of sufficient and reliable data influencing smart city development.

The concept of a smart city has a plethora of definitions with varying conceptual interpretations that often substitute the term smart with an alternative description such as digital or in certain instances intelligent (Smart Cities, 2023). This definition is evolving throughout literature within the smart city paradigm, hence many cities across the globe invest in the realm of information technology communication to ground the smart city definition (Mallory and Baches, 2022), however, with a particular focus on the fourth industrial revolution technologies. Table 1 below shows some list of different scholar's interpretation and meaning in relation to smart city definitions.

Studies show that there is no consensus on the definition of the concept of smart cities, however many definitions have one centrality to information and communication technology which is deemed to be critical in facilitating systems dimension that affect the lives of residents within the city or town. Smart cities change the development and spatial city planning and how it is managed over a short term which enables cities to become smarter in the long-term. The figure 1 below as adapted from (Joshi et al., 2016) illustrates smart city dimensions that enable it to function as different aspects that make an urban system.

| Source	Definitions
Townsend Anthony, 2013	A city where information technology is being incorporated into services that affect urban problems. "Smart city perspective places where information technology is combined with infrastructure, architecture, in order to address the social, economic, and environmental problems that the citizen is experiences in daily basis." Townsend, 2013 outlines these perspectives in relation to information technology as a mechanism to address societies social problems in the smart city.
McKenna Patricia, 2021	Smart city definitions and concepts are based on perspective regarding smart cities and regions which are definitions for urban theory in relation to smart cities.
Harrison Colin and Abbott Donnelly, 2011	A city that has "Urban Systems models that are capable of helping citizens, entrepreneurs, civic organizations, and governments to see more deeply into how their cities work, how people use the city, how they feel about it, where the city faces problems, and what kinds of remediation can be applied".
Rana et al., 2019	Smart city can be defined as "Technologically advanced and modernized territory with a certain intellectual ability that deals with various social, technological, economic aspects of growth based on smart computing techniques to develop superior infrastructure constituents and services".
The British Standards Institute (BSI, 2014)	Smart cities are "the effective integration of physical, digital and human systems in the built environment to deliver a sustainable, prosperous and inclusive future for its citizens".

Table 1: Smart City Definitions
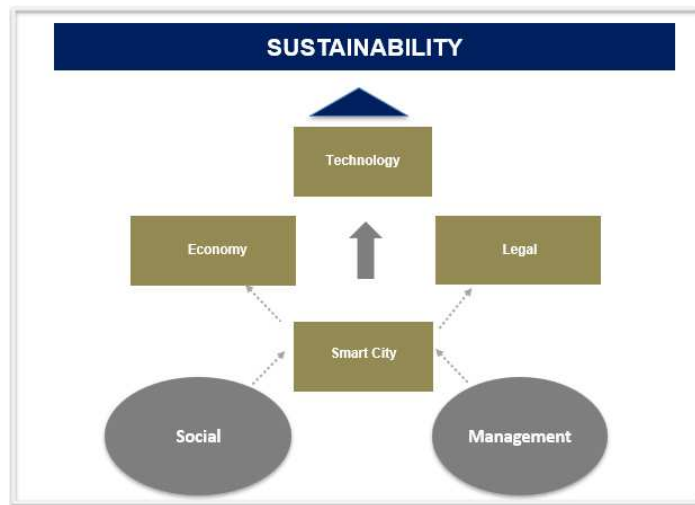
Figure 1: Smart Cities Dimension. Source: Joshi et al., 2016.

The figure above illustrates smart city dimensions that enable it to function as different aspects that make an urban system. There is a wide consensus of accepting the dimension of smart city concept, hence the development of city contributes to the investments in economy, technology, social, legal, and management.

3.2 Smart City Benefits

3.2.1   Smart City Global Perspective

Infrastructure is regarded as one of the very most powerful driver of economic and social growth in urban planning in the global south, hence literature studies reveal that the concept smart city is generally growing with time with its focus now shifted to generation of technology enabled and smart city led which is mainly people centric. These smart cities emergence, according to Tooran (2021), Global trends of smart cities as a results of information communication technology which plays a major role in the transformation and changing of urban life and space, hence cities and regions around the world have taken initiatives to prioritise integrated urban planning, economic development and productivity growth.

In the context of the global perspective, the concept smart city is essential in the development of the eco-system which ensures that citizens in the cities have access to provision of social amenities, security and safety including health environment. The table 2 below illustrate the best practices of the global and African perspective.

Table 2 illustrates Smart Cities best practices of the global, African, and South African perspective. Further highlights some critical success factors extracted from global smart cities. A few cities in Africa have taken a serious step on investing in ICTs for growth and development.

In the developed countries, information technology and innovation is central to the success of the smart city through introduction of big data and artificial intelligence, which plays a major role in the development of a smart cities and urban planning as shown in figure 2.

City	Key features and lessons to be learned
Key features and lessons to be learned from leading smart cities:	
Singapore	Developed an entire smart city ecosystem supported by infrastructure, technologies, policies, culture, and capabilities.
Búzios, Brazil	The Búzios Smart City project created a smart grid that generates renewable energy.
Key smart city features and lessons from an African perspective:	
Lagos, Nigeria	The city designed the national Nigeria Smart City Initiative, which has managed to secure significant investment from local and multinational ICT companies.
Moka, Mauritius	Moka is a relatively new city. It is being built around smart city technologies as a means of boosting the economy and improving the standard of living.
Key smart city features from South African perspective:	
Waterfall, South Africa	Waterfall City as the "the largest mixed-use development in South Africa". It gives the community the possibility of enjoying the convenience of work, life, and lifestyle all in one environment. Smart cities provide a new and improved transport networks Using wireless electronics and communication technologies, users and consumers are provided with a "smarter, safer and faster way to travel". Smart transport systems drastically reduce commuting times.

Table 2: Smart Cities Best Practices: Source: Maphangwa and van der Waldt, 2023
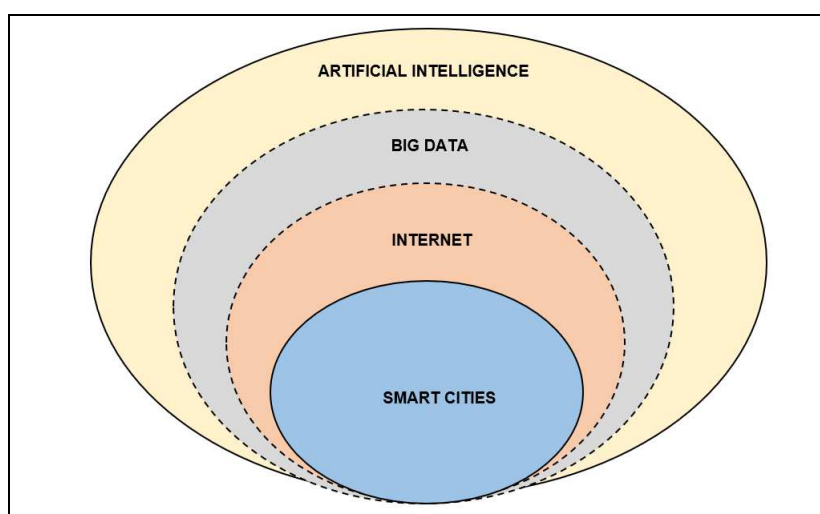

Figure 2: AI-Based Services for Smart Cities and Urban Infrastructure. Source: Kangjuan, Lyu et al., 2021.

The figure above shows that smart cities is an important phenomenon and provide a new model of urban governance which is able to protect the cites ecology and environment hence urban planning and big data and internet is a critical strategic decision making to the cities development.

3.2.2 Smart Urban Planning System in African Cities

The notion of spatial planning, particularly in the African continent is critical to ensure sustainable development for a country since it could impact the environment and socio-economic aspects. According to Chavunduka et al. (2022), the growing population and rapid migration in the African continents require adequate and reliable infrastructure that meets the demands of social amenities such as affordable human settlement and employment opportunities, hence spatial planning systems inherited during the colonial era are not suitable to African realities of rapid urbanization and change of spatial inequalities.

African cities are faced with greater challenges of urban planning and development arising from rapid urbanization and increasing population, hence developing countries have considered new initiatives and approaches, such as the smart city concept. This asserts that urban planning provides the basis for the development of all towns and cities including access to digital data and information communication technologies which are integral parts of geo-spatial information.

Smart cities create a wealth of opportunities and impact people's quality of life and directly improve citizens' convenience. Thus, initiatives to adapt to changing technological demands such as public Wi-Fi have a direct positive impact on people's quality of life. According to Gora and Banji (2017), the African urban growth rate and urbanization are rapidly growing at 3.5% with the majority of the African population sitting at 52% already living in towns and cities. These urbanizations and rapid African urban population are projected to increase to above 50% by 2030, hence the development of large cities and towns provides

opportunities for economies of scale and necessitates infrastructure investment to respond to the increased demand such as water sanitation, energy efficiencies and effective and efficient provision of waste solid management. An African smart city that is sustainable should be geared towards people centric approach premise on the principle and foundation of information communication technology, sustainable infrastructure development and social security, peace, and safer communities. Figure 3 below illustrates the dimensions and components of a smart economy in a smart African city, which provides opportunities for investment and economic growth.
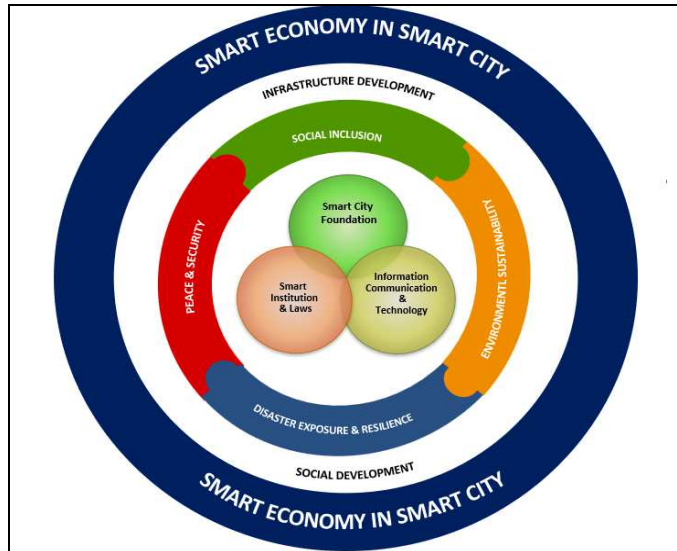

Figure 3: Smart Economy in Smart African Cities Conceptual Framework. Source: Mboup, 2017.

The figure above shows the dimensions and components of a smart economy in a smart African city, which provides an advance research institutes that enhance the telecommunications infrastructure, which contribute to the creation of employment and the advancement of advanced technology.

3.3 South Africa's Approach to Smart Cities

South Africa is a constitutional democracy with three spheres of government, which are national, provincial and local. These three spheres of government are distinct from one another and are interdependent. The Constitution of South Africa grants each one of these spheres the autonomy to exercise its powers and perform functions within the required parameters. South Africa's economic outlook is perceived to be steadily declining in growth rate as a result of domestic and global constraints. This is attributed to inadequate social infrastructure factors such as water shortages, serious drought and labour unrest, as well as the challenges for electricity generation, transmission and distribution which is aging infrastructure including, tighter fiscal policy and policy uncertainties, which inhibit private investment. This necessitates South African government cities and towns to embark on a drive to address the legacy of colonial and apartheid socio-economic and spatial engineering and adapt to a set of global forces that are redefining global economy.
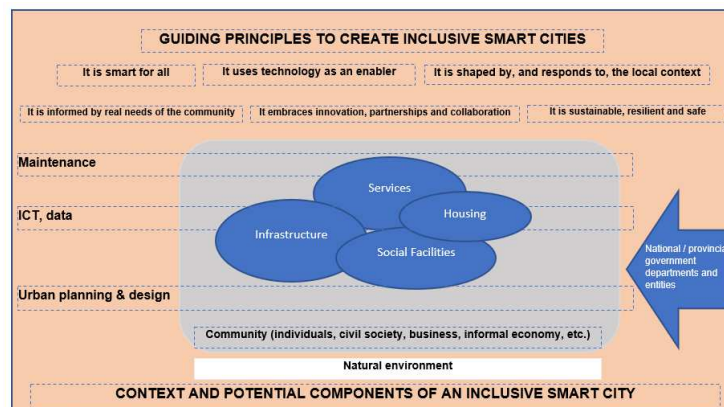

Figure 4: A South African Smart Cities Framework. Source: Department of Cooperative Governance (DCoG), March 2021.

The Department of Corporative Governance, 2021 provides a clear approach and understanding regarding Smart City initiatives and focused benefits to different municipalities that are entrusted with the responsibility to initiate smart cities. These initiatives should be direct and deliberate to improve the lives of the people who are residing in that city or town. Figure 4 outlines a detailed example of smart city components, collaboration and relevant role-players participating in a Smart City initiative.

The National Development Plan (NDP) 2030 provides a long-term vision for South Africa and defines a desired destination, specifically aimed at eliminating poverty and reducing inequality by 2030. The figure above further depicts an inclusive smart city that should incorporate smart technologies to improve the citizens' standard of living, urban processes, and services efficiencies to meet future needs in relation to socio-economic and environmental issues in a smart city, as well as smart people as defined in the United Nations Economic Commissions for Europe 2020, which foster sustainability across the environment, economic social and cultural dimensions. It is for this reason that there is more value in the usage of technology. It is therefore in this context that smart cities encourage the development of new ideas, as well as innovative solutions to increase employment and decrease the city inequalities and skewed land distribution.

The concept smart city and development model are gaining momentum necessitating many great cities globally and locally to be in the path of becoming smartest cities. Whilst South Africa is a developing country, is constraint with increasing population growth rate, high unemployment, constant demand for basics services, public transport, energy water and provision of health care services amongst other, hence metropolitan cities in South Africa have different challenges requiring specific solutions.

Sanjay (2019), argues that in South Africa, the largest mixed-use development is the Waterfall City, which is situated, adjacent to the Mall of Africa, located between Johannesburg and Pretoria in the Gauteng city region and essentially provides an integrated social amenities, and it is regarded as an enjoyable place for citizens to work in and live a fulfilled lifestyle. In the same vein, Sandton eco smart city which is the financial and commercial area in the City of Johannesburg, is also regarded as a world class precinct with sustainable, smart choice for business, transport, institutions of learning, health, as well as residential area for the citizens. In terms of transport integrated system is close proximity to Randburg, Rosebank, Bryanston and Hyde Park. In this regard these model of smart city in the Gauteng city region advance compaction, residential densification, in-fill development and mixed land uses within the existing urban fabric that promotes walking, as well as cycling. This further includes an integrated public transport nodes which is reliable, accessible and safe necessary to give effect to redress the apartheid spatial planning, in the Gauteng city region. It is therefore in this context that the (National Development Plan, 2030) provides clear initiatives to advance urban restructuring and revitalisation objectives in the rural and urban landscape development boundaries in South Africa.

Identification	
Systematic Literature Review	The first step was to conduct a literature review which in essence covers some critical concepts for the study which includes Smart City, sustainable infrastructure development, smart economy and how such apply to the study area of Johannesburg city region intervention. The approach in this study highlighted the benefits and challenges concerning people, information communication technology, provision of basic infrastructure services and policy context in the smart cities paradigm and how these favors a sustainable outcome and intervention in the new shape of urbanization, modernization and reindustrialization.
Screening	The concept of Smart City has become a buzzword and has evolved. Empirical evidence and studies reveal that there is constantly rising published papers on smart cities, however, the high population growth rate in the South African perspective, has an impact and strain on the infrastructure investment in the sense that the current level of infrastructure is not equivalent or meeting the demand on required social infrastructure, as well as provision of services.
Included and eligibility	This study outlines the findings using and analysis of literature in the methodology and design considering the preferred reporting items for systematic reviews and meta-analyses (PRISMA) TOOL. The published papers cited were screened and checked for relevance in relation to the concept of smart cities and infrastructure development.

Table 3: Study Research Methodology

4   METHODOLOGY

The research design for this paper entails case study and desktop approach incorporating various methods of data collection. This process of data collection and analysis for this paper is described in the following table. In this article, the researchers adopted "the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)", as an item checklist, that filter relevant information using the four criteria to guide

the researchers in their research study: identification, screening, eligibility and inclusion. This section introduces the methodology followed in this study, as depicted in table 3.

Table 3 illustrates the methodology followed in this study for data collection and analysis. The study adopted "the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA)", to screen or filter relevant information. It is an evidence-based minimum set of items for reporting in systematic reviews and meta-analyses.

5   RESULTS AND DISCUSSIONS

This paper finds that the concept Smart City has various meanings and interpretations. As such, in the context of this study, research is intended to increase the efficiencies of urban infrastructure development and management in the Gauteng city region through developmental solutions and possibly technologies, as well as promoting smart and green technologies. This is critical in light of changed climatic conditions and the need to promote a sustainable environment and green development. At the centre of this infrastructure value chain, is the provision of water, sanitation, and energy efficiencies which directly affect the livelihood and health of the people within the regions and cities. The study shows that rapid urbanization and growth in population rate continue to dominate the trends across the globe and South Africa, is no exception to these trends.

Gauteng City Region

Gauteng is South Africa's smallest but most densely populated province, South Africa's financial capital and most important economic node, producing 34% of the national GDP on 1.5% of the country's land area (GSDF, 2030). The province constitutes 1.4% of the total land area of South Africa, making it the smallest province and also the largest urban economy in Africa. Given this analysis, it is imperative to note that Gauteng does not function in isolation, as it has strong economic, movement, and functional linkages with towns and cities and the geographical space known as the Gauteng City-Region (GCR). The GSDF 2030 is a long-term spatial policy of the Gauteng province that provides a long-term spatial vision for the GCR. It has three Metropolitan Cities, which City of Johannesburg, which greatly enjoys the largest population, size and economy with total population of 5.4 million and contributes 15% of the national GDP, the second City is Ekurhuleni which is an economic hub within the Gauteng city region and contributes to over a third of the National GDP and the third being City of Tshwane which is situated in the northern part of Gauteng and is the advanced commercial city in Africa and contributes 10% of the South African GDP (Maphangwa and van der Waldt, 2023). The figure 5 below shows Map of GCR.
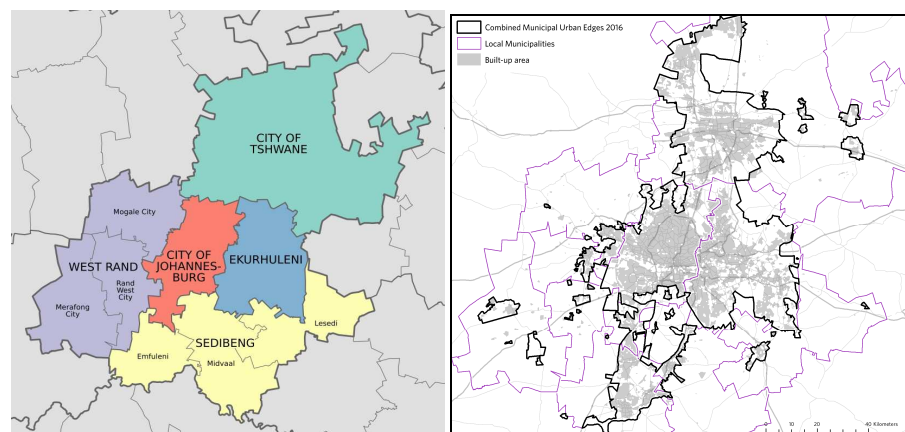

Figure 5 (left): Map of GCR. Figure 6 (right): Municipal Urban Growth Management. Source: Gauteng Spatial Development Framework, 2030

The figure above shows map of Gauteng City Region with five metropolitan cities which contributes to development and economic growth.

The City of Johannesburg continues to experience infrastructure pressures as a result of this fast-growing population and migration, and as such the spatial urban planning of the city plays a pivotal role in shaping and defining the infrastructure layout, use, and provision to ensure a sustainable outcome for Smart City. This is evident from the map on Municipal Urban Growth Management shown below as extracted from the Gauteng Spatial Development Framework 2030.

The infrastructure capacity is faced with enormous pressure and backlog because of migration and growing population rate. This further shows that Gauteng province and its municipalities have demarcated urban growth boundaries with the view to reduce urban sprawl and infrastructure investment management to ensure social cohesion and integration. In this research study, a particular reference point is made to the City of Johannesburg in which its infrastructure development and growth fall within this pressurized category of servicing and providing basic needs such as water, electricity sanitation, thus this paper shows a close relationship between Smart City and infrastructure development.

This study focuses on the Gauteng City Region, which is an integrated cluster of cities, towns and urban nodes, with particular attention to the City of Johannesburg, South Africa. The city reflects the challenges and opportunities of South Africa's economic demographic, social and political transformation. The figure below shows an aerial view of the City of Johannesburg.

Figure 7 (left): South Africa's Global Gateway: Profiling the Gauteng City-Region's International Competitiveness and Connections. Source: Joseph Parilla and Jesus Leal Trujillo, 2015. Figure 8 (right): Spatial Planning Map. Source: GSDF, 2030.

The Growth Development Strategy 2040 depicts the City of Johannesburg as a polycentric city, with high-intensity nodes, incorporating both residential and commercial land uses. These nodes, large and small, will anchor the spatial structure of the city's urban transformation which is achieved through constant improvement in planning and design, as well as in public infrastructure investment. According to Wray (2010) as cited in the GCRO (2013), these spatial considerations which are considered polycentric in the Gauteng city region are depicted in figure 9 below.
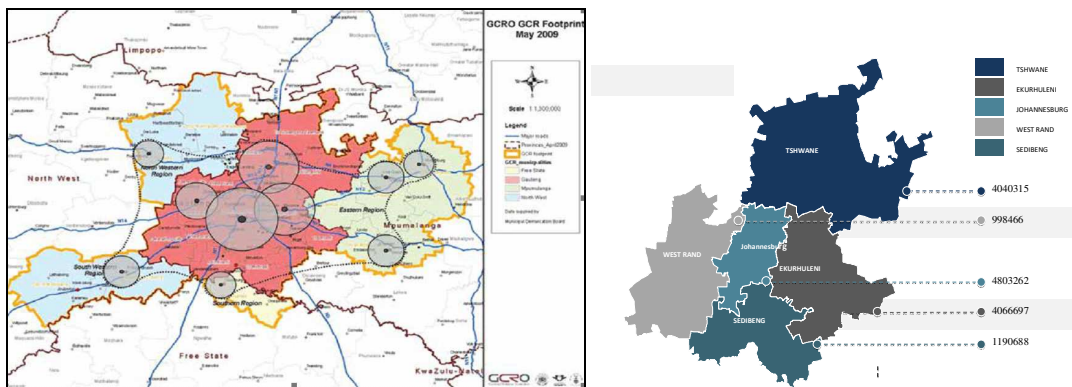

Figure 9 (left): Map (GCRO). Source: Brian and Harold, 2013. Figure 10 (rightGauteng Municipalities Population Growth. Source: Stats SA Census, 2022.

The City of Johannesburg, in its Development Plan Strategy 2040 concedes that the spatial inequality is a result of South Africa's legacy of apartheid planning which largely played a major role in urban inequalities and race-based towns. The new cities across the globe are faced with the impact of a growing population rate and urbanization. This population growth rate in the City of Johannesburg accelerates the challenges of urban poverty, housing, and water shortages, as well as electricity distribution to city residents (IDP, 2021). The below graph 1 and 2 shows the total population of South Africa and Gauteng Province by Census 1996–2022.
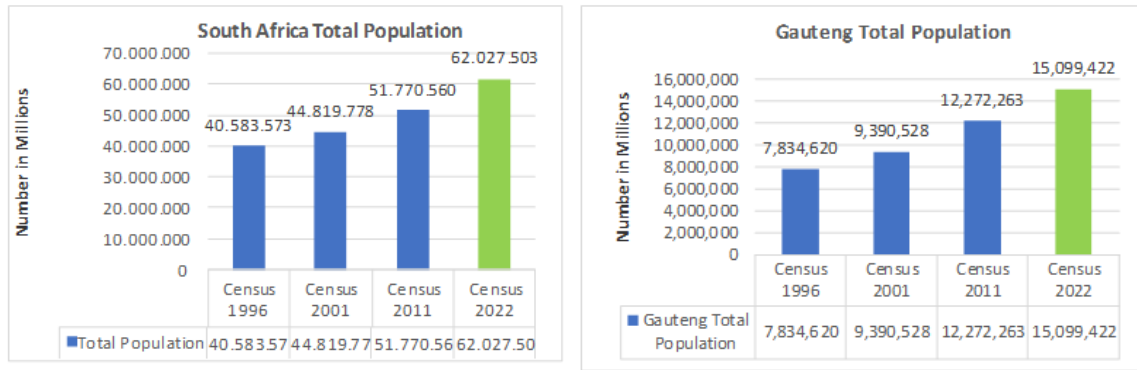
Graph 1 (left): South Africa Total Population Statistics. Source: Census, 2022. Graph 2 (right): Gauteng Province Total Population Statistics. Source: Census, 2022.

The graph above illustrates the population growth by Census over a period of ten years, 1996–2022. The results indicate that there is population growth or increase in the country. For the past 30 years, since 1996, the population increased from 40 583 573 to 62 027 503 in 2022, and this represents a growth rate of 4.1%. As such, the biggest growth rates were observed between 2011 and 2022 at 1,8%, while the rate between 2001 and 2011 was 1,4%. For Gauteng Province, since 1996 the population increased from 7 834 620 to 15 099 422.

Fig. 10 illustrates the 2022 Gauteng Municipalities population growth totaling to 15 099 422 over time. Given the growing population, this map shows that the province contributes 2,2 trillion rand (33,1%) to South Africa's GDP, the breakdown of population per municipality in the city region is also shown in the below map.

The continuous pressure for urban growth leading to lack of bulk infrastructure such as sanitation, as well as outfall water treatment works which is unable to cope with demand pressures in the City of Johannesburg gives rise to the need for regional Smart City initiatives (IDP, 2021). Notably, the initiative of Lanseria Smart City which is a high-impact, compact, complex, mixed-use urban development designed to deliver urban prospects to a marginalized periphery (GLMP, 2020), which is an urban intervention towards inclusive sustainable urban future as depicted in the below map.
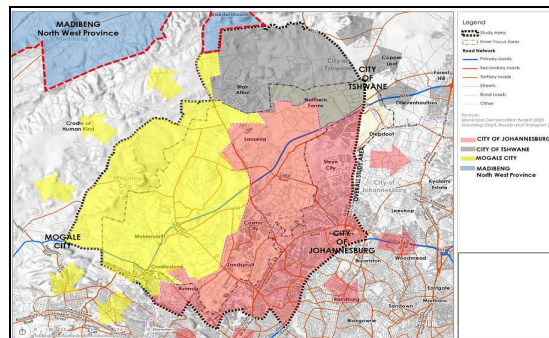

Figure 11: A Greater Lanseria Master Plan 2020. Source: Gauteng Provincial Government, 2020.

In view of the data presented and illustrated above, it is evident that the City of Johannesburg embraces the Smart City concept as shown through its integrated development plans and it can locate itself firmly in the global space with clear aspirations of further sustainable development and growth.

6 CONCLUSION AND RECOMMENDATION

This paper has argued that smart cities are diverse and complex in nature, and therefore this concept is not limited to a local phenomenon in the context of Gauteng city region but exists across the globe and has many economic benefits. Priyankan and Singh (2023) state that smart cities play a very pivotal role in poverty reduction and can make the city a much more enjoyable place to live and ultimately benefit their citizens, given that sustainable smart cities have multiple features aimed at enhancing cities competitiveness and economic growth.

This research paper largely focused on infrastructure as an enabler of development within the smart cities, thus effective development planning initiatives and strategies should be integrated in all dimensions across all spheres in order to yield positive suitable outcomes and economic benefits and growth, for instance, the provision of water services, and sanitation, wastewater treatment, and bulk sewer cannot operate in isolation of electricity provisions, as well as skilled or smart people in the smart economy. The integration of all these multiple dimensions will ensure that greater efficiency is achieved through improved communication technologies, as well as the capability to use data extensively to manage both supply and demand.

In view thereof, in the context of policy implication plays a vital role as a guiding tool for the policymakers who are engaged with smart cities development initiatives in the developing countries. In the same vein, effective policy management and implementation is imperative in assisting cities to understand the possible challenges that the cities are likely to face and consequently assist cities in policy decision to ensure sustainable development. Smart city approach plays a critical role in growing the economy, and reduce the spatial inequalities, as well as unemployment hence urban planning correlates with economic growth as well infrastructure development and as a result positively contributes in improving the quality life of the citizens. Smart cities have necessitated urban planners to rethink about the critical role of all stakeholders and not only national, or local government in the formulation of urban policies and implementation in the smart cities. Kundu, Sietchiping and Kinyanjui, (2020) argue that whilst the concept smart cities are engines of economic growth and innovation such economic growth needs to be sustained through a well-co-ordinated policies to guide and support the cities and regions in the management of their urbanisation pattern. Therefore, the implications for urban planners is to ensure that there are well developed smart cities economic framework and development models that will mitigate the challenges of inequalities and urbanisation.

This paper draws some lessons learnt on cities with greater challenges of inequality and urban sprawl, as a consequence of migration from rural to urban cities. Some of the lesson learnt relates to how smart cities and infrastructure development are vital in the creation of sustainable development thereby improving people's quality of life. It is in this context that infrastructure development lies at the heart of promoting inclusive economic growth and social equity (National Infrastructure Plan 2050), which intends to transform the nation's economic landscape, and structural urban planning changes by reducing spatial inequalities and strengthening the delivery of basic infrastructure service. The infrastructure investment in which resources are allocated within spheres of government is likely to get diluted as a result of poor management of the provision of services to the citizens, as well as possible maleficence that may arise during the implementation process.

This paper concludes that any policy intervention related to urban planning and smart cities of a country should be aligned to specific country local context so that it is able to respond to its specific local needs, opportunities, as well as challenges. Smart cities should not only be viewed in the context of information technology but should also include or consider other dimensions in the value chain such as a suitable climate conditions and environment in which people can learn, have knowledge through continuous interaction in the smart cities, as well as urban management. In this regard, this paper recommends that an effective infrastructure delivery value chain and expansion within the sustainable smart city requires a consolidated governance policy framework to guide how resources are allocated across all sectors of the economy to align with the growth and development path, given that the urban and spatial planning sectors need a growing economy.

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