



Smart City Concept

Readying the province

Contents

1. Background	2
2. Purpose	3
3. What makes a city, a Smart City?	3
4. Smart City Discourses.....	3
5. Characteristics of Smart Cities	5
6. Smart Cities around the world	6
7. Smart Cities in Africa	6
8. Smart City initiatives in South Africa.....	7
9. Measures to actualise a Smart City.....	8
10. Several things that a South African Smart City should not encompass	8
11. Is the Northern Cape ready for a Smart City?.....	9
12. Potential Smart Initiatives for the Northern Cape.....	10
13. Benefits of Smart Cities.....	12
14. Challenges in the implementation of smart initiatives.....	13
15. Conclusion.....	15
16. Recommendations	16
17. Bibliography	18

1. Background

It is projected that 70% of the world will live within cities by 2050 and the transition to urbanisation is expected to be most rapid in Africa and Asia, with Africa having 56% of the population living within urban areas by 2050 (United Nations, 2014). This means that African cities, which house approximately 1.1 billion people will need to accommodate almost double this population by 2050. Therefore, according to (P. Crous, G. Palmer, R. Griffioen, n.d.), it is imperative that African cities are able to accommodate and manage the population influx.

The high rate of urbanisation and the increasing need for more sustainable living creates the perfect conditions for the development of Smart Cities (B. Du Toit, J. Stimie, 2023). However, for Smart Cities to be successful and efficient, governments will have to develop a strong presence in Information and Communication Technology (ICT) and increase the use of Internet of Things (IoT) devices. The effective deployment of technology, more specifically of the (IoT), seems to be one of the characteristics of effective Smart Cities.

In his 2019 State of the Nation Address (SONA), South African President Cyril Ramaphosa spoke about a new type of city in South Africa, he described a Smart City powered by (IoT) devices and smart technology. In 2021 he introduced three new developments aiming to become examples of South African Smart Cities, which are Lanseria, Durban Aerotropolis, and Mooikloof Mega-City (B. Du Toit, J. Stimie, 2023).

It is, however, important to note that Smart Cities do not only hinge on technology alone. Smart Cities are also perceived as facilitators for sustainable development (P. Crous, G. Palmer, R. Griffioen, n.d.). A Smart City enables efficient management of municipal infrastructure, including water, sanitation, roads, stormwater and electricity. With the ever-increasing environmental pressures the world faces, the development of Smart Cities will need to increase to meet these challenges. As such, the main question that needs to be answered is, should implementation of the Smart City concept be considered for the Northern Cape?

2. Purpose

The focus of this report is centered on the review of literature on the meaning of a Smart City, benefits and challenges towards the implementation of Smart Cities and lastly what can the Northern Cape Province do now to become smarter.

3. What makes a city, a Smart City?

There are many definitions and understandings of a Smart City. (A. Echendu & P. Okafor, 2021), also asserts that Smart Cities mean different things to different individuals, but it is paramount to understand that a Smart City approach is linked to development. In many countries throughout the world and in academic literature, terms like Smart City, Smart Growth, Digital City and Intelligent City have become more relevant in the last twenty-five years, (K. Mori & A. Christodoulou, 2012), states that understanding these terms is critical since Smart City adoption is one of the most important aspects in enhancing social, economic, and environmental growth.

Ultimately, the diversity of definitions prompted the International Telecommunications Union (ITU) to come up with a common, global definition. They set up a group of experts who surveyed the definitions in use, analysed them to extract the most common elements, and crafted this definition: “A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social and environmental aspects.” (J. Backhouse, G. Karuri-Sebina & J. Guya, 2020).

4. Smart City Discourses

Researchers have identified several different “discourses” related to Smart Cities (S. Prahajan & H.Han, 2019). These discourses do, of course, overlap. However, the differences between them are evident in the values that underpin them. As a result, they tend to lead to different kinds of smart interventions and they tend to measure different kinds of outcomes.

4.1 Economic Growth

Some people understand Smart Cities as being about economic growth, which can include using technology to improve business, increasing privatization and supporting innovation to create new businesses and developing high-tech and creative industries. In this discourse the benefits of Smart Cities are economic competitiveness, job creation, and increased wealth.

4.2 Technology

Another very strong Smart City discourse focuses on technology and the creation of a high-tech urban space that makes use of (ICTs) to automate and control the city. It includes looking for ways to use emerging technologies such as the (IoT) to collect big data and automate decision-making using Artificial Intelligence (AI). The technology discourse is supported by the idea of the Fourth Industrial Revolution (4IR) which argues that developments in technology are fundamentally changing how societies are structured and creates a sense of urgency, that it is important to respond to these technological changes.

4.3 Service Delivery

There is also a discourse of service delivery, that focuses on how technology can help cities to understand the needs of businesses, residents and visitors and provide for them in seamless ways. This discourse focuses on improving traditional city services to businesses and residents, such as the provision of housing, energy, water, sanitation, safety and transportation in partnership with other city stakeholders.

4.4 Human Development

This discourse focuses on creating cities that are good to live in with services that work and pleasant residential, working and leisure spaces that are green and connected. The focus of this discourse is on the needs and experiences of all city residents, rather than those of knowledge workers and includes greater consultation and involvement of residents in the design and development of the city.

4.5 Environment

The Smart City concerns in this discourse are for improving the quality of air and water, improving the way that waste is handled, using more clean energy sources and understanding the climate impacts of infrastructure choices in cities.

5. Characteristics of Smart Cities

According to (R. Giffinger, 2007), a Smart City needs six characteristics to achieve the necessary Smart City criteria.

5.1 Smart Economy

A Smart Economy is an environment in which healthy competition between organisations drives innovation. A Smart Economy should also have a strong ability to integrate with other economies so as to allow the economy to grow.

5.2 Smart Mobility

Smart Mobility can also be referred to as 'Smart Transport'. It is the idea of creating a transport network that connects citizens in a city while considering such other aspects as the environment, the people and a smart living culture. Smart mobility does not only support the travel of people within the city, but also connect people to communities outside the borders of a Smart City. It should also be deeply integrated by (ICT) as this would add to the value and effectiveness of the system.

5.3 Smart Governance

Smart Governance supports the themes of transparency and integrity. The city should integrate all role players into the decision-making process including; government structures, public companies, the private sector and citizens should all play a role in ensuring data integrity.

5.4 Smart Environment

A Smart Environment is one of the core concepts that all of the literature notes as a necessity for Future Cities. The idea of a Smart Environment interacts with all of the other dimensions of a Smart City. When planning the mobility and transportation network, one should select options that will keep pollution to a minimum and set out routes that are the most efficient

and use as little energy as possible. Furthermore, a Smart City should also be smart in how it interacts with waste and water and other natural resources.

5.5 Smart People

In a Smart and Sustainable City, social and human capital occupies a predominant place. The 'Smart People' dimension refers to a more inclusive society, a community that offers equal treatment to everyone by considering the needs of all in the community. Thus, Smart Cities and the (IoT) should improve knowledge management and access to education and social capital.

5.5 Smart Living

Smart Living highlights one of the fundamental objectives of a Smart City. A Smart City should improve health, safety and social cohesion in the city.

6. Smart Cities around the world

While the Smart City concept is gaining momentum in South Africa, local cities are still a long way off when compared to their counterparts in the United States (US), Europe or Asia (SACN, 2016). Smart Cities have been and are being implemented globally, most notably in Singapore in Asia, but also in other prominent cities in India, Denmark, Finland, England and the (US). (Woetze et al., 2018), reports that New York, Los Angeles, London, Seoul, Singapore, and San Francisco are cities with the highest number of smart technology applications. Their solutions have also branched out into more than one domain.

The (IESE Business School, 2015), developed the Cities in Motion (CIM) index as a Smart City ranking method, to rank cities objectively on the basis of 10 key dimensions, namely: governance, urban planning, public management, technology, the environment, international outreach, social cohesion, mobility and transport, human capital and the economy. London ranked first, Singapore ninth, and San Francisco 21st (IESE Business School, 2015).

7. Smart Cities in Africa

According to (P. Crous, G. Palmer, R. Griffioen, n.d.), Smart Cities are specifically relevant to Africa through the increased urbanisation that will take place over the next decades. There

are five (5) Smart City initiatives on the African continent: Konza Techno City: Kenya, Eko Atlantic: Nigeria, Hope City: Ghana, Vision City: Rwanda and Waterfall City: South Africa (Estate Cloud, 2018).

8. Smart City initiatives in South Africa

In his 2019 State of The Nation Address (SONA), South African President Cyril Ramaphosa spoke about a new type of city in South Africa. He described a Smart City powered by (IoT) devices and smart technology. In 2021 he introduced three new developments aiming to become examples of South African Smart Cities: Lanseria, Durban Aerotropolis, and Mooikloof Mega-City. However, since the introduction of these ambitious projects, very little progress has been made towards their establishment (B. Du Toit, J. Stimie, 2023). (R. Fataar, 2022), points out that South Africa lacks an Integrated National Smart City strategy and the existing Smart City initiatives are uncoordinated and the private and public sectors are not jointly pursuing the goals of establishing thriving South African Smart Cities.

However, despite the apparent absence of a well-coordinated Smart City strategy, there are some examples where both the private and the public sector have been able to rise to the occasion. Waterfall City in Gauteng is one of these, (S. Balkaran, 2019) describes Waterfall City as 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. Also in Gauteng, the Melrose Arch is a Smart City that boasts safety and innovation with 24-hour Closed-Circuit Television (CCTV) surveillance, a fibre optic network, green-star-rated buildings, onsite power backup facilities and a mobile-enabled payment parking.

The City of Cape Town employed technology to overcome severe challenges during the 2018 drought, this extreme drought was a catalyst for smart water management. The city management introduced smart utility technology, using smart remote meters to measure and manage strategic points. (T. Solowski, 2016), found that the use of these smart technologies enabled the city council to reduce water use by 10%.

A Smart City promised for the Kwa Zulu Natal (KZN) province is the Durban Aerotropolis, which aims to become a premier business and trade hub in Sub-Saharan Africa and to convert the

whole area around King Shaka International Airport into a Smart City with “diversified economic activities that will boost the province’s economy”. In Limpopo province, the Nkuna Smart City Project is underway and unlike other Smart City developments in South Africa, it may be the first to be initiated by a black entrepreneur without any foreign investment (Construction Review, 2021).

The main purpose of Smart Cities in developed economies was to provide an integrated and connected Smart City providing efficient e-services, citizen engagement, mobility and energy to citizens. The majority of initiatives in South Africa on the other hand address the economy, crime and some aspects of mobility. The Western Cape, Gauteng and KZN take the lead, but successful, mature initiatives are in the minority (R. Lea & M. Blackstock, 2014).

9. Measures to actualise a Smart City

9.1 Promotion of Innovation

Innovation is the practical application of ideas that introduce new goods or services or an improvement in the way those goods or services are offered. Innovation should be promoted in the (ICT) sector so as to ensure actualisation of Smart Cities.

9.2 (ICT) Funding

This includes making monetary contributions to (ICT) sector beneficiaries with the goal of aiding and speeding up the development, sustainability and ultimate financial and operational independence of such beneficiaries.

9.3 Public Awareness

There should be public awareness on the importance of initiating a Smart City.

10. Several things that a South African Smart City should not encompass

What smart means in South Africa should mean what makes sense locally. The smart initiatives to be undertaken in each city need to be selected and pursued based on local priorities, conditions and resources while respecting the broader shared societal or national values.

Diversity in interpretations of smartness are abound, as this will lead to innovation, through locally feasible and effective interventions. According to (J. Backhouse, G. Karuri-Sebina & J. Guya, 2020), the following should be avoided in the establishment of Smart Cities in South Africa.

- Proliferation of policies, strategies and words about being Smart Cities, but with little action or results that evidence it.
- Copycat buying of systems or solutions in response to technology hype or vendor marketing.
- Undertaking smart initiatives for cosmetic and marketing purposes
- “Smart” projects that exacerbate current problems, for example increasing inequality
- Randomly implementing smart technologies in discrete parts of the city without any integration

11. Is the Northern Cape ready for a Smart City?

Smart City readiness entails the adoption of technological innovation and (ICTs) by role players to disseminate information to the citizenry in order to improve performance, quality of services and welfare maximisation (P. Enwereji, D. Uwizeyimana, 2022).

As such, several cities have attempted to use various strategies to create what is known as a Smart City (P. Enwereji, D. Uwizeyimana, 2022). However, according to (DCoG, CSIR, 2021), the unique South African context calls for local and tailor-made interventions to develop settlements that are not only smart but also inclusive. Any Smart City initiative should contribute to the well-being of ordinary city dwellers and support the broad national vision for human settlements outlined in, among others, the National Development Plan (NDP) and the Integrated Urban Development Framework (IUDF). As such, in deciding what a Smart City might be in the context of the Northern Cape, it is important to understand and consciously choose discourses and then initiatives that support national values and provincial development objectives.

However, in view of the socio-economic challenges in the province, it should be asked whether the development of a Smart city should be a priority for the Northern Cape? Is the provision of basic services such as water, sanitation, electricity, health-care and housing not more important than smart interventions that may not address the most critical needs of communities. Additionally, the country is facing overwhelming challenges related to the provision of electricity and a reliable supply of power is a critical prerequisite for the successful implementation of Smart City initiatives. According to (DCoG, CSIR, 2021), Smart Cities need to respond appropriately to local challenges rather than being based on generic models that may not be suitable to local conditions.

However, according to (A. Monzon, 2015), the Smart City approach is emerging as a way of solving entangled municipal problems. (A. Younus, 2021) affirms that, through the Smart City concept, the municipal administration can successfully measure and manage the numerous services they provide within its surroundings in real-time and with a high level of precision. (E. Ismagilova et al, 2019) also states that, through the actualisation of a Smart City, local municipalities can better prepare for future demand and improve the delivery of key services to the citizens. Electricity consumption may be projected in advance to avoid outages, water infrastructure upgrades can be recognised in advance, transportation services can be better planned and many other benefits can be gained.

As such, the Northern Cape can benefit from the establishment of a Smart City. However, to achieve this, it is essential that the province develops a Smart City Strategy to ensure that the smart initiatives that are proposed are in sync with the overall development objectives of the province.

12. Potential Smart Initiatives for the Northern Cape

Most modern towns, cities, and municipalities around the world have begun implementing 'Smart' programmes to deliver better services to people while saving money and increasing efficiency (A. Datta, 2015). It is worth cautioning, that the province must not be tempted to identify initiatives that have been implemented elsewhere and replicate them, as contexts and provincial dynamics or rather city dynamics are different.

Identifying smart solutions needs to be problem-driven and not technology-driven, this means that the province needs to start with its most pressing problems and from those, identify potential smart interventions that might be able to improve the situation.

According to (Praharaj & Hawken, 2018), improving the efficiency and management of utilities like power and water could lead to better service delivery, thus allowing more citizens to benefit from essential services. It is important that the province, determines the smart initiatives it chooses to deploy based on the potentials of such initiatives for the province. The potentials identified in the table below, can be used as examples by the province to identify which smart solutions might be worth exploring.

Potential	Smart idea / solution / process / technology
Automating decision-making	Artificial intelligence, automated traffic controls
Improving decision-making	Big data, open-data, data visualisation tools, machine learning, artificial intelligence.
Understanding conditions in cities	(IoT) devices, monitoring sensors, apps to collect data from residents, machine learning applied to large data sets.
Better understanding needs and priorities	Stakeholder mapping and profiling, consultative processes, surveys, importance/performance mapping, social media interactions.
Changing resident's behaviour	Smart metering devices, (IoT) devices with feedback, consultative processes, social media interactions

Source: (J. Backhouse, G. Karuri-Sebina & J. Guya, 2020)

It is also important, that the province works out how to leverage local innovation capacity to support its pursuit of a Smart City. Very often the most appropriate and successful innovative solutions originate in the immediate communities, including universities, businesses and residents, as they typically respond to existing needs in society and are already aligned to local, development imperatives.

13. Benefits of Smart Cities

According to (A. Caragliu & C. Del Bo, 2019), Smart Cities have the potential to deliver several benefits to individuals and society at large, such as improving the efficiency and management of utilities like power and water, thus allowing more citizens to benefit from essential services.

13.1 Economic development opportunities

Smart Cities do not only attract new residents, but also improve the businesses within them. Regional and global competitiveness improves where investment in Smart Cities takes place (Prasana, 2022). In Smart Cities a much greater onus rests on the private sector to provide traditional public services, such as transport. This outsourcing of responsibilities is an opportunity for economic development in the private sector (Woetze et al., 2018).

13.2 Improved infrastructure

Predictive analytics, which is one of the many benefits that smart technologies provide, can improve the infrastructure in Smart Cities (M. Richards, 2022). Predictive analytics provides information on and warnings about the possible failure of infrastructure, providing cities with the opportunity to fix the problem before an actual failure occurs.

13.3 Improved utilities

Smart Cities and smart metering in these cities have the potential to improve utilities. (M. Booyesen, 2017), highlights the potential of smart meters and how water usage can be reduced by implementing smart metering solutions. Smart meters can remotely record and report the use of electricity, gas, and water.

13.4 Reduced environmental footprint

Environmental pressures increase with the growth in population and consumption. According to (Woetze et al., 2018)), technology can be a powerful tool in addressing these environmental pressures. (S. Kondepudi, 2014), also highlights that a smart sustainable city should be innovative and use (ICT) and other means to improve the quality of life, the efficiency of urban operations and services, while ensuring that it meets the needs of present and future generations economically, socially, and environmentally. A Smart City therefore

not only increases the economic opportunities of a community, but also keeps the environmental needs of present and future generations in mind.

13.5 Better transport networks

Smart Cities can provide new and improved transport networks. By using wireless electronics and communication technologies, users are provided with a smarter, safer and faster way to travel.

13.6 Enhanced community engagement

Smart Cities have the potential to enhance engagement in communities, by developing applications for citizens to use, thus enabling residents to easily report any concerns or problems. The data collected can be used to make informed decisions thereby making governments more responsive.

13.8 Data-based decision making

With the correct use of collected data, public infrastructure maintenance could be facilitated, public safety could be prioritised and operational performance optimised. Furthermore, according to (B. Du Toit, J. Stimie, 2023), stronger decision-making is facilitated and possibilities are created by big data and the (IoT), which in turn enhances the lives of residents, cuts costs and improves services.

13.9 Safer cities

Deploying smart technologies can lead to safer cities. (Woetze et al., 2018), found that smart technologies can reduce fatalities by 8% to 10% and reduce crime incidents by 30% to 40% which is equivalent to 300 lives saved per year for a city with five million citizens.

14. Challenges in the implementation of smart initiatives

The benefits presented by the creation of Smart Cities are obvious, yet their establishment is not without difficulties. Below are some of the challenges that the Northern Cape and other province`s will need to overcome in their quest to develop Smart Cities.

14.1 No Integrated National Smart City Strategy

According to (R. Fataar, 2022), there is no Integrated National Smart City Strategy in the country and thus making it difficult to draw a Smart City development path for the country. moreover, there will be contending scholastic thoughts on how a Smart City concept should be driven, and which sector (i.e. private or public) will lead the development.

14.2 Lack of financial capacity

Limited resources to fund the Smart City concept, financial resources are more often channelled towards service delivery, while the little that is sometimes left would not be able to fund the Smart City project.

14.3 Poor basic infrastructure

According to (B. Du Toit, J. Stimie, 2023), the lack of technological knowledge among city planners and a failure to maintain the current infrastructure are problems that any government that aims to develop Smart Cities will need to solve. It is no secret that the costs involved with Smart City development are extremely high. If a city wants to become smart, it should not only account for the present, but should also consider how it will meet the maintenance costs of the technology that it implements.

14.4 Technology as a starting point and not an enabler

Smart Cities promote the potential of technology to address urban challenges. Governments have been accused of being more focused on the Smart City technologies of the future than on present development challenges. Although technology is a core aspect of a Smart City, technology alone is not enough to create and spread public value for residents. Another unintended consequence of the use of technology, including (4IR) technologies could be job losses, particularly amongst those who earn the lowest wages and are the least able to be reskilled (DCoG, CSIR, 2021).

14.5 Security problems

This includes flaws in the servers and software that connect clients, as well as flaws in processes and personnel. Any unaddressed danger or weakness in a system that hackers could exploit to harm systems or data is referred to as a security issue. The lack of security poses a threat to actualising the Smart City concept.

14.6 Lack of innovation

This refers to the inability to provide practical ideas that will introduce new goods or services, or an improvement in the way goods or services are offered. Cities should be more innovative to ensure that they will create more opportunities to actualise the smart concept.

14.7 Interventions are not appropriate to the context

Concerns are raised that Smart City ideas are implemented without due consideration of local contexts and priorities. If a Smart City innovation has been applied and piloted in one city, it does not necessarily mean that it can be rolled out universally. The challenges that cities face and will continue to face in the future, are complex and diverse. These challenges are also very context-specific since no two cities are the same. In addition, the most basic infrastructure is often lacking, or existing infrastructure has not been maintained for many years and may even be beyond repair.

14.8 Poor governance

Introducing new Smart City projects potentially creates extra need for good governance, which has not been a strong suit of the South African government in recent years. (J. Backhouse, G. Karuri-Sebina & J. Guya, 2020), found governance to be a hurdle in Smart City development in developing countries and unfortunately, the Northern Cape is no exception to the rule.

14.9 Regulation and corruption

With data and data-sharing being a large component of Smart Cities, it is vital that strong policies and regulations are put in place to protect citizens' private information. Corruption reduces public confidence and undermines democracy, it can further stifle economic development and exacerbate inequality, poverty, social division and mistrust.

15. Conclusion

In the excitement that surrounds Smart Cities, there is an assumption that smarter is better. However, according to (J. Backhouse, G. Karuri-Sebina & J. Guya, 2020), Smart Cities and settlements mean more than just implementing technology-based solutions to make cities

easier to manage, better to do business in, or more exciting to live in. As such, although technology is an important factor, it is not the only factor worth considering for the implementation of Smart Cities, as the establishment of Smart Cities requires an enabling environment with financial and institutional support.

Smart City projects from around the world, as well as nationally were outlined so as to identify which elements the Northern Cape government could incorporate into its future Smart City plans.

Data-based decision making and economic development opportunities are some of the benefits that result from the development of Smart Cities, while the costs associated with the procurement and operation of smart technology and lack of innovation were highlighted as challenges in the implementation of Smart City initiatives.

A number of factors that could be put in place to actualise the establishment of a Smart City were pointed out, as well as those that a South African Smart City should not encompass. This report therefore concludes that, the Northern Cape should consider the development of a Smart City strategy, in its pursuit towards the development of a Smart City.

16. Recommendations

The following recommendations are brought forth, as contributions towards actualisation of a Smart City for the Northern Cape:

- A Smart City strategy to be developed and aligned with all relevant existing development plans nationally and provincial.
- Participation of the community in the identification, development and implementation of Smart City initiatives could contribute significantly to the success of initiative. The term community could refer to all role players, relevant to the proposed initiative. These include residents, the business community, universities and research organisations.
- Smart City initiatives should not be driven by technology, instead they should be aimed at improving the lives of people residing in the province. The motivation should be more substantial than just a need to be known as a Smart City.

- Sufficient financial resources to be allocated to fund Smart City initiatives. To enable Smart City implementation, people with the right skills, in the right places are critical. As such, people's knowledge, skills, competencies, experience, qualifications, past performance as well as possible re-skilling and training programmes should be carefully considered.
- The province to encourage investors to invest in Smart City initiatives, through Public Private Partnerships (PPPs).
- Probable risks and unintended consequences linked to the implementation of smart initiatives and technologies, to be identified.

17. Bibliography

- A. Caragliu & C. Del Bo. (2019). *Smart innovative cities; The impact of Smart City policies on urban innovation.*
- A. Datta. (2015). *New urban utopias of post-colonial India.*
- A. Echendu & P. Okafor. (2021). *Smart City technology: A potential solution to Africa`s growing population and rapid urbanisation.*
- A. Monzon. (2015). *Smart Cities concept and challenges: Bases for the assessment of Smart City projects.*
- A. Younus. (2021). *Smart City in urban innovation: Concept, management, policy and technology.*
- B. Du Toit, J. Stimie. (2023). *Towards Smart Cities in South Africa: evolution, definitions and future cities.*
- B. Scholtz, A. Hoogen. (2022). *Access to technology and data in Smart Cities for South African digital citizens.*
- Construction Review. (2021). *Nkuna Smart City project underway in Limpopo South Africa.*
- D. Sikora-Fernandez & D. Stawasaz. (2016). *The concept of Smart City in the theory and practice of urban development management.*
- DCoG, CSIR. (2021). *A South African Smart Cities Framework - A decision making framework to guide the development of Smart Cities in South Africa.*
- E. Ismagilova et al. (2019). *Smart Cities: Advances in research - An information systems perspective. International Journal of Information.*
- Estate Cloud. (2018). *Top five Smart City initiatives in Africa.*

- H. Chourabi et al. (2012). *Understanding Smart Cities: An intergrative framework in system science* .
- IESE Business School. (2015). *IESE City Index*.
- J. Backhouse, G. Karuri-Sebina & J. Guya. (2020). *Discussion paper on a South African approach to Smart, Sustainable Cities & Settlements: Towards a S.A. Cities Network response to the COGTA National Smart City Framework*.
- J. Henreckson. (2018). *The benefits of Smart Cities in Africa*.
- K. Mori & A. Christodoulou. (2012). *Review of sustainability indices and indicators: Towards a new City Sustainability Index: Environmental Impact Assessment Review*.
- M. Booyesen. (2017). *How smart meters can save water in the drought ridden Cape Town*.
- M. Richards. (2022). *Public sector data analytics: leverage data to make better decisions* .
- P. Crous, G. Palmer, R. Griffioen. (n.d.). *What does "Smart City "mean for African municipalities? Investigating the current status,enablers, restraints and the future of Smart City adoption in Africa*.
- P. Enwereji, D. Uwizeyimana. (2022). *Smart City readiness in South African municipalities: A qualitative study, Holistical Journal of Business & Public Administration, vol.13, Iss.1*.
- Praharaj & Hawken. (2018). *Urban innovation through policy intergration*.
- Prasana. (2022). *Smart City advantages & disadvantages: list of all benefits & drawbacksof Smart Cities*.
- R. Fataar. (2022). *"Unpacking Smart City developments in Cape Town & Johannesburg" in Smart Cities papre series*.
- R. Giffinger. (2007). *Smart Cities ranking of european medium sized cities*.

- R. Lea & M. Blackstock. (2014). *Smart Cities: An IoT-centric approach*.
- R. Muggah & D. Kilcullen. (2016). *These are Africa`s fastest growing cities - and they`ll make or break the continent*. World Economic Forum.
- Ramaphosa. C. (2019). *State of the Nation Address*.
- S. Balkaran. (2019). *Smart Cities as misplaced priorities in South Africa: A complex balance of conflicting societal needs*.
- S. Balkaran. (2019). *Smart Cities as misplaced priorities in South Africa: A complex balance of conflicting societal needs, Journal of Management & Administration*.
- S. Bohloul. (2020). *Smart Cities: A survey on new developments, trends and opportunities*. *Journal of Industrial Intergration & Management* .
- S. Kondepudi. (2014). *Smart sustainable cities: An analysis of definitions* .
- S. Mzekandaba. (2021). *SONA: Ramaphosa`s Smart City dream becomes " reality in the making"*.
- S. Prahajan & H.Han. (2019). *Cutting through the clutter of Smart City definitions*.
- SACN. (2016). *The state of South African state report* .
- T. Solowski. (2016). *African Smart Cities strategies for agenda 2063, African Journal of Management* .
- United Nations. (2014). *World urbanisation prospects*.
- Woetze et al. (2018). *Smart Cities: Digital solutions for a more livable future*.