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Spatial Planning for Electronic Communication Infrastructure in South African Municipalities: A Case of the eThekweni Municipality, KwaZulu-Natal, South Africa

Submitted in fulfilment of the requirements for the degree of Master of the
Built Environment in the Faculty of Engineering and the Built Environment
at the Durban University of Technology

by

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JUNE 2024

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Date: 14 June 2024

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Abstract

The Fourth Industrial Revolution (4th IR) is marked by the convergence of digital, biological, and physical technologies supported by Information and Communication Technology (ICT). As societies increasingly rely on digital connectivity for economic growth, social interaction, and technological advancement, robust spatial planning frameworks to accommodate this infrastructure become paramount. Spatial planning for electronic communication infrastructure, a component of ICT in the 4th IR, is essential to shape a connected, resilient, and inclusive digital future. Despite the South African regulatory framework's recognition of ICT's potential to address socio-economic issues, electronic communication infrastructure delivery falls short due to financial constraints, governance failures, and policy misalignment between the tiers of government.

This study focused on the eThekweni Municipality, South Africa's third-largest city, to evaluate spatial planning and statutory processes' responsiveness and effectiveness in facilitating electronic communication infrastructure development. More specifically, it examined the alignment of the municipality's spatial plans, policies, and legislation with the national regulatory framework and its goals for ICT development. The study assessed the purpose and influence of statutory planning applications for infrastructure development and drew lessons from international and local precedents to enhance statutory procedures. By addressing these issues, it aimed to identify regulatory and procedural shortfalls and provide recommendations to improve electronic communication infrastructure development in the municipality. These include enhancing alignment with regulatory frameworks originating from national government and adaptive and flexible planning approaches to inform municipal planning and development for ICT and electronic communication infrastructure.

Declaration of originality by student

I declare that unless otherwise acknowledged in the text, this thesis is my own original unaided work, and has not been submitted in whole or part, to any other university.

Jenisha Chetty

2024

Acknowledgments

My interest in spatial planning for electronic communication infrastructure was sparked by my career journey, which took me from the private to the municipal sector. I wish to express my gratitude to several individuals who stood by me throughout this journey:

Firstly, to Dr Gilberte M. Lincoln, my supervisor for her invaluable contribution, expertise, and guidance during the writing of my dissertation. Dr Lincoln has witnessed my growth as a town planner since the inception of my studies in 2010 at the Durban University of Technology. I deeply admire her wealth of knowledge across various sectors and am immensely grateful for her time, patience, understanding, and encouragement. To my co-supervisor, Dr G. Musvoto, I extend my sincere thanks for providing me with the opportunity to undertake this research.

To my editor, Deanne Collins, I am immensely grateful for your dedicated effort and invaluable insights in editing my thesis. Your meticulous attention to detail and constructive feedback are appreciated. Thank you for your patience, expertise, and unwavering support throughout this process.

I am indebted to my husband, Everan Chetty, whose unwavering support, patience, and encouragement sustained me throughout this research journey. Your enduring belief in me, despite career changes, relocations, and challenging times, has been a cornerstone of my success. This accomplishment belongs to both of us.

To my parents, Shaam and Usha Ramjith, who selflessly sacrificed to ensure my well-being and success, I am profoundly grateful. Your love, support, encouragement, and wisdom guided me throughout my research.

I owe a debt of gratitude to my mentor and confidant, Rayven Moodley, whose leadership and teachings shaped me professionally and personally. Thank you for your guidance and lending me your ear.

To my in-laws, family and friends who offered their unwavering support and encouragement, thank you.

I extend my appreciation to the participants from the eThekweni Municipality Development Planning, Real Estate, and Roads departments, as well as those from the private sector, for their time and invaluable contributions to my research.

Lastly, this research is dedicated to the memory of my brother-in-law, Phildon Chetty, whose presence is deeply missed.

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List of Abbreviations and Acronyms

4 th IR	–	Fourth Industrial Revolution
5 th IR	–	Fifth Industrial Revolution
CBD	–	Central Business District
COGTA	–	Department of Cooperative Governance and Traditional Affairs
D'MOSS	–	Durban Metro Open Space System
DPEM	–	Development Planning, Environment and Management Unit
ECI	–	Electronic Communication Infrastructure
e-Services	–	electronic services
EMF	–	Electromagnet Field
GDP	–	Gross Domestic Product
ICASA	–	Independent Communications Authority of South Africa
ICT	–	Information and Communication Technology
IDP	–	Integrated Development Plan
IoT	–	Internet of Things
IUDF	–	Integrated Urban Development Framework
ITB	–	Ingonyama Trust Board
JAC	–	Joint Advisory Committee
KZN	–	KwaZulu-Natal
NDP	–	National Development Plan
NSDF	–	National Spatial Development Framework
SPLUMA	–	Spatial Planning and Land Use Management Act 16 of 2013
SDP	–	Spatial Development Plan

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CHAPTER 1: INTRODUCTION AND RESEARCH BACKGROUND

1.1. Introduction

This chapter outlines the research study and the structure of the dissertation. The study focused on spatial planning in South Africa within the context of Fourth Industrial Revolution (4th IR) and evaluated the extent to which spatial planning policies and legislation have responded to the development of electronic communication infrastructure.

The 4th IR has changed how the world functions (Stăncioiu 2017: 74-75). Information and Communication Technology (ICT) infrastructure is the backbone of the 4th IR, with electronic communication infrastructure being a component of ICT. Together, they link the physical, digital, and biological worlds, allowing for seamless global transactions and continued service delivery regardless of place and time.

According to Sutcliffe and Bannister (2020: 10), technology adoption by different sectors can promote economic growth, social cohesion, and equality in communities. The adoption of technological or 'smarter' solutions also encourages 'smart city' development.

Since the early 1990s, spatial planning in South Africa has evolved from a political agenda to ensuring the growth of the economy as means to address socio-economic challenges (Drewes and van Aswegen 2013: 194). However, given apartheid legacies, the post-apartheid regulatory framework is tasked with addressing the realities of the present whilst addressing past challenges.

Spatial planning in the digital era requires planners to be mindful of public and societal changes. Spatial planning tools thus need to become adaptive and radical. Two decades ago, Fernández-Maldonado (2005: 1) highlighted the challenges confronting urban planners, including the use of traditional spatial planning and land use tools and policies to enable ICT development. Pretorius *et al.* (2022: 544) note that planners are failing to align with the 4th IR since tertiary education does not integrate technology into spatial planning curriculum, resulting in the continued application of traditional planning methods.

The planner's emerging role in the 4th IR is envisioned as that of a mediator and negotiator, facilitating a connection between telecommunications and urban policies. Urban policies should prioritise the material foundation for digital connectivity, acknowledging the challenges posed by private network ownership. Local governments are therefore required to ensure a comprehensive understanding of ICT infrastructure and to advocate for network expansion to ensure equitable access across all city areas, preventing disparities and social exclusion. Addressing ICT-related issues is deemed essential to foster sustainability and democracy in urban development efforts.

The study analysed the eThekweni Municipality's spatial planning framework and how the municipality processes electronic communication infrastructure development. A qualitative research approach was used to collect data through questionnaires and interviews with open-ended and semi-structured questions. Secondary data included a selection of scholarly articles, journals, legislation, and books, to sketch the context for changes within urban systems, technological advancements; and innovations brought about by the 4th IR and emerging 5th IR.

1.2. Background

Perceptions of planning and the processes associated with spatial planning have evolved significantly over time. Traditionally, planning was viewed as a rational, goal-oriented process aimed at determining future actions through a series of choices to optimize resource usage and promote efficient decision-making. Davidoff and Reiner (1962: 11) described planning as a systematic process of selecting actions to ensure resource efficiency and expand opportunities for future change. Similarly, Faludi (2013: 1) framed planning as the application of scientific methods to policymaking, emphasizing the importance of structured, methodical approaches.

Spatial planning, a key component of urban development, addresses complex challenges by coordinating and integrating policies that promote economic development, environmental sustainability, and social cohesion. It encompasses frameworks that guide spatial development through physical plans, identifying areas for intervention, assessing environmental impacts, and offering guidance on land use

management (Stead and Nadin 2008: 1; Todes et al. 2010: 416). These frameworks rely on traditional planning tools such as master plans, development frameworks, and land-use schemes, which have been foundational in shaping urban landscapes (Graham and Healey 1999: 626). Master plans, for example, provide long-term spatial strategies for infrastructure, services, and public investment (Todes et al. 2010: 415), while land-use management, particularly zoning, allocates specific development rights to individual sites (Stead and Nadin 2008: 24-25).

However, these traditional spatial planning practices have been increasingly criticized for their limitations in addressing contemporary socio-spatial challenges. Graham and Healey (1999: 633) argued that planning theory needs to become more 'relational' that being a shift that would allow for a more dynamic, flexible approach to urban development. To be relational, planning must move beyond rigid, traditional frameworks and embrace the complexity and fluidity of modern urban contexts. This relational perspective emphasizes the connections and interactions between spaces, places, and people, acknowledging that these elements are constantly changing and influencing each other.

Albrechts (2015: 511) critiqued the continuity of traditional Euclidean concepts within spatial planning, highlighting the need for planning to evolve in response to the interconnected, multifaceted nature of contemporary urban issues. The emergence of the 4th IR further complicates spatial planning, as it brings new challenges and opportunities tied to the rapid integration of technology, diverse institutional frameworks, and evolving governance structures. Spatial planning today involves an intricate interplay between legal, strategic, and technical documents, such as municipal master plans, national land-use plans, and zoning regulations (Mendes et al. 2022: 2-3). These documents, while essential, often lack flexibility, with mandatory plans such as master plans carrying legal weight, while more strategic plans provide broad guidelines without legal enforcement.

In response to these challenges, relational, adaptive, and radical planning approaches have become more pertinent in the context of the 4th IR. These approaches advocate for more inclusive, collaborative methods of decision-making, where diverse stakeholders, ranging from institutional actors to local communities, engage in co-

creating solutions. Radical planning requires planners and institutional stakeholders to adopt more flexible and creative approaches to bridge the gap between policy intentions and actual implementation. Through collective decision-making and citizen empowerment, planning can become a more democratic and responsive process, capable of addressing complex, multi-dimensional issues.

In the South African context, development is guided by the National Development Plan (NDP) Vision 2030, which aims to address historical and present challenges by focusing on infrastructure delivery as a key enabler for economic growth and spatially inclusive communities (South Africa 2010). The Spatial Planning and Land Use Management Act (SPLUMA) of 2013 provides a legislative framework for spatial planning and land use development, supporting tools such as Integrated Development Frameworks (IDFs) and Spatial Development Frameworks (SDFs) to guide development and ensure that developmental objectives are met (South Africa 2013).

The National Spatial Development Framework (NSDF), adopted in 2022, reflects this shift toward a more integrated approach, aiming to align spatial planning objectives across all policies, plans, and programs that impact land development and management (South Africa 2022b: 35).

Despite these efforts, South Africa faces challenges in the development of electronic communication infrastructure, which falls under a complex regulatory framework that blends ICT, electronic communication, and spatial planning policies. The role of Electronic Communication Service Licensees, such as MTN, Vodacom, and Telkom, further complicates planning, as these private entities rely on infrastructure developers to roll out services (South Africa 2021b: 38).

Unlike other utilities such as roads, electricity and water, there is no conclusive categorisation of electronic communication infrastructure. Whilst some municipalities treat it as a utility, others process development applications as land uses. As a result, development of electronic communication infrastructure is guided by a regulatory framework which includes a combination of ICT, electronic communication and spatial planning policies, legislation, and processes. This has resulted in complexities in implementation and development, particularly for municipalities.

This regulatory complexity highlights the need for more relational planning approaches. The integration of ICT infrastructure into spatial planning requires an adaptable framework that can accommodate rapid technological changes, address diverse stakeholder needs, and navigate the complexities of legal and strategic planning documents. In this evolving landscape, a relational approach to planning offers the potential for more dynamic, collaborative, and inclusive solutions that can address the multifaceted challenges of modern urban development.

1.3. Problem statement

South Africa still confronts historical challenges which have resulted in spatial and socio-economic inequality, urban sprawl, social fragmentation, and poor service delivery (South Africa 2010: 77). These cannot be ignored if the country is to reap the economic and social benefits of the 4th IR. Government plays a pivotal role in providing a regulatory framework to be implemented across its different tiers.

Given that the private sector dominates electronic communication infrastructure development, the focus is return on investment as opposed to equitable provision and affordable communication services for all communities. As such, access to communication networks and infrastructure is limited in marginalised areas due to the lack of adequate infrastructure. Development is further challenged by complex application processes for rural areas and the former homelands which remain under the guidance of traditional authorities (South Africa 2021b: 38).

Whilst policies and legislation have acknowledged the need to incorporate technology in solving socio-economic challenges, a review by the National Planning Commission confirmed that public infrastructure delivery is not meeting the objectives set in the NDP (South Africa 2021b: 5). This is due to diminishing government budgets, failing state-owned enterprises, a lack of investment by the private sector, corruption, poor resource management and planning; and political interference, amongst other factors that have impacted infrastructure delivery (National Planning Commission 2020: viii).

The lack of policy cohesion between the governmental tiers in supporting ICT

development presents a substantial challenge that renders it difficult for municipalities to implement national and provincial policies and legislation (Development Bank of Southern Africa 2012: 89). This has exacerbated poor delivery of electronic communication infrastructure in South Africa. As a result, municipalities set different processes for licensees (Sutherland 2020: 235). It is difficult for planners in municipalities to align planning processes and regulatory requirements to drive growth and development.

The eThekweni Municipality is the third largest city in South Africa and the largest one in the province of KwaZulu-Natal, with an estimated population of four million (eThekweni Municipality 2021b: 29). Approximately 68% of the municipal area consists of rural settlements and is used for commercial farming and traditional/communal holdings. The remaining 32% is urban development comprising of residential, commercial/office and industrial land uses (eThekweni Municipality 2021b: 56).

The eThekweni Municipality's Integrated Development Plan (IDP) recognises the use of ICT and electronic communication to bridge gaps in improving the socio-economic conditions of its communities (eThekweni Municipality 2023b). The question that arises is whether the municipality's spatial plans and statutory processes enable the development of electronic communication infrastructure. This research evaluated the responsiveness and effectiveness of eThekweni Municipality's spatial planning policies and the statutory process for the development of electronic communication infrastructure.

1.4. Aim of the study

The primary objective of this study was to evaluate the responsiveness and effectiveness of spatial planning and the statutory process in facilitating and implementing electronic communication infrastructure development. Furthermore, it aimed to identify regulatory and procedural shortfalls in electronic communication development and suggest strategies to overcome them.

1.5. Objectives of the study

- To examine the regulatory frameworks for electronic communication infrastructure and its responsiveness to the socio-spatial contexts of the 4th IR in South Africa.
- To investigate the spatial planning regulatory frameworks across government tiers for electronic communication development.
- To critically evaluate the effectiveness of government responses in South Africa and elsewhere, to electronic communication policies and legislation.
- To evaluate the statutory processes implemented for the development of electronic communication infrastructure in the eThekweni Municipality. Based on the findings, the study aimed to provide recommendations for the development of electronic communication in the eThekweni Municipality.

1.6. Main research question

How responsive and effective are spatial planning legislation, policies, and procedures in guiding the development of electronic communication infrastructure in the eThekweni Municipality?

1.6.1. Research sub-questions

- a) Do municipal spatial plans, policies and legislation align to national goals and objectives for ICT and electronic communication infrastructure development?
- b) What is the purpose of statutory planning applications and how do they influence electronic communication infrastructure development?
- c) What can the eThekweni Municipality learn from international and local precedents on the procedures for the development of electronic communication infrastructure?
- d) How can the statutory procedures be improved for efficient and effective development of electronic communication infrastructure in the eThekweni Municipality?

1.7. Key concepts and definitions

1.7.1. The Fourth Industrial Revolution (4th IR)

The 4th IR emerged at the start of the 21st century. Also known as the 'digital age', it follows industries' shift from mechanisation (1st IR); to mass production, assembly, and the use of electricity (2nd IR); and the use of computers and increased automation (3rd IR) (Schwab 2016: 1).

Founder and Executive Chair of the World Economic Forum Schwab (2016: 1) describes the 4th IR as one which will "...*fundamentally alter the way we live, work, and relate to one another*". The 4th IR is characterised by artificial intelligence, robotics, and the Internet of Things (IoT). A major pillar of this revolution is the use of technology to promote connectivity (Boyle and Staines 2019: 4).

1.7.2. Information and Communication Technology (ICT)

Information and communication technology is derived from information technology and includes any communication device or application, including radio, television, cellular, and so on (Huth, Vishik and Masucci 2017: 131). Similarly, Leal and Loural (2010: 1) define it as the convergence of information technology, network computing and telecommunications.

Chen, Castillo and Ligon (2015: 28) describe ICT as "...*skills around computing and communication devices, software that operates them, applications that run on them, and systems that are built with them*". Boyle and Staines (2019: 4) state that it is a means to provide access to information through telecommunications, with the focus on communication technologies through the Internet, wireless networks, cell phones and others. There is no universal or agreed-upon definition of ICT; its use enables sectors to converge and supports the 4th IR.

1.7.3. Electronic Communication

There is overarching consensus on what constitutes electronic communication infrastructure. Black (2001) identifies electronic communication, as: "*communication carried over both a wired and wireless systems*". Talvitie (2003: 5) recognises wireless or mobile communication as part of ICT infrastructure, which includes "*exchange centres, underground fixed networks, base station masts and base stations on roofs, air cables, poles, satellites, and underwater cables, amongst others.*" Frenzel (2016:

3) adds that electronic communication transmits messages and data referred to as information. This is transmitted via electronic signals and conveyed to a receiver.

This study was limited to investigating the following electronic communication infrastructure: land-based fibre, antennae, masts, and infrastructure which supports the attachment of electronic communication, namely, monitoring equipment and poles. The purpose was to ensure that the research was focused and related to spatial planning regulatory frameworks.

1.7.4. Electronic communication infrastructure types

a) Land-based fibre

Land-based fibre refers to optical fibres laid in the ground. These fibres are thin strands of glass or plastic that transmit data using light pulses. Land-based fibre is a fundamental component of telecommunications networks that is used to provide high-speed Internet, telephone, and TV streaming services and is a common method to connect homes and businesses between cities (Jabar 2021: 1). The location of installations varies depending on the terrain, the cost of installation and the purpose of the fibre.

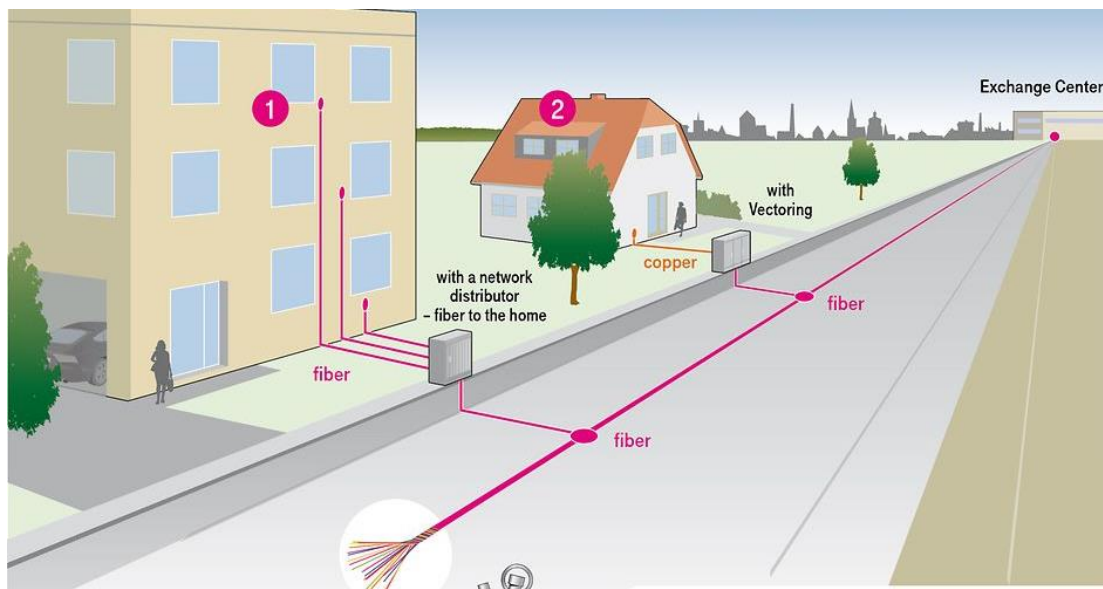


Figure 1: Optic fibre installation in the ground to homes and businesses (Source: Deutsche Telekom 2021)

b) Telecommunication mast

A telecommunication mast is a tall structure which varies in height and design. It is designed to support various types of telecommunications equipment and antennae, which play an important role in transmission and reception of wireless communication signals used by mobile phones, radio, television, and Internet services. Antennae are used for transmission of electromagnetic waves and include satellite dishes but exclude television dishes/antennae. The taller the tower or mast, the further the coverage. Antennae are also mounted onto buildings and rooftops (Ndlambe Municipality 2019: 2-3).

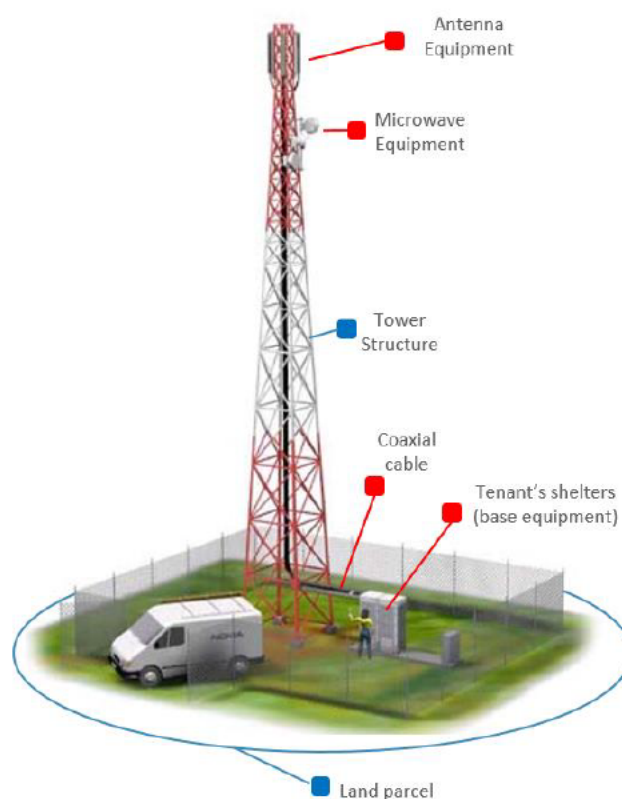


Figure 2: A telecommunication mast and its components (Source: KDM Force 2020)

1.7.5. Smart Cities

There are varied definitions of a 'smart city'. Smart cities are the result of ICT and the convergence thereof. Mohanty (2016: 1) conceptualises a smart city as "... a place where traditional networks and services are made more flexible, efficient, and sustainable with the use of information, digital and telecommunication technologies, to improve its operations for the benefit of its inhabitants".

The definition of a smart city also goes beyond the basic incorporation of technology into sectors. Moura and de Abreu e Silva (2021: 5) and the Smart Cities Strategic Advisory Group of the International Standards Organisation view a ‘smart city’ as one that should also address socio-economic, environmental and social issues through advanced solutions which bring people and systems together (South Africa 2021c: 7).

According to Atha *et al.* (2020: 8-9), the basic elements of a smart city include the acquisition of data through technological systems and integration of this data into a city’s management system. The technologies used to gather data include sensors, satellite positions and video capturing. Transmission of data in smart cities occurs through exchange systems, which are not reliant on location. Data transmission can support machine-to-person or machine-to-machine communication (Atha *et al.* 2020: 8-9).

Application Area	Applications	Application Area	Applications
Energy	Smart streetlights	Mobility	Real-time public transit information
	Dynamic electricity pricing		Digital public transit payments
	Home energy automation systems		Autonomous vehicles
	Building automation systems		Predictive maintenance of transportation infrastructure
	Energy recycling		Smart parking
	Energy distribution automation systems		Intelligent traffic signals
Water	Water consumption tracking		Congestion pricing
	Leakage detection and control		Real-time road navigation
	Smart irrigation		Car sharing
	Water quality monitoring		Bike sharing
Security	Emergency response optimization		Waste
	Real-time crime mapping	Digital tracking and payment for waste disposal	
	Facial recognition	Optimization of waste collection routes	
	License plate recognition	Integrated Platforms	Emergency response systems
	Predictive policing		E-governance
	Smart surveillance		
	Early warning systems		
	Crowd management		

Figure 3: Possible application of smart city concepts across different sectors (Source: Atha *et al.* 2020: 9).

1.8. Dissertation structure

This dissertation is structured in a manner that meets the study's objectives. It is presented in seven chapters.

Chapter 1 provides an introduction and background to the research study. It presents an overview of the study, the problem statement, and the research objectives and questions.

Chapter 2 presents a literature review, which sets out a conceptual and theoretical framework that details the research concepts and theories that informed the research.

Chapter 3 discusses precedent cases relating to the research study in developed and developing countries across the world. It also examines the African and South African regulatory context for ICT and electronic communication. This enabled an understanding of the research topic and informed the recommendations and conclusions at the end of the study.

Chapter 4 outlines the research methodology employed to conduct the study. It discusses research philosophies, data collection, sampling techniques, data analysis, and the validity and reliability of the research as well as the ethical considerations considered.

Chapter 5 provides a detailed overview of the case study area and an integrated analysis and discussion of the research findings based on the data collected, policies, legislation, strategies, and projects relating to ICT planning and development, particularly for electronic communication in the eThekweni Municipality.

Chapter 6 analyses the primary and secondary data gathered to evaluate the role and effectiveness of spatial planning and statutory planning processes for the facilitation and implementation of electronic communication infrastructure. The key findings are highlighted at the end of the chapter.

Chapter 7 concludes the research by providing recommendations and suggestions for future research based on the overall findings.

1.9. Chapter Conclusion

This chapter introduced the study. It presented a brief background, defined the key concepts employed, and highlighted the problem statement, and the research objectives and questions.

The following chapter presents a literature review based on selected scholarly articles, journals, legislation, and books, to set the context for changes taking place within urban systems, technological advances and innovations brought on by the 4th IR and emerging 5th IR, and their impact on planning theory and practice.

CHAPTER 2: CONCEPTUAL AND THEORETICAL FRAMEWORK

2.1. Introduction

This chapter presents a comprehensive literature review based on scholarly articles, journals, legislation, and books. Through the synthesis of conceptual and theoretical frameworks extracted from these diverse sources, the review fulfils several functions. As stated by Rocco and Plakhotnik (2009: 122), the objectives of a literature review are to set out the fundamental principles underlying a study to lay a robust foundation for the research, conceptualise its framework, and provide a reference point for interpretation of the findings.

The structure and content of this review are guided by a systematic approach that explains the key concepts, theoretical perspectives, and empirical evidence relevant to the subject matter. To facilitate clarity and coherence, it is organised thematically as depicted in Figure 4 below, reflecting the interconnectedness of various scholarly discourses, and providing insights essential to advance understanding of the research problem at hand. In doing so, the researcher aims to contribute to the on-going academic dialogue on spatial planning and the development of electronic communication infrastructure in the 4th IR.



Figure 4: The conceptual and theoretical framework (Source: self-generated by researcher)

2.2. Conceptual framework

The conceptual framework serves as a framework to understand spatial planning and electronic communication by outlining key concepts related to the research which include social change and technological development; globalisation; post-globalisation and ICT; sustainable development; smart cities; ICT; spatial planning; and ICT development.

2.3. Social change and technological development

Social changes have occurred over time driven by many factors such as economic and political changes, technological advancements, and cultural and belief systems. Theorists such as Karl Marx, Max Weber, Herbert Spencer, and Gerhard Lenski, among others, explored different theories linked to social change with each contributing a unique perspective on the relationship between technology, social structures, and development (Boundon and Bourricaud 1983: 2).

Karl Marx highlighted the pivotal role of the economy in driving social change, suggesting that the rise of capitalism would trigger significant shifts in societal and political structures (Boundon and Bourricaud 1983: 226-227).

Similarly, Max Weber focused on the role of culture and values in social change, particularly how ethical systems contributed to capitalism's rise. This is relevant to understanding how cultural attitudes toward technology and development affect the acceptance and implementation of communication infrastructure in South Africa (Boundon and Bourricaud 1983: 293-294). South Africa, with its complex history of apartheid, and socio-economic disparities, presents a unique challenge for the adoption of technology, particularly in rural or previously disadvantaged areas. The legacy of apartheid not only shaped the physical infrastructure of the country but also left a significant imprint on the cultural attitudes toward technology and development.

Herbert Spencer viewed social change as an evolutionary process, driven by the increasing complexity of social roles and the division of labour. The introduction of electronic communication infrastructure in municipalities introduces new roles and complexities in governance, business, and society, aligning with Spencer's view of how technology can transform social structures (Boundon and Bourricaud 1983: 368).

Like Spencer, Gerhard Lenski argued that technological advancements drive social change by reshaping social structures and relationships. In South Africa, the rollout of communication infrastructure is not only about technological progress but also influences broader social and economic dynamics, in line with Lenski's perspective (Kennedy 2004: 319).

The perspectives of Marx, Weber, Spencer, and Lenski offer valuable frameworks to analyse the intricate relationship between technology, the economy, culture, and society in the context of the 4th IR. These theories provide insights into the multifaceted nature of societal development during a period marked by rapid technological innovation and digital transformation.

Technological advancements have served as a key catalyst for social change since the onset of the 1st Industrial Revolution in the 1700s. The increasing prevalence of

technology, particularly since the 3rd Industrial Revolution, has facilitated the convergence of human activities and technological innovations (Prisecaru 2016: 58).

As discussed in Chapter 1, the advent of the 4th IR ushered in a new wave of technologies, leading to innovative 'smart' solutions across various industries and sectors. The heightened development of ICT infrastructure during this period, compounded by the transformative impact of the Covid-19 pandemic, revolutionised economies and communities. This transformation has resulted in boundary-less environments where individuals, economies, and service provision are able to seamlessly connect without the constraints of physical location (Noble *et al.* 2022: 200-201).

Looking ahead, the emergence of the 5th Industrial Revolution presents opportunities for harmonious collaboration between humans and machines, leveraging 4th IR technologies to enhance well-being in workspaces and communities (Ali, Al-Sultan and Al Rubaie 2022: 203).

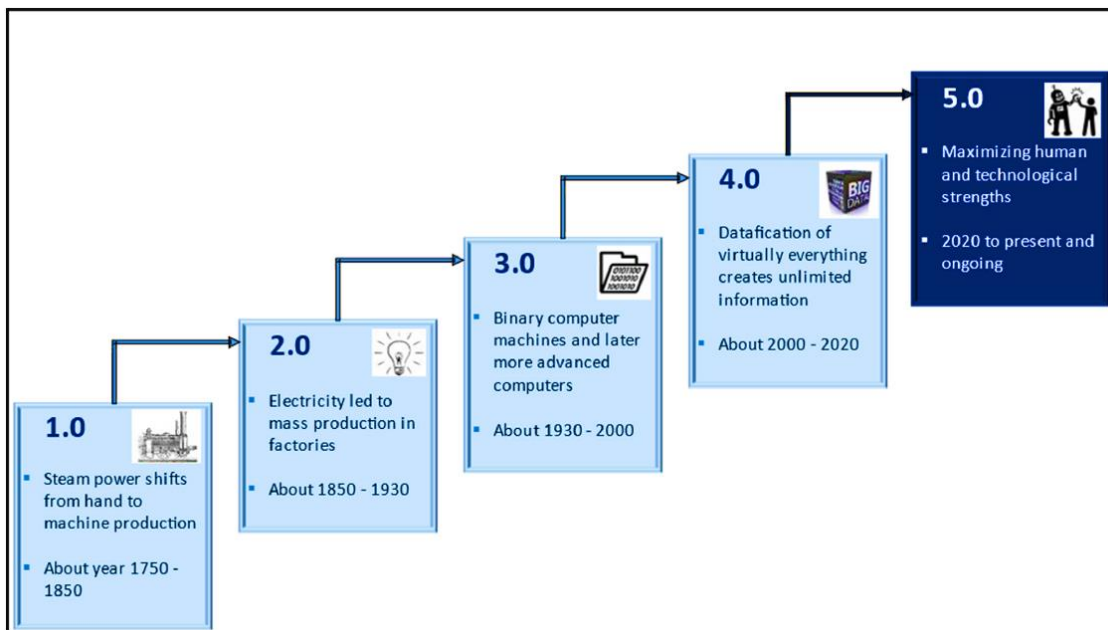


Figure 5: The progression of Industrial Revolutions (Source: Noble *et al.* 2022: 200)

The Industrial Revolutions have been pivotal in driving societal changes, shaping the modern world in terms of economics, politics, culture, and technology. They laid the

foundation for the development of modern industrialised societies and continue to influence global development and social transformation.

Societal development in the 4th and 5th IR is expected to be characterised by rapid technological advancements, digital transformation, workforce transitions, socio-economic changes, and ethical considerations. Balancing the opportunities and challenges of these revolutions will require proactive policies, collaboration among stakeholders, and a commitment to ensuring that technological progress is harnessed for the benefit of all members of society (Floridi 2014: 96-98). Policymakers are therefore required to consider social dimensions in the design and development of policies which regulate technology (Wolff 2021: 2).

2.3.1. The informational city

Castells (1991: 1) defines the informational city as a spatial manifestation of a new social organisation driven by technology, cultural, and social information. In the context of the 4th IR, technology and information processing play central roles, reshaping societal activities. Unlike previous industrial revolutions that focused on product development, the 4th IR emphasises process-oriented technological changes, altering how societies function (Castells 1991: 2). Sassen (1991: 3) builds on Castells' framework by focusing on the role of global cities in the informational city by emphasizing the role of global cities as hubs for managing information and capital.

While ICT and telecommunication cannot eliminate cities or urban sprawl, they redefine the concepts of space and place, necessitating a re-evaluation of global economic and societal processes. National governments must adapt policies to accommodate technological advancements, while local governments must remain flexible to align with national directives, enabling participation in the global economy (Castells 1991: 20).

Florida (2002: 23) highlights that the informational city is driven by the "creative class". He argues that economic success in the informational city depends on knowledge, creativity, and digital infrastructure, suggesting that cities thrive when they attract and nurture talent in these areas. Florida's contribution underscores the role of human

capital and innovation in the new urban landscape shaped by technology.

Similarly, Harvey (1989: 280) discusses how global information flows disrupt traditional urban boundaries, making cities more flexible and interconnected in a transnational system. Harvey's analysis of the fluidity of information and capital further complements the notion of the informational city by showing how cities are no longer isolated but are increasingly linked in a transnational system of interconnected urban centres.

2.4. Globalisation, post-globalisation, and ICT

Globalisation refers to the expansion and linkages of societies on a global scale. Economic activities can occur across boundaries, allowing countries to integrate their economies through cross-border movement of goods, services, and people (Shahzad 2006: 204-205). Saskia Sassen (2011: 652) explores the influence of new technologies and globalisation on cities, resulting in a convergence of spaces (Sassen 2011: 657-658).

The transition to a post-globalisation phase is not marked by a specific event or date, but rather represents a gradual evolution in global dynamics, economic structures, and political landscapes. Information and communication technology acts as a pivotal enabler of the post-globalisation phase, facilitating global interactions through digital platforms. It encompasses the expansion and interlinking of societies on a global scale driven by ICT and the convergence of economies (Erturk 2015: 365).

By integrating ICT into economies and industries, various sectors can capitalise on existing infrastructure and technology, particularly in developing economies. This phenomenon of technological leapfrogging varies across countries, with some leveraging technology to enhance productivity and narrow gaps, while others focus on advancing sectors previously lacking in technological advancement, such as mining or production (Adeleye *et al.* 2022: 231). It fosters economic growth, exemplified by the transformative impact of mobile phones on digital economies for trade, socialising, and networking.

The introduction of innovations like 3D printing and robotics promises to enhance

businesses and the quality of life, empowering entrepreneurs to realise their vision and offering communities more efficient and cost-effective transportation and communication options (Xu, David and Kim 2018: 92). However, technological advancements also pose challenges, particularly for developing countries reliant on traditional methods. Sutherland (2020: 19) argues that they can exacerbate inequalities in access to and usage of ICT, contributing to digital divides within and between countries. Post-globalisation efforts should focus on addressing these disparities and ensuring inclusive access to digital resources and opportunities.

This has prompted planners to reconsider urban design, presenting both opportunities for socio-economic growth and concerns regarding increased inequality. Planners grapple with these dynamics while navigating changing economies, societies, and political landscapes (Sanyal 2002: 118). This necessitates an understanding of the current socio-economic context, enabling planners to navigate complex challenges and contribute to inclusive and sustainable urban development (Sanyal 2002: 119-120).

2.4.1. The network society

In Castells' conceptualisation of the 'Information Age', technology plays a pivotal role in reshaping the economy, society, and community culture. The onset of the information technology revolution in the 1970s (Castells 2002: 548) fuelled globalisation and the concept of 'networking', where individuals utilise information technology to organise, manage, produce, and navigate daily life (Castells 2002: 548).

The integration of technology and networking gives rise to the 'network society', also referred to as the 'information society' (Allmendinger 2001: 56). Both concepts underpin modern and postmodern societies. Allmendinger (2001: 57-58) outlines five fundamental pillars underpinning the information/network society: technological advancements, an economy centred on information industries, transitions in occupational structures towards service-oriented positions, the globalisation-induced interconnectedness of time and space, and cultural shifts stemming from heightened information accessibility through media channels.

The network or information society illustrates the social complexities of post-globalisation and technological advancements. The integration of technology into global economies has led to the emergence of open markets and disparities in social inclusion or exclusion among communities within cities (Castells 2002: 548). Castells (2002: 557) emphasises the need for urban policies to adapt and transform to ensure functional societies within global networks. Planners must address spatial and social inequalities through urban and spatial planning and design, providing disadvantaged communities with resources and opportunities to participate in the 'network society' (Castells 2002: 557).

2.5. Sustainable development

Sustainable development concerns the socio-economic relationship between humans and nature and foregrounds environmental problems such as climate change and socio-economic challenges in society such as poverty and inequality. This led to the Brundtland Report and subsequent earth and climate summits that culminated in the Sustainable Development Goals (Georgeson and Maslin 2018: 1-2). Sustainable development in the context of the 4th IR refers to the integration of environmental, social, and economic considerations into technological advancements and societal transformations to ensure long-term well-being for current and future generations (Guandalini 2022: 466).

2.5.1. Climate change

Climate change and sustainability are two pressing global matters. The challenge facing governments and nations is clear: to honour the Paris Agreement's call to limit global warming to 1.5°C and reduce carbon emissions by 45% by 2030, reaching net zero by 2050. At COP26 in 2021, world leaders were urged to take decisive action and commit to meaningful reductions in emissions. Achieving net zero carbon emissions by 2050 requires a fundamental shift in society, government policies, industries, and corporate practices towards embracing technological innovation (Dwivedi Yogesh *et al.* 2022: 2).

Addressing climate change in the context of the 4th IR requires transitioning to sustainable practices which address the use of energy linked to the deployment of ICT

technologies. Therefore, sustainable energy sources, promoting energy efficiency and conservation measures, reducing electronic waste, adopting sustainable supply chain practices, and enhancing resilience to climate risks should be at the forefront of the climate agenda in the 4th IR. Collaboration among governments, businesses, and civil society is essential to mitigate the environmental footprint of the 4th IR and ensure a sustainable future.

Utilising ICT and electronic infrastructure have the potential to facilitate the shift towards sustainable development. This necessitates a holistic approach, integrating technological innovation, policy measures, and societal changes. Solutions include transitioning to renewable energy through solar, wind, and hydropower to power digital infrastructure and reducing reliance on fossil fuels. Technological innovations such as sensor-based water management and energy consumption monitoring, along with data collection and analysis, offer effective means to address climate challenges. Other measures include incentives to invest in renewable energy technologies and supporting the development of smart grids and energy storage solutions to facilitate integration into the energy system. Policy and regulations should promote environmental sustainability and public awareness and education campaigns should be run to raise awareness of the importance of sustainable practices such as remote working to reduce carbon footprints. Moreover, access to digital platforms enables a global marketplace that is both cost-efficient and environmentally friendly (Dwivedi Yogesh *et al.* 2022: 3-5).

2.6. Smart cities and ICT

Chapter 1 outlined the concept of a smart city and presented the fundamental components of such cities in Figure 3. The smart city concept is underpinned by technology and innovation, which converge in urban environments aiming to foster innovation and create a cohesive living environment for residents. The ultimate goals include enhancing sectoral performance, ensuring cost-effectiveness, and minimising environmental impact (Cugurullo 2018: 9).

Earlier definitions of smart cities emphasise the importance of sustained investment in the economy and human capital as drivers of smart city development. This highlights

the dynamic nature of smart city concepts and ideologies, which can vary based on factors such as the socio-economic status of the country, Gross Domestic Product (GDP), and the availability of a skilled workforce. Figure 6 illustrates the convergence of ICT across different sectors, contributing to the realisation of a 'smart city'.

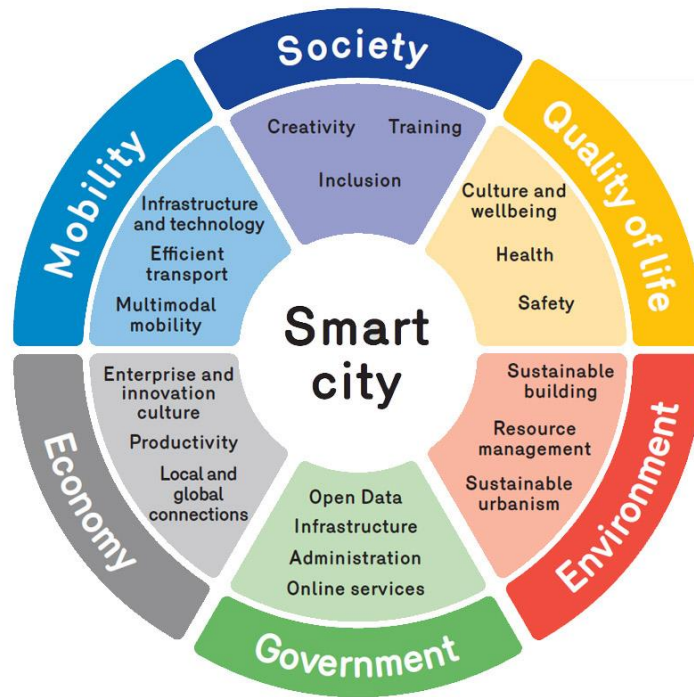


Figure 6: Outline of sectors and convergence of ICT in a 'smart city' (Source: Brussels Smart City 2023)

Increasing urbanisation has created new challenges related to infrastructure and service provision, housing and resource availability, transportation, and security needs which often compound current and historical challenges. Smart city concepts present possible solutions to address urban challenges more efficiently and sustainably across various sectors by using data to create 'smart' sectors.

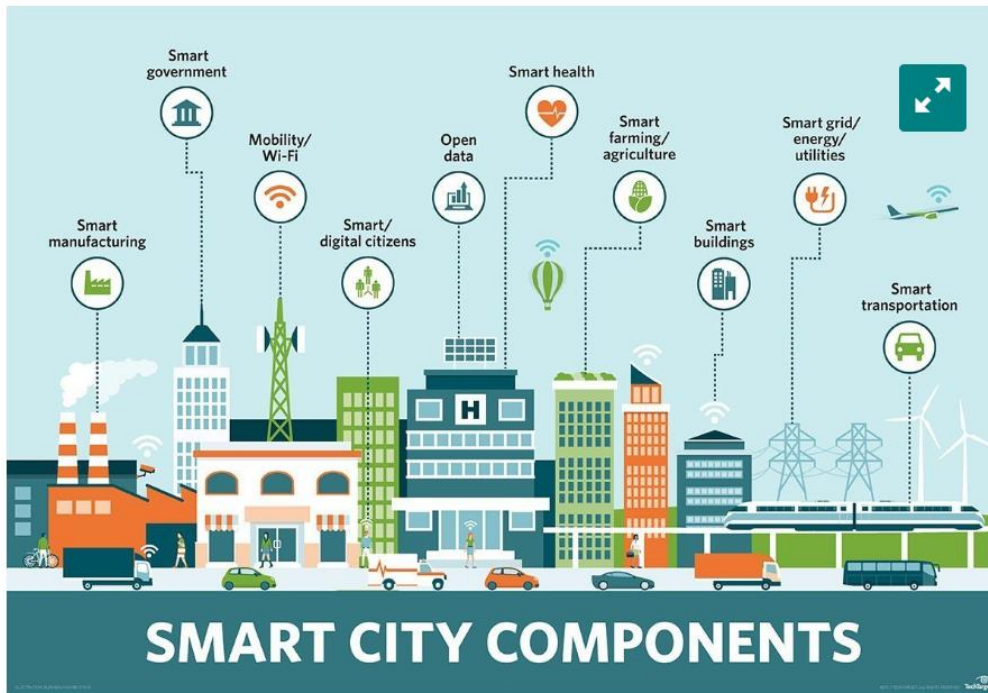


Figure 7: Smart City components (Source: Sharon Shea 2023)

Smart cities integrate spatial planning principles with electronic communication infrastructure development to create more efficient, sustainable, and connected urban environments. By leveraging data-driven technologies and advanced communication networks, they aim to improve the quality of life, promote economic development, and address pressing urban challenges.

2.7. Spatial planning and ICT development

Chapter 1 introduced the concept of planning and spatial planning. This section considers spatial planning and the development of ICT which are intertwined aspects of urban governance and infrastructure management. Spatial planning involves the strategic organisation of land use, infrastructure, and resources within urban areas to achieve the Sustainable Development Goals, while ICT development encompasses the deployment of digital technologies and communication networks to enhance connectivity and information exchange. Integration of spatial planning and ICT development is essential to facilitate more efficient and responsive government decision-making (Talvitie 2004: 4).

Smart city initiatives leverage ICT innovations to improve urban management and service delivery. They often incorporate spatial planning principles to optimise the use of urban space and resources. For example, spatial analysis tools such as Geographic Information Systems (GIS) are used to inform decision-making about infrastructure placement, land use zoning, and transportation networks in smart cities through the input of data into the system (Caragliu, Del Bo and Nijkamp 2011: 70-72). By integrating ICT solutions with spatial planning strategies, smart cities aim to enhance urban sustainability, resilience, and the quality of life.

The development of ICT infrastructure, including electronic communication infrastructure such as fibre and telecommunication masts, is essential in enabling smart city initiatives. Such infrastructure supports the deployment of smart technologies for various urban applications such as transportation management, environmental monitoring, and public safety. Investment in ICT infrastructure is essential to enhance urban connectivity and digital inclusion, bridging the digital divide and promoting equitable access to digital services (Nam and Pardo 2011: 186-187).

Information and communication technology tools have transformed citizen engagement and participatory planning processes, allowing residents to actively contribute to urban decision-making. Online platforms, social media networks, and mobile applications enable citizens to provide feedback, share ideas, and collaborate with government agencies and urban planners. These ICT-enabled participatory planning approaches promote transparency, accountability, and inclusivity in spatial decision-making (Chatzoglou, Chatzoudes and Symeonidis 2015: 1489-1490).

The integration of spatial planning and ICT development offers promising opportunities to enhance urban governance, sustainability, and liveability. Smart city initiatives leverage ICT innovations to optimise urban management processes and improve service delivery, while spatial planning principles ensure efficient use of urban space and resources. By embracing ICT-enabled participatory planning approaches, cities can foster greater citizen engagement and collaboration, ultimately creating more inclusive and resilient urban environments.

For this to be achieved, spatial planning initiatives must integrate a strategic vision for ICT development within urban areas. This entails establishing clear objectives to leverage ICT to enhance connectivity, improve service delivery, and foster economic

growth. Strategic planning frameworks and policy guidelines are essential to drive ICT development through spatial planning.

According to Caragliu, Del Bo and Nijkamp (2011: 58), well-defined policy frameworks enable coordinated efforts among government agencies, private sector stakeholders, and community organisations to utilise ICT for urban development. These frameworks provide a roadmap for infrastructure investment, regulatory reform, and capacity building initiatives. Collaboration between the public and private sectors is required to drive ICT development through spatial planning.

Nam and Pardo (2011: 170) highlight the significance of public-private partnerships (PPPs) in mobilising resources, sharing expertise, and leveraging innovative financing mechanisms to support ICT infrastructure projects. Such partnerships facilitate knowledge exchange, technology transfer, and risk-sharing arrangements that promote more efficient and sustainable urban development. Enhancing the capacity of urban planning professionals and stakeholders to utilise ICT tools and technologies is vital to drive innovation and informed decision-making. Investing in training programmes, workshops, and knowledge-sharing platforms can enhance the digital literacy and technical competencies of planners, policymakers, and community leaders. Capacity building initiatives empower stakeholders to effectively utilise spatial data and other ICT tools in the planning process.

By integrating these elements into spatial planning practices, cities can effectively drive ICT development and utilise technology to address urban challenges and enhance service delivery, resulting in improved socio-economic conditions.

2.7.1. Space of Flows

The space of flows model, which is closely tied to the network society, encapsulates the disconnect between space and time within Castells' conceptualisation of the Information Age. It delves into the dynamics of spatial-temporal relationships and their impact on societies. The concept refers to the material infrastructure enabling simultaneous social activities across distant locations, facilitated by technological advancements in networks and industries. It encompasses the interaction among networks and the utilisation of electronic spaces such as the Internet for communication (Castells 1999: 295).

The space of flows model extends into physical spaces or the space of place, resulting in a model which incorporates both cyberspace and physical spaces within the information era. Practically, through the implementation of ICT and smart technology, traditional activities are dissolved, allowing people to interact at different times and places. Like other theories, it is evident that the implementation of ICT has transformed spatial form. The space of flows model thus accelerates the interchange of time and space. It also changes traditional land use planning (Xi, Zhen and Chang 2016: 42-43).

Traditionally, land use planning has emphasized the physical separation of urban functions such as residential, commercial, and industrial zones. However, ICT and smart technologies have lessened the reliance on fixed physical spaces by enabling remote communication and interaction. This shift moves land use planning from geographic proximity to virtual connectivity. For instance, telecommuting reduces the need for office space in central business districts, while ICT supports more flexible, mixed-use developments that combine work, leisure, and residential functions.

The model highlights the dynamic interplay between spatial planning and ICT development, underlining the need for adaptable urban strategies that embrace connectivity, accessibility, and technological innovation in shaping the built environment. Ultimately, the integration of ICT, as seen in the space of flows model, redefines traditional land use planning, promoting more flexible, interconnected urban environments that facilitate greater mobility and interaction across time and space.

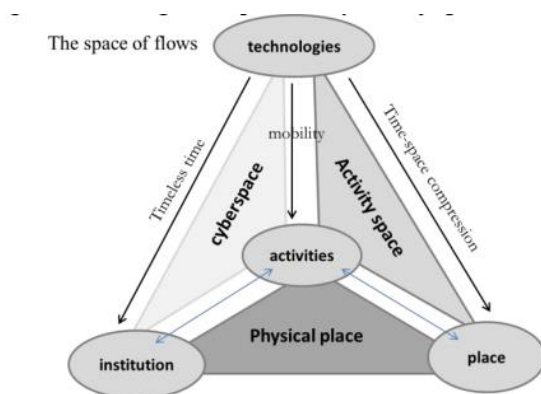


Figure 8: Space of Flows model (Source: Xi, Zhen and Chang 2016: 46)

2.8. Theoretical framework

Planning theories offer a knowledge base for informed decision-making, fostering sustainable and resilient communities. Yiftachel (1989: 24-25) and Davidoff and Reiner (1962: 11) sought to establish relationships between goals and planning theories for effective decision-making. While the application of specific theories may vary by context, this section unpacks those relevant to the current technological age, rather than providing a comprehensive analysis of all planning theories.

Two overarching categories emerge: substantive and normative planning. Substantive planning concerns itself with the practical aspects of planning, encompassing methodologies such as procedural planning and relational theories, which focus on the process and dynamics of planning activities. Normative planning delves into the idealised frameworks guiding city planning, encompassing concepts such as Just Cities and Compact Cities, which articulate desired principles and objectives for the organisation and development of urban spaces. Through the examination of these key concepts, this section highlights the multifaceted nature of spatial planning practices and their theoretical underpinnings.

2.9. Post-modernism

Modernisation theory, which originated in the late 1950s to 1970s, examines societal development, notably contrasting western Europe's advanced states with underdeveloped regions. Neoliberalism that influences policies and spatial planning promotes market-oriented solutions, sparking concerns about equity and sustainability. Critics advocate for inclusive planning that prioritises community and environmental needs over market interests (Goorha 2010: 3).

Postmodernist planning theory diverges from 18th century ideals, recognising the impossibility of justifying one planning view over another in post-globalisation contexts. Unlike traditional views, it advocates for flexibility to accommodate diverse paradigms and challenge prevailing planning norms (Allmendinger 2001: 5). A nuanced understanding acknowledges critiques of its treatment of traditional theories and combination of perspectives, while recognising its potential for transformative planning practice.

Information and communication technology revolutionised societies, resulting in a post-modernist approach. Technology is viewed as the driving force of post-modernism and a principal icon of modernity (Mokgobu 2005: 74-75). The relationship between technology and modernisation is complex due to societies' adaptability to the use and application of technology. The use of technology has meant that societies are now becoming informed and better equipped to interact both socially and as part of the political context to influence legislation and policy development through public participation (Mokgobu 2005: 92-93).

However, the planning profession lags these global changes, lacking responsiveness to evolving environments and stakeholder management. Education is required to equip planners to reflect on spatial planning and policy issues (Allmendinger 2001: 2-3). Post-modernisation theory provides an essential lens through which to approach spatial planning for ICT, encouraging planners to embrace cultural diversity, flexibility, participatory decision-making, spatial justice, and the integration of physical and virtual spaces. By incorporating these principles into their planning processes, they can develop more responsive, inclusive, and equitable ICT strategies that reflect the complex realities of contemporary societies.

2.10. Procedural Planning

Procedural planning theories focus on decision-making methods, while substantive theories involve interdisciplinary knowledge (Yiftachel 1989: 24-25). Procedural theories address planning forms, styles, or approaches, delineating planners' roles and responsibilities in decision-making processes. They guide planners in formulating job functions and planning processes to achieve desired outcomes (Ravindra 2019: 580).

Faludi (2013: 19) suggests that procedural theory should encompass substantive theories to accommodate the diverse contexts planner's encounter. Procedural theories have historically shaped what is known as 'planning theory' and have influenced various planning traditions such as Synoptic, Incremental, Transactive, Advocacy, and Communicative Planning (Olesen 2018: 305). These traditions are

associated with normative planning theories, where planners jointly determine the goals and methods of planning (Mukhopadhyay 2015: 21).

Procedural planning methodologies are linked to how city planning is conducted. In the case of South Africa and the eThekweni Municipality, procedural methods still centre around planning within a strategic management framework with a focus on developing the economy whilst addressing past and present socio-economic challenges.

The role of planners has shifted from regulatory oversight of the market to facilitating economic growth, often at the expense of addressing social and environmental injustices. This has reshaped planning processes from collaborative and relational to inherently political endeavours in which planners actively participate. Davoudi Simin (2017: 10) critiques spatial planning procedures, advocating for the incorporation of social democratic values to challenge political dynamics and prioritise societal well-being over market transactions. Criticism extends to spatial planning practices in the 4th IR, which are critiqued for adhering to traditional geographic-based planning methods despite technological innovation (Davoudi Simin 2017: 9-10).

2.11. Normative and substantive planning theories

Normative and substantive theories intersect and mutually influence each other within the realm of spatial planning. Normative theories establish the foundational principles for policymaking and institutional development, while substantive theories aid in evaluating the feasibility and efficacy of these policies and institutions in delivering public goods. Normative planning theories require planners to consider both the objectives and the methods of policies, fostering a rational approach to planning that integrates scientific analysis. By adhering to normative theories, planners can justify their decisions beyond mere political motivation or professional assertions, thereby enhancing the credibility of planning outcomes. Normative theories guide the provision of public goods by offering guidelines and principles to policymakers and decision-makers during the design of systems for public goods provision (Klosterman 1978).

Substantive theories are grounded in empirical reality and encompass scientific methodologies and tools for policy formulation. Through observation, experimentation,

and testing, they inform the development of planning strategies. Drawing from diverse disciplines and expertise, these theories aim to enhance long-term political planning by addressing sociological impacts and fundamental concerns related to public goods provision (Ravindra 2019: 580). Substantive theories delve into planning practices and analyse how individuals and institutions interact with them, often relying on empirical observations and data analysis to inform decision-making (Faragó 2004: 8).

Watson (2002: 28) advocates for planners to have a thorough understanding of social-spatial and political processes as these shape planning contexts. Together, normative, and substantive theories provide a framework to guide spatial planning for ICT. Normative theory sets the overarching goals and values, while substantive theory informs the practical implementation of these goals by providing the necessary knowledge and analysis. By integrating both normative and substantive considerations, planners can develop more effective and equitable ICT strategies that address the needs and aspirations of diverse communities while promoting sustainable development and social justice (Victor, Precious and Facundo 2022: 1). The application of normative and substantive planning approaches is seen in the formulation and implementation of the SPLUMA 16 of 2013 as an overarching planning policy for South Africa which is discussed in Chapter 3.

2.12. Relational theories

Relational theories concerning urban time and space have become increasingly influential within urban studies, geography, and social theories. Graham and Healey (1999: 623) offer theoretical insights into the interplay between space and place, shedding light on how this dynamic relationship informs spatial planning practices. They conceptualise space as the physical domain where various spatial factors interact to mould cities (Graham and Healey 1999: 626). Their argument suggests a departure from traditional planning theory debates towards deeper consideration of the complex socio-spatial contexts that planners must navigate.

It is posited that city dynamics are interlocked within the space of a city, which further relates to physical form and land uses. This relates to the idea that cities are shaped by environmental and physical attributes. However, theorists such as John Friedmann recognise the need for planning to move away from Euclidean or traditional planning

and consider 'real-time' challenges and strategies (Graham and Healey 1999: 624-625).

Massey (2005: 10-11) highlights the dynamic nature of space, contending that places are not static entities but are rather continuously moulded by interactions among various social, economic, and political forces. Building on Massey's insights, Cavaco *et al.* (2023: 16-17) delve into spatial practices and everyday experiences, shedding light on how individuals' interactions shape perceptions of space and place. Their research underscores the significance of lived experiences and social interactions in defining the meaning and importance of different urban spaces.

Healey (2003: 4-5) and Albrechts (2013: 4-5) extend relational theories by highlighting planning's pivotal role in mediating spatial relations and influencing urban development. They advocate for planning practices that acknowledge the complex and dynamic connections between various spatial elements such as people, places, and institutions. They also argue for inclusive and participatory decision-making processes that consider stakeholders' diverse needs and perspectives.

Relational theories provide a holistic framework for spatial planning for ICT, emphasising the interconnectedness of social, technological, and spatial dimensions. By incorporating relational perspectives into planning practices, planners can create more inclusive, participatory, and contextually sensitive ICT interventions that enhance social connectivity, equity, and well-being. Globalisation, telecommunication, and faster transport networks can support growing economies, societies, and cultures beyond the physical spatial boundary of a city (Graham and Healey 1999: 627-628).

2.13. Just Cities

The 'Just City' concept stemmed from Judith Innes and Booher's (2015) debate on communicative planning and its relationship to creating Just Cities. Communicative planning considers the importance of inclusive and participatory decision-making processes in urban planning. The debate on Just Cities gained momentum as Innes and planning theorists such as Susan Fainstein highlighted the social, economic, and environmental gaps that arise due to traditional planning practices (Fainstein 2006).

Information and communication technology can play a significant role in shaping and enhancing the implementation of the "Just City" theory by increasing access to information for all communities and societies regardless of their geographical or social

circumstances. This would address the digital divide currently experienced by outlying/rural communities by enabling them to utilise online platforms such as e-governance which in turn promotes citizen participation. Smart City initiatives could be deployed to create equitable opportunities, for example through improved transport systems. Data collection could assist in identifying urban inequalities and assessing policies' impact.

2.13.1. Placemaking

In her seminal work, *The Death and Life of Great American Cities* published in 1961, urbanist and author Jane Jacobs championed diversity through mixed-use development and advocated for the creation of safe urban spaces (Project for Public Spaces 2010a). William H. Whyte, whose influential work *The Social Life of Small Urban Spaces* examined the impact of public spaces on social development, complemented Jacobs' efforts (Project for Public Spaces 2010b).

Placemaking can be described as the act of creating public spaces and well-functioning, lively cities, whereby people play a pivotal role in giving meaning to places and spaces. It involves the physical and philosophical process of transforming public places and collaboration among different stakeholders (Foth 2017: 203). Similarly, Wyckoff (2014: 1) defines placemaking to improve the quality of places, communities and regions. It involves creating quality live-work-play environments.

There are four types of placemaking, namely, standard, strategic, creative and tactical. The latter three specialised types focus on quality-of-life improvements, methods to achieve larger/smaller outcomes or benefits and the time taken to achieve such, as well as methods to test their feasibility (Wyckoff 2014).

Information and communication technology has accelerated the congruency between people and places. Using the Internet, smartphones and digital networks, people can connect more intensely in virtual spaces than in physical ones (Woerjantari *et al.* 2021: 164). The 4th IR can offer solutions to challenges in placemaking. For example, digital storytelling can help to capture and relay historical records of a place and digital participation will encourage stakeholder involvement and transparency. Digital placemaking does not limit community involvement; it regards people as co-creators in a collaborative form of planning. Through digital placemaking, citizens, government

and economic stakeholders could converge to leverage productive and sustainable places (Foth 2017: 204-205).

2.14. The compact city

The compact city concept is associated with theorist Jane Jacobs (2016) and is characterised as having relatively high densities, a mix of land uses and pedestrian-friendly built environments, which promote sustainable urban development (Jacobs 2016). Other authors describe a compact city as a mixture of urban forms, space and social function (Bibri, Krogstie and Kärrholm 2020: 3).

The compact city approach recognises the use of ICT to develop a sustainable city and promote long-term resilience using renewable energies, resulting in reduced use of energy and other resources as well as mitigation of pollution, and minimising waste. This approach also focuses on promoting social equality and well-being (Bibri, Krogstie and Kärrholm 2020: 2).

2.15. Chapter Conclusion

This chapter explored technology's impact on social dynamics and its implications for the evolving landscape of the 4th and emerging 5th IR, globalisation, and sustainability, particularly in addressing pressing issues like climate change. The integration of ICT in sustainability efforts is exemplified through smart city initiatives and its application across various sectors. The conceptual framework highlights the importance of spatial planning for ICT, underlining the need for planning frameworks to formulate policy guidelines to drive ICT development. Issues such as PPPs, skills enhancement within the planning sector, and resource capacity were also emphasised.

The theoretical framework covered planning theories relevant to ICT and the transition to the 4th IR. In the technological age, planners need to acquaint themselves with present-day challenges. The theoretical framework offered insights into how theorists have grappled with ICT's incorporation into planning. However, as highlighted in this chapter, the practical challenge for planners lies in transcending traditional Euclidean planning methodologies to address the borderless spaces and networked societies resulting from the convergence of ICT and the built environment.

The following chapter presents precedent cases relating to the research study in both developed and developing countries across the world. The South African context is further explored in relation to ICT and spatial planning policies and legislation. This promoted an understanding of the research area and enabled informed recommendations and conclusions to be made.

CHAPTER 3: PRECEDENT STUDIES

3.1. Introduction

This chapter discusses ICT's use and socio-economic impact through the implementation of government policies, initiatives, programmes, and planning in developed and developing countries. It explores cases in developed countries, Singapore, Japan, and Australia, and developing countries such as Malaysia and Bangladesh. The chapter contextualises ICT in Africa and South Africa and unpacks the latter's ICT, electronic communication and spatial planning regulatory framework. It concludes by considering two metropolitan areas in South Africa, the Cities of Johannesburg and Cape Town.

According to Islam *et al.* (2012: 159), ICT can improve societies and economies through boundary-less connectivity, interactive organisations, and information sharing. It has also been an integral component in creating employment, harnessing skills, reducing corruption, and creating equal opportunities. However, urbanisation has resulted in high levels of inequality, unemployment and informality, and a lack of basic service delivery. As a result, the implementation of ICT and smart innovations varies between countries and cities, based on their historical challenges. Although ICT and smart initiatives have been implemented worldwide, the level of implementation remains inconsistent (Islam *et al.* 2012: 159).

3.2. ICT and electronic communication in developed countries

This section unveils several ways in which ICT has been adopted and used in developed countries, resulting in societal and economic benefits. This is a result of a long legacy of competitiveness, innovation, diverse economic sectors, and financial markets, which have cumulatively enhanced citizens' standard of living.

3.2.1. Singapore

In 2022 Singapore had a population of approximately 5.63 million and was one of the most densely populated countries in the world. Its advanced port and facilities make it a global hub for commerce and logistics and a vital world trade route (The World Bank 2023a). The smart and innovative infrastructure in Singapore is one of the most advanced in the global ranking. This is due to its diverse economy which is

characterised by a strong services sector in petroleum and chemicals, high-tech manufacturing of electronics and medical devices, innovation-driven growth, a favourable business environment, and a skilled workforce. Through its strategic policies and investments, Singapore has achieved significant economic success and positioned itself as a global business and financial hub (United Nations 2021: 25).

Informed by a vision for a smart metropolis, the government began engaging with smart responses as early as 1971 and established a planning department to control the development of the land and transportation. Through revised planning policies, Singapore addressed issues relating to the quality of life and housing (Lee *et al.* 2016: 5). Due to the small physical size of the country, which measures approximately 597 km², smart initiatives are used to address challenges such as liveability, environmental sustainability, and economic competitiveness (Lee *et al.* 2016: 1-5). Pilot projects were implemented to determine the feasibility of these initiatives. However, according to Lee *et al.* (2016: 28), a major challenge to the implementation of smart services is the overlapping platforms that have not been rationalised to support optimal utilisation of smart devices and data sharing and minimise costs.

According to Pereira, Lee and Fife (2023), the following smart initiatives and innovations were implemented by the Smart Nation and Digital Government office:

- Intelligent Transport Systems and e-governance to control traffic flow through the creation of fleets and self-driven ferries. Real-time data assists in traffic monitoring and ensures road safety.
- Citizen safety emergency messaging, providing access to information or file reports online, making Singapore the second safest city in the world.
- Central monitoring of water management, pollution and waste.
- Smart sensors in homes to monitor energy use and switch off appliances when no one is home.
- Various e-governance programmes to cater for citizens, businesses, and governmental sectors.

Singapore has successfully implemented smart initiatives through combined efforts between strategic planning, government and infrastructure investment, clear

regulatory frameworks and standards, monitoring and feedback mechanisms, and collaboration with the private sector. Government's vision and leadership to transform the nation into a smart nation drove the implementation of strategies. These initiatives are supported by well-built ICT infrastructure systems and PPPs. Overall, Singapore's success can be attributed to strong governance, investment in technology and infrastructure, and a focus on socio-economic development.

3.2.2. Japan

Japan has one of the largest populations globally with approximately 125.4 million people in a geographic area of 377,944 km² and is known for manufacturing motor vehicles and importing and exporting manufactured goods and electronics (Jozuka, Yeung and Fukutome 2023). It is estimated that ICT has contributed 40% of Japan's GDP growth. By 2012, 80% of the population had Internet access, resulting in Japan becoming one of the most technologically-savvy nations with generally high-quality ICT infrastructure and services related to ICT and the education and health sectors (Schwab 2019: 17).

However, Japan's rapidly ageing population and low birth rates are on-going challenges (Jozuka, Yeung and Fukutome 2023). The aged population has resulted in many firms still operating on legacy systems (Broeckaert 2022: 2). In 2001, Japan launched e-health policies to enable elderly individuals to receive medical consultations and health monitoring from their homes, reducing the need for travel (Obi, Ishmatova and Iwasaki 2012: 3).

Urban planning is particularly challenging in Japan due to densification along the riversides or coastline resulting from unfavourable inland topography (Pham 2014: 9-10). The government has implemented ICT projects within cities to address rapid urbanisation and geographical planning challenges. Examples within the transportation and energy sector include the use of geospatial positioning technology to control and manage traffic (Deguchi *et al.* 2020: 60-62).

In 2016, the Japanese Government established Society 5.0 to leverage technological transformation across all sectors, resulting in a smart society and aligning with the 5th IR. It focused on converging cyberspace and physical space through digital

transformation to promote economic growth and societal development (Broeckeaert 2022: 15).

Like Singapore, successful implementation of smart initiatives in Japan is attributed to the availability of ICT infrastructure to support initiatives, coupled with government policies which play a pivotal role in implementation and regularisation. Public-private partnerships also assist in developing and rolling out smart solutions. Due to geographical constraints, smart initiatives have been incorporated into the planning framework to address challenges such as urban planning and development.

3.3. ICT and electronic communication in developing countries

The stark difference between the experiences of the global north and south cannot be ignored. Cities in developing countries are characterised by poverty, poor infrastructure, a lack of basic services and unequal opportunities, amongst other factors. Marginalised communities' inability to access information, knowledge, and networks contributes to their challenges. This phenomenon is known as the 'digital divide' and is a prominent challenge for rural communities (Pedrelli 2001: 5).

3.3.1. Malaysia

In 2019 Malaysia was home to 32 million people residing in a total area of 329,847 km². The country is one of the more successful developing countries through manufacturing (Schwab 2019: 16). More than 90% of citizens have access to mobile communication services. Malaysia's ICT infrastructure includes optic fibre, with wireless facilities deployed in rural areas; however, the costs are still significantly higher. The country has also adopted ICT in education, health care and government, through 'E-Learning', 'E-Healthcare' and 'E-Governance' (Malaysian Industry-Government Group for High Technology 2021).

Malaysia has pilot smart city initiatives in Kuala Lumpur, Kota Kinabalu, Kuching, and Iskandar Malaysia. These cities are supported by an array of policies, regulators, and facilitators as well as enablers or providers of ICT. Together, these stakeholders support the creation and functioning of smart initiatives (Malaysian Industry-Government Group for High Technology 2021: 4).

National and local policies and frameworks have been developed to ensure integrated and holistic planning. The Malaysia Smart City Framework is the overarching national framework guiding smart city development. Regional plans and frameworks are formulated to address regional development. Similarly, local plans target a city, for instance, the Putrajaya Smart City Blueprint (Malaysian Industry-Government Group for High Technology 2021: 5).

The Malaysia Smart City Framework 2018–2025, drafted by the Malaysian Industry-Government Group for High Technology outlines seven components of smart cities, namely, smart government, people, economy, environment, living, mobility, and digital infrastructure. The framework includes policies, strategies and initiatives linked to the seven components, which are benchmarked against international best practices. It also encourages PPPs (Malaysian Industry-Government Group for High Technology 2021: 5). However, its success is a gradual, evolving process, and results may become more evident over time.

The Malaysia Smart City Outlook 2021-2022 highlighted achievements in smart initiatives over the seven components (Malaysian Industry-Government Group for High Technology 2021), including:

- National Liberation and Connectivity Plan 2019-2023: formulated to improve broadband quality and coverage and to reduce the cost of providing Internet access. Investment has been made to leverage 5G and satellite technologies.
- E-Wallet: aimed at increasing the number of electronic payment transactions.
- E-Governance: using ICT to transform administrative processes, automation of public services and encourage e-payments and e-court.
- Digital Infrastructure: since 1996, Malaysia has initiated smart digital infrastructure by investing in the rollout of ICT installations such as cables, satellites, and fixed broadband. Information and communication technology was also developed in rural regions to ensure inclusivity and equity. The National Digital Network introduced in August 2020 aimed to respond to the increased need and demand for digital connectivity because of 5G.

- Intelligent road and traffic system initiatives, low emission mobility and travel assistance to deal with real-time traffic challenges.
- Smart housing and living incorporate smart infrastructure to create affordable and sustainable housing through initiatives such as rainwater harvesting and solar power.
- Smart environment initiatives include waste, water, carbon, and greenery management.

This case study shows that the key elements required for successful implementation of government initiatives such as the Smart City Framework include government being able to obtain and provide funding and regulate frameworks. Like Singapore and Japan, government efforts and a collaborative approach with industries enabled the adoption of smart solutions, allowing communities to grow and enhancing their ability to work and participate in the digital age.

3.3.2. Bangladesh

According to the World Bank, Bangladesh's population in 2022 stood at more than 171 million within a geographical area of 147,570 km², one of the most densely populated countries in the world (The World Bank 2023a). Technology was introduced in 1964 with the use of computers. In 2002, the government released its National ICT Policy, resulting in approximately 20 million computer users in the country (Islam *et al.* 2012: 162). However, only 1% of citizens has access to the Internet due to the high charges imposed by service providers (Islam *et al.* 2012: 162).

Bangladesh's population is largely disadvantaged, with an economy still based on traditional agrarian forms of trade. The Charter for Change that was adopted in 2008 aimed to achieve a "Digital Bangladesh" by 2021. This required the expansion and integration of ICT in various sectors. "Digital Bangladesh" is based on four pillars, namely, human resource development, connecting citizens, digital government and ICT in business (Mazumdar and Alharahsheh 2020: 7).

Human resource development aims to upskill employees in the ICT industry. To address the digital divide, government aims to ensure that all citizens are digitally

connected to enable them to access public services. This will also make local content available in native languages and ensure access to channels and platforms. The digital government introduced e-services in various sectors for efficient service delivery and improved interaction between government services and citizens. Following the Covid-19 pandemic, government redoubled its efforts to address digital inclusion and ensure equality, targeting the upskilling of women and girls. Information and communication technology has also been harnessed to connect local businesses with international markets and to assist disadvantaged producers and businesses by facilitating market access (Mazumdar and Alharahsheh 2020: 8).

Examples of ICT programmes relating to the four pillars include e-Governance which enables the poor and disadvantaged to express their concerns and access information and 'e-Krishi' or e-Agriculture that produces TV shows and establishes contact centres to assist farmers with knowledge and training. Bangladesh has also used communication technology to relay important health messages (Islam *et al.* 2012).

In comparison with Malaysia, Bangladesh still grapples with serious socio-economic challenges. Further consideration and deployment of ICT infrastructure will be required to address these challenges efficiently and effectively. Regulatory frameworks need to move beyond traditional agrarian approaches and create solutions which that are easily accessible and user friendly. Public-private partnerships can be used to leverage the development of infrastructure. Only through the effective leveraging of technology will the country be able to address challenges linked to socio-economic development and improve its citizens' quality of life.

3.4. The African context

One of the primary challenges confronting the African continent is the development of robust ICT infrastructure to address socio-economic issues and promote inclusivity (Nchake and Shuaibu 2022: 12). Social systems, governance and technological infrastructure in African cities cannot be compared to their western counterparts.

Equal development is essential for cities to implement ICT initiatives to address current challenges. This requires that governments promote this principle and align it to traditions and cultures which shape African cities through holistic policies and

regulations (Achieng *et al.* 2021: 4). Despite the socio-economic challenges faced by African countries which include poverty, unemployment, inequality and weak governance systems, some countries have grown their ICT and electronic communication sectors.

3.4.1. Nigeria

With an estimated population of 202 million people inhabiting 910,770 km² of land, Nigeria relies on sectors such as agriculture, mining, and telecommunications to support its economy (The World Bank 2024b). While the country plays a significant role in the global oil market, challenges such as low levels of production, fluctuating oil prices, and security issues, including vandalism and pipeline sabotage, hinder the sector's growth (The World Bank 2023b).

In its quest to address poverty, unemployment, and inequality, Nigeria has identified short- and medium-term policy reforms focusing on economic diversification, infrastructure development, investment in the social sector, human capital, security, corruption, and fostering PPPs (The Nigerian Economic Summit Group 2023: 19).

The country has one of the largest and fastest-growing telecommunications markets in Africa, with major telecommunications companies such as Microsoft being active players. In contrast to other service sectors, the ICT industry in Nigeria grew by 9.5% in 2022 (The Nigerian Economic Summit Group 2023: 12).

The sector's growth is facilitated by various policies and acts that regulate electronic communication infrastructure. The National Digital Economy Policy and Strategy (2020-2023) aimed to transform the digital economy and foster digital innovation. Key enablers include the deployment of electronic communication infrastructure, e-service platforms, digital financial services, e-commerce, and enhanced digital skills (Nlerum and Eleje 2022: 63-64). However, the digital divide, which is exacerbated by low levels of education and poverty, remains a challenge (Nlerum and Eleje 2022: 65 - 66).

Harnessing the transformative potential of ICT and electronic communication offers Nigeria an opportunity to tackle socio-economic challenges, foster inclusive growth, and develop a resilient society. Collaboration among government, the private sector, civil society, and international partners is imperative to ensure that ICT interventions are inclusive, sustainable, and aligned with national development priorities.

3.4.2. Kenya

According to the the World Bank (2024a), Kenya's population stood at 54.027 million in 2022, spanning an area of approximately 582,646 square kilometres. The socio-economic challenges facing the nation mirror those encountered across the African continent, encompassing high levels of poverty, unemployment, inequality, corruption, and inadequate infrastructure, among others. Kenya's economy relies on the agricultural sector, supplemented by manufacturing, mining, and the electricity and water supply industries (The Kenya Institute for Public Policy Research and Analysis 2023: 11).

Like Nigeria, Kenya could harness the potential of ICT to address socio-economic challenges. However, this requires that several issues be addressed, including unequal investment and access to ICT, underutilisation of ICT for service provision and economic opportunities, cultural resistance to ICT adoption, and supportive policies and procedures for ICT development (Ministry of Information Communications and Technology Kenya 2019: 12).

The Ministry of Information, Communications, and the Digital Economy is tasked with formulating, administering, managing, and developing ICT policies. The national ICT policy aims to bolster the economy by facilitating the provision of high-speed, quality wireless Internet nationwide, fostering frameworks conducive to ICT development, and leveraging the ICT sector's contribution to GDP growth. Four key areas have been identified: universal access to mobile Internet connectivity, leveraging ICT for economic growth, investing in skills development to promote e-commerce and investment, and utilising ICT for enhanced public service delivery (Ministry of Information Communications and Technology Kenya 2019: 6 - 8). The ICT Authority of Kenya is mandated to promote and regulate ICT. The Strategic Plan (2020-2024) aligns with the key focus areas identified by the Ministry (ICT Authority 2020: 7).

Overall, Kenya has a more developed and advanced ICT sector than Nigeria, with superior infrastructure, policies, and a digital innovation ecosystem. However, like Nigeria, there is a need for robust policy reform, infrastructure investment and development, digital skill development and equal access to ICT services and resources.

3.5. South Africa

In 2023, South Africa's population stood at an estimated at 60,14 million people residing within an area of 1,221,037 km² (South African Government 2023). The country's economy is based on farming, mining, and informal trade. A large majority of its citizens lack basic skills, resulting in high levels of unemployment (Sutherland 2020: 234).

Historical challenges entrenched in the country cannot be ignored. Rural and traditional authority areas lack sufficient ICT and electronic communication infrastructure development. In addition, communities lack digital literacy and the ability to effectively utilise digital platforms. This has resulted in a low ranking on the Human Development Index, on-going poverty, and slow rates of socio-economic development.

According to the 2022 ICT Sector Report, household Internet access in South Africa increased to 74.1%. Internet access stood at 66.8% in metropolitan areas, 71.6% in urban areas and 52.9% in rural areas (Independent Communications Authority of South Africa 2022: 12-13). However, the actual useability of digital devices and platforms as well as the quality of services provided is yet to be determined.

National and provincial government are responsible for the development of ICT and electronic communication infrastructure. They are tasked with policy development, strategies and regulations, funding, skills development, delivery of e-services and collaboration with the private sector. Municipalities are at the bottom tier of the governmental hierarchy and are responsible for the implementation of the national and provincial regulatory framework (Musakwa and Mokoena 2017: 9).

3.5.1. The ICT and electronic communication policy context in South Africa

The South African ICT and electronic communication industry has been shaped by international law, the country's constitution and several policies and pieces of legislation (Thornton *et al.* 2006: 22). Since this study focused on electronic communication as a form of ICT, Annexure 3.1 outlines the regulatory framework consisting of legislation, policies and plans which guide ICT and electronic communication infrastructure development in South Africa and KwaZulu-Natal. In addition to the national legislation and policies listed in Annexure 3.1, other regulations

guide the development of ICT and electronic communication infrastructure. These are listed in Annexure 3.2.

3.5.2. Planning practice in South Africa

Spatial planning in South Africa underwent a significant evolution from a focus on political considerations in the early 1990s to an emphasis on economic growth and industrial development. This shift was underpinned by the principles of resource management and environmental sustainability, signalling a transition towards a realm of public management (Drewes and van Aswegen 2013: 194).

The historical challenges persisting in urban contexts in South Africa such as spatial inequality, urban sprawl, social fragmentation, socio-economic disparities, and inadequate service provision cannot be overlooked by planners (South Africa 2010: 77). The advent of electronic communication exacerbates these challenges, particularly if marginalised communities are unable to bridge the digital divide. Therefore, there is a growing need for planning to recognise the influence of space and time through adaptable regulatory frameworks.

As outlined in Annexure 3.1, the NDP Vision 2030 serves as a comprehensive long-term strategy to address the country's challenges. It highlights the significance of ICT in driving socio-economic transformation and fostering an inclusive democracy (Sutcliffe and Bannister 2020: 70-71). Moreover, the NDP acknowledges that merely implementing policies to advance 4th IR technologies will not resolve the inherent issues facing the nation (South Africa 2020a: 77).

Nonetheless, the slow response to real-time spatial planning and historical challenges suggests a disconnect between policy formulation and implementation, resulting in systematic governmental shortcomings (Abukhater 2009: 71-72). This is evident in the country's general failure to deliver basic services in line with the objectives outlined in the NDP (South Africa 2022a: 3).

3.5.2.1. The Spatial Planning and Land Use Management Act No. 16 of 2013

To align with the vision of the NDP, pre-1994 planning acts and ordinances were replaced by the SPLUMA No. 16 of 2013. As the overarching legislation for the entire country, it provides for an integrated planning system in the context of spatial transformation (South African Cities Network 2015: 18).

Built on the principles set out in the White Paper on Spatial Planning and the NDP, the SPLUMA provides for fundamental changes related to spatial planning and land use management. Its adoption of the principles of inclusion, efficiency, sustainability and good governance is expected to bring about positive spatial change (South African Cities Network 2015: 60).

In the context of the 4th IR, the SPLUMA is a framework to guide sustainable, equitable, and efficient deployment of ICT and electronic communication. This will be achieved by guiding spatial planning efforts, regulating land use activities, promoting public engagement, facilitating infrastructure deployment, and ensuring sustainable development outcomes in the digital age. Collaboration among the planning authorities, ICT stakeholders, and communities is essential to effectively integrate digital infrastructure into spatial planning processes and maximise its benefits for all residents and businesses. However, this calls for planning and regulatory frameworks to promote ICT's integration into development whilst using it to address spatial challenges.

The SPLUMA seeks to align different elements within municipal planning systems such as planning principles and SDFs to link processes. It places greater responsibility on local government for effective intervention to bring about transformation (South African Cities Network 2015: 7).

An analysis of the SPLUMA since its adoption in 2013 reveals that the Act itself does not provide specific implementation methods for municipalities, but rather suggests principles and planning tools such as the SDP and Land Use Scheme to guide development. This has resulted in inconsistency and uncertainty in its application at local government level. Without clear guidance on how to translate the SPLUMA's principles into actionable plans and policies, municipalities may struggle to effectively

implement it in a coordinated and cohesive manner.

The current fragmentation across government spheres and departments largely results from inadequate recognition and assessment of the hierarchy and interconnections among diverse planning instruments. Successful implementation necessitates surpassing siloed and sectoral approaches and nurturing a cohesive vision and agenda, as advocated in the Integrated Urban Development Framework (IUDF) (South Africa 2016a: 8).

The IUDF also calls for recognition of the hierarchy of spatial plans and the spatial logic required to effectively determine development activities. Sectoral plans and capital investment should be guided by strategic plans such as the SDF which should be integrated into the municipal IDP, resulting in a collaborative effort among all levels of government and their partners (South Africa 2016a: 8).

Effective coordination between national and provincial governments, state-owned entities and municipalities is essential to ensure that capital investment decisions align with municipal spatial plans. Furthermore, municipalities must ensure that their spatial and sectoral plans are credible and in line with provincial and national development priorities, moving beyond mere compliance-driven approaches (South Africa 2016a: 8).

3.5.2.2. The National Spatial Development Framework 2022

The National Spatial Development Framework (NSDF) adopted in 2022 builds on a series of national policies dating from the Reconstruction and Development Programme (1994-1995) to the NDP. Anchored in the principles of the NDP, the IUDF, and the SPLUMA, it aims to comprehensively address the country's spatial and settlement challenges (South Africa 2022b).

The NSDF seeks to foster integrated planning and infrastructure investment between the public and private sectors to benefit local communities. By promoting radical, decisive, and sustainable settlements, it aims to create more liveable and resilient environments through improved spatial and land use planning, thereby enhancing

access to land, economic opportunities, and amenities (South Africa 2022b: 33).

The framework identifies nine key 'shapers' that influence national settlement patterns and development and addresses challenges and opportunities associated with demographic shifts, urbanisation, rural development, natural resource management, climate change, land reform, technology, globalisation, and institutional capacity.

Led by the Department of Land Reform and Rural Development, the Department of Planning, Monitoring, and Evaluation, and provincial Premiers' Offices, the NSDF rollout emphasises intergovernmental support and collaboration. Government departments involved in spatial planning and development will utilise various platforms, including the Internet, to educate stakeholders about the NSDF, and integrate it into long- and medium-term budgeting, implementation, monitoring, and evaluation processes across all government tiers and planning tools (South Africa 2022b: 188-189).

3.5.3. Local government/municipal planning

To foster sustainable and liveable communities, municipalities must establish regulations that facilitate growth and development. Given that the SPLUMA places municipal planning at the forefront, and the influence of national spatial planning, local governments in South Africa are increasingly relied on to drive socio-economic growth and transformation through the implementation of strategic spatial planning strategies. However, this heightened responsibility is challenged by issues such as workforce capacity constraints and dependence on intergovernmental cooperation to bolster support (South African Cities Network 2015).

Municipal strategic spatial planning operates within a framework of plans, with the IDP serving as a cornerstone. The IDP aims to foster coordination and integration among various entities, including governmental tiers, parastatals, and the private sector (South Africa 1998c: 24). A key element of the IDP is the SDF, which serves as a spatial representation that guides all planning decisions and sets out fundamental guidelines for municipal land-use management systems (South Africa 2000b: 38).

Land use schemes are developed in accordance with the directives outlined in relevant planning legislation. They consist of a series of plans that delineate zones and controls, empowering municipalities to regulate and oversee development in alignment with higher-order plans like the SDF and IDP. Permissible land use activities are designated within each zone (Forbes 2011: 8). All development proposals must adhere to planning legislation and align with the objectives outlined in strategic spatial plans. Statutory planning applications encompass various activities, including rezoning of land, special consent, and land subdivision applications, among others (eThekweni Municipality 2023a: 24-25).

3.5.3.1. The City of Cape Town

The City of Cape Town located in the Western Cape of South Africa has a population of 3.7 million within a geographic expanse of 2,461km². Cape Town's economy is characterised by diverse sectors, with tourism, finance, the creative industries, and manufacturing playing significant roles in driving economic growth and development. Like other cities, Cape Town faces challenges including the digital divide, infrastructure access, and data affordability. Mobile data prices in South Africa are nearly five times higher than those in the most cost-effective African nation (Boyle and Staines 2019: 8).

In 2000, the city initiated the 'Smart City Strategy' to tackle the digital divide and enhance Internet access and connectivity. It encompasses four pillars: digital government for streamlined service delivery, digital inclusion to bridge gaps, fostering a digital economy to attract investment in the ICT sector, and realising associated benefits like job creation and infrastructure deployment (Abrahams 2016). However, Boyle and Staines (2019: 16) critique the strategy for its lack of substantive content, particularly in relation to implementation.

In line with its IDP for 2017-2022, the city prioritises transformation towards inclusivity, safety, sustainability, efficiency, and resilience, aiming to create better living, working, and recreational spaces (South Africa 2017-2022: 3). Technology plays a pivotal role in this transformation, linking people, systems, and processes. Cape Town aspires to become Africa's foremost digital metropolis (South Africa 2017-2022: 35).

Significant strides have been made in enhancing access to public e-services, fostering digital interactions between citizens and government. This not only enhances Cape Town's competitiveness in ICT industries, but also provides valuable data for business and social sector development while empowering residents through information dissemination. Initiatives such as the Local Area Network (LAN) project improve citizen engagement and introduce digital social services. Furthermore, smart public transportation initiatives like the MyCiTi bus rapid transit system underscore the city's commitment to digital transformation (South Africa 2017-2022: 71).

From a planning perspective, all development applications are submitted via the city's online portal known as "DAMS". The City of Cape Town Municipal Planning Bylaw, 2015 integrates the Land Use Scheme, with Schedule 3 detailing the 'Development Management Scheme'. This framework categorises electronic communication infrastructure development as either primary or consent use based on zoning, with specific parameters outlined for infrastructure establishment. It is important to note that policymakers do not treat electronic communication differently from other land uses within the scheme.

Primary uses do not require statutory planning applications, whilst consent use requires the city's permission. Section 130 deals with the development of Base Telecommunication Stations as a primary or consent use and includes development parameters relating to the establishment of the infrastructure. Electronic communication is not differentiated from the other land uses within the scheme.

In 2002, the city approved a Cellular Telecommunication Infrastructure Policy (revised in 2014) to complement the scheme, although its relevance may be questioned due to its age. Nevertheless, the policy guides the development of new and existing telecommunication systems operating alongside the scheme (South Africa 2002b: 6).

Despite leveraging ICT and electronic communication for community growth and development through e-services and smart public transportation, Cape Town contends with high levels of informality and spatial inequality. The prohibitive costs of

data and ICT skills gaps hinder technology from offering equitable benefits across communities.

3.5.3.2. The City of Johannesburg

The population of the City of Johannesburg stands at 5.74 million. Interprovincial and international migration flows contribute to Gauteng province's status as South Africa's most populous region. The province anticipates reaching a total population of 16.9 million by 2024, primarily driven by economic opportunities linked to finance, business, mining, manufacturing, and entrepreneurship. These factors contribute to Johannesburg's position as the economic hub of South Africa (South Africa 2020-2021: 12).

The city's mission is to create a resilient, sustainable, and liveable city by 2040 through long-term projects. To do so, its IDP identifies the use of smart infrastructure to support a low-carbon economy (South Africa 2020-2021: 2). In pursuit of its vision, ten strategic priorities have been pinpointed within the city's long-term strategy, with technology earmarked to play a pivotal role in each. The tenth priority pertains to smart city generation. The objective is to embrace innovative methods in citizen development, service delivery, safety, governance, and the economy, ultimately culminating in the creation of a liveable, sustainable, and resilient city (South Africa 2020-2021).

The 'Smart City Strategy' aims to incorporate innovation and technology to achieve the city's vision. It will harness this strategy to strengthen institutional performance using technology and digitisation to create efficient systems. Johannesburg has embarked on projects which include the expansion of the fibre network and the roll-out of free Wi-Fi and e-services in health, education, and service delivery (South Africa 2020-2021: 109-110). Other smart city initiatives implemented include equipping libraries with fibre for free Wi-Fi hotspots and state-of-the-art video education on ICT, as well as CCTV surveillance. Smart mobility initiatives include designated cycle lanes, the establishment of the bus rapid transit system and the Gautrain (Musakwa and Mokoena 2017: 4-5).

In contrast to the City of Cape Town, the City of Johannesburg's Land Use Scheme does not include cellular/telecommunication masts as a land use but categorises them

as infrastructure (South Africa 2001: 5). Consequently, the scheme lacks provisions to control mast development. To address this gap, the city instituted a Cellular Mast Policy, applicable within its municipal jurisdiction (South Africa 2001: 5).

Prior to the formation of the City of Johannesburg municipal council, four metropolitan local councils handled these applications in varying ways, leading to discrepancies between council requirements and applicants' expectations. Each local council mandated applicants to submit building plan applications solely for telecommunication infrastructure development (South Africa 2001: 1). The Cellular Mast Policy offers guidelines to assess applications and outlines procedures to process cellular mast building plans.

Like the City of Cape Town, infrastructure development remains spatially fragmented in Johannesburg. Marginalised communities face challenges due to a lack of affordable, accessible, and user-friendly technological platforms. Persistent challenges stemming from post-apartheid planning continue to hinder spatial equality. To fully leverage the benefits of ICT and electronic communication, metropolitan areas, cities, and towns require a holistic approach involving national government and stakeholders. Such collaboration is necessary to target investment and reimagine the development of ICT infrastructure in an equitable manner.

The transition from physical to digital platforms is reshaping the world. This chapter examined the implementation of ICT and electronic communication to enhance economic growth, inclusivity, and service accessibility. It is evident that the role of technology varies across different development paradigms, influenced by factors such as government policies, stakeholder investment, and the availability of ICT resources tailored to each country's context.

3.6. Chapter Conclusion

Government intervention is essential to address urban challenges, with policies aimed at promoting ICT development, particularly in rural areas, to drive efficiency, growth, and foster private partnerships and Research and Development support. This is evident from the cases in developed countries which have largely succeeded in implementing policies and legislation to address issues such as spatial inequality and unemployment. Consequently, ICT and smart initiatives enhance citizens' livelihoods

and bolster the economy. However, these efforts have not completely eradicated the challenges rooted in historical planning and bureaucracy. In developing countries, spatial inequality and the lack of basic services remain pressing concerns (Bahrini and Qaffas 2019: 11).

In developing countries, smart city initiatives often adopt a top-down approach, with governments primarily responsible for integrating the ICT sector to yield societal and economic benefits. While public and private stakeholder investment is essential, ICT innovation alone may not propel developing countries into better-performing economies or foster socially inclusive societies. Each country should assess its historical and current challenges to determine the level of innovation necessary to address these issues.

The implementation and adoption of technology in traditional developing countries is a gradual process. Balancing the delivery and incorporation of ICT and addressing historical social and geographical challenges is imperative. Provision of ICT infrastructure does not automatically translate into technology usability. Therefore, it is essential to educate communities about technology use and its potential benefits.

Public participation, often overlooked in top-down approaches, is vital to prevent deepening inequality and spatial disparities. This dynamic is mirrored in the South African context. Despite several initiatives incorporating ICT and electronic communication, without government support, stakeholder investment, and supportive policies, these initiatives may not achieve their intended goals.

The following chapter outlines the research philosophies, design and methodology employed to conduct this study, as well as the tools used to gather and analyse the data collected for the eThekweni Municipality case study.

Annexure 3.1

Policy/legislation	Objective	Relevance to electronic communication and ICT
National		
Constitution of the Republic of South Africa Act No. 108 of 1996	The Constitution is the supreme law of the land, and all legislation must be consistent with that of the government and the Constitution (Thornton <i>et al.</i> 2006: 20).	Chapter 2 of the Constitution of the Republic of South Africa relates to the Bill of Rights. Clause 16 (1) (b) of the Constitution states “ <i>Everyone has the right to freedom of expression, which includes, freedom to receive or impart information or ideas</i> ”. Clause 32 (1) (a) and (b) states “ <i>Everyone has the right of access to – (a) any information held by the state; and (b) any information that is held by another person and that is required for the exercise or protection of any rights</i> ” (South Africa 1996a).
Telecommunications Act No. 103 of 1996. Amended by the Telecommunications Amendment Act 12 of 1997, Telecommunications Amendment Act 64 of 2001 and Telecommunications Amendment Act No. 2 of 2004	The Act sets out the purpose and scope for telecommunications regulation (South Africa 1996b: 2). The amendment Acts amended and substituted definitions, made further provision for licensees, introduced new decision-making criteria, provided further regulation, and assigned powers and duties to certain operators for the purposes of interconnection and facility leasing.	The main purpose of the Act is to regulate and control telecommunications in the interests of the public. It sets out rules for the telecommunication industry especially in respect of licensees operating at different levels. The Act established a telecommunications regulator, initially known as the South African Telecommunications Regulatory Authority (SATRA) which later merged with the Independent Communication Authority of South Africa (ICASA) (Thornton <i>et al.</i> 2006: 30).
White Paper on Telecommunications Policy 1996	The White Paper on Telecommunications articulated a universal service and created a market structure and an independent regulator of telecommunications for Telkom SA Limited as the basic provider of such services. The White Paper was	The White Paper on Telecommunications provided a regulatory framework for government interventions, regulations and practices. It ensured that the industry liberalised competition by introducing different service providers. Importantly, the White Paper focused on infrastructure development, ensuring universal

	also responsible for facilitating new services and technologies to support international trading (Thornton <i>et al.</i> 2006: 23 - 24).	access, and driving innovation and collaboration in telecommunications. The White Paper was replaced by the National Integrated ICT Policy White Paper.
Independent Communication Authority of South Africa Act No. 13 of 2000. Amended by the Independent Communication Authority of South Africa Act No. 3 of 2006; and the Independent Communication Authority of South Africa Act No. 2 of 2014	The Act outlines the establishment of ICASA (South Africa 2000a: 1).	The purpose of ICASA is to regulate telecommunications in the interests of the public. The ICASA Act provides administrative and procedural legislation, regulates licensing for electronic communication licensees, promotes access to communication services and innovation and sets quality standards for services (Thornton <i>et al.</i> 2006: 33).
Electronic Communications and Transactions Act No. 25 of 2002	The Act regulates and facilitates the development of strategies including e-strategies and e-services for government. It promotes universal access to electronic communication for small and medium enterprises (South Africa 2002a: 2).	Like the Telecommunications Act, the Electronic Communications and Transactions Act is intended to enable and facilitate electronic communications and transactions in the public interest. Importantly, it provides licensees with legal guidelines for electronic communications and transactions. It also facilitates the use of electronic communication, encourages e-government services and issues directives on consumer protection, personal data and cyber security (Thornton <i>et al.</i> 2006: 37-39). The Act was amended by the Cybercrimes Act No. 19 of 2020 and the Consumer Protection Act 68 of 2008 that introduced specific sections to deal with cybercrimes and consumer protection.

<p>Electronic Communications Act No. 36 of 2005. Amended by Electronic Communications Act No. 37 of 2007 and the Electronic Communications Amendment Act No. 1 of 2014</p>	<p>In terms of the latest amendment Act, the Act provides definitions, promotes black economic empowerment and sets out licensing provisions. Through the amendments, the Act aims to promote efficient competition amongst licensees and remove regulatory bottlenecks. It sets out provisions for institutions such as schools and health facilities (South Africa 2014a: 2).</p>	<p>The Electronic Communications Act is the primary legislation used to regulate the electronic communication industry. It covers licensing, and licensee rights to infrastructure for wayleaves and dictates how markets and competition are to be managed in the country (South Africa 2014a: 2).</p> <p>The latest amendment Act of 2014 is more inclined to ensure equal and fair competition between licensees whilst broadband access is made easily accessible and fast for schools, educational facilities and health establishments (South Africa 2014a).</p>
<p>National Integrated ICT Policy Green Paper No. 44 of 2014</p>	<p>The Green Paper aims to address policy, legislative, regulatory and institutional frameworks so to enable the country to align with the vision of the NDP to '<i>ensure seamless information infrastructure by 2030</i>' to support the creation of dynamic and connected societies and economies which are inclusive and equitable (South Africa 2014b: 3).</p>	<p>The Green Paper facilitated engagements between stakeholders by evoking discussion through policy questions. The first phase of the paper included a Framing Paper, gazetted in April 2013. The Green Paper was the next phase, which included the consultative process, review, and development of new policies. This was followed by a Discussion Paper and thereafter a White Paper was gazetted (South Africa 2014b: 7-8).</p> <p>The Green Paper following the Discussion Paper established the need to converge the telecommunications, broadcasting and postal services to create an overarching policy which guides development, implementation and public interest based on the objectives and principles derived from the Constitution. It aims to promote access, enable innovation and address social issues linked to digital literacy and skills development (South Africa 2014b: 9).</p>

<p>National Integrated ICT Policy White Paper No. 1212 of 2016</p>	<p>The purpose of the White Paper is to ensure that provision of ICT aligns with constitutional obligations and the vision of the NDP to improve the life of all citizens through the provision of equal rights and opportunities (South Africa 2016b: 1-2).</p>	<p>The Green Paper and White Paper complement each other in the policy-making process. The White Paper is a translation of the outcomes from the discussions and consultations emanating from the Green Paper.</p> <p>The White Paper is inclined to be a rights-based and holistic policy that considers all policies and legislation, resulting in co-operative, collaborative and coherent governance. It provides a policy and regulatory framework for ICT development, drives innovation, and focuses on transformation, inclusion and universal access. Like the Green Paper, it considers digital literacy development and skills development. It also promotes the use of e-services by government (South Africa 2016b: 6-7).</p> <p>The National Integrated ICT Policy White Paper replaced the White Paper on Telecommunications of 1996 and Postal Services policy of 1998. It influenced changes to Acts such as the Electronic Communications Transactions Act No. 25 of 2002 and the Electronic Communications Act No. 36 of 2005 (South Africa 2016b: 6)</p>
<p>NDP – Vision for 2030</p>	<p>The NDP introduced in 2012 by the National Planning Commission was identified as a coordinated and focused national plan to address poverty and inequality. This was implemented to bring about spatial transformation in the country by dealing with long-standing issues such as unemployment, poor health systems, a divided society, the lack of infrastructure and public services, inefficient use</p>	<p>The NDP broadly identifies the importance and need to invest in ICT infrastructure to promote economic growth and societal inclusion. Since ICT is intertwined in almost every sector, it identifies strategies to ensure that ICT infrastructure contributes to delivering better results. For instance, to enhance economic growth, the NDP recognises the need to change regulatory frameworks to improve broadband capacity, decrease the cost of data and improve access (South Africa 2010: 32).</p>

	<p>of natural resources and corruption (Drewes and van Aswegen 2013: 201).</p>	<p>While it was crafted in 2011, the NDP identified that ensuring stable ICT connections depends on electricity availability which is unreliable. This is coupled with policy constraints, weak institutional arrangements, conflicting departmental policies, and regulation failure (South Africa 2010: 171).</p> <p>The NDP identifies short-, medium-, and long-term goals towards achieving the 2030 goals. The short-term goal from 2012-2015 was to review policies since 1995 which at the time had not been done. Between 2015 and 2020, the medium-term goal was to ensure 100% access to broadband connectivity for all schools, health facilities and similar social institutions, with faster communicating speeds at lower costs. The long-term goal between 2020 and 2030 is to refine and implement e-strategies to support global competitiveness, introduce interactive digital government platforms and promote collaboration among government, industries and academic institutions to grow the country's ICT sector (South Africa 2010: 178)</p>
<p>The Integrated Urban Development Framework (IUDF)</p>	<p>Published in 2016, the purpose of the IUDF is to guide government policies for the future growth and development of urban areas. The overall goal is to achieve spatial transformation in line with the NDP (South Africa 2016a: 7)</p>	<p>A pillar of the IUDF is to promote connected cities and towns through technological solutions. It also considers smart solutions which drive the sustainability agenda.</p>
<p>National Digital and Future Skills Strategy South Africa</p>	<p>Published by the Department of Communications and Digital Technologies in September 2020, <i>“the strategy considers the need for (i) a diversity of digital skills, (ii) priority skills</i></p>	<p>The document consists of eight strategies. The first four relate to developing cross-relations among government, industries, skilled labour, communities, and educational institutions. The second four address</p>

	<p><i>areas, and (iii) convergence of digital skills with subject matter knowledge” (South Africa 2020e: 1).</i></p> <p>The mission speaks to the need to foster digital skills development within the digital era starting as early as early childhood development.</p>	<p>cross-cutting issues to build digital awareness, promote research and monitoring on digital skills, coordinate and align various sectors and address funding for digital skills (South Africa 2020e: 3).</p>
<p>National Infrastructure Plan 2050 (NIP 2050) Phase 1</p>	<p>The National Infrastructure Plan 2050 (NIP 2050) published in March 2022 lays the foundation to achieve the objectives of the NDP, to promote infrastructure delivery, address institutional blockages, and achieve inclusive growth (South Africa 2022a: 3)</p>	<p>Objectives set by NIP 2050 include the provision of high-speed broadband; regulating competitiveness, enabling the public sector to drive the required policy agenda, driving partnerships to promote a growing knowledge base for delivery and innovation, enabling digital services in government and buildings; and encouraging private sector participation to drive ICT accessibility (South Africa 2022a: 44).</p> <p>The Strategic Integrated Project 15 (SIP 15) is a national catalytic project aimed at fast-tracking development in the ICT sector (South Africa 2010).</p>
<p>National Spatial Development Framework (NSDF) 2023</p>	<p>The NSDF is the first of its kind, mandated by Chapter 8 of the NDP and Section 5(3)(a) of the SPLUMA.</p> <p>Its key aims are to set out a vision for national spatial development; ensure integration and trade-offs with relevant national sector plans and policies; guide planning and development across all sectors of national government; contribute to coherent planning with all three spheres of government; provide clear and accessible information to all citizens;</p>	<p>The NSDF identifies technology as a crucial influencer in national spatial settlement and development, emphasising the need to adapt to technological innovations and disruptions.</p> <p>While acknowledging the impact of the Covid-19 pandemic and reliance on human interactions within the economy, the NSDF highlights concerns about the potential threats posed by ICT technologies such as automation and robotics to the working population. It anticipates rapid expansion in broadband coverage and automation across various economic sectors, but also foresees challenges, including</p>

	<p>prioritise previously disadvantaged areas and State-Owned Enterprises; ensure inclusion and integration of the spatial, social, economic, and environmental objectives of national government; address historical imbalances; identify risks associated with spatial development; and provide direction for strategic developments and infrastructure investment (South Africa 2022b).</p>	<p>business closures due to the inability to compete globally.</p> <p>To ensure South Africa keeps pace with the technological era, the NSDF outlines requirements such as nationwide broadband rollout, improvements in road and rail networks, a focus on innovation and knowledge production, alignment of higher education programmes with technological advancements, and investment in youth development and well-being (South Africa 2022b: 6).</p> <p>According to the NSDF, failure to adapt to the technological age may result in job losses, unemployment, poverty, increased inequalities, spatial fragmentation, higher crime rates, segmented settlement development, and limited economic opportunities (South Africa 2022b: 68).</p>
Provincial – KwaZulu-Natal		
<p>KwaZulu-Natal Provincial Planning and Development Norms and Standards for Electronic Communication Facilities</p>	<p>These norms and standards were published by the KwaZulu-Natal Department of COGTA and came into effect in January 2020 following a series of workshops and circulation of draft norms and standards for public comment.</p>	<p>The norms and standards are applicable to all persons, companies, and municipalities across the province of KwaZulu-Natal. Municipalities are still encouraged to utilise their land use schemes to plan and regulate telecommunication development. They may apply for exemption from the norms and standards and unless exemption is granted by the MEC for COGTA, these norms and standards shall prevail over any municipal regulations on telecommunications (South Africa 2020d: 3).</p> <p>In essence, these norms and standards are intended to guide all municipalities when assessing applications for telecommunication infrastructure and to</p>

		create a standardised method to process such applications.
Guideline: Submission of Planning Norms and Standards for Electronic Communication Facilities in KwaZulu-Natal	These norms and standards were published by the KwaZulu-Natal Department of COGTA in January 2021, following the January 2020 norms and standards.	It appears the Department has simplified the 2020 version of the KwaZulu-Natal Provincial Planning and Development Norms and Standards for Electronic Communication Facilities by providing checklists in tabular format for ease of use. There is no significant difference between the 2020 and 2021 version.
KwaZulu-Natal Digital Transformation Strategy 2020-2025	The strategy builds on the national strategy and other existing ICT frameworks, including the NDP. Similarly, the mission is to leverage digital technologies and innovation to transform the province's economy and society (South Africa 2020c: 16).	The strategy comprises of six strategies which focus on connectivity, digital skilling, information and knowledge management and information security, automation, system integration and government's digitisation. It provides recommendations for the province to implement smart city concepts and unpacks governance and risk management for digitisation.
KwaZulu-Natal Provincial ICT Integration Plan for Digital Transformation Strategy	This strategy's vision is to leverage the 4 th IR to build a citizen-centric, modern, innovative, and digitally enabled province. The goal is to use technology to enhance human dignity, improve health, foster harmony, develop skills, ensure safety, and provide citizens with a gateway to Africa and the rest of the world (South Africa 2020b: 14).	Like the Digital Transformation Strategy, this strategy seeks to use digitisation to address imbalances caused by the lack of ICT implementation in sectors and assist with planning to grow the business sector and enable it to align with the 4 th IR. This strategy is made up of seven goals and objectives which are closely related to those above and provides indicators and suggestions to achieve the identified goals.
KwaZulu-Natal Provincial Growth and Development Strategy (PGDS)	Aligns with global, national, and provincial frameworks and presents seven strategic goals which are expanded into 39 strategic objectives. The primary purpose is to assist the province in developing its growth and development trajectories based on the	Strategic Goal 4 is based on strategic infrastructure which includes ICT infrastructure development to enable the growth and development of KwaZulu-Natal communities. Like the other strategies and frameworks, the PGDS recognises the need for increased broadband service accessibility with faster speeds and

	seven key priority areas (KwaZulu-Natal Provincial Planning Commission 2018).	increased funding for operation and maintenance of the infrastructure (KwaZulu-Natal Provincial Planning Commission 2018).
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Annexure 3.2

Policy/legislation	Relevance to electronic communication and ICT
<p>The National Environmental Management Act No. 107 of 1998</p>	<p>The National Environmental Management Act No. 107 of 1998 (NEMA) aims to ensure effective environmental governance by establishing principles for decision-making regarding the environment, promoting cooperative governance, and coordinating environmental functions among state organs. The Act's Chapter 2 outlines these principles (South Africa 1998a: 2).</p> <p>The NEMA includes a series of Listing Notices (1-3) that identify activities requiring environmental authorisation and the competent authorities for decision-making. Listing Notice 1 and 3 necessitate a Basic Assessment for proposed activities, while Listing Notice 2 requires a full Environmental Impact Assessment (South Africa 2017: 1-2).</p> <p>Telecommunication infrastructure development, such as masts or towers, falls under Listing Notice 3. This includes new infrastructure exceeding 15 metres in height on previously unused sites but excludes attachments to existing buildings or masts on rooftops (South Africa 2017: 74).</p>
<p>National Building Regulations and Building Standards Act No. 103 of 1977</p>	<p>The National Building Regulations and Building Standards Act No. 103 of 1977 aims to ensure uniformity and standards in the construction of buildings within the jurisdiction of local authorities. The Act has been amended several times since 1985 to enhance its provisions (South Africa 1977: 2).</p> <p>Telecommunication infrastructure is not explicitly regulated under the building regulations. However, all structures must comply with the South African National Standards (SANS) outlined in the Act. Certification by a competent and qualified professional according to the SANS code is required for all buildings or structures,</p>

	ensuring adherence to national standards (South Africa 1977: 59-60).
National Heritage Resources Act No. 25 of 1999	<p>The Act aims to establish a comprehensive system, norms, and standards to manage all heritage resources across different levels of government in South Africa. It mandates the authorities to protect and manage various categories of heritage resources, defined as places or objects of cultural significance. The Act specifies different types of heritage resources, including movable and immovable objects, buildings, and uses (South Africa 1999: 3).</p> <p>The AMAFA Built Environment Applications Policy and Procedures guide applicants in making additions and alterations, or demolishing buildings older than 60 years, in accordance with the national Act's provisions. According to the KwaZulu-Natal AMAFA and Research Institute, a structure is defined as any human-made building, works, or device fixed to land, including fixtures, fittings, and equipment older than 60 years. While telecommunications infrastructure is not explicitly listed, it can be inferred that all types of infrastructure may require permission if placed on a heritage resource (KwaZulu-Natal AMAFA and Research Institute: 1-2).</p>
Civil Aviation Act No. 13 of 2009	<p>The Civil Aviation Act No. 13 of 2009 replaced the South African Civil Aviation Authority Act. The Act established the South African Civil Aviation Authority with the objective of controlling and regulating civil aviation in the country, overseeing the industry, and promoting safety and security (South Africa 1998b: 4).</p> <p>To ensure the safety and security of aircraft, the authority manages obstacles that affect the skyline, including telecommunication masts, buildings, and wind turbines. Approval is required before erecting telecommunication masts taller than 15 metres. This process involves applying to update the obstacle database. Applications are assessed for their impact on aviation activities or infrastructure, and decisions are provided in</p>

	approval notices, which may include specific controls such as markings, lighting requirements, or height restrictions.
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CHAPTER 4: RESEARCH DESIGN AND METHODOLOGY

4.1. Introduction

This chapter outlines the research philosophies, design and methodology employed to conduct this study, as well as the tools used to gather and analyse the data. A case study was conducted of the eThekweni Municipality to establish the responsiveness of spatial planning policies and legislation for electronic communication infrastructure, and to evaluate statutory planning procedures for the development of such infrastructure.

To ensure that the research was focused and relevant to spatial planning, it was limited to investigating the deployment of the following electronic communication infrastructure: land-based fibre, antennae, masts, and infrastructure which supports the attachment of electronic communication such as monitoring equipment and poles.

4.2. Research philosophies

According to Igwenagu (2016), research is the process of investigation to understand the relationship between phenomena and their environment. Kothari (2004: 2) describes research as a method used to find answers to a question. To achieve this, researchers use knowledge and experiences obtained during the research to shape their hypothesis and conclusions.

Philosophies shape how researchers formulate research problems and questions, determine a study's variables and are guided by research in the field. According to Saunders, Lewis and Thornhill (2009: 150), research philosophies refer to: "...*systems of beliefs and assumptions about the development of knowledge*". Similarly, Creswell (2007: 16) conceptualises philosophy as ideas and beliefs that inform research.

The following research philosophies cited by Creswell (2007: 23-29) and Saunders, Lewis and Thornhill (2009: 151-152) were employed to guide this study:

- Critical Realism: explains the relationship between experiences and reality. Reality is the most important variable in a study. This theory relates to the interpretation of social action in studies.

- Postmodernism: relates to the role of language and the power of relations. It questions ways of thinking and offers alternate views.
- Pragmatism: focuses on the outcomes of research and thus the problem researched and subsequent solutions. Research methods are not fixed, and researchers consider different or multiple methods of collecting and analysing data.

This research study focused on a problem and practical solutions which can be applied in future practice. As such, it drew on the above three research philosophies, with the data gathered used to establish a cause-and-effect relationship between spatial planning policies, legislation, and procedures for electronic communication infrastructure, and thereafter reach conclusions and offer recommendations.

4.3. Research design and methodology

Research methodology refers to the systematic techniques used in research, which guide how it is conducted. Scientific research methods are typically split into qualitative and quantitative techniques. Based on the research questions and its underlying philosophies, this research study adopted a qualitative research approach. Qualitative research is concerned with the relationship between phenomena and human behaviour – why people think or do certain things (Kothari 2004: 3).

4.3.1. The use of a case study in research

The case study is one of the most common methods used in academic research (Rashid *et al.* 2019: 1). According to Zainal (2007: 1), case studies are a “...*method which enables a researcher to closely examine the data within a specific context thus selecting a small geographical area or very limited number of individuals as the subjects of study*”.

A case study can play a significant role in investigating a specific real-life phenomenon through contextual analysis. Case studies usually focus on a small geographical area and a particular number of subjects. The information unveiled is often not anticipated at the inception of the study. Case studies assist researchers in examining data based on the context in which a phenomenon occurs (Zainal 2007).

However, case studies can be too generalised and lack rigour due to researchers allowing their personal views to influence their conclusions, which negatively impacts a study's validity. They are also viewed as a lengthy process, with extensive data collection which can result in obscure results due to mismanagement of data (Zainal 2007: 5).

4.3.1.1. The use of eThekwini Municipality as a case study

The case study focused on the eThekwini Municipality to establish spatial planning policies and legislation's responsiveness to electronic communication infrastructure, and to evaluate statutory planning procedures for electronic communication infrastructure development. It therefore sought to establish the cause-and-effect connections between the spatial planning regulatory framework and procedures in guiding statutory planning for electronic communication infrastructure development in the eThekwini Municipality.

The eThekwini Municipality is amongst the four largest metropolitan areas in South Africa. As cities grow in the wake of the 4th IR, pressure is placed on ICT infrastructure to support the economy and communities; and the eThekwini Municipality is no exception.

In 2019 the Land Use Management Department of eThekwini Municipality revised its Development Standards for Telecommunication Infrastructure for cell masts and associated infrastructure (eThekwini Municipality 2021b: 174). The investigation of the municipality's regulatory framework presented an opportunity to unpack the spatial planning policies, legislation and statutory planning processes which influence the development of electronic communication facilities. The research also enabled an exploration of the role of electronic communication in the 4th IR; the use of such ICT infrastructure and how it can be used to address challenges and improve cities internationally and locally.

4.4. Data collection methods and tools

Data collection plays an integral role in dealing with real-life problems (Kothari 2004: 17). After defining a research problem and design, a researcher embarks on data collection. Two types of data are gathered, namely, primary and secondary. Primary data refers to data that was not previously gathered by another researcher and is thus original. Secondary data is obtained from research conducted by someone else. It includes but is not limited to books and journals, official government publications, private data services and computer data bases (Kothari 2004: 95).

Interviews and surveys are used to gather primary data. Interviews are described as a 'person-to-person' or virtual interaction (via email/online meeting platform). Interviews can be structured or unstructured, allowing the researcher to be flexible when posing questions (Kumar 2011: 137).

For the purposes of this study primary data was collected through semi-structured interviews, which included open and closed-ended questions. The use of open-ended questions allowed for a constructive conversation on statutory planning matters relating to the development of electronic communication infrastructure. Close-ended questions were used to determine timeframes and statistical data. The participants' names and personal details are not revealed, and pseudonyms are used.

The researcher also used participant observation to gather data whilst being employed at the municipality. Participant observation is a qualitative data collection tool. Kawulich (2005: 2) highlights that it includes observation and learning of behaviour, events, people, and things in their natural environment which enables the researcher to understand trends and routines. Participant observation increases a study's validity as the researcher obtains improved understanding through observation, strengthening the findings from interviews or surveys (Kawulich 2005: 4-5).

Secondary data was obtained by means of a review of publications, government policies, and precedent studies. This enabled the researcher to understand how policies influence ICT and electronic communication infrastructure. Using multiple data sources, data are converged to support ideas, findings and conclusions to address the research question and objectives.

4.5. Sampling method and design

Sampling is the technique used to represent a given population or study area and involves the researcher selecting items for a sample, as it is impossible to collect the views of every person in the field of study. The sample population and size are influenced by the survey method employed, including random/probability or non-random/non-probability sampling techniques (Kelley *et al.* 2003: 263-264).

This study adopted purposive and snowballing sampling methods. Pandey and Pandey (2015) and Sharma (2017: 750-752) define purposive sampling as a method which allows the researcher to use his/her judgment when selecting the sample population and it is used during case sampling. Its advantages include the fact that it draws on available knowledge, there is control over variables; and sample groups can be easily identified.

The researcher sets inclusion or exclusion criteria to determine who is eligible to participate in the study (Hornberger and Rangu 2020: 4). The inclusion criteria for this study included individuals in the public and private sectors who work directly in the field of planning and electronic communication and are involved with or impacted by spatial planning legislation and the statutory planning process for the development of electronic communication infrastructure.

Snowballing sampling is used to access additional participants that the researcher identifies during the data collection process. It does not require initial identification as part of the sample population. This technique was utilised in circumstances where the identified participant/s were unable to participate in the study or the researcher needed to identify and approach other participants within a specific sector. By choosing participants who are directly related to the field, responses are likely to be

unambiguous as participants have first-hand experience in the development of electronic communication infrastructure.

Participants who are not directly involved with the planning, processing, or the development of electronic communication infrastructure were excluded from the study. Furthermore, the study was limited to participants who worked with or within the eThekweni Municipality. This ensured that the study's aim and objectives could be achieved as the participants are directly involved in the delivery of electronic communication infrastructure in the municipality.

The sample population consisted of the following participants:

Category A: Public stakeholders in eThekweni Municipality's Development Planning department:

- Senior Management Development Planning,
- Regional Managers Land Use Management,
- Town Planners in the Land Use Management branch,
- Town Planners in the Development Planning Projects Team which deals with the land use scheme and land use policy development,
- Town Planners from eThekweni's SPLUMA office who deal with statutory policies,
- Personnel in eThekweni Municipality Real Estate who deal with applications for electronic communication infrastructure development on municipal-owned land.
- Additional municipal stakeholders identified during data collection.

Category B: Private stakeholders:

- Electronic Communication Licensees (representatives of MTN, Vodacom and Cell C), and
- Private town planners who submit statutory planning applications for electronic communication infrastructure development to eThekweni Municipality on behalf of the licensees (Huawei Technologies South Africa, ATC South Africa and Atlas Towers South Africa).

The following table lists the interviewees initially identified for each category:

Category		No. of participants
A	Public sector stakeholders:	
	• Development Planning	14
	• Real Estate	4
	• Other	2
	Total	20
B	Private sector stakeholders:	
	• Electronic Communication Licensees	6
	• Private Town Planners	14
	Total	20

Table 1: Sample categories (Source: Compiled by researcher)

To recruit participants in the public and private sectors, the researcher emailed invitations to planners within the Development Planning department of the eThekweni Municipality and the Senior Manager of Real Estate to disseminate to staff who process applications for electronic communication infrastructure on municipal-owned land. Similarly, emails were sent to regional managers who represented Electronic Communication Licensees and managers of private companies, inviting private planners to participate in the study. Other stakeholders were included as identified during the data collection process.

Once a participant showed interest, the researcher contacted him/her via email or telephonically to establish the participant's chosen means of communication, i.e., via email or in-person. A letter containing information and an informed consent form were then provided to the participant.

Of the identified sample size, the final number of responses received from the public sector was 14 of the 20 identified and in the private sector nine of 20. The point of saturation was reached once no new information was forthcoming from the respondents.

The participants' names and personal details are not disclosed. Pseudonyms are used, with the participants identified by their stakeholder status, i.e., public stakeholder

(Development Planning and Real Estate department) and private stakeholder (electronic communication licensee and private town planner). Each interview was allocated a unique reference number for recording purposes. After the mandatory five-year storage period, the electronic data will be deleted from all devices and any hard copies will be shredded.

The secondary data included previously published academic research, the eThekweni Municipality's policies; other government policies, and precedent studies that was also used to answer the research questions and validate the findings of the primary data.

To maintain objectivity and avoid participant bias, especially for participants known to the researcher, the interview questions were formulated to ensure objectivity and allow for multiple types of answers. At the end of the data analysis, the conclusions were discussed with the researcher's supervisor and co-supervisor to ensure that they are a true reflection of data gathered.

4.6. Data analysis

Three approaches are used to analyse qualitative data, including cross-sectional and categorical indexing, non-cross-sectional data organising and the use of diagrams and charts. These are not necessarily mutually exclusive and are often used in conjunction to support different findings (Mason 2002: 147).

Mason (2002: 150) refers to coding as 'cross-sectional' indexing of data whereby the researcher establishes a system to index or categorise data into common principles and themes. Coding enables a set of categories to be applied to the data. This can be done by inserting headings or sub-headings at relevant points of the data set. Thematic analysis refers to the method where researchers identify common themes, topics and ideas which appear repeatedly in the data collected. Coding is an approach to conduct thematic analysis (Mason 2002: 34-35).

Thematic analysis and coding using Microsoft Excel was employed to analyse the primary and secondary data and validate and confirm the findings. By summarising the collected data, the researcher was able to answer the research questions and

determine patterns of relationships between the variables. The following themes and sub-themes were used to analyse the data:

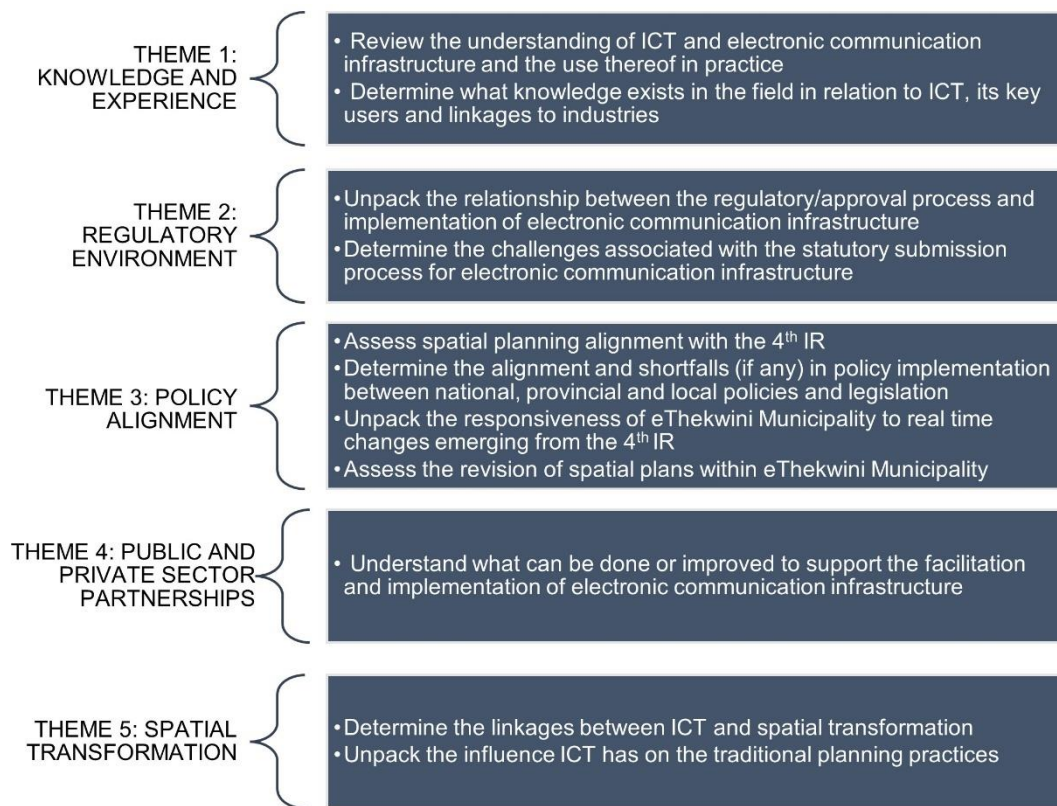


Figure 9: Themes and sub-themes were used to analyse the data

4.7. Ethical considerations

According to Parveen and Showkat (2017: 3), ethics refer to the moral principles which govern an individual's behaviour. Research ethics involve doing what is morally and legally acceptable in research. Ethics are pivotal to a research study, and it is the researcher's responsibility to ensure that all ethical considerations are in place when conducting a study to protect the rights of participants and the data. Researchers must ensure the participants' safety, dignity, rights and well-being (Parveen and Showkat 2017: 4).

Participants have the right to be informed about the study, and the right to choose whether to participate, remain autonomous and withdraw without any consequences. It is the researcher's responsibility to ensure that informed consent is obtained from the participants prior to data collection (Parveen and Showkat 2017: 5). The research

should '*do good for others and prevent harm*' (Orb, Eisenhower and Wynden 2000: 95).

The researcher adhered to the Durban University of Technology (DUT) Research and Ethics Guidelines. Participation was voluntary, and no remuneration was offered. All ethical considerations, including confidentiality and informed consent were adhered to. Participants were well informed about the purpose of the study and consent was obtained from all participants before conducting interviews using a Letter of Information and Consent. Participants were assured of their right to withdraw at any time.

The privacy of all participants was guaranteed, and the data gathered will be stored according to the DUT Research and Ethics Guidelines for no more than five years. All data was electronically backed up and saved on cloud storage with access limited to the supervisors. Arrangements will be made with DUT to store the physical data per its guidelines.

4.8. Limitations of the study

The validity and reliability of research is based on the research design, data collection methods and sampling. According to Connelly (2016: 435), trustworthiness in a study relates to confidence that the data, interpretation and methods used are of high quality. The use of well-structured interview questions enables optimal research results, by ensuring that the questions are focused and are in line with the research questions.

Data was gathered solely by the researcher, thus eliminating inconsistency. The research was limited to investigating the deployment of the following electronic communication infrastructure: land-based fibre, antennae, masts, and infrastructure which supports the attachment of electronic communication, namely, monitoring equipment and poles. This ensured that the research was focused and relative to spatial planning regulatory frameworks.

Participants were selected using purposive and snowballing techniques. To ensure that data is not ambiguous, responses are taken from personal experiences in the study field. This study was limited to public and private stakeholders who are directly involved with or impacted by the spatial planning regulatory framework and the

statutory planning process for the development of electronic communication infrastructure.

Other limitations included the availability of identified participants or their withdrawal from the study. Telephonic and virtual interviews were conducted with participants who afforded the time to do so. If this was not possible, a physical interview was arranged. Physical interviews presented challenges in terms of finding a suitable venue without being disturbed by surrounding noise or the discomfort associated with physical meetings post Covid-19 lockdowns.

4.9. Chapter Conclusion

This chapter presented the research methodology employed to conduct this study, as well as the tools used to gather and analyse the data relating to spatial planning and electronic communication infrastructure in the eThekweni Municipality. By focusing on a case study of the municipality, the research explored the statutory planning procedures governing infrastructure development such as land-based fibre, antennae, masts, and related support structures.

The methodological approach adopted, particularly the use of qualitative research, enabled an in-depth analysis of both public and private sector perspectives, providing valuable insights into how spatial planning practices intersect with the evolving needs of the telecommunications sector in the context of the 4th IR.

Although there were limitations, such as participant availability and the challenges of conducting physical interviews post-pandemic, the research method used achieved its primary objective of evaluating the efficacy of spatial planning frameworks in supporting the development of electronic communication infrastructure.

The following chapter frames the eThekweni Municipality case study to provide a deeper understanding of the municipality.

CHAPTER 5: CASE STUDY – THE ETHEKWINI MUNICIPALITY

5.1. Introduction

This chapter frames the case study of the eThekwini Municipality by discussing the city's spatial policies which guide planning and development. The roles of specific departments are detailed to provide an understanding of how electronic communication infrastructure is facilitated by the city and how responsibilities are shared in approving developments.

The chapter supports the aim of the study which was to evaluate the role and effectiveness of spatial planning and the statutory planning processes for the facilitation and implementation of electronic communication infrastructure. It also explores the study's objectives and research questions.

5.2. The eThekwini Municipality

5.2.1. Locality

Following the end of apartheid, a new municipal administration emerged in Durban that significantly transformed the cityscape, leading to the establishment of the eThekwini Municipality. This entity unified Durban into a single metropolitan area. As South Africa's third-largest city and the primary urban centre in KwaZulu-Natal, Durban boasts diverse geographical features such as rolling terrain, gorges, and rivers, spanning approximately 2556 km². Its population surpasses four million residents, making it a vibrant and populous hub (eThekwini Municipality 2023b: 6).

Situated along the eastern coastline of the country, the Port of Durban forms the basis for economic activities and is one of Africa's busiest ports. The city can be accessed via the N2 and N3 national freeways. eThekwini's 2023 vision was to become Africa's most caring and liveable city, where all citizens live in harmony (eThekwini Municipality 2022b).



Figure 10: Location of the eThekweni Municipality (Source: The Nations Online Project 2023)

The challenges faced by eThekweni are like those in other cities across the country, which include spatial inequality, high rates of informality, limited access to basic services, and traffic congestion. These issues are linked to the city's unemployment rate, which stood at 18.2% in 2023, an increase since 2020 (eThekweni Municipality 2023b: 384-385).

In terms of ICT and telecommunications, the city confronts deficiencies in infrastructure development that would ensure affordability and equitable access across all communities. Statistics for 2018 on ICT connections per 100,000 individuals revealed that 12.5% had access to fixed landlines, 99.2% to mobile telephones, and 75% to Internet connections (South African Cities Network 2021: 38-39).

To provide Internet access to communities, the municipality initiated the installation of fibre-optic networks in its offices. Where fibre installation was not feasible, 1,241 public Wi-Fi hotspots were established across the urban areas. Furthermore, 83 municipal libraries were equipped with Wi-Fi hotspots to enable citizens to connect to the Internet

via their mobile devices – see Annexure 5.1 (eThekweni Municipality 2023b: 381). However, the spatial distribution of fibre and Wi-Fi hotspots depicted in Annexure 5.1 highlights a predominant focus on the central business district (CBD) and urban areas, with limited coverage in rural or peripheral areas.

5.2.2. Spatial context

Land holdings within the municipality are complex and layered. According to the 2023 Municipal IDP, some 32% consists of private or stated-owned land, comprising of residential, commercial/office and industrial land uses. The highest residential uses are concentrated within the central and northern regions. The remaining municipal area consists of rural settlements and is governed by the Ingonyama Trust Broad (ITB), making up 68% of the municipality (eThekweni Municipality 2023b: 47-48).

The land holdings in eThekweni highlight complex land systems that present challenges to land administration. These are discussed in the section on land management. This backdrop is important as it has a bearing on the way in which ICT infrastructure is rolled out and potential bottlenecks. It is contentious, with political nuances, and this manifests in an administrative conundrum for land use administrators and practitioners.

Embedded in the Roman Dutch legal framework, black South Africans in rural regions and the former homelands have historically been subjected to traditional land management practices governed by customary law. These areas are predominantly devoted to commercial farming and traditional or communal ownership. Consequently, a 'dual governance' system has emerged within the municipality, posing challenges to implementing a comprehensive land use management strategy (Sim *et al.* 2018: 356). Informal settlements also abound throughout the municipality.

Acknowledging the legacy of apartheid planning, urban peripheries have been created, influencing eThekweni's density patterns. Residential densities tend to increase as one moves from the traditional core, leading to the formation of new central hubs supported by private developers' economic and social development efforts (Meth *et al.* 2021: 988, 995-996).

Settlement patterns within the municipality are also dictated by the protected natural environment. The eThekweni Municipality established the Durban Metropolitan Open Space System (D'MOSS) to protect and manage threatened and vulnerable natural spaces around the city (eThekweni Municipality 2022d: 136). Thus, infrastructure development and ICT infrastructure requires careful planning to minimise its environmental impact and is linked to the National Environmental Management Act No. 107 of 1998 discussed in Chapter 3, Annexure 3.2.

5.3. eThekweni Municipal Spatial Planning Framework

To manage such a large municipality, eThekweni's jurisdiction has been spatially divided into four functional planning areas, namely, the Central Municipal Planning Region, South Municipal Planning Region, Outer West Municipal Planning Region, and North Municipal Planning Region. Each region is planned for separately in accordance with its challenges and needs (eThekweni Municipality 2021b: 68).

Chapter 3 outlined the planning practices in South Africa which set the context for planning within local government. The eThekweni Municipality’s Development Planning Department, which falls within the Development Planning, Environment and Management Unit (DPEM), is responsible for leading, directing and managing the spatial, built, and natural environment to ensure sustainable and integrated growth and development.

5.3.1. The eThekweni Municipality Development Planning, Environment and Management Unit (DPEM)

The DPEM unit comprises of three departments, Development Planning, Development Management and Environmental Planning and Climate Protection. Analysis of the operational procedures relating to spatial planning is important to understand where applications for electronic communication fit within the spatial planning procedures (eThekweni Municipality 2022a). Each department has various branches as shown in Figure 12 below:



Figure 12: DPEM departments and units (Source: eThekweni Municipality 2022a)

5.3.2. The eThekweni Municipal Planning and Land Use Management Second Amendment Bylaw 2021

As detailed in Chapter 3, the SPLUMA assigns local government the responsibility of planning and implementing strategies to tackle historical and contemporary challenges. In compliance with this Act, the eThekweni Municipality enacted its Planning and Land Use Management Bylaw (No. 114 of 2017) in 2016, subsequently amending it twice, with the latest iteration being the Planning and Land Use Management Second Amendment Bylaw, 2021. Management of this bylaw falls under the SPLUMA office within the municipality.

The purpose of the bylaw is:

to provide for the Municipal Spatial Development Framework and the land use scheme of the Municipality; to provide for the development of the package of plans; to regulate and manage spatial and land use planning and development; to provide for the categorisation of land development applications; to provide for processes and procedures for land development applications; to provide for compliance with the land use scheme; to provide for an Appeal Authority; to provide for offences and penalties and to provide for matters incidental thereto.
(eThekweni Municipality 2021a: 1)

It therefore serves to reinforce the SPLUMA's administrative provisions. It is imperative to understand this bylaw's role in planning and development, as it applies to all land within the municipal jurisdiction, thereby obliging applicants to adhere to SPLUMA regulations (eThekweni Municipality 2021a: 11). However, the SPLUMA does not dictate procedures, which results in non-standardised planning methods.

For this purposes of this research, the focus is on Chapters 6-13 of the eThekweni Planning and Land Use Management Bylaw. These chapters encompass land use management, the scheme, types of applications, the public participation process, the decision-making body, criteria for application decisions, the appeals process, compliance, and enforcement. In addition, Chapter 14 relates to management of the bylaw in ITB areas, allowing the municipality to establish service level agreements with traditional authorities to process land development applications (eThekweni Municipality 2021a).

Based on the researcher's participant observation, all land development applications adhere to a uniform municipal process and are governed by the same land use scheme. In instances of development on ITB land, consent from the ITB is mandatory. If applications are submitted directly to the ITB, it must notify the municipality and furnish evidence of land rights allocation based on relevant customary laws. This typically involves presenting a lease agreement accompanied by a lease diagram delineating the designated land area for utilisation.

Section 21 of the bylaw states that no persons can commence/conduct land development without approval being granted in terms of the bylaw; furthermore, all applications are to be first submitted to the municipality as the authorising body (eThekweni Municipality 2021a: 20). Dual governance thus presents challenges for ITB development as it might not align with the land use scheme and would result in complex town planning applications for uses which are ordinarily practised on the land. The significance of the bylaw lies in its provision of a structured and inclusive framework for land use planning and management within the municipality. It emphasises sustainability, community involvement, and systematic development practices. However, despite its objectives, a persistent challenge remains the task of striking a balance among various interests, including those of private developers, addressing basic needs, tackling housing and infrastructure deficiencies, and resolving tenure issues. It is imperative for the bylaw to carefully assess present challenges to facilitate orderly growth and development while safeguarding the environment and upholding the rights of property owners.

5.3.3. eThekwini Municipality Package of Plans

In accordance with the Municipal Systems Act (2000) and the SPLUMA, the municipality has developed a comprehensive land use management system for the entire municipal area. Its Planning and Development Management Toolbox includes a package of plans to inform social, economic, environmental, and infrastructural development in the municipality. According to the IDP, the city will only support development that aligns with the municipal policies and strategies outlined in the package of plans (eThekwini Municipality 2023b: 97). Figure 13 below shows the package of plans which includes strategic plans, detailed local plans and land-use schemes.

Except for the land use schemes, the Strategic Spatial Planning Branch is responsible for formulating and reviewing plans and frameworks. A dedicated team is assigned to manage and review the land use schemes. Each plan is thoroughly examined in Annexure 5.2, with a focus on critically evaluating the regulatory framework concerning ICT and electronic communication within the municipality.



Figure 13: eThekwini Municipality's package of plans (Source: eThekwini Municipality 2023b: 465)

The package of plans is intended to inform social, economic, environmental, and infrastructural development within the municipality and is essentially a hierarchical representation of the city's policies, strategies, and implementation tools. It starts with the highest order plans which are spatially broad and applicable to the city at large and translates into the lower order plans which contain more site-specific guidelines for land use development for both the public and private sectors.

In considering the package of plans in relation to spatial planning for electronic communication, there is acknowledgement of the value of ICT in growing the economy, ensuring global competitiveness, and connecting industries and communities by means of plans such as the IDP and SDF. However, unlike water, sanitation and electricity, the top tier plans do not identify ICT or electronic communication as essential infrastructure or as infrastructure that can address challenges such as spatial inequality or sustainability.

Furthermore, many policies and plans are outdated, including the 2001 Long-Term Development Framework, the Spatial Development Plans established in 2014, and numerous Local Area and Precinct Plans spanning 2010 to 2018. Plans and policies need to undergo regular review or reassessment to ensure that they adequately tackle present-day challenges and align with current circumstances. Questions can thus be raised concerning the efficacy of the existing package of plans for planning and development. Notably, the land use scheme is the sole spatial planning tool currently employed to oversee the implementation of electronic communication infrastructure.

5.3.4. eThekweni Municipal Land Use Schemes

From a legislative and procedural perspective, Chapter 5 of the SPLUMA is dedicated to land use management and mandates municipalities to prepare, adopt or amend land use schemes. All municipalities were required to adopt a single land use scheme for the entire municipal jurisdiction within five years of the adoption of SPLUMA in 2013. Section 24 (2) outlines what the scheme must include and consider. Sections 24 (2) (f) and (g) state that schemes should implement national and provincial policies as well as the IDP and SDF (South Africa 2013: 36). This discussion does not delve into the purpose, content, and legal implications of land use schemes. Instead, it assesses the extent to which these schemes incorporate electronic communication within municipal planning and development strategies.

As highlighted in Figure 13, land use schemes are depicted as the ‘last’ plan in the package of plans for eThekweni Municipality. However, they are central to spatial planning and development tools within municipalities. The SPLUMA defines a land use scheme as *“the regulation of land use”*. Land use is defined as *“the purpose for which land is or may be used lawfully in terms of a land use scheme, existing scheme or in terms of any other authorisation, permit or consent issued by a competent authority, and includes any conditions related to such land use purposes”*. A zone is defined by the SPLUMA as *“a defined category of land use which is shown on the zoning map of a land use scheme”* (South Africa 2013: 12-14).

The eThekweni Municipality has established five regional land use management schemes within the metropolitan area: the northern, central, outer west, inner west, and southern schemes. The central and outer west schemes were initially adopted in 1991 and 2000, respectively, with the other three adopted in 2012. Figure 14 below illustrates the boundaries of these schemes within the municipality. It should be noted that these differ from the spatial boundaries depicted in Figure 11 This can be attributed to historical shifts in settlement patterns, variations in the timing of scheme adoption, and procedural and regulatory requirements, including the incorporation of ITB land into land use planning.

To ensure alignment with the SPLUMA's vision, which advocates for a single land use scheme covering the entire municipal area, the schemes undergo annual revision by the Development Planning Department. This team is tasked with assessing necessary changes within the schemes, which may stem from requests originating from regional land use management offices, shifts in economic, social, and infrastructure trends, or the identification of errors, omissions, and discrepancies within the schemes. For the purposes of this research, we utilised the most recent review, Version 1.7, which was adopted in July 2023.

SCHEME BOUNDARIES

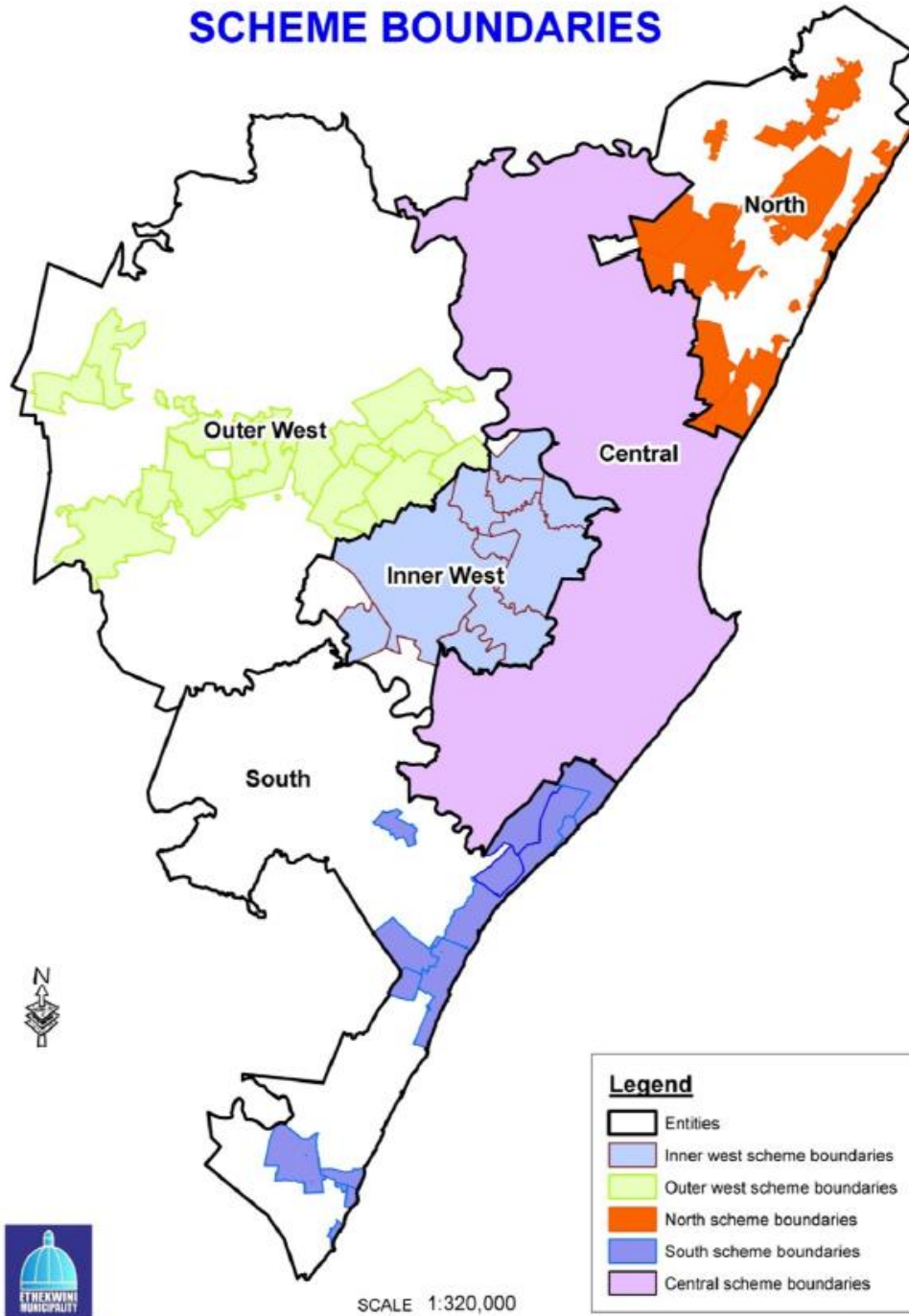


Figure 14: Land Use Scheme boundaries within the eThekweni municipality (Source: Davids et al. 2018: 9)

Since the implementation of the SPLUMA in the eThekweni Municipality, the need to create a comprehensive 'wall-to-wall' land use scheme for all areas, irrespective of land tenure systems, has been emphasised. However, this mandate encounters significant challenges, particularly concerning land tenure and development on traditional land, which makes up 68% of the municipality (eThekweni Municipality 2023b: 47-48). To address these complexities, the municipality has introduced two distinct 'holding' zones: the Land Use Management Holding Area and the Traditional Authority Area.

The zoning of areas identified as 'Entities' in Figure 14 requires planners to meticulously consider the type of ownership prevailing in each zone to guide land use development, i.e., traditionally owned land falling under the Traditional Authority Area and privately-owned land within the Land Use Management Holding Area.

This scenario underlines the persistent challenge of dual governance and the clash between traditional or customary, and urban land use planning. These approaches diverge significantly in their principles, methods, and underlying philosophies. Applying a standard land use scheme to such a complex landscape exacerbates planning complexities and emphasises the need for context-specific planning strategies (Pieterse and Coggin 2023: 14-15).

5.3.5. Development applications

The municipality's Land Use Management branch, which is part of Development Planning, is responsible for processing development applications. Among the various types of applications, the predominant one for electronic communication is the 'special consent' application, which is elaborated on later in this chapter.

Special consent applications are necessary when a proposed land use falls within the designated scope of ‘Special Consent’ as categorised in the Development Standards of a zone. These applications pertain to activities that are solely permitted with written special consent from the municipality. Detailed zone information can be found in the Land Use Scheme for the region. Once submitted, special consent applications legally bind the proposed use to the land, or the erection and utilisation of a building as specified in the application. If a development application contradicts the acceptable parameters outlined for a particular zone, the municipality will reject the application (eThekweni Municipality 2023a: 26).

5.3.5.1. Categorisation and authorising bodies of development applications

According to the bylaw, it is mandatory to categorise all development applications. Chapter 8 of the bylaw provides the categorisation of all types of land applications and specifies the authority responsible for decision-making based on each category. Table 2 below simplifies the categorisation and the responsible authorities within the eThekweni Municipality for special consent applications, which are classified under Category 3 of the bylaw.

	Category 3
Authorising/approval body	The Head: Development Planning and Environmental Management
Application types	<p>a) special consent application.</p> <p>b) an application for subdivision.</p> <p>c) an application for consolidation.</p> <p>d) an application for a township establishment.</p> <p>e) an application for the closure of roads and public open spaces.</p> <p>f) an application for the rezoning of land which is in line with the Municipal SDF.</p> <p>g) an application for the removal, amendment, or suspension of a restrictive condition.</p> <p>h) an application for the development of land outside of a land use scheme; and</p> <p>(i) a combined application, which includes one or more of the land developments uses set out in (a) to (h) above as well as any land uses falling within Category 4 land development applications.</p> <p>j) a non-material amendment.</p>

Table 2: Categorisation of development applications and authorising bodies (Source: eThekweni Municipality 2021a: 22-23)

The Head of the DPEM is responsible for approving or refusing special consent applications. To support the decision taken by the head, the municipality has established the Joint Advisory Committee (JAC) to make recommendations on land applications. The committee consists of four municipal officials who are registered planners (eThekweni Municipality 2021a: 24).

From the researcher's observation and knowledge of the department's functioning, a planning report and recommendation is drafted by a municipal town planner and presented to the JAC that deliberates on the recommendation. This is done prior to the head receiving the recommendation in the form of a decision notice to approve or refuse the application based on the JAC's evaluation of the application's merits. Once a recommendation is agreed upon, the decision notice together with the minutes of the JAC meeting at which the application was deliberated upon are forwarded to the Head of the DPEM for final consideration and signature of the decision notice.

5.3.5.2. Development application submission process

Prior to the Covid-19 pandemic, all development applications were submitted in hard copy to the municipality for processing. From the researcher's observation, during the pandemic applicants sent applications via email and these were distributed to planning officials via email. This presented various challenges relating to record keeping, tracking, and processing of applications.

Following the pandemic, the municipality implemented an online submission system known as the eThekweni Municipality e-service portal. Through this portal, development applications are electronically submitted for evaluation. This submission procedure adheres to the criteria outlined in Sections (22) - (24) of the bylaw governing application submissions. Figure 15 below illustrates the standard inquiry process for online submission of all development applications in accordance with the Electronic Submission Requirements of Land Use Management (South Africa 2021a).

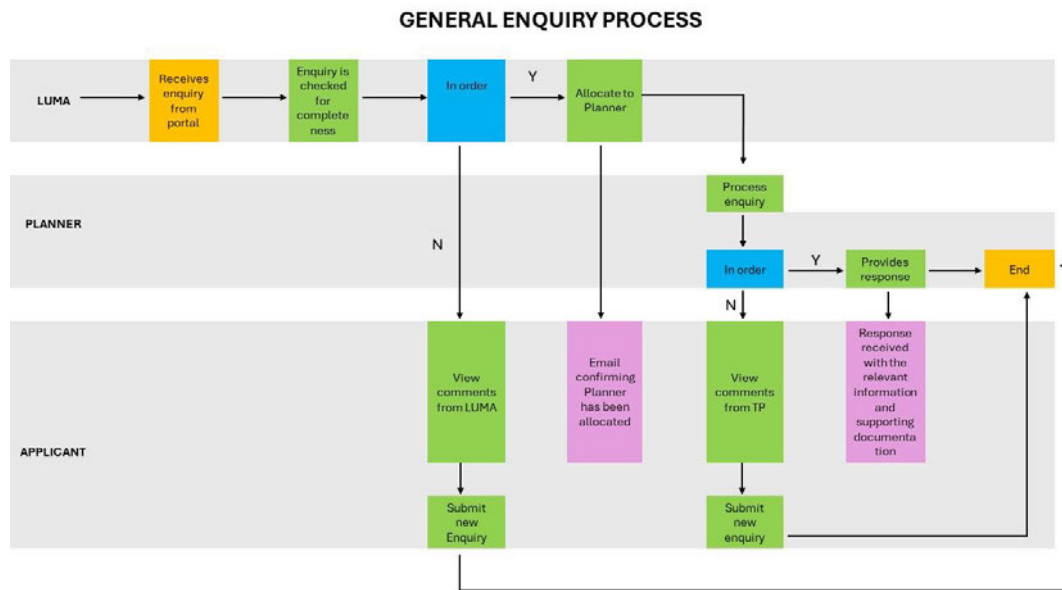


Figure 15: General enquiry process via the e-services portal (Source: eThekweni Municipality: 10)

Based on the researcher's understanding and experience of the system, upon receipt of a development application through the e-services portal, it undergoes a preliminary inquiry. If the application fails to meet the stipulated requirements, it is returned to the applicant to address any comments or outstanding issues. Should the application meet all submission criteria, it is assigned to a municipal town planner within the Land Use Management branch for further processing.

Chapter 9 of the bylaw delineates the public participation process mandated for specific development applications, such as special consent, rezoning, or the removal of restrictive title deed conditions. Special consent applications require public participation (South Africa 2021a: 24) prior to the application being presented to the JAC and the Head of the DPEM for a decision. The researcher constructed the process chart in Figure 16 based on first-hand experience and familiarity with the internal procedures to handle complete applications.

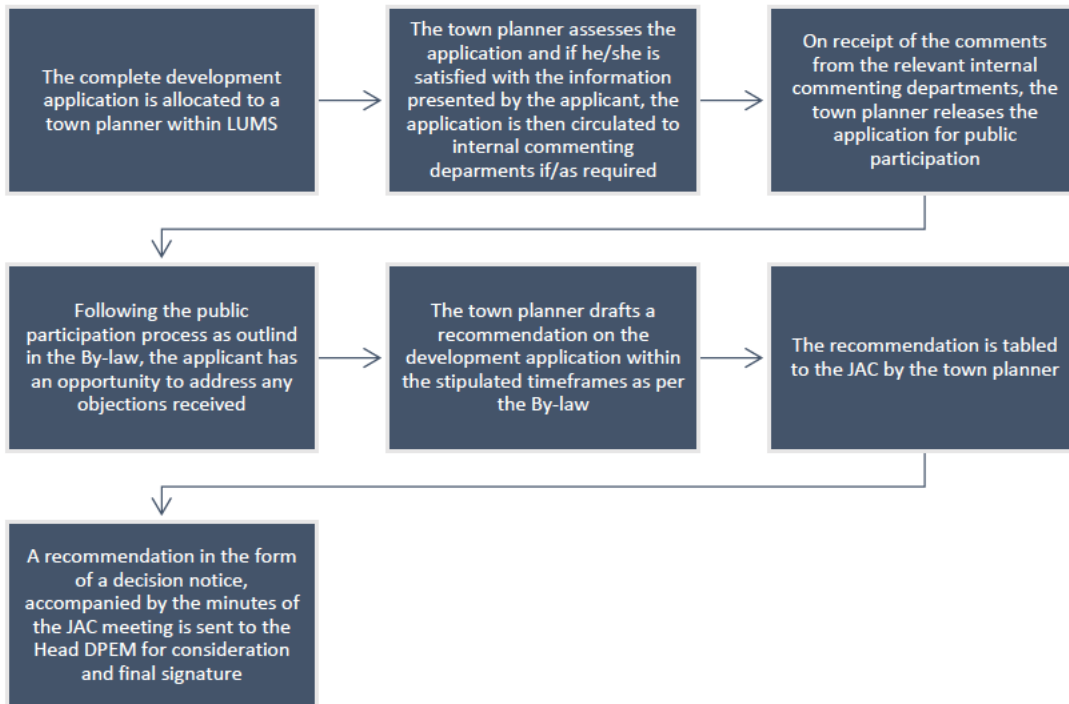


Figure 16: Development application process (Source: Generated by the researcher)

5.4. Electronic communication applications

The preceding sections explained the policy framework guiding development applications and the eThekwini Municipality's planning and development processes. This section explores the procedures for electronic communication applications limited to land-based fibre, antennae, masts, and supporting infrastructure such as monitoring equipment and poles.

Through participant observation, it was determined that multiple departments within the municipality contribute to the development of electronic communication infrastructure. This stems from the nature of the infrastructure deployed, its placement (whether on private land, municipal land, or servitudes), and ownership considerations (municipal-owned, privately-owned or ITB land).

The following discussion addresses pertinent aspects relating to electronic communication applications in the eThekwini Municipality, including the roles and responsibilities of the Land Use Management, Roads, and Real Estate Departments concerning electronic communication infrastructure and their applicable development norms and standards associated with the development of electronic communication infrastructure.

5.4.1. Development Standards for Telecommunication Infrastructure – eThekwini Land Use Management Branch

Across all municipal land use schemes, electronic communication is termed 'telecommunication infrastructure' and defined under land uses as: "... *any structure designed and used for the accommodation of equipment used in the transmitting or receiving of electronic communications signals and includes a telecommunications mast but excludes any Television/Radio receiving equipment with a diameter of 1,5 metres or less*" (eThekwini Municipality 2023a: 42).

The eThekweni Municipality has categorised electronic communication infrastructure as a land use, focusing on structures intended or utilised to transmit and receive electronic communication signals, alongside telecommunication masts (defined in Chapter 1). The rationale for categorising this equipment as a land use remains unclear. However, through observation, it was determined that land-based fibre and the development of municipal land are overseen by separate departments within the municipality (see sections 5.5.2 and 5.5.3 below).

Section 9 of the municipality's land use schemes includes development standards for specific land uses. Section 9.1 pertains to Development Standards for Telecommunication Infrastructure. While these do not specify an exact date of review or adoption, the revised standards were implemented between 2020 and 2021. The researcher was a member of the task team that reviewed Section 9.1. These development standards were formulated in accordance with the Electronic Communication Act 2005 (Act No. 36 of 2005) (eThekweni Municipality 2023a: 188).

Since the adoption of the KwaZulu-Natal Provincial Planning and Development Norms and Standards for Electronic Communication Facilities in January 2020 by the Department of COGTA, land use schemes have been identified as the regulatory tools for electronic communication development. Municipalities have the option to seek exemption from the Norms and Standards. However, unless an exemption is granted by the MEC for COGTA, the Provincial Norms and Standards supersede any municipal regulations concerning telecommunications (South Africa 2020d: 3). At the time of the research, there were no gazetted records indicating that eThekweni was exempt from implementing the Provincial Norms and Standards.

The eThekweni Municipality's Development Standards establish a statutory framework that dictates the type of development application required based on the zone of the property being developed. Table 3, which is extracted from the Development Standards, tabulates the zones, application type, and additional requirements.

ZONE	APPLICATION TYPE	OTHER REQUIREMENTS
All residential zones	Special Consent	
Worship Zone	Special Consent	
Institutional Zone	Special Consent	Requires a consent letter and the plan's endorsement by the registered property owner
Education Zone	Special Consent	Requires a consent letter and the plan's endorsement by the registered property owner
All Single Use Commercial / Office Zones	Free Entry	Should this zone abut any Residential Zone or land use, clause 9.1.2.3 will be applicable
All Industrial Zones	Free Entry	

Table 3: Application Matrix for telecommunication infrastructure development applications in eThekweni Municipality (Source: eThekweni Municipality 2023a: 189)

The matrix is designed to encompass a broad range of zones rather than listing each individual zone separately. For instance, 'all residential zones' would encompass every type of residential zone specified in the region's land use scheme. Zones not explicitly mentioned will be permitted without the need for a special consent application. However, if an 'unlisted' zone borders any residential zone, the applicant must secure written consent from the registered owner of each adjacent property, as well as any other property specified by the Head of the DPEM. In cases where the owner refuses consent, a comprehensive special consent application becomes necessary (eThekweni Municipality 2023a: 188-189).

Like the KwaZulu-Natal Provincial Planning and Development Norms and Standards for Electronic Communication Facilities, eThekweni's Development Standards provide guidelines on locational provisions, visual attributes, and safety and environmental issues which applicants are required to consider when preparing development applications (eThekweni Municipality 2023a: 189-190).

The development standards outline the approval procedures for land use planning, which include a comprehensive list of required supporting documents. Any significant alterations to an approved application, such as an increase in the height of a telecommunication mast, antenna, or the footprint of a base station, require a special consent application following the statutory framework. However, routine maintenance or replacement of infrastructure without altering the approved specifications does not require an additional application. It should be emphasised that all applications must adhere to the National Building Regulations and Standards Act No. 103, the Civil Aviation Act No. 13 of 2009, and the National Environmental Management Act No. 107 of 1998 (eThekweni Municipality 2023a: 191-192).

Previously, applications for electronic communication infrastructure were exclusively reviewed by the municipality if submitted as a special consent application, irrespective of the zoning. However, the revised development standards re-evaluated the need for special consent for all zones. This is part of an initiative to streamline the development of electronic communication infrastructure by offering simplified application requirements for specific zones.

5.4.2. Land-based fibre applications – eThekweni Roads Department

Chapter 1 provided an understanding of what fibre entails and illustrated how it is laid and connected to houses and businesses. Fibre is generally placed within public roads, municipal servitudes, and verges to ensure access and ease of connectivity to homes and businesses.

According to the researcher's observation, responsibility for land-based fibre applications lies with the eThekweni Roads Department. At the onset of the initial phase of fibre infrastructure rollout in the municipality, the process was not formalised. A draft bylaw was planned to provide guidance to applicants regarding the necessary steps to obtain approval for fibre rollout. The repercussions of unregulated fibre rollout are evident in the unsightly dug-up roads and sidewalks throughout the municipality, as depicted in Image 1 below



Image 1: Dug-up and unrestored municipal verge during fibre rollout at the corner of St Thomas and Peter Mokaba Roads in eThekweni (Source: Chetty 2022)

Subsequently, the eThekweni Municipality Wayleaves and Excavation Bylaw 2022 has been released for public comment; however, no adoption date has been set and it is still in draft form (eThekweni Municipality 2022c). It is not clear if or when it will be adopted. Notwithstanding this, it is important to understand the bylaw's intent and how it will influence the development of land-based fibre.

The purpose of the bylaw is:

to provide for the regulation of all works to be executed in any public road reserve and municipal servitudes; to provide for wayleave application approval, rejection and withdrawal procedures; to provide for the regulation of protected precincts; to provide for matters relating to costs; to provide for existing and planned services; and to provide for matters incidental thereto. (eThekweni Municipality 2022c: 2)

Prior to the placement of fibre on public or municipal land, a wayleave application must be submitted to the municipality. Wayleave is defined as “...right of way granted by the Municipality to a private service agency to install infrastructure for a specific purpose” (eThekweni Municipality 2022c: 7). Chapter 4 of the bylaw extensively discusses wayleaves, the wayleave application procedure and how to approach work in public road reserves and municipal servitudes.

The basic wayleave procedure set out in Chapter 4 Subsection 5 of the bylaw is illustrated in Figure 17.

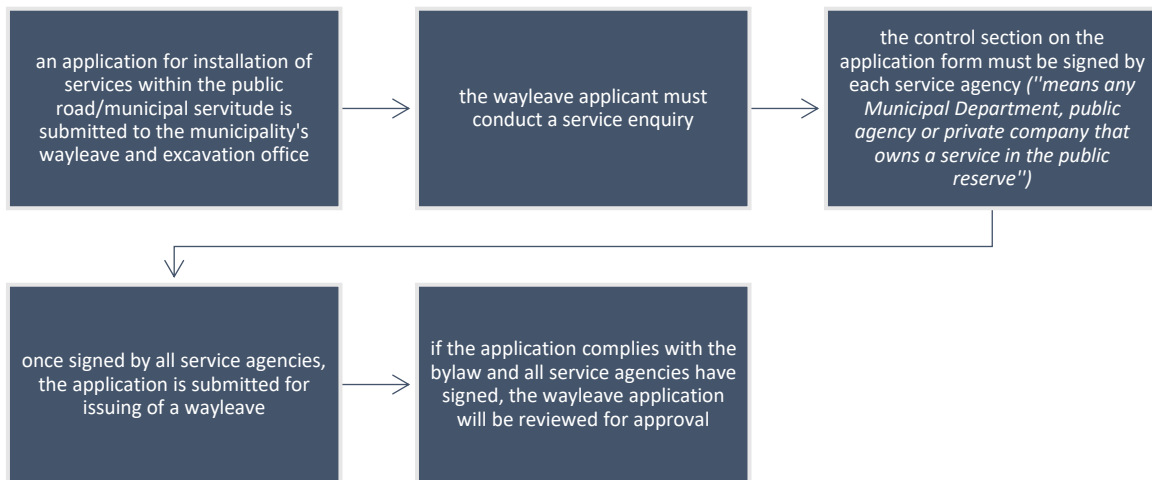


Figure 17: The basic wayleave application process (Source: eThekwini Municipality 2022c: 9-10)

Commencement of work within public roads or municipal servitudes must receive prior approval. Wayleave applications risk rejection if they fail to comply with the bylaw's requirements or address concerns raised by service agencies. The bylaw further specifies the conditions under which work may be conducted (eThekwini Municipality 2022c: 11-12). Akin to the development standards for telecommunication infrastructure, it outlines the prerequisites for a wayleave application and the necessary supporting documentation (eThekwini Municipality 2022c: 14-15). In enforcing the bylaw, the municipality will enhance control and management of fibre rollout initiatives.

5.4.3. Development on municipal-owned land – Real Estate Department

The municipality's Real Estate Department operates like other property management entities. Its responsibilities include preparing and maintaining the general valuation roll, which undergoes review every five years to reassess property values, impacting municipal rates. The department also oversees property acquisition for projects that align with the municipality's vision and goals and manages the leasing and administration of municipal-owned land. Consequently, all developments on municipal-owned land are facilitated by the Real Estate Department.

The researcher's observation of the Real Estate Department revealed that compliance with the Municipal Finance Management Act of 2003 is mandatory, as it offers guidelines to regulate municipal asset transfers. Unlike the LUM and Road departments, the Real Estate Department lacks specific policies or regulations for the submission of applications for projects on municipal-owned land.

Figure 18 below is derived from consultations with the department regarding the submission process for electronic communication infrastructure on municipal-owned land.

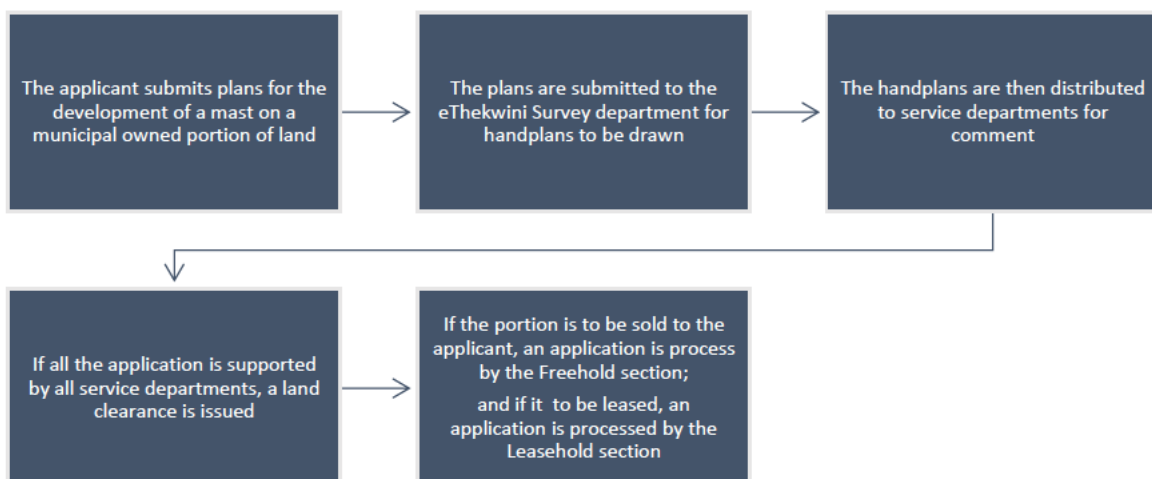


Figure 18: Application process for the development of municipal-owned land (Source: Derived by the researcher during consultations with the eThekweni Real Estate Department)

5.5. Chapter Conclusion

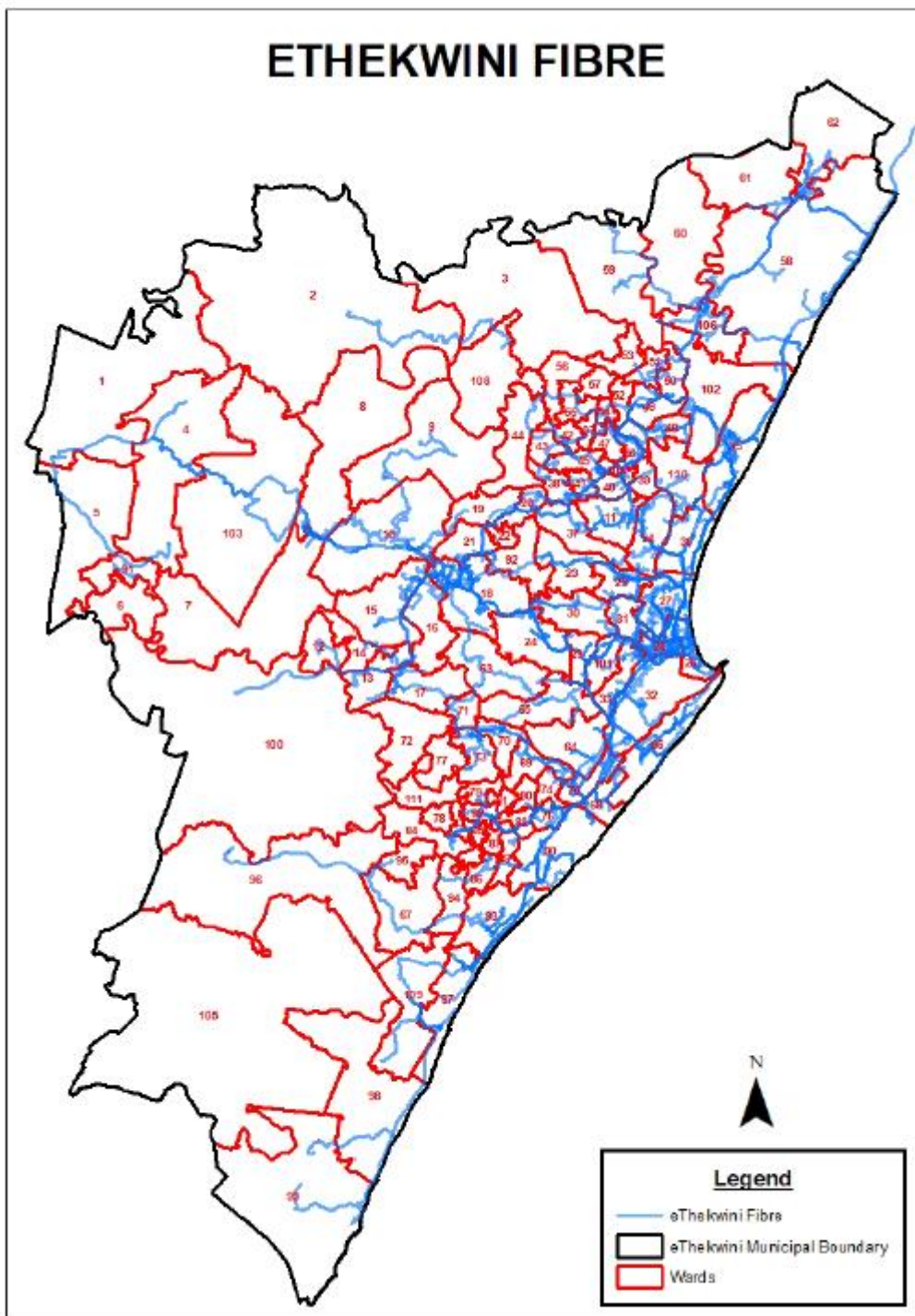
The establishment of the eThekweni Municipality following the dismantling of apartheid governance marked a pivotal moment in Durban's history, consolidating it into a unified metropolitan area. While efforts have been made to bridge the digital divide through initiatives like the installation of fibre-optic networks and the establishment of public Wi-Fi hotspots, the spatial distribution of these resources predominantly favours urban areas, leaving rural and peripheral communities underserved.

The complex land holdings within the eThekweni Municipality, as outlined in the 2023 Municipal IDP, highlight the complex challenges facing land administration and management. Effective land administration strategies are essential to navigate these challenges. Moreover, collaborative efforts between the government authorities, private developers, and community stakeholders are essential to foster sustainable development and equitable access to resources within the municipality.

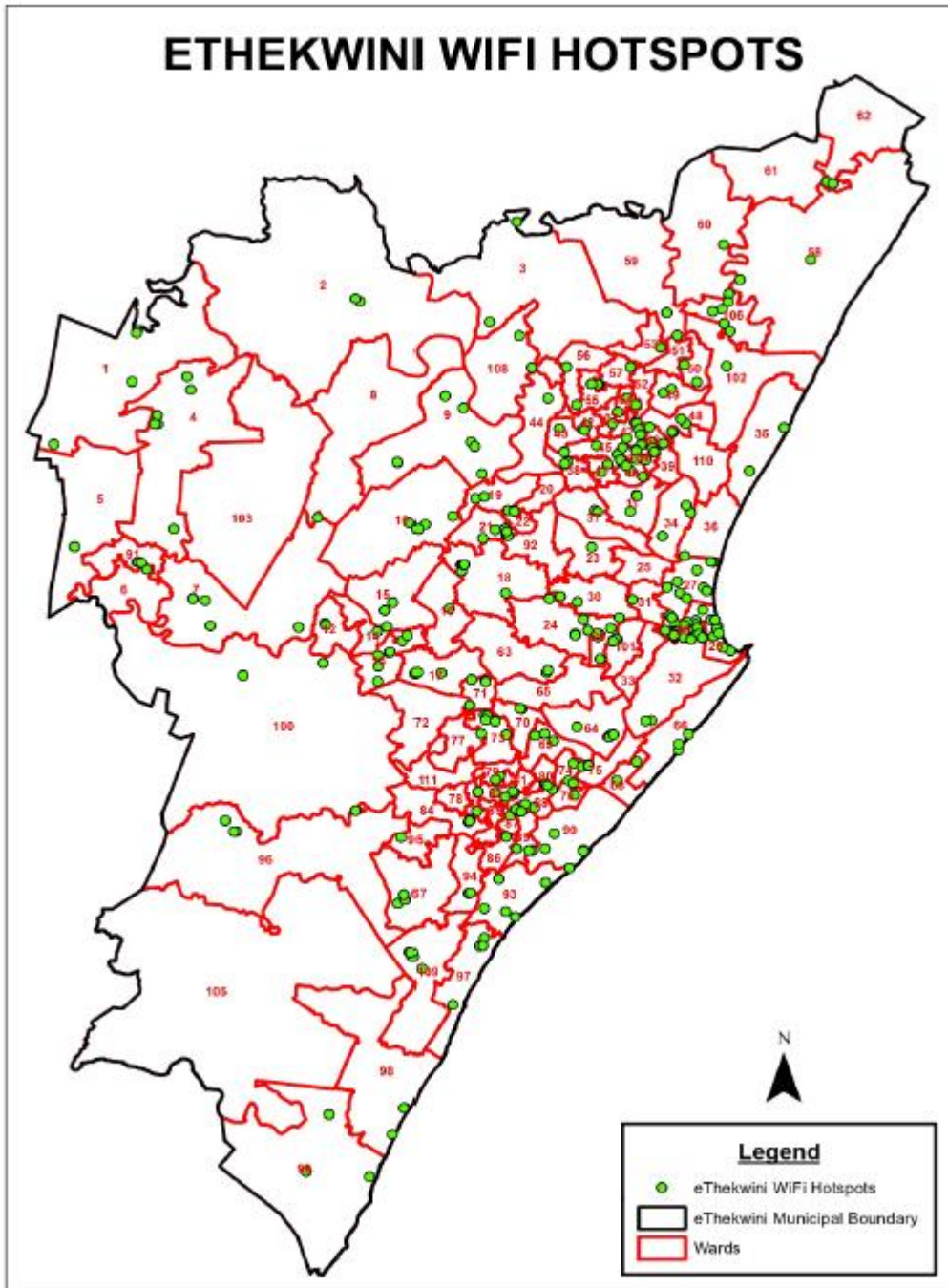
This chapter has shown that the processing and subsequent development of electronic communication infrastructure in the eThekweni Municipality is a multi-layered process which requires different types of applications to different departments, depending on the type of application, the location of the infrastructure and ownership of the land. Attempts to streamline the application process and implement regulations for the development of electronic communication infrastructure can be seen within the LUM and Roads departments.

Chapter 6 presents an analysis of the primary and secondary data to evaluate the role and effectiveness of spatial planning and the statutory planning processes for the facilitation and implementation of electronic communication infrastructure.

Annexure 5.1



ETHEKWINI WIFI HOTSPOTS



Annexure 5.2

Policy/strategy/implementing tool	Purpose	Relevance to ICT
The Long-Term Development Framework	Created in 2001, it captured the vision at the time for the next 20 years which was to ensure that the city is responsive to people’s social and economic needs and to ensure transparency and accountability. It identified challenges and possible solutions to create a better quality of life for citizens and communities (eThekwini Municipality 2001).	<p>The framework identified three sets of actions to improve the quality of life, namely, “meeting basic needs”, “strengthening the economy”; and “building skills and technology”. Although this framework was created 22 years ago, it identified the need for skills and technology upgrade to ensure that Durban becomes a globally competitive, smart city that connects people (eThekwini Municipality 2001: 8).</p> <p>With a focus on the technology aspect, the framework suggested partnerships with industries to grow the ICT economy as well as with educational facilities for skills development and for communities to have access to ICT services. It also aimed to ensure that unicity institutions have highly skilled ICT service providers (eThekwini Municipality 2001: 11).</p>
eThekwini Municipality Integrated Development Plan (Five-Year Plan: 2023/24 to 2027/28)	<p>An IDP is a requirement of the Municipal Systems Act (No. 32 of 2000). It is a five-year strategy that acts as a transformative tool within local government to drive and facilitate development (eThekwini Municipality 2021b: 1-2).</p> <p>The vision is to be Africa’s most caring and liveable city by 2030 and it is informed by the Municipal Eight-Point Plan which sets out strategies for effective service delivery (eThekwini Municipality 2021b: 1).</p> <p>These approaches translate into long-term development objectives and align with municipal budgets, monitoring and evaluation mechanisms and</p>	<p>The IDP is based on the current situational analysis; however, for telecommunications, statistics from 2011 are still being referenced. Attempts have been made to connect citizens through the implementation of fibre in municipal offices and libraries, as well as provision of public Wi-Fi hotspots (eThekwini Municipality 2023b: 368).</p> <p>The IDP identifies means of incorporating technology into different sectors to enhance service delivery such as improved revenue collection and customer interactions through ‘e-services’ (eThekwini Municipality 2023b: 330).</p>

	<p>timeframes for delivery (eThekweni Municipality 2021b: 2).</p>	<p>The IDP's ICT strategy aims to enable business platforms and economic growth. Other uses of ICT are directed towards ensuring sustainability through the efficient use of resources such as energy to curb climate change and the exploitation of natural resources. Monitoring and evaluation using ICT technologies are also identified (eThekweni Municipality 2023b).</p> <p>Strategic Plan 7 relating to "good governance and responsive local government" budgets for infrastructure in municipal offices to enable communities to access ICT. However, this is where the investment in ICT rollout stops (eThekweni Municipality 2023b).</p>
<p>eThekweni Municipal Spatial Development Framework 2022 - 2023</p>	<p>The MSDF is also a five-year framework plan that sets out the spatial representation of the IDP. The Municipal Systems Act and the SPLUMA require all municipalities to adopt such a framework. The long-term spatial vision for 2030 is a "<i>socially equitable, environmentally sustainable, resilient and functionally efficient Municipality that bolsters its status as a gateway to Africa and the world</i>" (eThekweni Municipality 2022d: 404).</p> <p>Land use and infrastructure development is guided by the MSDF. It is also aligned with provincial plans and other municipal sectoral plans and strategies which is also backed by the municipal budget and resource allocation (eThekweni Municipality 2022d: 19 - 20).</p>	<p>The MSDF overlaps with the IDP, with many sectors carrying forward the same information from the IDP. However, it does not provide high levels of detail for each sector as is presented in the IDP such as situational analysis, opportunities, challenges, budgets, etc.</p> <p>The MSDF does not identify telecommunications as essential infrastructure or a basic service (eThekweni Municipality 2022d: 486-489). Furthermore, ICT and telecommunications do not form part of the capital investment framework and implementation strategies. A small budget of R67,914 is allocated to the Office of Strategic Management for Information Technology, but there is no explanation as to what this is</p>

		<p>intended for (eThekwini Municipality 2022d: 519).</p> <p>Smart infrastructure and ICT investment by the municipality is identified to promote spatial justice and sustainability, enhance the economy and support economic growth among marginalised groups and areas (eThekwini Municipality 2022d: 407). However, none of the spatial strategies mention the use of ICT or telecommunications as strategies to improve the different sectors which form part of the municipality, i.e., the environment, built environment, the economy, etc. (eThekwini Municipality 2022d: 417-418).</p> <p>The MSDF identifies the Land Use Management System as an important tool to drive development objectives (eThekwini Municipality 2022d: 416). Land use management guidelines therefore need to align with the strategies to achieve the envisioned outcomes. Again, none of the land use management guidelines highlighted by the MSDF speak to ICT or telecommunications development and deployment.</p> <p>The MSDF identifies the value of streamlining land use procedures for all developments within the primary and urban zones and priority housing development areas to achieve spatial integration and promote sustainability (eThekwini Municipality 2022d:</p>
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		564). The review of the land use scheme below elaborates on the development procedures for ICT or telecommunications.
Spatial Development Plan (SDP)	<p>The last review of the SDP was adopted in March 2014 (eThekweni Municipality 2022d: 737). Due to the large geographical extent of the municipality, SDPs are sub-metropolitan or region specific and align with the spatial regions indicated above.</p> <p>As noted by the MSDF, the implementation of regional SDPs aims to provide strategic guidance to various sectors within the region. The SDP also provides land use directives and guidelines for infrastructure development based on the region (eThekweni Municipality 2022d: 61, 737).</p> <p>Since the SDPs are region-specific, the level of detail is greater, with input from key municipal sectors and departments, particularly for transport, water and sanitation, the environment, housing, and economic issues. In addition, bilateral, interdepartmental, and cross-border engagements inform the regional SDP (eThekweni Municipality 2022d: 737-738).</p>	<p>There are four regional SDPs – north (NSDP), south (SSDP), central (CSDP), and outer west spatial (OWSDP). Given that these plans are almost ten years old, the status quo and situational analysis might not be relevant to the current planning context of the region. Therefore, the challenges identified at that time within the regions form the basis for this evaluation. The issues highlighted were informed by reports, studies, research, and interdepartmental workshops held at that time. It is critical to establish whether ICT and telecommunications were identified to address regional challenges and the implementation of ICT or telecommunication solutions (if any) within planning guidelines to address such challenges.</p> <p>The NSDP only briefly mentions the potential of technology as a driver of economic growth and to support industrial development (eThekweni Municipality 2013: 45, 108). The CSDP identified joblessness due to the growth in capital and technology (eThekweni Municipality 2014: 39). The OWSDP cites technology as a social, economic, and industrial enabler as does the SSDP which uses the term technology very loosely with a generic copy-and-paste statement as with the other SDPs.</p>

<p>Local Area Plans (LAPs)</p>	<p>LAPs are physical, detailed plans which provide recommendations as an extension of the IDP and SDF based on specific geographical areas. They inform integrated land use management (eThekweni Municipality 2023b: 466).</p>	<p>There are several LAPs for each planning region. Again, this study does not give an account of all policies but focuses on those that relate to electronic communication and spatial planning. A random selection of one LAP per region was used to broadly evaluate the use of ICT and electronic communication within these plans. Observation of the LAPs used by the municipality indicates that several policies dating back to 2008 to 2018 are still in use (eThekweni Municipality 2023b: 516).</p> <p>The following four LAPs were randomly selected and evaluated:</p> <ul style="list-style-type: none"> • Northern Region: Ohlanga-Tongati Local Area Plan and Coastal Management Plan (latest revision 2010) • Central Region: eThekweni Inner City Local Area Plan (November 2016) • Outer West Region: Cato Ridge Local Area Plan Review, Functional Area Plans and Draft Scheme (June 2018) • South Region: Final draft Adams/Folweni LAP Framework Report (May 2012) <p>According to the Ohlanga-Tongati LAP, “<i>access to electricity and telecommunication is good</i>”. There is no measurement of what ‘good’ amounts to in terms of availability or capacity (Ferguson 2010: 44).</p>
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		land use that is considered in planning and development.
Precinct Plans (and Land Use Guidelines)	Precinct Plans provide a detailed framework for both the public and private sector and inform and direct physical development and management of local areas. They aim to integrate factors such as accessibility, tourism, safety, and environmental preservation. To do so, Precinct Plans provide land use guidelines, identify programmes and projects and creates project plans for implementation (eThekweni Municipality 2023b: 466-467).	<p>There are fewer Precinct Plans for each region, and they were published between 2010 and 2014 (eThekweni Municipality 2023b: 516). As with the LAPs, a Precinct Plan was selected per region and is evaluated below:</p> <ul style="list-style-type: none"> • North Region: Umhlanga Node Precinct Plan • Central Region: Pinetown CBD Node Precinct Plan • Outer West Region: Molweni Nodal Precinct Plan • Southern Region: Craigieburn Precinct Plan/Functional Area Plan <p>An assessment of the above Precinct Plans reveals that they are more design orientated and directed at the built form of an area. Except for the Craigieburn Precinct Plan, none of the plans acknowledge or include any form of ICT or electronic communication infrastructure. Considering that the Craigieburn Precinct Plan was published in 2011, fixed landlines were still commonly used and were thus considered as part of the infrastructure network within the Precinct Plan (RCR Project Team 2011).</p>
Special Projects	Special projects relate to the spatial policy, strategies, plans and guidelines for a specific geographical region or area. They include the City Densification Strategy, Rural Development Strategy, Transit Oriented Development Strategy and	There is currently no special project relating to spatial planning for ICT or electronic communication infrastructure.

	Climate Resilience Strategy (eThekweni Municipality 2023b: 467).	
Built Environment Performance Plan (BEPP)	The BEPP was previously adopted by the city to articulate its investment rationale and institutional arrangements to address spatial transformation and integration between line departments. However, in 2021/22, it was established that it is no longer required (eThekweni Municipality 2023b: 467).	Not applicable.
Rural Settlement Plans	According to the IDP, Rural Settlement Plans are not a requirement, but can assist in creating a 'wall-to-wall' scheme in the municipality, where all areas are essentially managed by land use scheme requirements, whilst considering planning for an area which is mainly governed by traditional authorities. However, rural, or traditional authority areas do not have distinct cadastral demarcation (eThekweni Municipality 2023b: 467).	<p>According to the 2023/23 IDP, the Northern Rural Settlement Plan is currently in the process of being approved. This appears to be the only Rural Settlement Plan within the municipality (eThekweni Municipality 2023b: 516). A draft of the Northern Rural Settlement Plan is available online for public perusal; however, since it has not been approved, there is no adoption date. The plan covers the traditional/rural settlement area within the Northern Region.</p> <p>The report considers base telecommunication transceiver stations as a land use and places it within the development facilitation table of each 'zone' to be established within the project area. Overall, the report only considers telecommunications within the draft scheme and does not suggest the use of ICT or electronic communication to address issues related to rural development (Mabune Consulting CC 2023).</p>
eThekweni Municipal Land Use Scheme Version 1.6 dated June 2022	Land use schemes are statutory planning tools that guide spatial development within specific areas. They are intended to translate the municipal goals and objectives	Land use schemes do not entirely align with spatial frameworks. There are five schemes, i.e., the north, central, outer west, inner west, and south land use schemes.

	<p>identified in higher order plans. Land use schemes contain regulations and procedures to ensure efficient and effective use of land (eThekwini Municipality 2023b: 76). They are elaborated on in the next chapter as an essential tool for planning and development within eThekwini Municipality, particularly for electronic communication.</p>	<p>It should be noted that the inner west land use scheme would align with the central SDP.</p> <p>Section 9 of the various eThekwini Municipal Land Use Schemes relates to development standards with Section 9.1 specifically relating to telecommunication infrastructure. The municipality has aligned its development standards with COGTA's norms and standards to guide telecommunication infrastructure development on all parcels of land within the municipality (eThekwini Municipality 2023a). These development standards are unpacked in Chapter 5.</p>
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CHAPTER 6: ANALYSIS OF FINDINGS AND RESULTS

6.1. Introduction

This chapter analyses the primary and secondary data to achieve the study's objective of assessing the role and effectiveness of spatial planning and statutory planning processes in facilitating and implementing electronic communication infrastructure. Key findings are presented in its conclusion.

Chapter 2 set out the contextual and theoretical frameworks that guided the researcher in understanding ICT and electronic communication in the 4th IR, while Chapter 3 presented precedent case studies in developed and developing countries, Africa, and South Africa. Chapter 5 provided an understanding of the location of the eThekweni Municipality case study and discussed the roles of different municipal departments in relation to electronic communication infrastructure facilitation and implementation. The analysis in this chapter is supported by the data in these three chapters.

As noted previously, to ensure that this research study was focused and related to the research questions, it was limited to investigating the deployment of the following electronic communication infrastructure: land-based fibre, antennae, masts, and infrastructure which supports the attachment of electronic communication, i.e., monitoring equipment and poles.

6.2. Research Themes

While the literature acknowledges the importance of ICT and electronic communication infrastructure to support the 4th IR, deployment of such infrastructure confronts challenges in the South African context, with the sector influenced by national, provincial, and local legislation, policies, norms, and standards which all aim to regulate the rollout of electronic communication infrastructure.

Spatial planning is essential in the development of land and infrastructure, with local authorities holding the key authorising powers. Consequently, municipalities must ensure that their processes are in line with national and provincial goals. However, as highlighted in previous chapters, there is significant misalignment between government legislation and policies, leading to processes that do not fully support the

country's vision for ICT development. This lack of policy coherence poses challenges to applicants seeking municipal approval for electronic communication infrastructure projects, resulting in ambiguous processes as municipalities seek to integrate directives from higher levels of government (Sutherland 2020: 235).

The focus of this study was to unpack how responsive spatial planning legislation, policies, and procedures are in guiding statutory planning for electronic communication infrastructure in the eThekweni Municipality. To analyse the data and maintain consistency, themes were identified in the primary data that correspond with the research questions and can be compared against the secondary data. These themes are outlined below.

Each theme was used to analyse the primary and secondary data. The findings provide insights into spatial planning for electronic communication infrastructure and municipal statutory processes' ability to meet the demands of the 4th IR. The findings underpin the study's conclusions and recommendations.

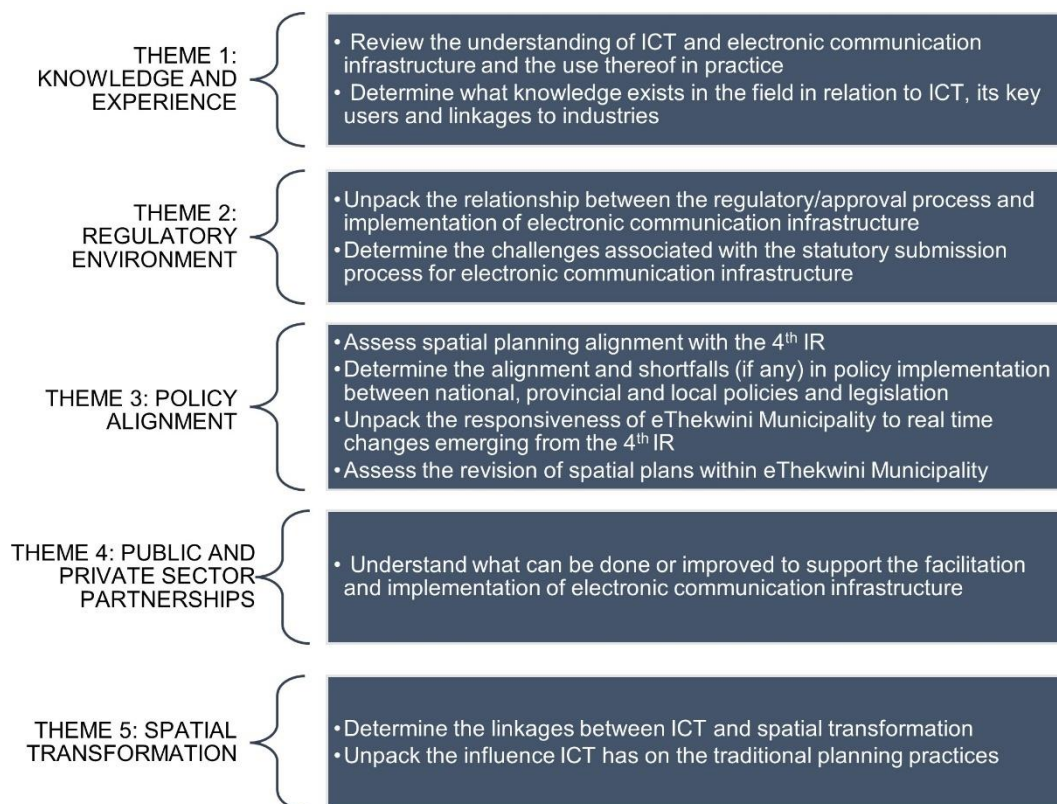


Figure 19: Themes and sub-themes were used to analyse the data

6.3. Analysis of primary and secondary data in relation to the research themes

This study used a qualitative research approach to collect data using interviews conducted face-to-face and electronically. The interviews consisted of open-ended and semi-structured questions. Secondary data was obtained through a review of publications, municipal policies, precedent case studies and research relating to spatial planning and electronic communication infrastructure within the eThekweni Municipality (see Chapter 5 and Annexure 5.2).

The initial sample size was 40 participants in total, split evenly between Category A and Category B as public sector and private sector stakeholders, respectively. The inclusion criteria were that the participants in each category work directly in the planning and electronic communication field and are directly involved in or impacted by spatial planning legislation and the statutory planning process for the deployment and development of electronic communication infrastructure.

Snowball sampling was utilised in circumstances where the identified participant/s were unable to participate in the study and the researcher was required to identify and approach other participants within the specific category. By choosing participants who are directly related to the field, the responses were likely to be unambiguous, with participants having first-hand experience in processing applications for electronic communication infrastructure from a municipal and private sector perspective.

As shown in Figures 20 and 21 below, of the identified sample size, Category A had a total of 14 respondents and Category B nine. The primary data was collected post the Covid-19 lockdown period. Most of the interviews were conducted electronically. This presented a challenge as identified participants were non-responsive or slow to respond. The point of saturation was reached when no new information was provided by respondents in each category.

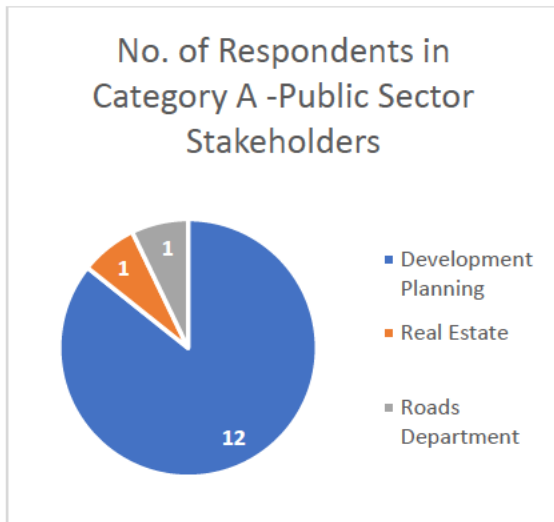


Figure 20: Number of Respondents in Category A

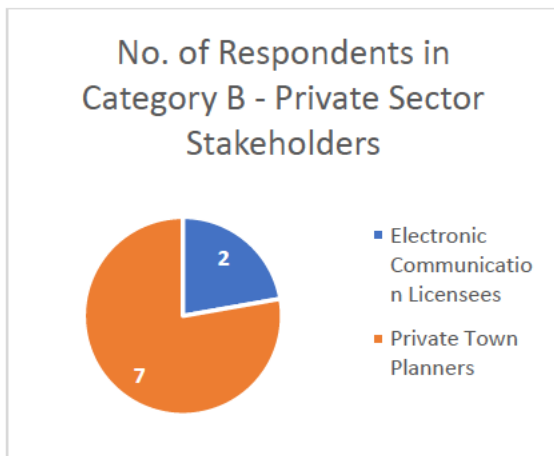


Figure 21: Number of Respondents in Category B

6.3.1. Theme 1: Knowledge and experience

The interview questionnaire explored the respondents' knowledge and understanding of electronic communication infrastructure. They were able to identify what constitutes electronic communication infrastructure, distinguishing between rooftop installations and masts and the use of electronic communication infrastructure in society.

Respondent 4A articulated the description and use of electronic communication infrastructure as:

...infrastructure that enables digital connectivity, communication, and information sharing. Such infrastructure includes fibre lines, antennae,

telecommunication masts and the likes. The aim of this infrastructure is to provide expanded connectivity and access to the Internet, good cell phone coverage and general empowerment for users.

As noted in Chapter 2, there is no set definition of ICT and electronic communication, but rather a convergence of views. The responses confirmed that there is general understanding of ICT and electronic communication.

Respondents were asked to declare their years of professional experience. The question was posed to establish whether the number of years spent in the field impacted their understanding of electronic communication infrastructure and the use thereof. There was no difference in understanding of electronic communication infrastructure among respondents with less than six years' experience and those with more than six years.

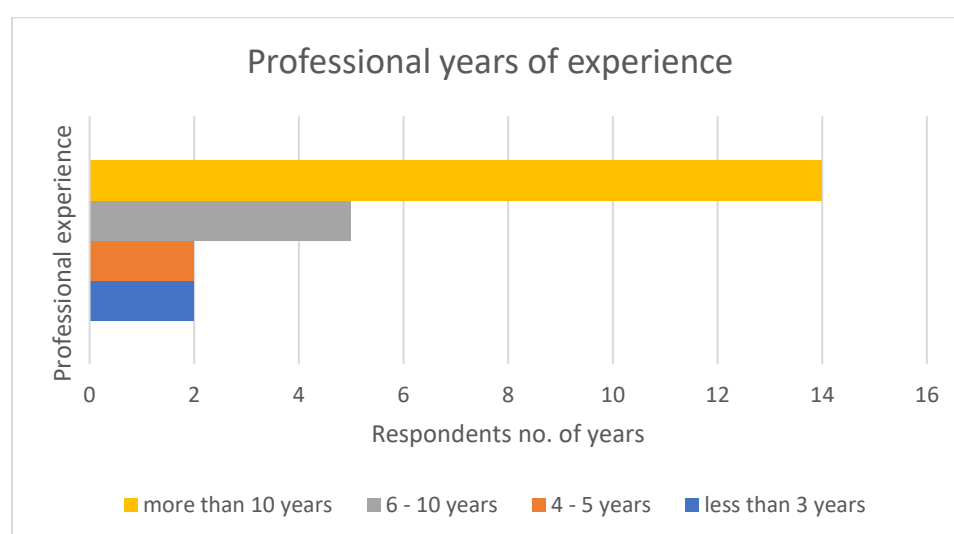


Figure 22: Respondents' professional experience

All the respondents indicated that they are reliant on some form of ICT, with examples including the Internet, mobile/cell phones linked to digital applications such as email, or Microsoft Teams and television streaming services. Human activity has shifted beyond physical dimensions and now operates in an almost virtual world. Information and communication technology is a pivotal component of the 21st century and the reliance on these technologies expressed by the respondents reiterates that the 4th IR has revolutionised economies and communities. People and places, economies and

service provision are reliant on ICT technologies for virtual connection and access without having to physically be in the same location (Noble *et al.* 2022: 200-201).

6.3.2. Theme 2: Regulatory environment

Theme 2 examines feedback related to the regulatory landscape, encompassing aspects such as the volume of applications processed, procedures and timelines for regulatory approvals, how ICT infrastructure is classified (as a utility or a form of land use) and its connection to statutory land use processes, alongside challenges within statutory planning.

6.3.2.1. Application submissions and processing

Different departments, processes and regulations govern the rollout of electronic communication infrastructure within the municipality. To unpack the experience of processing and submitting applications for the development of such infrastructure, the public and private sector respondents were asked about the number of applications processed per month and the time taken to do so. Category A respondents would process applications which are submitted by Category B respondents.

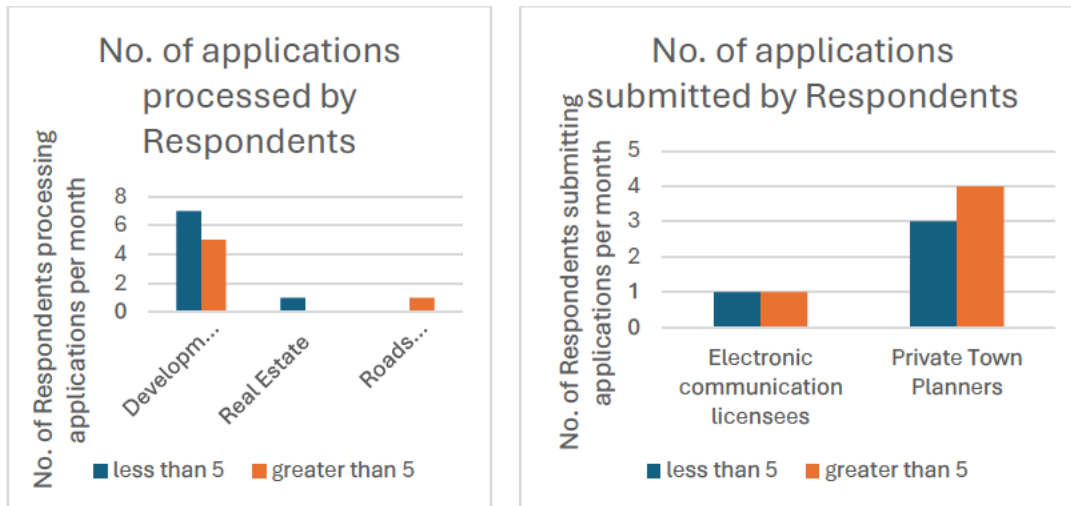


Figure 23: Number of applications processed and submitted per month

A total of seven respondents from the Development Planning branch and the Real Estate respondent indicated that they processed less than five applications per month. However, five respondents within Development Planning and the respondent in the Roads Department indicated they processed more than five per month.

In the private planning sector, individual town planners reported submitting more than five applications per month, indicating that the number of plans submitted by the private sector exceeds the municipality's processing capacity. This suggests that the former is generating applications at a rate the latter is struggling to deal with.

Chapter 5 elaborates on the municipal application process, which complies with Sections 22 – 24 of the SPLUMA bylaw governing application submissions (South Africa 2021b). However, the bylaw does not specify processing timeframes. This means that there are no enforceable deadlines for the Development Planning branch when processing applications. In turn, it removes the possibility of the private sector legally challenging the municipality over delays in processing applications. Such delays have a direct impact on the scale, deployment, and development of electronic communication infrastructure by the private sector.

6.3.2.2. The regulatory/approval process for electronic communication infrastructure across departments in the Municipality

Table 4 below presents a summary of the timeframe indicated by the respondents for statutory applications for electronic communication infrastructure. Respondents in Category A were asked to indicate the timeframe for a planning decision, and those in Category B to state the timeframe to be advised of the decision.

Sector		Time taken		
		Less than 1 month	2 – 3 months	More than 4 months
Category A	Development Planning	5	5	2
	Real Estate			1
	Roads Department		1	
Category B	Electronic communication licensees			2
	Private Town Planners			7
Total		5	6	12

Table 4: Summary of responses on the time taken to process applications

All the respondents in Category B indicated that it takes longer than four months to receive a decision on applications. These results again point to a disjuncture between processes and timeframes within the public sector.

The time taken by the Development Planning department to process applications once again brings into question the procedures in place. As noted previously, the bylaw does not specify timeframes for processing applications. Municipal officials' inability to process applications promptly highlights concerns about the department's efficiency, adaptability, and capability to respond to the demands of the 4th IR in relation to ICT and electronic communication infrastructure.

Chapter 5 discussed the telecommunication standards set by the Development Planning department. These merely serve as guidelines for submitting electronic communication infrastructure applications and do not guarantee streamlined or

expedited processing. The simplified application requirements outlined in the development standards fail to ensure timely processing, as evidenced by the processing times reported by Category B participants. The varied processing times reported by participants in Category A within Development Planning indicate a lack of standardised timeframes or requirements for efficient and effective planning.

Turning to the regulatory process for municipal-owned land, eight Respondents in Category B indicated that it takes more than four months to receive consent for development on municipal-owned land, with Respondent 6B indicating that they “...*do not develop on municipal-owned land*”. Within the Real Estate department, Respondent 13A indicated that it takes more than four months to grant consent for the development of electronic communication infrastructure on municipal-owned land.

Reflecting on the complex nature of land tenure within the municipality, where formal, traditional, and informal land systems coexist, the concept of dual governance highlighted in Chapter 5 discussed obstacles in implementing developmental policies, securing access to land, and distributing infrastructure (Sim *et al.* 2018: 356-357).

The responses from Category B participants on developing on municipal-owned land imply significant hurdles stemming from political and administrative obligations, or sometimes the lack of such requirements. The Real Estate department lacks explicit policies and regulations for the development of land owned by the municipality. This leads to the private sector either delaying deployment or avoiding areas governed by municipal or traditional authorities.

Respondent 13A from the Real Estate department also indicated that the municipality does not refuse development on municipal-owned land; however, “*if declined it would be due to departmental comments or plans to utilise the site otherwise*”. Departmental comments are essential, but, as highlighted in Chapter 5, the administrative process is controlled by Real Estate.

The Roads Department also facilitates development on municipal-owned land and servitudes. Respondent 14A from Roads indicated that it takes less than a month to grant consent, and that applications for development on municipal-owned land are not

refused. At the time of the interview, there was no policy in place to regulate fibre applications; the respondent stated that: *“There is no policy at present. Currently we are using a project specification document that was drawn up by the Engineering unit in 2009. The Wayleaves and Excavations Office is working on a Wayleave and Excavation Bylaw”*.

However, since the interview, the department has released the eThekweni Municipality (2022c) Wayleave and Excavation Bylaw for public comment. Whilst the document does not indicate an adoption date to confirm enforcement, it sets guidelines and requirements for wayleave and fibre development applications. This will ensure that applicants clearly understand what is required and will assist in streamlining such applications.

As outlined in Chapter 3 (see Annexures 3.1 and 3.2), while national and provincial ICT policies and regulations exist, municipalities are responsible for interpreting, aligning, and implementing these directives. An evaluation of municipal policies and regulations revealed that there is a lack of awareness and alignment with the national and provincial government regarding ICT development. Despite the introduction of Norms and Standards for Electronic Communication Facilities by the KZN COGTA (South Africa 2020d), the eThekweni Municipality has developed and implemented its own approach to process electronic communication infrastructure applications. Consequently, essential objectives, strategies, and regulatory procedures remain unimplemented.

The municipality confronts difficulties in converting the multitude of national and provincial ICT policies and their intricacies into actionable strategies. This challenge is further compounded by capacity and resource limitations, stemming from a lack of the ICT expertise and technical proficiency required for effective policy implementation at local government level. Consequently, departments persist in working independently, adhering to familiar and more straightforward policies and procedures, rather than attempting to integrate and implement complex policies.

6.3.2.3. Statutory planning applications for electronic communication infrastructure

The planning process or statutory planning relates to compliance with rules, regulations and policies which regulate land use. Land use planning is central to statutory decision making (Mäntysalo, Kangasoja and Kanninen 2015: 170-171). Unlike basic infrastructure, it is unclear whether electronic communication infrastructure is categorised as a utility or a land use. This creates debate on the need for land use statutory planning applications. As noted in Chapter 5, the eThekweni Municipality's Development Planning department considers electronic communication infrastructure to be a land use and thus implements statutory planning regulations for the development of such infrastructure.

Category A – Development Planning and all the Category B respondents were asked to indicate whether they believed statutory planning applications are necessary for the development of electronic communication infrastructure and to substantiate their answer. The aim was to establish whether this infrastructure should still be considered and processed as a land use as opposed to a utility.

Eight of the 12 respondents within Development Planning favoured statutory planning applications. Whilst it was expected that private sector (Category B) respondents would opt for simplified regulatory processes, six of the nine respondents in this category supported statutory planning applications.

The respondents within Development Planning who supported statutory applications stated that this is necessary due to the visual or aesthetic impact of electronic communication infrastructure on the built form. As expressed by Respondent 4A, given that it is above ground, it should be regulated. Respondents 8A and 10A felt that statutory planning applications ensure public consultation and participation which is “*fundamental to good planning*”. Other reasons cited by respondents included record keeping and the ability to identify gaps to improve technology rollout. It also allows for feedback to be provided on timeframes.

Respondents in Category B echoed the sentiments shared by Development, Respondent 8A who said:

It is important for an application to be submitted, so that it can be assessed for its merits and against development controls. This will ensure that these infrastructures are within the safety EMF zone and to encourage co-location with existing infrastructures. It also allows for transparency and gives the community a chance to comment, so that the amenity of the area is protected.

This highlights the need for planners to make well-informed decisions regarding applications and to ensure regulated development.

Seven respondents were not in favour of statutory planning applications. Respondent 3A was of the view that, while the planning criteria detailed within the Development Standards for Telecommunication Infrastructure are extensive, *“location and type of infrastructure actually triggers whether or not this information is needed”*. This respondent also confirmed planners’ lack of technical ability to evaluate radio plans which form part of statutory applications.

Respondents 7A and 12A stated that the application process is marred by biased opinions and perceptions of electronic communication infrastructure among decision makers and the public. Respondent 7A observed: *“... statutory planning application is a waste of time for the planners because the decision makers do not consider planners’ view, especially when one does not wish to approve the application. Often these facilities are approved without considering communities’ perception”*.

Respondents 1B and 4B believe that electronic communication infrastructure should be assessed as minor building works in accordance with the National Building Regulations. There were conflicting views regarding public participation and whether it should be required, with Respondent 2B stating that *“...planning applications do not aid in rapid deployment of telecommunication infrastructure”*.

Based on the feedback, there would appear to be validity in establishing a formal application process to regulate electronic communication infrastructure to ensure compliance with ICT development policies and regulations. This would assist the municipality in monitoring progress and identifying gaps in service delivery. However,

as Taylor (2010: 200) points out, spatial planning should extend beyond conventional land use planning controls and regulations to address social, environmental, and economic concerns.

Despite the municipality's revision of its development standards for electronic communication infrastructure, the Development Planning department continues to employ traditional planning methods. Evaluation of electronic communication infrastructure is conducted as a 'tick-box' exercise, resulting in a predominantly procedural approach. Planners and decision-makers lack the technical knowledge and expertise necessary to differentiate these applications, rendering the process somewhat mechanical.

6.3.2.4. Statutory planning challenges

Given that the municipality mandates statutory planning applications for electronic communication infrastructure, it is essential to assess potential hurdles within the statutory planning procedure. The private sector predominantly spearheads the development of this infrastructure, Respondents in Category B were asked to outline their development challenges.

The first challenge identified is long timeframes linked to receiving decisions on applications. As noted above, while municipal respondents indicated different response times, all the Category B respondents stated that it takes more than four months to receive a decision on applications. Other challenges include the general lack of feedback from municipal officials on applications, coupled with difficulties in contacting the responsible official and further delays resulting from officials going on leave as applications are not reallocated. Respondent 2B suggested that "*a dedicated team should be allocated for streamlined facilitation*".

The eThekweni Municipality e-services portal is intended to streamline submission of applications. Whilst there were different views on this system, Respondent 6B indicated a preference for it, stating that, "*it saves on paper prints and logistics of physical submission*". Respondent 8B said that there are "*... no major challenges*".

when applying to the municipality, as long as you meet the minimum requirements for your application to be taken in”.

However, other respondents identified challenges with the e-services portal. Respondent 3B stated that there is *“poor flow of information - meaning in most cases files do not upload on the electronic system”*. Respondent 9B noted: *“... planners and [the] public need education on how to use the portal”*. The respondent linked this challenge to the delay in processing applications as *“applications go missing on the portal and are then deemed abandoned”*.

It was felt that municipalities do not acknowledge the importance of electronic communication infrastructure, despite licensees expressing the need to prioritise these applications. Respondents 2B, 4B and 5B also pointed to misalignment between national, provincial and local electronic communication infrastructure policies.

Challenges relating to statutory procedures include delays in obtaining departmental comments and dealing with objections lodged against the application. Respondents 5B and 6B felt that the municipal officials lack technical knowledge to understand and assess radio plans for electronic communication applications. Respondent 6B stated that: *“...more knowledge obtained in the Radio Planning field will enhance the technical assessment and will avoid enquiries with the respective consultant for confirmation on technical aspects in regard to the analysis of the Radio Plan annexure in the LUMS application”*.

Given that applications are assessed by different municipal officials, Respondent 4B drew attention to *“...individual or personal perceptions”* of the information required when assessing applications and a *“lack of uniformity”* when applying standard criteria to deem an application complete. This respondent also felt that there are *“bias[ed] officials – totally against electronic communication infrastructure”*.

These challenges, coupled with conflicting views on the need for statutory planning applications support Fernández-Maldonado's (2005: 1) assertion that municipal officials are struggling to move away from traditional planning methods for ICT. Graham and Healey (1999: 641-643) identified the need for planning practice to

become relational and dynamic considering changing urban and social contexts. Whilst the municipality has implemented an e-services portal, functional and technical challenges suggest system and knowledge deficits in processing electronic communication infrastructure applications.

6.3.3. Theme 3: Policy alignment

Given this study's focus on spatial planning, town planners in both categories were asked to share their views on policy coherence. The aim was to gain insights into their experience of the implementation of spatial planning policies within South Africa and specifically within the eThekweni Municipality.

6.3.3.1. ICT and electronic communication policies across government

Policy implementation between national, provincial, and local government involves translating policies into actions and initiatives (Sutcliffe and Bannister 2020: 91). Respondent 4A noted that challenges can arise due to differences in political objectives, prioritisation and budget allocations across the tiers of government.

Spatial planning is still based on traditional practices and outdated legislation and terminology. As highlighted by Respondent 1A, this results in plans being “...*inflexible and the scope for testing new concepts and creative, responsive, adaptive solutions ... [is] limited - best hope lies in private sector initiative[s]*”.

As discussed in Chapter 5, spatial planning in South Africa is further challenged by issues relating to land tenure. Responsibility for a vast amount of land is vested in traditional authorities which can present a challenge in implementing spatial plans. As indicated by Respondent 5B: “... *South Africa has many traditional leaders and authorities who do not want to engage in the implementation of spatial planning policies, thus delays in development of ICT*”.

Departmental silos create problems when development applications are circulated for comment. This results in applications being adjudicated by departments without necessarily considering the overall goals and objectives. Respondent 6A stated: “... *Silo planning is problematic. Strategic plans need to address gaps/unnecessary*

requirements to allow for enabling conditions in 4IR". Respondent 3A observed: "In my experience, very rarely are spatial plans implemented. A lot of resources are used to adopt policies and plans but most of these plans are not implemented".

The intersection of the regulatory environment (Theme 2) and policy coherence, particularly concerning municipalities' difficulty in aligning with national and provincial governments is a further notable issue. The plethora of national and provincial policies regarding ICT, electronic communication, and spatial planning introduces complexities for municipal implementation, compounded by the additional challenges discussed under Theme 2.

Regulations and policy alignment are intricately linked concepts that guide decision-making processes. An examination of existing policies and legislation revealed that the government has broadly considered ICT and electronic communication from an academic and theoretical perspective. However, as highlighted by respondents, numerous issues hinder the effective implementation of these policies and legislation. Until such time as the tiers of government and departments can establish common goals and objectives, the regulatory environment within municipalities is likely to remain misaligned with the policies and legislation set out by national and provincial governments.

6.3.3.2. Spatial planning alignment with the 4th IR

South African municipalities have incorporated technology into spatial planning through e-service portals and online mapping tools that are used to enhance the efficiency and effectiveness of spatial planning processes. The need to acknowledge the influence of space and time in spatial planning is due to demands and reliance on ICT. Figure 24 below indicates the respondents' feedback on whether they felt that spatial planning policies and plan align with the technological agenda of the 4th IR.

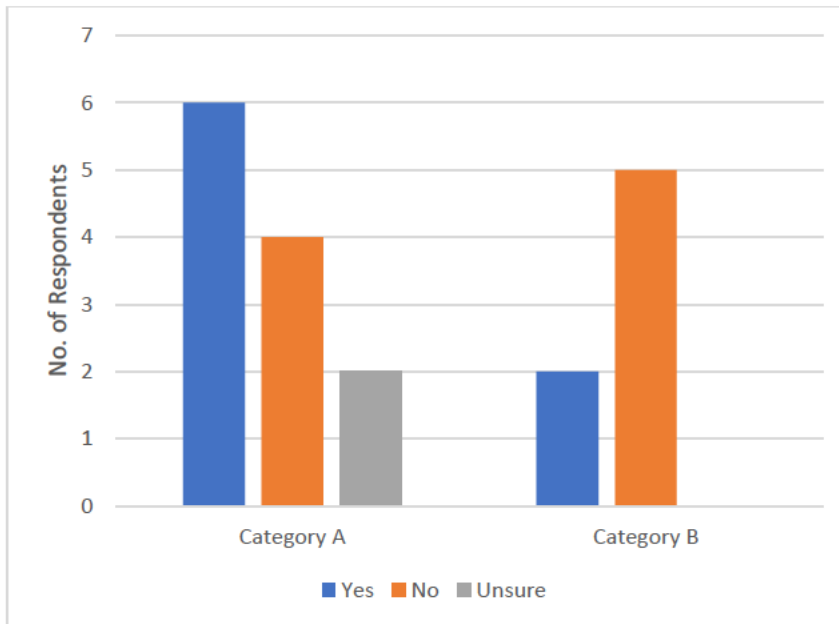


Figure 24: Respondents' feedback on whether spatial planning aligns with the 4th IR

Within Category A, six respondents felt that spatial plans align with technological change brought on by the 4th IR. Respondent 3B stated: *"To a certain extent, yes. Spatial Plans and Packages of Plans informed by the Integrated Development Plan all speak about technological advancement, but no real implementation takes place"*. This speaks to the lack of alignment and implementation between policies and objectives across government tiers.

Most Category B respondents did not agree that spatial planning aligns with the 4th IR. They felt that this is due to a lack of efficient and effective policies to drive the implementation of electronic communication infrastructure resulting from the long timeframes to grant consent, failure to translate national directives into provincial and municipal policies, complex planning processes and the influence of personal bias.

Respondent 1A stated:

With the exception of communication technology as part of Disaster Management Response strategy and surveillance systems for safety and traffic monitoring - I am not aware of the City Driving ECI as a factor within spatial planning - it certainly isn't a criterion in the adjudication of Town Planning

applications...the politics of EC has still to be understood and exposed - there is still a bias - with the more affluent still having preferential access...

Respondent 5A raised the concern that: “... *there’s far [more] complex problems SA is still dealing with. Can we afford to be electronically excellent? We need to assess alternate tech solutions that are context or province specific. At the end the public suffer more from plans and policies that are difficult to implement*”.

Respondents 3A and 6A’s indecisiveness in responding to this question points to planners in the public sector’s lack of knowledge of the role of technology in spatial planning. Indeed, Respondent 3A acknowledged having “... *limited knowledge of communication infrastructure and its relation to spatial plans and policies to answer this question*”.

The NDP and the NSDP introduced in 2012 and 2023, respectively, serve as guiding frameworks for spatial development. The NDP recognises ICT as a catalyst for economic advancement (South Africa 2010: 32). Progress in achieving its goals has been observed through initiatives such as the enactment of new or revised policies and legislation since 1995, the deployment of Wi-Fi hotspots in public facilities, and the establishment of e-services portals nationwide, including within the eThekweni Municipality.

The NSDP acknowledges ICT’s influence in shaping spatial settlements and development (South Africa 2022b: 6). However, it falls short of delineating how this can be translated into action by local municipalities. Despite proposing strategies to drive technological growth and development, the NSDP fails to offer solutions to socio-economic challenges. While spatial planning acknowledges the importance of ICT, a deficit remains in terms of the tools and methodologies necessary for implementation towards achieving broader goals and objectives.

A notable trend was the more critical attitude of Category B respondents towards spatial planning policies and legislation compared to Category A respondents. This could stem from the perceived obligation for municipal planners to adhere to policies and legislation regardless of their effectiveness and relevance to contemporary

planning needs. It leaves little room for adaptability, flexibility, or responsiveness to evolving circumstances.

6.3.3.3. eThekwini's responsiveness to the 4th IR

To achieve the vision of the NDP, local government needs to align with its ICT goals and objectives. The respondents were asked an open-ended question relating to eThekwini's alignment with the NDP's goal to expand ICT access. It aimed to draw on the experiences of respondents employed within and external to the municipality. This question explored the ICT situational analysis of the municipality.

A total of 14 respondents (11 in Category A and three in Category B) expressed positive views on the municipality's efforts in aligning with the NDP. Respondents in Category A believe that the municipality is promoting ICT delivery and accessibility. As with other questions, it was apparent that respondents in this category are less likely to dispute or respond negatively to the municipality's actions, policies and plans.

Eight respondents (three in Category A and five in Category B) felt that eThekwini is not aligned with the NDP's goals in relation to ICT. Respondent 1A stated that: "*...the city is grappling with service delivery basics, and this has compromised its focus on ICT development - the private sector are best drivers for this sector; however, investor confidence has also been marred*".

Respondents reiterated the challenges highlighted in previous responses as reasons for the municipality's inability to meet the NDP's goals. A further challenge is reliance on the private sector to develop electronic communication infrastructure within the municipality.

Potential lies in driving development through internal municipal departments that can take the lead in infrastructure deployment; but "*only if they clearly define their functions and understand the local priorities*" (Respondent 5A). Respondent 6A also highlighted that "*...rapid deployment is an issue.... It is unclear ... who is responsible for ICT...*".

Respondents 7A and 8A expressed positive views on the municipality's efforts; however, their subsequent comments raised concern about the value of statutory planning applications. Respondent 7A believed that: "... eThekwini ignores the public comments. Hence, I stated ... that ICT should not be a statutory application. It is a tick box exercise where even the planner's viewpoints are not considered by the decision makers".

Respondent 8A asserted that "...most of the telecommunication infrastructure applications received by the municipality obtain the approval". Bureaucratic tick-box procedures within statutory planning delay development and do not necessarily add value to planning and land use management.

As described in Chapter 5, the municipality has three mechanisms to process applications for electronic communication infrastructure, each governed by distinct requirements regulated by various legislation. The NDP acknowledges the need to reform regulatory frameworks to enhance broadband capacity, reduce data costs, and enhance accessibility (South Africa 2010: 32).

One could argue that the eThekwini Municipality has taken steps in this direction by introducing revised Development Standards and through initiatives such as the Wayleaves and Excavation Bylaw 2022, although the latter remains a draft policy. However, due to institutional challenges related to service delivery and policy implementation, the effectiveness of these efforts remains somewhat constrained. Consequently, the private sector emerged as the primary driving force behind the development of ICT infrastructure despite government efforts.

6.3.3.4. Review of eThekwini's spatial plans

Chapter 5 showed that several intermediate plans within the Package of Plans are outdated. Respondents in Category A – Development Planning were asked to indicate how often spatial plans are reviewed to align with the SDF which is reviewed annually. The responses are indicated in Figure 25 below.

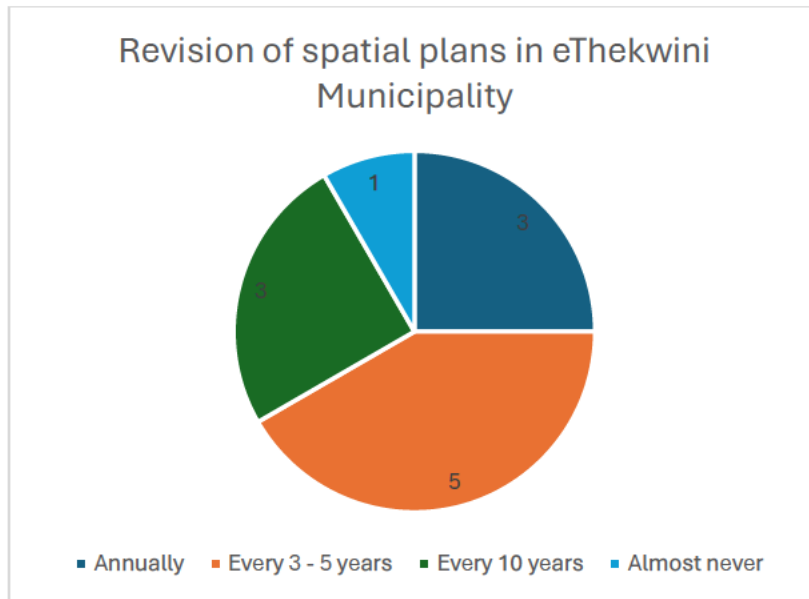


Figure 25: Respondents' feedback on the frequency of spatial plan revision within the municipality

While most respondents indicated that spatial plans are typically reviewed every three to five years, doubts arise regarding the actual implementation of this practice when examining Annexure 5.2. It is evident that intermediate plans such as the SDP, LAPs, and Precinct Plans adopted between 2010 and 2018 have not undergone review since their adoption. The National Policy Development Framework of 2020 emphasises the importance of regular reviews due to evolving social, political, economic, technological, and environmental circumstances. Although the framework does not specify the frequency of policy reviews, it emphasises the need for regular review and, if necessary, modification or repeal (South Africa 2020f: 17).

The failure to revise policies and plans within the eThekweni Municipality suggests a lack of adaptability to changing conditions, which may undermine the effectiveness of these plans in driving comprehensive development and addressing current challenges in the municipality. Moreover, the lack of alignment could lead to inadequate resource allocation to address real-time challenges that are not considered in budget allocations. Given the variability of policies and plans, it is imperative that they undergo review at least every three to five years to accommodate specific changes and needs.

6.3.4. Theme 4: Public-private partnerships

Public-private partnerships are essential for development and enable the sharing of costs, risks, and resources. Within the ICT and electronic communication sector, private companies invest in the development and deployment of electronic communication infrastructure. In addition, the private sector includes service providers who enable communication services such as mobile networks, Internet access, etc. through electronic communication infrastructure.

Respondents were asked to suggest ways to develop government-private stakeholder investment for electronic communication infrastructure. The themes that emerged from the responses relate to procedures and timeframes; and development on government/municipal-owned land.

6.3.4.1. Procedures and timeframes

This was a common theme and challenge. Respondents indicated that government needs to assist with streamlining the processing of applications. For electronic communication licensees, it is imperative that municipalities align their processes with plans to roll out the infrastructure, ensuring that sites are built within the projected timeframes to address issues such as the lack of connectivity in areas.

Respondent 1B stated that:

as a licensee, relationships need to be built with local authorities as base stations are planned in advance. Municipalities, i.e., planning dept. can be consulted to make the municipality aware of forthcoming applications. Thereafter municipal dept. can guide development and share future plans. This can shorten time frames for applications, to at most four to six months. This will also allow all sites to be built as projected within the financial year.

The need for clear procedures was also expressed by Category A respondents, with Respondent 4A stating that “...government can contribute by providing clear and prompt procedures through local municipalities...”. The issues of capacity and knowledge must be addressed to ensure sound PPPs.

Given the complexity of electronic communication infrastructure, government officials need to understand the purpose and technical information which informs the development of infrastructure such as radio plans. This will enable decision-makers to better understand and efficiently process applications. Respondent 8A stated that:

Information sharing needs to be improved as the municipality would not have all the capacity that may be required to take the informed decision on these applications. For instance, the municipality mostly does not have a tool to verify the radio plans being provided by the applicants.

An understanding of the theoretical underpinning of procedural planning is essential to ensure that procedures and timeframes are relevant to South Africa's current planning context (Faludi 2013: 19). This can be achieved by national government consulting with the private sector to align with development needs and challenges and thereafter providing clear directives for planning and development which can be implemented at municipal level.

The review of policies and legislation in Chapter 3 noted that no guidelines, procedures, or timeframes are provided by national government for the development of ICT and electronic communication infrastructure. This poses a challenge to municipalities striving to establish a standardised procedure and timeframe that aligns with policy objectives, addressing the need and demand for ICT infrastructure to bolster socio-economic development within the 4th IR.

Within the eThekweni Municipality, procedural methodologies continue to revolve around planning within a strategic management framework, prioritising economic development and tackling socio-economic challenges through the traditional methods outlined in the IDP and SDF. In the absence of clear directives from national government, the municipality will likely fall behind in the deployment of ICT infrastructure, as it may not be considered a necessary deliverable. This could lead to conflict with the private sector, which is driving ICT development. It is thus imperative for national government to collaborate with the private sector to establish standardised procedures and directives for ICT development.

6.3.4.2. Development on government/municipal owned land

Development or leasing of government or municipal-owned land involves long timeframes which could discourage developers. Respondent 2B believed that *“...licensees would be more willing to develop on municipal land if the process was more streamlined. Municipalities could benefit from the use of municipal infrastructure”*.

When leasing land for development, the lessor/owner of the land is compensated for occupation of the property; thus, leasing and development on government/municipal-owned land could boost financial revenue. Respondent 4B proposed that, to build the relationship between the sectors:

Government should review the lease processes to allow the Network Operators and Infrastructure Providers to enter into a lease agreement for the utilisation of Government property, buildings, and infrastructure to be utilised for the placement of Electronic Communication Infrastructure to allow for a lease to be entered and concluded within a maximum period of three months. Standard rental amount, throughout all spheres and allow for a minimum lease period of nine years and 11 months or long-term lease agreements (99- year lease) to be entered.

Chapter 5 delved into the intricate landscape of land tenure in South Africa. The eThekweni Municipality is among the municipalities characterised by government or municipal-owned land, with 68% of its area consisting of traditional authority regions managed by the ITB (eThekweni Municipality 2023b: 47-48). The detailed examination of land holdings in the 2023 eThekweni Municipal IDP highlights the multifaceted challenges inherent in land administration and management. Addressing these challenges requires the implementation of effective land administration strategies.

Given that both national and municipal landowners are subject to regulations and requirements governing land use, it is imperative for them to align their efforts, particularly in driving infrastructure development. This could yield various positive outcomes, including more efficient and effective planning and implementation of infrastructure projects across the municipality, particularly in rural areas beyond the urban core. It would foster community development and sustainable growth by

ensuring that projects are inclusive of all communities, thereby promoting economic and social progress. Alignment would also help to resolve conflicts within the legal and regulatory framework, thus attracting investment by the private sector. Without such alignment, both landowners will continue to operate independently, potentially conflicting with each other's objectives and impeding community growth and development. A possible approach to managing development could be case-by-case analyses to establish tailored development processes.

6.3.5. Theme 5: Spatial transformation

South Africa is a developing nation that has been profoundly influenced by apartheid-era planning. To fully harness the economic and social advantages linked with the 4th IR, the country must confront its historical challenges. Theme 5 explores ICT's impact on spatial transformation and its influence on planning processes.

6.3.5.1. Spatial transformation through ICT

Information and communication technology holds the potential to narrow the digital divide; however, several challenges must be tackled for this potential to be realised. These include the lack of ICT utility, delays in infrastructure rollout, and shortcomings in policy implementation (Fernández-Maldonado 2005: 1). The digital divide extends beyond connectivity issues and encompasses marginalised locational disparities, differences in skill levels, and variations in access to financial resources.

Respondents were asked about electronic communication infrastructure's ability to address issues such as spatial inequality, the digital divide, and socio-economic development. While most expressed confidence in its ability to do so, some also voiced reservations due to concerns about mismanagement and fragmented resource distribution, particularly essential resources like electricity that are necessary to support electronic communication infrastructure.

One of the consequences of technology is less physical interaction with more virtual meetings and gatherings held online. As stated by Respondent 1A, this threatens society's ability to maintain camaraderie: "... *One could also argue that EC facilitates 'separateness' and distance - less social contact and togetherness - the movie house*

as a social space has become obsolete with streaming services for example”.

For technology to effectively enhance socio-economic conditions, it must be readily accessible to all. Respondents emphasised the significance of PPPs in extending access to disadvantaged or marginalised regions. Deployment of electronic communication infrastructure carries substantial costs for the private sector, prompting infrastructure and service providers to prioritise return on investment. While the private sector acknowledges the importance of ensuring equitable network connectivity, it is vital for the government to devise mechanisms that guarantee the rollout of electronic communication infrastructure to all areas by infrastructure providers and licensees. Respondent 7B suggested that: “... *the mast itself is designed ... specifically to accommodate more than one operator through sharing. All cellular users will benefit from this development and not only those using a specific cellular operator*”.

Respondent 8B stated that:

...government should identify disadvantaged areas that have the potential to be developed and improve its economy. Government should provide funding or incentives to the private sector to encourage them to invest in electronic communication infrastructure in those areas. Government should also assist in mainstreaming the municipal approvals for those areas.

Private sector incentivisation will encourage investment in disadvantaged areas allowing for “... *a digital society where all citizens can benefit from the opportunities offered by digital technologies to improve their quality of life*” (Respondent 9A). Incentives should also be used to ensure affordable access for all income groups.

Educating government/municipal officials on electronic communication infrastructure will enable better understanding of the technology and lead to more responsive, efficient, and inclusive governance, ultimately benefiting communities by improving the quality of life and fostering social and economic development through improved service delivery, enhanced community participation, technological empowerment, and societal benefits such as economic growth and social inclusion. Respondent 7B recommended: “...*Create brochures and social media pages with monthly updates of the benefits for*

these developments in order to gain interest from the stakeholders. The aim should be ... how we can become a developed country...".

Education to dispel the misconceptions associated with electronic communication infrastructure could also mitigate concerns raised by the public during the consent application process which delays decision making. Respondent 12A believes there needs to be: *"...ongoing research and investigation, as studies are outdated. There needs to be more credible and [up-to-date] ... information given to public, to alleviate the misconceptions around telecommunication"*.

Drawing on the previous studies highlighted in Chapter 3, it is apparent that developed nations are more inclined to utilise ICT solutions and smart initiatives to strengthen their economies, foster societal development, and tackle challenges like climate change and rapid urbanisation. However, in the context of South Africa and other developing countries, pressing issues such as inequality, poverty, and inadequate access to basic services persist. While efforts to narrow the digital divide are evident in the introduction of various 'e-portals', like the 'DAMS' established by the City of Cape Town, these do not fully address the accessibility challenges faced by many communities. Such challenges may stem from issues of affordability, insufficient ICT resources, and a lack of technical proficiency in utilising electronic devices and applications.

An examination of best practices in developed countries reveals that government plays a pivotal role in driving the implementation of ICT solutions. However, this proactive approach is lacking in the South African context, leading to the private sector assuming responsibility. It is imperative for the government to collaborate closely with the private sector to tackle issues such as affordability, accessibility, and usability, particularly in disadvantaged areas. Only through such collaboration can the benefits of ICT be harnessed to effectively transform communities across South Africa.

6.3.5.2. Planning in the digital age

Planning has been dominated by the need to create sustainable cities, centred on societal development. Policies and regulations have been directed towards ensuring

that land use conflicts are avoided and that a clear set of rules is enforced. However, planning is increasingly being critiqued for its inability to move beyond traditional Euclidian concepts (Albrechts 2015: 511-512). In the context of the 4th IR, planning necessitates adaptability to evolving physical, environmental, and social conditions.

Spatial planning is inherently strategic, aiming to address real-world circumstances and set objectives to leverage a city's strengths. This calls for a shift from conventional approaches to embrace radical thinking, avoid reliance on singular concepts, procedures, or tools to tackle societal and economic challenges and adopt a more innovative and flexible approach. It is especially pertinent with the emergence of boundary-less cities facilitated by the integration of technology into urban spaces (Albrechts 2015: 514). Planners in Category A and B were asked to comment on the emergence of 'boundary-less cities' resulting from the integration of technology in urban spaces.

Respondents reflected on the working circumstances prior to the Covid-19 pandemic and the shift in the use of ICT from conventional workplaces to home/school environments. This was welcomed by most respondents, who cited benefits such as: *"...work-home travel to be less... or the need to factor in parking at work or central spaces..."* (Respondent 1A). They also noted higher levels of productivity when working from home due to fewer distractions and the ability to work flexible and long hours if necessary.

A recurring sentiment was the need for policies to recognise evolving circumstances and for land use management to adopt flexible planning approaches rather than reactive responses to crises or changing conditions. Respondent 6A shared: *"... new spaces create new worlds for new people. Planners need to be resilient and integrated to become modernised. Policies are outdated. There are necessary requirements for planning, i.e. people, infrastructure, and technology"*.

Like many other municipalities, eThekweni Municipality has considered home businesses as a land use and has incorporated this into the land use scheme (eThekweni Municipality 2023a: 15-16). This exemplifies the municipality's recognition of the transition from single-use spaces to mixed-use environments. However, for

planning to accommodate the integration of technology into these spaces, a comprehensive review of land use management is necessary, as traditional regulations may no longer suffice. It is imperative for planners to envision and reimagine spaces; failure to do so may lead to vacant and obsolete areas that cannot be effectively repurposed.

Fernández-Maldonado (2005: 1) highlighted the challenge facing urban planners in facilitating ICT development through planning practices and strategic policy implementation. This reinforces the need for planning practices to evolve into more adaptable and responsive frameworks that can accommodate changing urban and social landscapes (Graham and Healey 1999: 641-642). However, municipalities are constrained by the processes and procedures dictated by existing policies and legislation. Their capacity to adapt and innovate is often hindered by the slow pace at which policy and legislative changes occur – a limitation shaped by administrative systems and individuals' willingness to embrace change.

Chapters 3 and 5 of this study showed that government is the driving force behind the implementation of policies and legislation. However, national government continues to use traditional planning methods, basing policies and legislation on historical challenges. As a result, municipalities and planners will continue to be challenged in enforcing tools which do not speak to the real-time spatial planning and land use management contexts of the 4th IR.

While the SPLUMA aims to transform spatial planning and land use management, Chapter 3 shed light on the obstacles posed by this national legislation, particularly for local municipalities. The Act suffers from a lack of policy alignment and implementation directives, hindering local municipalities' efforts to achieve inclusivity, efficiency, sustainability, and good governance.

The SPLUMA is expected to address the planning context in a more progressive manner, especially considering the years of planning post-apartheid. However, like previous planning laws, it continues to implement traditional planning approaches and overlooks the evolving planning dynamics of the 4th IR. For the SPLUMA to progressively address socio-economic challenges in the current planning context, it is

recommended that technology be integrated in planning and decision-making while considering environmental sustainability and promoting equitable access to resources and opportunities. It should also emphasise the importance of flexibility and adaptability in planning frameworks to accommodate the dynamic and complex nature of modern urban environments. Overall, the SPLUMA is expected to pave the way for more holistic, forward-thinking and responsive approaches to spatial planning and land use management.

6.4. Discussion of findings

Planning in the 4th IR means that planners need to be mindful of two factors – planning for the public and the societal changes driven by ICT. The 4th IR has not only influenced human activities but invoked the need for planning to become more adaptive and less reactive in the wake of the technological era. This study focused on spatial planning in South Africa within the 4th IR and assessed the extent to which spatial planning policies and legislation have incorporated ICT and electronic communication infrastructure development into the current planning context. The key findings listed below are linked to the outcomes from the interviews and document review conducted throughout the study.

6.4.1. Finding 1

Numerous national and provincial policies and legislation acknowledge the need to invest in and develop ICT infrastructure to grow the economy and promote social inclusion. While the KwaZulu-Natal COGTA introduced Norms and Standards for Electronic Communication Facilities, municipalities are responsible for economic planning efforts, shaping community growth and management of land use through the implementation of national and provincial policies and legislation (Musakwa and Mokoena 2017: 9).

Based on the data, the predominant observation is the lack of alignment and implementation shortcomings at the local government level. This is partly attributed to local governments' reliance on national and provincial authorities to furnish directives or guidelines for implementation and progress.

Moreover, municipalities grapple with budgetary limitations, capacity constraints, and resource scarcity, which hinder their ability to foster growth and development. Consequently, municipal procedures tend to become mere checkbox exercises, prioritising compliance with policies and legislation rather than actively striving to enhance conditions in the municipality through development efforts. The IUDF outlined in Chapter 3 proposes the adoption of a unified local-level plan. This should encompass all government intentions, plans, and objectives while also incorporating capital investment to guide strategic planning efforts (South Africa 2016a: 8).

6.4.2. Finding 2

Different role players, legislation, regulations, and processes are part of the ICT sector. The numerous stakeholders and their roles include:

- ICASA, which is responsible for the regulation of telecommunication.
- National government has different departments which produce separate policies and Acts for telecommunication, electronic communication, ICT, infrastructure planning, spatial planning, and development.
- Provincial government that introduced Electronic Communication Norms and Standards, digital transformation strategies, and growth and development strategies.
- Local municipalities that have adopted their own development and spatial plans which are guided by budgets and resource capacity. They are also the authorising government tier for all development.
- Organs of state such as the environmental department and South African Civil Aviation Authority that regulate the use of electronic communication infrastructure.
- Traditional authorities who manage rural areas and homelands in accordance with traditional land management practices.

In the ICT and electronic communication industry, electronic communication licensees such as MTN, Vodacom, and Telkom are tasked with network provision. To facilitate this, infrastructure companies are responsible for deploying the actual electronic communication infrastructure. However, many companies lack capacity to submit

applications for the development of such infrastructure, leading them to enlist the assistance of private town planners for this purpose.

The study uncovered complexities within the ICT sector stemming from diverse policy and legislative directives, and multiple stakeholders, including organs of state, traditional authorities, and other entities. Consequently, there exist various decision-makers, competing priorities, resource limitations, conflicting data and opinions, and operational silos. These factors collectively hinder the efficient and effective rollout of ICT and electronic communication infrastructure both nationally and within the eThekweni Municipality.

6.4.3. Finding 3

The study demonstrated that spatial plans are inflexible and unable to adapt to changing circumstances, largely due to their roots in traditional practices. Consequently, planners tend to adopt a cautious approach, adhering to established norms and past practices rather than embracing dynamic strategic spatial planning. Policies and regulations are intended to guide work processes towards achieving sectoral goals. However, their stringent nature often prevents professionals from working in a responsive and agile manner, hindering their ability to engage effectively with contextual complexity. This poses a challenge as they attempt to reconcile current circumstances with outdated planning policies and legislation.

The efficacy of statutory planning hangs in the balance. While planning applications serve to regulate land use and ensure controlled development that enhances the environment, economy, and community, their value is questioned in the context of electronic communication infrastructure. Primary data and researcher observations suggest that planners and decision-makers often lack a comprehensive understanding of the technical aspects associated with ICT and electronic communication. Consequently, applications for electronic communication infrastructure are often assessed based on visual and aesthetic considerations rather than their inherent value or impact. Furthermore, public awareness and understanding of ICT and electronic communication infrastructure remain limited, leading to numerous objections during public consultations. These are sometimes inadequately addressed due to planners'

lack of expertise or thorough knowledge, resulting in subjective assessments rather than technical merit being prioritised.

The study identified that even though various municipal departments within eThekweni oversee the development of ICT infrastructure, there is a notable deficiency in technical understanding of this infrastructure among these departments. Furthermore, internal municipal departments do not offer support or provide technical guidance or expertise to address the complex challenges associated with the development of ICT infrastructure.

6.4.4. Finding 4

The private sector is fundamental in driving ICT infrastructure development within South Africa. However, aligning the goals and objectives between the public and private sectors is challenging due to differences in goals and decision-making processes. As a result, the private sector is focused on maximising profit, resulting in the high cost of ICT technology and Internet connections. More investment is needed to drive collaborative partnerships between the public and private sectors. Stakeholders need to maintain trust and uphold ethical values to successfully implement new-age solutions (Sutcliffe and Bannister 2020).

6.4.5. Finding 5

International best practices highlight government's use of ICT to drive community growth and development through the introduction of ICT strategies, frameworks, investment, and initiatives such as e-government services and public inclusion. Whilst South Africa has introduced similar practices to a certain extent, the accessibility and usability of these services are limited to those who can afford smart devices and data to support the use of the device.

None of the respondents referred to smart solutions as a method to address challenges such as economic growth and equality. Smart initiatives are not effectively driving spatial transformation in South Africa. This results in communities remaining stagnant without the ability to tap into the broader or global economy. If the country is to benefit from ICT infrastructure development, challenges related to the digital divide,

resource constraints, the lack of awareness and education, regulations and policies, resistance to change and limited collaboration need to be addressed. This finding aligns with that of Nokele and Makganya (2023: 7890), who highlighted the lack of integration of smart city strategies into municipal IDPs as means to address local challenges.

6.5. Chapter Conclusion

This chapter analysed the primary data obtained by means of interviews with officials in the eThekweni Municipality and stakeholders in the private sector relating to ICT and electronic communication infrastructure. It also provided a detailed comparative analysis of the findings from the primary and secondary data.

This chapter highlights several challenges in integrating ICT and electronic communication infrastructure into South Africa's spatial planning. Key issues include local governments' struggles with policy implementation due to limited capacity and budget constraints, as well as a lack of alignment between national, provincial, and local authorities. The rigidity of traditional planning practices hampers adaptability to technological changes, while a lack of technical expertise in municipal departments affects decision-making. Additionally, the disconnect between public and private sector goals complicates infrastructure development, and barriers such as the digital divide and limited access to technology hinder ICT's potential to drive social and economic growth. The study highlights the need for greater collaboration and investment to overcome these challenges.

Chapter 7 presents an overall conclusion and key recommendations related to the research questions.

CHAPTER 7: CONCLUSION AND RECOMMENDATIONS

7.1. Introduction

This study explored the connection between spatial planning and the development of electronic communication infrastructure by examining the case of the eThekweni Municipality. Its objectives included evaluating the effectiveness of spatial planning and statutory processes in facilitating electronic communication infrastructure implementation and identifying policy, legislative, or procedural gaps hindering such development to propose solutions. The research delved into theories and concepts concerning ICT and spatial planning and reviewed international and South African perspectives and practices regarding spatial planning and ICT development.

The research findings demonstrate that ICT has the potential to improve livelihoods, promote efficiency, and enhance sustainability within urban areas (Eremia, Toma and Sanduleac 2017: 13). In particular, the built environment plays a significant role in facilitating the development of ICT infrastructure, enabling previously marginalised communities to access socio-economic benefits through technology and thus addressing spatial inequality (Pretorius *et al.* 2022: 537).

While South Africa has implemented national, provincial, and local policies on ICT and electronic communication infrastructure, ICT's integration into the country's operational domains remains insufficient. Despite the dominance of sectors like mining, manufacturing, and agriculture, incorporating ICT into operations poses challenges for developing nations like South Africa. To capitalise on the opportunities afforded by technological advancements, it must address longstanding challenges such as inadequate basic infrastructure provision, poverty, unemployment, and inequality.

7.2. Synopsis of research

Chapter 1 introduced the research topic and delved into the pivotal role played by ICT and electronic communication infrastructure in catalysing the progression of the 4th and 5th IR. Chapter 2 explained how technology has been instrumental in driving social transformation since the onset of the 1st Industrial Revolution. Information and

communication technology has not only reshaped economic landscapes, fostering globalisation and societal interconnectedness, but has also emerged as a driver of sustainable development, particularly in the realm of smart city initiatives.

The significance of governmental involvement in establishing regulatory frameworks for the development of ICT and electronic communication infrastructure was highlighted throughout the study. It was also noted that responsibility for policy implementation and enforcement primarily lies with local government. In the South African context, the classification of ICT and electronic communication infrastructure poses challenges for local authorities, compounded by issues such as resource constraints and capacity limitations in municipalities.

In the digital era, planners are tasked with navigating the intersection of traditional spatial planning policies and the evolving landscape of telecommunications. Chapter 2 elaborated on theories advocating for a departure from conventional planning methodologies towards more flexible and adaptable approaches, necessitated by the advent of the 4th IR.

The case studies in Chapter 3 showed that government-driven initiatives aimed at advancing ICT and electronic communication infrastructure have the potential to address socio-economic disparities. However, cohesive policies, substantial infrastructure investments, and strategic PPPs are imperative to realise these objectives.

Despite the formulation of national and provincial policies and legislation, the enduring legacy of apartheid-era planning continues to challenge planning and development in South Africa. The research findings pointed to discrepancies in goals and objectives across government levels, resulting in regulatory inconsistencies and procedural hurdles at the municipal level, particularly in terms of approval processes for ICT infrastructure deployment.

The study aimed to establish the responsiveness of spatial planning policies and legislation for electronic communication infrastructure, and to evaluate statutory planning procedures for electronic communication infrastructure, with a focus on the

eThekwini Municipality. Chapter 5 delved into the city's revision of Development Standards for Telecommunication Infrastructure, contextualising it within broader spatial policies and plans.

Chapter 6 analysed the primary and secondary data, including insights from the interviews with the participants, leading to the identification of five thematic areas. Despite initially identifying a total of 40 participants, as noted in Chapter 4, the final number of responses received from the public sector was 14 out of 20 and nine of the 20 identified in the private sector. This was due to challenges in contacting participants post-Covid-19 as interaction was mainly confined to virtual communication via email or telephone. Despite not receiving responses from all the identified participants, the research reached a point of saturation after observing the responses. Therefore, no additional data was sought from the sample groups.

The study's findings shed light on the responsiveness of spatial planning frameworks to ICT and electronic communication infrastructure development and the intricate dynamics of planning and development within local municipalities, as elucidated through external stakeholder consultations.

7.3. Objectives of the study

Chapter 1 outlined the main research question which was to determine how responsive spatial planning legislation, policies, and procedures are in guiding statutory planning for electronic communication infrastructure in the eThekwini Municipality. To answer this question, the researcher outlined research objectives and further sub-questions in Chapter 1.

This study aimed to investigate the effectiveness of spatial planning policies in addressing socio-spatial contexts, particularly in accommodating electronic communication infrastructure. It evaluated the adaptability of planning regulations to meet the evolving requirements of electronic communication infrastructure and critically analysed the planning responses implemented by municipalities, both in South Africa and globally. Focusing on eThekwini Municipality, it evaluated the Development Standards for Telecommunication Infrastructure and provides

recommendations to enhance planning strategies to facilitate the deployment of electronic communication infrastructure within the municipality.

In order to address the main inquiry, the study: a) Assessed the alignment of local government spatial plans, policies, and legislation with national objectives for ICT infrastructure and electronic communication; b) Examined the purpose of statutory planning applications concerning electronic communication; c) Investigated the influence of statutory planning processes on the implementation of electronic communication infrastructure; d) Drew insights from international and local precedents to inform eThekweni Municipality's approach to electronic communication infrastructure implementation procedures; and e) Proposed improvements to statutory procedures for implementing electronic communication infrastructure within the eThekweni Municipality.

7.4. Key findings

This section summarises the key findings linked to the research objectives and sub-questions.

7.4.1. Assessment of ICT and intergovernmental systems for spatial planning and electronic communication

Electronic communication, which is an integral aspect of ICT, plays a role in facilitating communication and socio-economic participation at both local and global levels. However, to enable communities to fully leverage these benefits, policies and procedures must offer greater support for the deployment of such infrastructure. Chapter 3 highlighted disparities in the implementation of ICT across countries, with developed countries leading the way due to their advanced economic status and robust government policies and regulations. In these countries, the private sector's innovation has further propelled the implementation of ICT and electronic communication infrastructure, resulting in the adoption of advanced smart solutions across various sectors such as business, transportation, healthcare, urban planning, and environmental management.

Developing countries grapple with deep-rooted challenges including inequality, poverty, unemployment, and inadequate basic infrastructure. While developed

countries demonstrate the potential to enhance the quality of life through smart solutions, the governments of developing countries must exert significant effort to implement similar solutions to bolster economic growth, foster social inclusion and development, and safeguard the environment.

Despite efforts to embrace ICT or smart initiatives, the African and South African experiences diverge. Like other developing countries, effective integration and execution of ICT hinge on various factors including cohesive policies and regulations, collaborative PPPs, and substantial investment in ICT infrastructure development. It is essential for the planning context to align infrastructure and governmental initiatives with the expectations of all stakeholders. This would foster social cohesion and facilitate the development of smart cities (Achieng *et al.* 2021: 7).

The bureaucratic nature of the South African government and its departments poses a persistent challenge across various sectors. As shown by the study, the fact that governmental tiers and departments operate in silos has led to the introduction of numerous policies and legislation that may be deemed redundant, inefficient, and duplicative in regulating the sector. This creates confusion and hurdles for local government and applicants in coordinating and implementing regulations and processes to achieve the goals and objectives outlined in the regulatory framework.

The study's findings resonate with Lochmann (2022: 9) who highlighted the complexities in intergovernmental sectors. Local municipalities are required to manage development and service delivery in a multifaceted environment. The multi-layered and complex land management systems for urban and rural areas and those administered by traditional authorities, results in the private sector prioritising the rollout of electronic communication infrastructure to more affluent areas. This exacerbates the digital divide, leaving rural and homeland communities behind in the development of the skills and knowledge required to thrive in the 4th IR. As observed by Hausmann *et al.* (2023: 117), flexible and adaptive policies are required to address systemic challenges and failures and tackle place-based issues.

The examination of the ICT objectives outlined in the NDP (see Chapter 3) showed that South Africa has made some policy revisions since 1995. However, while these policies and legislation are comprehensive, they are also complex, and their goals and

objectives are not aligned. The NDP's medium-term goal from 2015 to 2020 was universal access to fast and affordable Internet facilities. This target remains unmet. According to the 2022 ICT Sector Report by ICASA, Internet access rates in urban areas reached 71.6% in 2020 and stood at 52.9% in rural areas (Independent Communications Authority of South Africa 2022: 12-13).

Although South Africa has made progress in implementing e-strategies as part of its long-term goals, sectors have not progressed beyond basic e-service or digital platforms. The usability of such platforms remains limited due to issues like Internet access and a lack of information on usage. This challenge is exacerbated by the lower return on investment compared to urban areas, as detailed in Chapter 6.

For South Africa to reap the benefits of ICT and electronic communication across sectors, departments need to be committed to working together, ensuring open communication and addressing capacity deficits. While there are links among different departments, multilateralism and more concerted cooperation could enable the formulation of a regulatory framework with clear goals, objectives, and processes. Better-structured departments would also mean that local governments have a direct link to national or provincial governments.

The advent of the 4th IR has ushered in an era characterised by 'boundary-less' environments, challenging the suitability of traditional planning and land use management approaches in constantly evolving and converging spaces. Chapter 6 highlighted the need for planning to adapt and remain relevant to current planning contexts. However, as demonstrated in Chapter 2, planning theories have exerted a significant influence on urban development for decades.

Fainstein (2005: 121) critiqued planning theories as dictatorial tools that overlook socio-spatial constraints. Similarly, Yiftachel and Huxley (2000: 908-909) identified shortcomings in such theories, noting their focus on prescribing ideal scenarios rather than explaining outcomes and adapting to changing circumstances.

The planning gaps identified by planning theorists are validated by the findings in Chapter 6. The study revealed that spatial plans and procedures, as well as the

alignment of planning processes and digital systems are still in their infancy in South Africa. Given that ICT infrastructure is categorised as a land use, spatial plans such as land use schemes and electronic communication infrastructure development must conform to these regulatory frameworks. However, the use of out-dated and disjointed spatial regulatory frameworks, as evidenced in the case of eThekweni leaves little room for recognition of smart concepts as viable solutions to address socio-economic challenges.

Municipal IDPs often lack integration of ICT as a unifying element across sectors. This is the case in eThekweni Municipality, where the IDP addresses sectors as independent units (eThekweni Municipality 2023b). Were the IDP to be used as the principal planning instrument, as proposed by the IUDF (South Africa 2016a: 8), the implementation of the package of plans would encounter fewer complexities, as a unified plan would direct and inform all development initiatives.

The introduction of the SPLUMA in 2013 was intended to provide a single piece of planning legislation aimed at integrated planning and spatial transformation (South African Cities Network 2015: 18). However, the legislation falls short of introducing transformative planning measures which cater for the current planning context. The challenges faced in the 4th IR require planners to be more flexible and adaptive to changing circumstances. The SPLUMA reinforces the traditional implementation of schemes and frameworks to manage planning and development, but it cannot be a 'one-size-fits-all' approach as implementation is still subject to the local context of a town or city.

As shown by the participants' responses set out in Chapter 6, the lack of a coherent regulatory framework frustrates the private sector's initiatives to develop electronic communication infrastructure. This can lead to various challenges, including fragmented infrastructure development, increased costs for infrastructure and network providers, obstacles to smart innovation, and limited global connectivity for economies and societies. Numerous policies and legislation are currently in place with no standardisation. Furthermore, they are often developed independently by different departments, exacerbating the problem.

7.4.2. Spatial planning for electronic communication within local government

One of the study's objectives was to critically assess the planning response adopted by the eThekweni municipality in the digital age. Traditional planning policies tools need to be reviewed to fulfil expectations pertaining to the benefits of integrating of ICT into various sectors. Local municipalities' inefficiency and ineffectiveness in driving development are attributed to the misalignment of national and provincial directives. This challenge is compounded by a lack of human capacity, and financial and technological resources within municipalities, hindering their ability to create policies and procedures that align with the goals and objectives outlined in national and provincial regulations.

Chapter 3 highlighted the disjuncture in spatial planning for electronic communication infrastructure development among municipalities. For instance, like the eThekweni Municipality, the City of Cape Town treats development as a land use, while the City of Johannesburg does not, resulting in different types of applications and requirements. National government's failure to clearly categorise electronic communication infrastructure as a land use or utility and subsequently provide implementation guidelines has led to municipalities adopting varying approaches to spatial planning and development.

The study's findings align with the South African Cities Network's (2016: 79) evaluation of local government capacity for spatial transformation. The research revealed that municipalities continue to operate in isolation, both internally and within other governmental spheres. Despite comprehensive spatial policies and plans, there is a notable lack of alignment between departments.

Sutcliffe and Bannister (2020) argue that government, particularly municipalities, could mitigate deepening societal inequalities by reassessing infrastructure and planning policies related to land use development. They emphasise the need for ICT and electronic communication infrastructure to be classified as a land use or utility, with regulatory frameworks aligned to unified goals and objectives, to streamline development application processes.

Statutory applications are influenced by land use management schemes that are essential to implement the SPLUMA principles. The findings presented in Chapter 6 highlight reservations relating to the value of statutory planning applications for

electronic communication infrastructure. This results in lengthy processes and delays in obtaining development approval. It is partially attributed to municipal employees' lack of expertise and knowledge of electronic communications and complex land tenure challenges.

The research further revealed a fundamental challenge concerning conflicting perspectives, opinions, and personal bias toward electronic communication infrastructure. This stems from a lack of understanding, education, and training among municipal officials regarding the technical complexities of such infrastructure. Consequently, the application process tends to prioritise compliance or due diligence rather than facilitating efficient and effective development of electronic communication within the context of the 4th IR. This is in line with Nokele and Makganya's (2023: 7892) research that calls for municipal employees to be equipped with skills and knowledge to ensure that communities benefit from the use of ICT and electronic communication.

7.4.3. Spatial planning for the deployment of electronic communication infrastructure within the eThekweni Municipality

The analysis of the processing of applications for ICT infrastructure within the eThekweni Municipality found that different departments deal with applications in line with their respective regulations. The municipality lacks a dedicated department staffed with adequately qualified and experienced professionals that specialise in ICT and electronic infrastructure development. Consequently, applications are assessed solely on their environmental, visual, or aesthetic impact.

As highlighted in Annexure 5.1, the eThekweni Municipality's spatial planning approach is heavily tilted towards land tenure, leading to challenges in implementing electronic communication infrastructure. This is evident in the uneven distribution of fibre optic networks across the municipality. Rural areas continue to be treated differently from urban areas. Moreover, the focus in rural areas is preservation of agricultural and natural landscapes alongside basic services provision and promotion of food security to enhance community resilience as opposed to finding ways to enhance socio-economic development. This approach risks marginalising rural areas and impeding their modernisation.

Moreover, disparities in the distribution of electronic communication infrastructure, coupled with complex administrative procedures and a lack of technological literacy and accessibility in rural and traditional areas, run counter to the SPLUMA principles of spatial justice, efficiency, and sustainability. This highlights the urgent need to reassess planning strategies to ensure equitable access to modern infrastructure and promote socio-economic development across all regions.

The eThekweni Municipality does not bear direct responsibility for the physical expansion of electronic communication infrastructure. Spatial planning and development within the municipality are guided by a set of plans endorsed by local authorities. As outlined in Chapter 5, these are a vital component of the municipality's regulatory framework. Although the IDP and SDF recognise electronic communication infrastructure's potential to catalyse socio-economic progress, they do not classify it as an essential service. These observations echo those of Sutcliffe and Bannister (2020: 91) who noted a similar lack of emphasis on leveraging 4th IR technologies to address challenges like service delivery and foster social inclusion in the municipality's long-term strategies and plans.

Development of electronic communication infrastructure, excluding fibre, primarily falls under the jurisdiction of the land use scheme within the eThekweni Municipality. While revised development standards for telecommunications offer a pathway to streamline infrastructure deployment by permitting its development without the need for statutory planning applications, this approach remains zone-specific and relies on traditional land use management tools to govern electronic communication infrastructure development.

Chapter 6 revealed significant disparities between policy adoption and review processes within the municipality. Feedback from municipal respondents indicated a lack of recognition of deficiencies in the regulatory framework. It is imperative that the Development Planning department investigate the underlying reasons for the prolonged stagnation of spatial planning policies which can adequately support ongoing developments in an efficient and effective manner. The need for a single planning policy is also highlighted by the IUDF (South Africa 2016a: 8).

Although the eThekweni Municipality adopted the Development Standards for Telecommunication Infrastructure, all development is still subject to procedural

requirements as dictated by the land use scheme in accordance with the SPLUMA and the Municipal Planning Bylaw. The method employed to process applications within the municipality cannot be proven to be procedurally correct or incorrect due to the variation and lack of standardisation across municipalities.

While it was anticipated that the SPLUMA would address the planning landscape in a more forward-looking manner, particularly given the extensive planning efforts post-apartheid, like its predecessors, it continues to adopt conventional planning methodologies, disregarding the evolving dynamics of 4th IR planning.

To effectively address contemporary socio-economic challenges, it is suggested that the SPLUMA integrates technology into planning and decision-making processes, prioritises environmental sustainability, and promotes equitable access to resources and opportunities. Furthermore, it could highlight the importance of flexibility and adaptability within planning frameworks to accommodate the intricate and dynamic nature of modern urban settings. It is envisaged that the SPLUMA will ultimately pave the way for comprehensive, future-oriented, and agile approaches to spatial planning and land use management.

Regulatory initiatives are essential to foster the development of ICT and electronic communication infrastructure in the eThekweni Municipality. However, it is imperative that these efforts are coordinated by national government and disseminated across all municipalities to ensure alignment with national goals and objectives. This approach will provide clear regulatory frameworks, encouraging private sector investment in electronic communication infrastructure within the municipality.

7.5. Recommendations

Based on the findings outlined in Chapter 6 and summarised above, the following recommendations are proposed to address the complexity of spatial planning for electronic communication infrastructure and ensure its efficient and effective rollout to all communities:

1. **Establish Clear Policy Frameworks and Departmental Responsibilities:** National government should determine whether ICT and electronic communication infrastructure are to be managed as utilities or as distinct land uses. This should

be followed by alignment of governmental tiers with policy and legislative requirements to streamline regulations. Consideration should be given to establishing a dedicated department at the national level responsible for driving ICT infrastructure development, with clear goals and objectives. Standardisation of development processes across municipalities would facilitate the achievement of national development goals.

2. **Revise Spatial Planning Policies to Adapt to the 4th IR:** National policies, particularly the SPLUMA, should be revised to reflect the changing dynamics of the 4th IR. Emphasis should be placed on addressing delays and challenges in processing statutory applications to encourage private sector investment in infrastructure development, particularly in marginalised communities.
3. **Enhance Municipal Employees' Technical Capacity:** Municipalities should invest in training and education programmes to ensure that employees possess the technical expertise required to effectively process development applications. This will enable planners and personnel to assess applications in line with the requirements of the digital realm of the 4th IR.
4. **Provide Institutional Support to Local Municipalities:** National government should provide institutional support to local municipalities to address budgetary and resource capacity challenges. This could include education and training initiatives, technical assistance, funding opportunities, incentives, and promoting policy coherence.
5. **Foster Collaboration Between the Private Sector and Government:** Government and the private sector should collaborate to ensure equitable development and distribution of ICT infrastructure. Government intervention may be necessary to supplement or incentivise private sector initiatives, thereby reducing costs and promoting equitable development.
6. **Promote Adoption of Smart Solutions:** National government should prioritise the adoption of smart solutions to drive socio-economic development. Incremental introduction of small-scale measures at the municipal level would familiarise

communities with technology and its potential benefits, fostering acceptance and adoption.

7. **Educate Stakeholders and Invest in Technological Literacy:** All stakeholders, especially the youth and young adults, should receive education and training on technology use. Higher education institutions should develop curricula that incorporate technological knowledge and innovation across various fields, starting from primary school. This will equip graduates with the necessary skills and understanding to thrive in a technologically driven world.

7.6. Chapter Conclusion

The primary aim of this study was to assess the effectiveness of spatial planning legislation, policies, and procedures in guiding statutory planning for electronic communication infrastructure, focusing on the case of the eThekweni Municipality. To achieve this goal, it conducted an extensive analysis of the regulatory framework governing the development of ICT and electronic communication infrastructure at national, provincial, and municipal levels. While the study delved into the objectives of relevant policies and legislation, particular emphasis was placed on spatial planning and its associated regulatory framework.

The investigation revealed an overlap between various governmental policies and legislation governing ICT and electronic communication, further complicated by management of electronic communication infrastructure as a land use subject to spatial planning policies and legislation. Moreover, the study highlighted the lack of standardised application processes among municipalities for the development of such infrastructure, as evidenced by a comparison across metropolitan municipalities in South Africa.

The findings highlight the need for spatial planning and land use management to depart from traditional methods and embrace more flexible approaches that can adapt to the evolving circumstances driven by the 4th and 5th IRs. This calls for regular review and updating of policies to ensure that the regulatory framework remains relevant.

Accessibility and usability by communities should be prioritised to fully harness the benefits of ICT convergence and electronic communication usage. However, faced with challenges such as providing basic services and alleviating poverty, municipalities have often deprioritised the rollout of ICT and electronic communication infrastructure.

Collaborative planning and development involving all tiers of government, electronic communication licensees, infrastructure developers, and educational institutions hold promise in overcoming the challenges stemming from the regulatory framework. Through PPPs, these stakeholders could facilitate efficient and effective rollout of electronic communication infrastructure to all areas, ensuring access for all communities. Moreover, such partnerships would enhance the adoption and usability of smart solutions to address socio-economic challenges in South Africa.

References

Abrahams, R. 2016. *The City of Cape Town's digital journey*. Cape Town: Available: <https://acceleratecapetown.co.za/wp/wp-content/uploads/2016/11/The-City-of-Cape-Towns-Digital-Journey-Towards-a-Smarter-Future-Rudy-Abrahams-CoCT.pdf> (Accessed 3 May 2021).

Abukhater, A. 2009. Rethinking planning theory and practice: A glimmer of light for prospects of integrated planning to compact complex urban realities. *Theoretical and Empirical Researches in Urban Management*, 2 (11): 64-79. Available: https://www.researchgate.net/publication/46567780_Rethinking_planning_theory_and_practice_A_glimmer_of_light_for_prospects_of_integrated_planning_to_compact_complex_urban_realities (Accessed 15 August 2021).

Achieng, M., Ogundaini, O., Makola, D. and Iyamu, T. 2021. The African Perspective of a Smart City: Conceptualisation of Context and Relevance. Article ID. Available: https://www.researchgate.net/publication/354604057_The_African_Perspective_of_a_Smart_City_Conceptualisation_of_Context_and_Relevance (Accessed 29 July 2022).

Adeleye, B. N., Jamal, A., Adam, L. S. and Oyedepo, T. 2022. ICT Leapfrogging and Economic Growth Among SAARC Economies: Evidence From Method of Moments Quantile Regression. *Journal of Global Information Technology Management*, 25 (3): 230-253. Available: 10.1080/1097198X.2022.2094184 (Accessed 09 July 2023).

Albrechts, L. 2013. Reframing strategic spatial planning by using a coproduction perspective. *Planning Theory*, 12: 46-63. Available: 10.1177/1473095212452722 (12 November 2022).

Albrechts, L. 2015. Ingredients for a more radical strategic spatial planning. *Environment and Planning B: Planning and Design*, 42 (3): 510-525. Available: https://www.researchgate.net/publication/276316137_Ingredients_for_a_More_Radical_Strategic_Spatial_Planning (Accessed 25 November 2022).

Ali, S. H., Al-Sultan, H. A. and Al Rubaie, M. T. 2022. Fifth Industrial Revolution: (New Perspectives). *International Journal of Business, Management and Economics*, 3 (3): 196-212. Available: 10.47747/ijbme.v3i3.694 (Accessed 03 May 2023).

Allmendinger, P. 2001. *Planning in Postmodern Times*. London: Available: <https://www.taylorfrancis.com/books/mono/10.4324/9780203186152/planning-postmodern-times-philip-allmendinger> (Accessed 28 August 2022).

Atha, K., Callahan, J., Chen, J., Drun, J., Green, K., Lafferty, B., McReynolds, J., Mulvenon, J., Rosen, B. and Walz, E. 2020. *China's Smart Cities Development*. SOS

International LLC. Available: https://www.uscc.gov/sites/default/files/2020-04/China_Smart_Cities_Development.pdf (Accessed 22 June 2022).

Bahrini, R. and Qaffas, A. A. 2019. Impact of information and communication technology on economic growth: Evidence from developing countries. *Economies*, 7 (1): 21. Available: <https://www.mdpi.com/2227-7099/7/1/21> (Accessed 21 June 2021).

Bibri, S. E., Krogstie, J. and Kärrholm, M. 2020. Compact city planning and development: Emerging practices and strategies for achieving the goals of sustainability. *Developments in the Built Environment*, Article ID: 1-20. Available: <https://doi.org/10.1016/j.dibe.2020.100021> (Accessed 03 May 2021).

Black, S. K. 2001. *Telecommunications law in the Internet age*. San Francisco: Morgan Kaufmann. Available: <https://www.sciencedirect.com/book/9781558605466/telecommunications-law-in-the-internet-age> (Accessed 02 May 2021).

Boundon, R. and Bourricaud, F. 1983. *A critical dictionary of sociology*. London: Routledge. Available: <http://ndl.ethernet.edu.et/bitstream/123456789/1745/1/27.pdf.pdf> (Accessed 16 November 2023).

Boyle, B. and Staines, I. 2019. *Overview and analysis of Cape Town's Digit City Strategy*. Cape Town: Available: <http://www.ureru.uct.ac.za/> (Accessed 03 May 2021).

Broeckaert, L. 2022. *Digital Transformation in Japan - Assessing business opportunities for EU SMEs*. Tokyo: EU-Japan Center of Industrial Cooperation,. Available: <https://www.eu-japan.eu/sites/default/files/publications/docs/Digital-Transformation-Japan-Assessing-opportunities-forEU-SMEs.pdf> (Accessed 27 June 2022).

Brussels Smart City. 2023. *Brussels Smart City Definition*. Available: <https://smartcity.brussels/the-project> (Accessed 12 October 2023).

Caragliu, A., Del Bo, C. and Nijkamp, P. 2011. Smart Cities in Europe. *Journal of Urban Technology*, 18 (2): 65-82. Available: 10.1080/10630732.2011.601117 (Accessed 24 November 2022).

Castells, M. 1991. The informational city: A new framework for social change. Article ID. Available: <https://tspace.library.utoronto.ca/handle/1807/94355> (Accessed 12 September 2022).

Castells, M. 1999. Grassrooting the space of flows. *Urban Geography*, 20 (4): 294-302. Available: 10.2747/0272-3638.20.4.294 (Accessed 02 May 2021).

Castells, M. 2002. Local and Global: Cities in the Network Society. *Tijdschrift voor Economische en Sociale Geografie*, Article ID: 548-558. Available: 10.1111/1467-9663.00225 (Accessed 02 May 2021).

Cavaco, C., Mourato, J., Costa, J. P. and Ferrão, J. 2023. Beyond soft planning: Towards a Soft turn in planning theory and practice? *Planning Theory*, 22 (1): 3-26. Available: 10.1177/14730952221087389 (Accessed 06 November 2023).

Chatzoglou, P., Chatzoudes, D. and Symeonidis, S. 2015. Factors affecting the intention to use e-Government services. Article ID: 1489-1498. Available: 10.15439/2015F171 (Accessed 24 November 2022).

Chen, A. N., Castillo, J. G. D. and Ligon, K. 2015. Information and Communication Technologies (ICT): Components, Dimensions, and its Correlates. *Journal of International Technology and Information Management*, 24 (4): 25-46. Available: https://scholarworks.lib.csusb.edu/jitim/vol24/iss4/2?utm_source=scholarworks.lib.csusb.edu%2Fjitim%2Fvol24%2Fiss4%2F2&utm_medium=PDF&utm_campaign=PDFCoverPages (Accessed 27 April 2021).

Chetty, J. 2022. *Fibre rollout St Thomas Road, Musgrave, eThkekwinini* (jpg). 27 October 2022.

Connelly, L. M. 2016. Trustworthiness in qualitative research. *Medsurg Nursing*, 25 (6): 435. Available: <https://www.proquest.com/openview/44ffecf38cc6b67451f32f6f96a40c78/1?pq-origsite=gscholar&cbl=30764> (Accessed 13 February 2022).

Creswell, J. W. 2007. *Qualitative Inquiry & Research Design*. Sage Publications. Available: <https://us.sagepub.com/en-us/nam/qualitative-inquiry-and-research-design/book246896> (Accessed 09 May 2021).

Cugurullo, F. 2018. *The origin of the Smart City imaginary: From the dawn of modernity to the eclipse of reason*. London: Routledge. Available: https://www.researchgate.net/publication/325474312_The_origin_of_the_Smart_City_imaginary_from_the_dawn_of_modernity_to_the_eclipse_of_reason (Accessed 08 June 2021).

Davidoff, P. and Reiner, T. A. 1962. A choice theory of planning. *Journal of the American Institute of Planners*, 28 (2): 103-115. Available: <https://www.tandfonline.com/doi/pdf/10.1080/01944366208979427?needAccess=true> (Accessed 17 August 2021).

Davids, R., Rouget, M., Boon, R. and Roberts, D. 2018. Spatial analyses of threats to ecosystem service hotspots in Greater Durban, South Africa. *PeerJ*, 6. Available: 10.7717/peerj.5723 (Accessed 02 September 2023).

Davoudi Simin. 2017. Spatial Planning: the Promised Land or roll-out neoliberalism? Available: https://www.researchgate.net/publication/305688656_Spatial_Planning_the_Promised_Land_or_roll-out_neoliberalism/link/5799dfeb08aedca4efb91200/download (Accessed 05 April 2022).

Deguchi, A., Hirai, C., Matsuoka, H., Nakano, T., Oshima, K., Tai, M. and Tani, S. 2020. *Society 5.0: A People-centric Super-smart Society*. Tokyo: Springer Open. Available: https://www.google.co.za/books/edition/Society_5_0/6SjoDwAAQBAJ?hl=en&gbpv=1&printsec=frontcover (Accessed 27 June 2022).

Deutsche Telekom. 2021. *Fiber optics: learn all about the technology*. 2023. Available: <https://www.telekom.com/en/company/details/fiber-optics-learn-all-about-the-technology-640910> (Accessed 12 October 2023).

Development Bank of Southern Africa. 2012. *The State of South Africa's Economic Infrastructure: opportunities and challenges 2012*. South Africa: Available: <https://www.dbsa.org/EN/About-Us/Publications/Documents/State%20of%20economic%20infrastructure%202012.pdf> (Accessed 8 January 2021).

Drewes, E. and van Aswegen, M. 2013. National planning in South Africa: A critical review. *Sustainable Development and Planning*, Article ID: 193-204. Available: 10.2495/SDP130161 (Accessed 12 August 2021).

Dwivedi Yogesh K., Hughes Laurie, Kar Arpan Kumar, Baabdullah Abdullah M., Grover Purva, Abbas Roba, Andreini Daniela, Abumoghli Iyad, Barlette Yves, Bunker Deborah, Chandra Kruse Leona, Constantiou Ioanna, Davison Robert M., De' Rahul, Dubey Rameshwar, Fenby-Taylor Henry, Gupta Babita, He Wu, Kodama Mitsuru, Mäntymäki Matti, Metri Bhimaraya, Michael Katina, Olaisen Johan, Panteli Niki, Pekkola Samuli, Nishant Rohit, Raman Ramakrishnan, Rana Nripendra P., Rowe Frantz, Sarker Suprateek, Scholtz Brenda, Sein Maung, Shah Jeel Dharmeshkumar, Teo Thompson S. H., Tiwari Manoj Kumar, Vendelø Morten Thanning and Wade Michael. 2022. Climate change and COP26: Are digital technologies and information management part of the problem or the solution? An editorial reflection and call to action. *International Journal of Information Management*, 63: 102456. Available: <https://doi.org/10.1016/j.ijinfomgt.2021.102456> (Accessed 01 April 2022).

Eremia, M., Toma, L. and Sanduleac, M. 2017. The smart city concept in the 21st century. *Procedia Engineering*, Article ID: 12-19. Available:

<https://www.sciencedirect.com/science/article/pii/S1877705817309402> (Accessed 08 June 2021).

Erturk, E. 2015. A Comprehensive Approach to the Role of Information and Communication Technology (ICT) in Globalization. *Journal of International Social Research*, 8: 359-359. Available: https://www.researchgate.net/publication/283337210_A_Comprehensive_Approach_to_the_Role_of_Information_And_Communication_Technology_ICT_in_Globalization (Accessed 23 November 2022).

eThekwini Municipality. *Land Use Management - Electronic Submission & Requirements*. eThekwini Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Land%20Use%20Management/eServices%20LUMS%20Online%20Reference%20Manual%20V1.0> (Accessed 02 September 2023).

eThekwini Municipality. 2001. *eThekwini Municipality Long Term Development Framework*. eThekwini Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Regulations%20%20Legislations/Strategic%20Spatial%20Planning/Municipal%20Legislation> (Accessed 20 August 2023).

eThekwini Municipality. Development Planning. 2013. *eThekwini Municipality Northern Spatial Development Plan (2013/2014 Review)*. Durban: eThekwini Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning> (Accessed 20 July 2023).

eThekwini Municipality. Development Planning. 2014. *eThekwini Municipality Central Spatial Development Plan (2013/2014 Review)*. Durban: eThekwini Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning> (Accessed 20 July 2023).

eThekwini Municipality. 2021a. *eThekwini Municipal Planning and Land Use Management Second Amendment By-law 2021*. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Regulations%20%20Legislations//Land%20Use%20Management> (Accessed 02 September 2023).

eThekwini Municipality. eThekwini Municipality. 2021b. *eThekwini Municipality: Integrated Development Plan, 5 Year Plan: 2017/18 to 2021/22*. Available: http://www.durban.gov.za/City_Government/City_Vision/IDP/Pages/default.aspx (Accessed 06 June 2021).

eThekwini Municipality. 2022a. *About*. Available: <https://www.durban.gov.za/pages/residents/about> (Accessed 26 September 2023).

eThekwini Municipality. 2022b. *About eThekwini*. Available: <https://www.durban.gov.za/pages/government/about-ethekwini> (Accessed 12 February 2023).

eThekwini Municipality. eThekwini Roads Department. 2022c. *eThekwini Municipality: Wayleaves and excavations By-Law 2022*. Available: <https://www.durban.gov.za/pages/government/documents?d=By-Laws/Draft%20By-Laws> (Accessed 15 October 2023).

eThekwini Municipality. 2022d. *Municipal Spatial Development Framework 2022 - 2023*. Available: [http://www.durban.gov.za/City_Services/development_planning_management/Pages/Strategic-Spatial-Planning-\(Framework-Planning\)-2.aspx](http://www.durban.gov.za/City_Services/development_planning_management/Pages/Strategic-Spatial-Planning-(Framework-Planning)-2.aspx) (Accessed 20 August 2022).

eThekwini Municipality. Development Planning. 2023a. *eThekwini Municipal Land Use Scheme: Outer West Sub-Scheme Version 1.7*. Available: http://www.durban.gov.za/City_Services/development_planning_management/Pages/Document-and-Notices-2.aspx (Accessed 30 August 2023).

eThekwini Municipality. 2023b. *eThekwini Municipality Integrated Development Plan 5 year plan 2023/24 - 2027/28*. Durban: Available: <https://www.durban.gov.za/storage/Documents/Integrated%20Development%20Plans%20IDP%20-%20eThekwini%20Municipality/Integrated%20Development%20Plan%202023-24%20to%202027-28.pdf> (Accessed 10 April 2023).

Fainstein, S. 2005. Planning Theory and the City. *Journal of Planning Education and Research - J Plan Educ Res*, 25: 121-130. Available: 10.1177/0739456X05279275 (Accessed 14 August 2021).

Fainstein, S. 2006. Planning and the Just City. Article ID. Available: https://www.researchgate.net/publication/242072460_Planning_and_the_Just_City (Accessed 18 July 2022).

Faludi, A. 2013. *A reader in planning theory*. Elsevier. Available: https://www.google.co.za/books/edition/A_Reader_in_Planning_Theory/OCMIBQAAQBAJ?hl=en&gbpv=1&printsec=frontcover (Accessed 17 August 2021).

Faragó, L. 2004. *The general theory of public (spatial) planning*. Available: <http://hdl.handle.net/11858/00-1735-0000-0001-3377-6> (Accessed 10 August 2022).

Ferguson, C. 2010. *Ohlanga-Tongati Local Area Plan and Coastal Management Plan*. Durban: eThekweni Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning> (Accessed 02 September 2023).

Fernández-Maldonado, A. M. 2005. *ICT infrastructures as a new challenge for the urban planning profession* (Discussion Paper). Available: http://www.isocarp.net/Data/case_studies/631.pdf (Accessed 6 January 2021).

Florida, R. (2002). *The rise of the creative class: And how it's transforming work, leisure, community, and everyday life*. Basic Books. Available: https://www.academia.edu/20277797/Florida_Richard_2002_The_Rise_of_the_Creative_Class_and_How_Its_Transforming_Work_Leisure_Community_and_Everyday_Life_NY_Basic_Books (Accessed: 28 November 2024).

Floridi, L. 2014. *The fourth revolution: How the infosphere is reshaping human reality*. OUP Oxford. Available: https://books.google.co.za/books?hl=en&lr=&id=65eAAwAAQBAJ&oi=fnd&pg=PP1&ots=n_86zllxCE&sig=_eEzP_eQjz-PFSGAsE9q-qh6Xuk&redir_esc=y#v=onepage&q&f=false (Accessed 16 November 2022).

Forbes, J. 2011. *An introduction to municipal planning within South Africa*. Durban: Municipal Institute of Learning. Available: [https://www.salga.org.za/Documents/Municipalities/Municipal%20Planning/PLANNING-BROCHURE\(1\).pdf](https://www.salga.org.za/Documents/Municipalities/Municipal%20Planning/PLANNING-BROCHURE(1).pdf) (Accessed 08 June 2021).

Foth, M. 2017. Some thoughts on digital placemaking. *Media Architecture Compendium: Digital Placemaking*, Article ID: 203-205. Available: <https://eprints.qut.edu.au/105753/> (Accessed 02 April 2022).

Frenzel, L. E. 2016. *Principles of Electronic Communication Systems*. New York: McGraw-Hill Education. Available: <http://e4uhu.com/down/communication%20electronics/Book%204th.pdf> (Accessed 13 June 2021).

Gabisa Planning and Investments. 2012. *Final Draft Adams/Folweni LAP Framework Report*. Durban: eThekweni Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning> (Accessed 02 September 2023).

Georgeson, L. and Maslin, M. 2018. Putting the United Nations Sustainable Development Goals into practice: A review of implementation, monitoring, and finance. *Geo: Geography and Environment* 5: e00049. Available: 10.1002/geo.2.49 (Accessed 16 November 2022).

Goorha, P. 2010. *Modernization Theory*. Denmark. Blackwell Publishing. Available: https://www.researchgate.net/publication/301731821_Modernization_Theory (Accessed 13 June 2021).

Graham, S. and Healey, P. 1999. Relational concepts of space and place: Issues for planning theory and practice. *European Planning Studies*, 7 (5): 623-646. Available: 10.1080/09654319908720542 (Accessed 06 August 2021).

Guandalini, I. 2022. Sustainability through digital transformation: A systematic literature review for research guidance. *Journal of Business Research*, 148: 456-471. Available: 10.1016/j.jbusres.2022.05.003 (Accessed 23 November 2022).

Harvey, D. (1989). *The urban experience*. Johns Hopkins University Press. Available: <https://archive.org/details/urbanexperience0000harv> (Accessed: 28 November 2024).

Hausmann, R., O'Brien, T., Fortunato, A., Lochmann, A., Shah, K., Venturi, L., Ahuja, K., Klinger, B., Sturzenegger, F. and Tokman, M. 2023. Growth Through Inclusion in South Africa. *The Growth Lab Report*. Cambridge, MA: Harvard University Article ID. Available: <https://growthlab.hks.harvard.edu/policy-research/south-africa> (Accessed 20 November 2023).

Healey, P. 2003. Collaborative Planning in Perspective. *Planning Theory*, 2 (2): 101-123. Available: 10.1177/14730952030022002 (Accessed 02 September 2022).

Hornberger, B. and Rangu, S. 2020. Designing inclusion and exclusion criteria. Article ID. Available: <https://repository.upenn.edu/cgi/viewcontent.cgi?article=1000&context=crp> (Accessed 13 February 2022).

Huth, M., Vishik, C. and Masucci, R. 2017. *From Risk Management to Risk Engineering: Challenges in Future ICT Systems*. Boston: Syngress. Available: <https://www.sciencedirect.com/science/article/pii/B9780128037737000085> (Accessed 30 April 2021).

ICT Authority. 2020. *The Strategic Plan (2020 - 2024)*. Available: https://cms.icta.go.ke/sites/default/files/2021-12/downloads_9.pdf (Accessed 09 November 2023).

Igwenagu, C. 2016. *Fundamentals of research methodology and data collection*. Nigeria. Available: https://www.researchgate.net/publication/303381524_Fundamentals_of_research_methodology_and_data_collection (Accessed 09 May 2021).

Independent Communications Authority of South Africa. 2022. *The State of the ICT Sector Report of South Africa*. Centurion: Independent Communications Authority of South Africa. Available: <https://www.icasa.org.za/uploads/files/State-of-ICT-Sector-Report-March-2022.pdf> (Accessed 01 May 2023).

Innes, J. E. and Booher, D. E. 2015. A turning point for planning theory? Overcoming dividing discourses. *Planning Theory*, 14 (2): 195-213. Available: <https://www.jstor.org/stable/26098706> (Accessed 21 July 2023).

Islam, A. K. M., Jivanadham, L., Mansoor, N., Baharun, S. and Khanam, S. 2012. A Comparative Analysis of ICT Developments in Developing and Developed countries. *RSI (Regional Science Inquiry)*, IV: 159-182. Available: https://www.researchgate.net/publication/235800153_A_Comparative_Analysis_of_ICT_Developments_in_Developing_and_Developed_countries (Accessed 02 May 2021).

Jabar, M. 2021. Fiber-Optic Cables. Article ID. Available: [https://www.researchgate.net/publication/356914952_Fiber-Optic_Cables#:~:text=Optical%20fibers%20are%20used%20most,transfer%20rates\)%20than%20electrical%20cables](https://www.researchgate.net/publication/356914952_Fiber-Optic_Cables#:~:text=Optical%20fibers%20are%20used%20most,transfer%20rates)%20than%20electrical%20cables) (Accessed 12 October 2023).

Jacobs, J. 2016. *The death and life of great American cities*. Vintage. Available: https://www.google.co.za/books/edition/The_Death_and_Life_of_Great_American_City/hklmDQAAQBAJ?hl=en&gbpv=1&printsec=frontcover (Accessed 16 November 2022).

Jozuka, E., Yeung, J. and Fukutome, J. 2023. Japan's population fell by 800,000 last year as demographic crisis accelerates. *CNN* (Electronic article), 27 July 2023 Available: <https://edition.cnn.com/2023/07/27/asia/japan-population-drop-2022-intl-hnk/index.html> (Accessed 08 August 2023).

Kawulich, B. B. 2005. Participant observation as a data collection method. *Forum Qualitative Sozialforschung/Forum: Qualitative Social Research*, 6 (2). Available: <https://www.qualitative-research.net/index.php/fqs/article/view/466> (Accessed 15 December 2023).

KDM Force. 2020. *Largest Cell Tower Investment in Italy*. Available: <https://kdmforce.com/works-largest-tower-investment-in-italy.html> (Accessed 10 October 2023)

Kelley, K., Clark, B., Brown, V. and Sitzia, J. 2003. Good practice in the conduct and reporting of survey research. *International Journal for Quality in Health Care*, 15 (3): 261-266. Available: 10.1093/intqhc/mzg031 (Accessed 13 May 2021).

Kennedy, M. D. 2004. Evolution and event in history and social change: Gerhard Lenski's critical theory. *Sociological Theory*, 22 (2): 315-327. Available: <https://journals.sagepub.com/doi/epdf/10.1111/j.0735-2751.2004.00220.x> (Accessed 16 November 2023).

Klosterman, R. E. 1978. Foundations for Normative Planning. *Journal of the American Institute of Planners*, 44 (1): 37-46. Available: 10.1080/01944367808976875 (Accessed 10 August 2022).

Kothari, C. R. 2004. *Research Methodology: Methods and Techniques*. New Delhi: New Age International Publishers. Available: https://www.academia.edu/33779875/C_R_Kothari_Research_Methodology_Methods_and_Techniques (Accessed 16 May 2021).

Kumar, R. 2011. *Research Methodology*. Sage Publications. Available: <https://study.sagepub.com/kumar4e> (Accessed 09 May 2021).

KwaZulu-Natal AMAFA and Research Institute. *The Heritage Legislation and its impact on the Built Environment*. Available: <https://amafainstitute.org.za/legislation/> (Accessed 03 January 2023).

KwaZulu-Natal Provincial Planning Commission. Office of the Premier. 2018. *KwaZulu-Natal Provincial Growth and Development Plan*. Pietermaritzburg: Available: www.kznppc.gov.za (Accessed 20 May 2022).

Leal, R. and Loural, C. 2010. ICT and Telecommunications: sectoral transformation and public policy agenda. Article ID. Available: https://www.researchgate.net/publication/291347844_ICT_and_Telecommunications_sectoral_transformation_and_public_policy_agenda (Accessed 01 May 2021).

Lee, S. K., Kwon, H. R., Cho, H., Kim, J. and Lee, D. 2016. *International Case Studies of Smart Cities*. Singapore: Available: <http://www.iadb.org/> (Accessed 23 June 2021).

Lochmann, A. 2022. Diagnosing Drivers of Spatial Exclusion: Places, People, and Policies in South Africa's Former Homelands. *CID Research Fellow and Graduate Student Working Paper Series*, Article ID. Available: <https://dash.harvard.edu/handle/1/37376227> (Accessed 25 January 2024).

Mabune Consulting CC. 2023. *Northern Rural Settlement Plan & Draft Scheme: Final Report*. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning/North%20Spatial%20Planning%20Region/Northern%20Rural%20Settlement%20Plan> (Accessed 02 September 2023).

Malaysian Industry-Government Group for High Technology. 2021. *Malaysia Smart City Outlook 2021 - 2022*. Malaysia: Malaysian Industry-Government Group for High Technology, Confex Hub. Available: <https://icsc-my.org/malaysia-smart-city-outlook-2021-2022-msco/> (Accessed 23 July 2022).

Mäntysalo, R., Kangasoja, J. K. and Kanninen, V. 2015. The paradox of strategic spatial planning: A theoretical outline with a view on Finland. *Planning Theory & Practice*, 16 (2): 169-183. Available: 10.1080/14649357.2015.1016548 (Accessed 05 May 2021).

Mason, J. 2002. *Qualitative Researching*. London: Sage. Available: http://www.sxf.uevora.pt/wp-content/uploads/2013/03/Mason_2002.pdf (Accessed 21 May 2021).

Massey, D. 2005. *For Space*. Sage Publications Ltd. Available: <https://us.sagepub.com/en-us/nam/for-space/book227109#preview> (Accessed 25 November 2022).

Mazumdar, A. and Alharahsheh, H. 2020. Digital Bangladesh -Vision 2021: What is the Digital Bangladesh Concept? *South Asian Research Journal of Engineering and Technology*, 02. Available: 10.36346/sarjet.2020.v02i01.002 (Accessed 25 July 2022).

Mendes, R., Fidélis, T., Roebing, P., Teles, F. and Farrelly, M. 2022. What is spatial planning saying? A conceptual and methodological framework to assess the institutionalization of nature using critical discourse analysis. *Critical Discourse Studies*, Article ID: 1-19. Available: 10.1080/17405904.2022.2150668 (Accessed 23 November 2023).

Meth, P., Goodfellow, T., Todes, A. and Charlton, S. 2021. Conceptualizing African urban peripheries. *International Journal of Urban and Regional Research*, 45. Available: 10.1111/1468-2427.13044 (Accessed 15 October 2023).

Ministry of Information Communications and Technology Kenya. 2019. *National Information, Communications and Technology (ICT) Policy*. Available: <https://ict.go.ke/mygov-issue/> (Accessed 09 November 2023).

Mohanty, S. 2016. Everything You Wanted to Know About Smart Cities. *IEEE Consumer Electronics Magazine*, 5: 60-70. Available: 10.1109/MCE.2016.2556879 (Accessed 18 July 2022).

Mokgobu, E. P. 2005. The role of technology in the modernisation process. Article ID: University of Pretoria. Available: <https://repository.up.ac.za/bitstream/handle/2263/29469/04chapter4.pdf?sequence=5&isAllowed=y> (Accessed 17 June 2021).

Moura, F. and de Abreu e Silva, J. 2021. Smart Cities: Definitions, Evolution of the Concept, and Examples of Initiatives. In. 989-997. Available: https://www.researchgate.net/publication/351586528_Smart_Cities_Definitions_Evolution_of_the_Concept_and_Examples_of_Initiatives/link/60be673092851cb13d88b47f/download?_tp=eyJjb250ZXh0ljp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uliwicGFnZSI6InB1YmxpY2F0aW9uln19 (Accessed 19 July 2022).

Mukhopadhyay, C. 2015. *Faludi*. The Netherlands: InPlanning. Available: https://www.researchgate.net/profile/Chandrima_Mukhopadhyay2/publication/309575731_Faludi_Introducing_a_Theory_of_Planning_Andreas_Faludi_in_conversations_with_Chandrima_Mukhopadhyay/links/5c06074c458515ae5444cde5/Faludi-Introducing-a-Theory-of-Planning-Andreas-Faludi-in-conversations-with-Chandrima-Mukhopadhyay.pdf (Accessed 13 August 2021).

Musakwa, W. and Mokoena, B. 2017. Smart cities in South Africa! A case of misplaced priorities? Paper presented at. Available: https://www.researchgate.net/publication/326711215_Smart_cities_in_South_Africa_A_case_of_misplaced_priorities?enrichId=rgreq-115154581326abcf5f6b2f7437509a66-XXX&enrichSource=Y292ZXJQYWdlOzMyNjc5MTIxNTtBUzo2NTQzOTU2NzA4MDI0NDdAMTUzMzAzMTQ5NDU1NQ%3D%3D&el=1_x_2&_esc=publicationCoverPdf (Accessed 27 June 2021).

Nam, T. and Pardo, T. 2011. Smart city as urban innovation: Focusing on management, policy, and context. Article ID: 185-194. Available: 10.1145/2072069.2072100 (Accessed 24 November 2022).

National Planning Commission. Department of Planning Monitoring and Evaluation. 2020. *Public infrastructure delivery and construction sector dynamism in the South African economy*. South Africa. Available: <https://www.nationalplanningcommission.org.za/assets/Documents/Infrastructure%20delivery%20-Watermeyer%20Phillips%2025%20April%20final.pdf> (Accessed 28 April 2022).

Nchake, M. A. and Shuaibu, M. 2022. Investment in ICT infrastructure and inclusive growth in Africa. *Scientific African*, 17: e01293. Available: <https://doi.org/10.1016/j.sciaf.2022.e01293> (Accessed 09 November 2023).

Ndlambe Municipality. 2019. *Telecommunication Mast Infrastructure Policy*. Available: <chrome-extension://efaidnbnmnibpcajpcgclclefindmkaj/https://ndlambe.gov.za/web/wp-content/uploads/2023/05/Cell-Phone-Tower-Policy.pdf> (Accessed 10 October 2023).

Nlerum, P. and Eleje, C. B. 2022. Information and Communications Technology (ICT) and the Nigeria's Digital Economy, Regulations and Challenges. 8: 60-67. Available:

https://www.researchgate.net/publication/363801299_Information_and_Communications_Technology_ICT_and_the_Nigeria's_Digital_Economy_Regulations_and_Challenges (Accessed 09 November 2023).

Noble, S. M., Mende, M., Grewal, D. and Parasuraman, A. 2022. The Fifth Industrial Revolution: How Harmonious Human-Machine Collaboration is Triggering a Retail and Service [R]evolution. *Journal of Retailing*, 98 (2): 199-208. Available: <https://www.sciencedirect.com/science/article/pii/S0022435922000288> (Accessed 27 March 2023).

Nokele, K. and Makganya, K. 2023. Embedding the Fourth Industrial Revolution (4IR) in South African Municipalities: Challenges and Prospects. *International Journal of Social Sciences and Humanities Invention*, 10: 7890-7894. Available: 10.18535/ijsshi/v10i05.05 (Accessed 12 November 2023).

Obi, T., Ishmatova, D. and Iwasaki, N. 2012. Promoting ICT innovations for the ageing population in Japan. *International Journal of Medical Informatics*, 82. Available: 10.1016/j.ijmedinf.2012.05.004 (Accessed 22 June 2022).

Olesen, K. 2018. Teaching planning theory as planner roles in urban planning education. *Higher Education Pedagogies*, 3 (1): 302-318. Available: 10.1080/23752696.2018.1425098 (Accessed 13 August 2021).

Orb, A., Eisenhauer, L. and Wynden, D. 2000. Ethics in qualitative research. *Journal of Nursing Scholarship*, 33 (1): 93-96. Available: <http://www.columbia.edu/~mvp19/RMC/M5/QualEthics.pdf> (Accessed 06 June 2021).

Pandey, P. and Pandey, M. M. 2015. *Research methodology: tools and techniques*. Romania: Available: <https://www.euacademic.org/BookUpload/9.pdf> (Accessed 13 May 2021).

Parveen, H. and Showkat, N. 2017. *Research Ethics*. Available: https://www.researchgate.net/publication/318912804_Research_Ethics (Accessed 06 June 2021).

Pedrelli, M. 2001. Developing countries and the ICT revolution. *European Parliament, Directorate for General Research Report*, Article ID. Available: [https://www.europarl.europa.eu/RegData/etudes/etudes/join/2001/296692/DG-4-JOIN_ET\(2001\)296692_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/etudes/join/2001/296692/DG-4-JOIN_ET(2001)296692_EN.pdf) (Accessed 02 May 2021).

Pereira, F., Lee, B. and Fife, E. 2023. Singapore's Smart Nation Program and potential lessons for the European Union's Digital Decade program. Article ID. Available: <https://www.econstor.eu/bitstream/10419/278012/1/Pereira-et-al.pdf> (Accessed 10 October 2023).

Pham, C. 2014. *Smart Cities in Japan: An assessment on the potential for EU-Japan Cooperation and business development*. EU-Japan Centre for Industrial Cooperation,. Available: <https://www.eu-japan.eu/sites/default/files/publications/docs/smartcityjapan.pdf> (Accessed 23 June 2021).

Pieterse, M. and Coggin, T. 2023. Property's Shadow: Governing Land and Plurality in Durban, South Africa. *International Journal of Urban and Regional Research*, 47 (6): 1013-1029. Available: <https://onlinelibrary.wiley.com/doi/full/10.1111/1468-2427.13207> (Accessed 22 November 2023).

Pretorius, O., Pillay, N., Yeni-Letsoko, V. and Huston, Z. 2022. Integrating the 4th Industrial Revolution in spatial planning curricula: the case of South African tertiary institutions. Paper presented at. Available: https://www.researchgate.net/publication/358525364_Integrating_the_4th_Industrial_Revolution_in_spatial_planning_curricula_the_case_of_South_African_tertiary_institutions (Accessed 28 August 2022).

Prisecaru, P. 2016. Challenges of the fourth industrial revolution. *Knowledge Horizons. Economics*, 8 (1): 57-62. Available: <http://orizonturi.ucdc.ro/arhiva/khe-vol8-nr1-2016/09.%20Petre%20Prisecaru.pdf> (Accessed 29 April 2021).

Project for Public Spaces. 2010a. *Jane Jacobs*. Available: <https://www.pps.org/article/jjacobs-2#:~:text=Her%201961%20treatise%2C%20The%20Death,of%20urban%20planners%20and%20activists.> (Accessed 09 February 2024).

Project for Public Spaces. 2010b. William H. Whyte. Available: <https://www.pps.org/article/wwhyte> (Accessed 09 February 2024).

Rashid, D. Y., Rashid, A., Warraich, M., Sabir, S. and Waseem, A. 2019. Case Study Method: A Step-by-Step Guide for Business Researchers. *International Journal of Qualitative Methods*, Article ID: 1-18. Available: [10.1177/1609406919862424](https://doi.org/10.1177/1609406919862424) (Accessed 07 May 2021).

Ravindra, N. 2019. Theory of Planning: Comparison of Four Different Urban Development Approaches *International Journal of Research and Innovation in Social Science*, III (VI): 580-583. Available: <https://www.rsisinternational.org/journals/ijriss/Digital-Library/volume-3-issue-6/580-583.pdf> (Accessed 10 August 2022).

RCR Project Team. 2011. *Craigieburn Precinct Plan*. Durban: eThekweni Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20>

%20Notices/Strategic%20Spatial%20Planning/South%20Spatial%20Planning%20Region/Cragieburn%20Precinct%20Plan,%20FAP (Accessed 02 September 2023).

Rocco, T. and Plakhotnik, M. 2009. Literature Reviews, Conceptual Frameworks, and Theoretical Frameworks: Terms, Functions, and Distinctions. *Human Resource Development Review*, 8: 120-130. Available: 10.1177/1534484309332617 (Accessed 26 April 2021).

Sanyal, B. 2002. Globalization, Ethical Compromise and Planning Theory. *Planning Theory*, 1 (2): 116-123. Available: <http://www.jstor.org/stable/26001793> (Accessed 07 September 2022).

Sassen, S. 1991. *The global city: New York, London, Tokyo*. Princeton University Press. Available: <https://www.jstor.org/stable/j.ctt2jc93q> (Accessed 28 November 2024).

Sassen, S. 2011. *The Impact of the New Technologies and Globalization on Cities*. Available: https://www.researchgate.net/publication/303913159_The_Impact_of_the_New_Technologies_and_Globalization_on_Cities (Accessed 17 June 2021).

Saunders, M., Lewis, P. and Thornhill, A. 2009. Understanding research philosophies and approaches. *Research Methods for Business Students*, Article ID: 106-135. Available: https://www.researchgate.net/publication/309102603_Understanding_research_philosophies_and_approaches (Accessed 03 May 2021).

Schwab, K. 2016. The Fourth Industrial Revolution: what it means, how to respond. In: *Proceedings of World Economic Forum*. Available: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/> (Accessed 29 April 2021).

Schwab, K. 2019. *The Global Competitiveness Report*. Switzerland: Available: http://www3.weforum.org/docs/WEF_TheGlobalCompetitivenessReport2019.pdf (Accessed 22 June 2021).

Shahzad, A. 2006. What is Globalization - Historical Background. *Jadavpur Journal of International Relations*, 10 (1): 204-212. Available: 10.1177/0973598406110013 (Accessed 17 June 2021).

Sharma, G. 2017. Pros and cons of different sampling techniques. *International Journal of Applied Research*, 3 (7): 749-752. Available: <https://www.allresearchjournal.com/archives/2017/vol3issue7/PartK/3-7-69-542.pdf> (Accessed 17 May 2021).

Sharon Shea. 2023. *Definition: Smart City*. Available: <https://www.techtarget.com/iotagenda/definition/smart-city> (Accessed 13 August 2023).

Sim, V., Sutherland, C., Buthelezi, S. and Khumalo, D. 2018. Possibilities for a Hybrid Approach to Planning and Governance at the Interface of the Administrative and Traditional Authority Systems in Durban. *Urban Forum*, 29 (4): 351-368. Available: 10.1007/s12132-018-9355-2 (Accessed 15 October 2023).

South Africa. Department of the Prime Minister. 1977. *National Building Regulations and Building Standards Act No. 103 of 1977*. 5640. Cape Town. Available: https://www.gov.za/sites/default/files/gcis_document/201504/act-103-1977.pdf (Accessed 23 December 2022).

South Africa. Department of Justice and Constitutional Development. 1996a. *Constitution of the Republic of South Africa Act Act No. 108 of 1996*. 17678. Available: <https://www.justice.gov.za/legislation/constitution/saconstitution-web-eng.pdf> (Accessed 28 December 2022).

South Africa. 1996b. *Telecommunications Act No. 103 of 1996*. 17581. City of Cape Town. Available: https://www.gov.za/sites/default/files/gcis_document/201409/act103of1996s.pdf (Accessed 28 December 2022).

South Africa. 1998a. *National Environmental Management Act No. 107 of 1998*. 19519. Available: https://www.gov.za/sites/default/files/gcis_document/201409/a107-98.pdf (Accessed 03 January 2023).

South Africa. Office of the President. 1998b. *South African Civil Aviation Authority Act No. 40 of 1998*. 19212. Cape Town. Available: https://www.gov.za/sites/default/files/gcis_document/201409/a40-98.pdf (Accessed 04 February 2023).

South Africa. 1998c. *The White Paper on Local Government*. Available: <https://www.gov.za/documents/local-government-white-paper-0> (Accessed 20 August 2021).

South Africa. Office of the President. 1999. *National Heritage Resources Act No. 25 of 1999*. 19974. Cape Town. Available: https://www.gov.za/sites/default/files/gcis_document/201409/a25-99.pdf (Accessed 28 December 2022).

South Africa. 2000a. *Independent Communications Authority of South Africa Act No. 13 of 2000*. 29044. Available: <https://www.gov.za/documents/electronic-communications-act> (Accessed 23 December 2022).

South Africa. 2000b. *Municipal Systems Act*. 21776. Cape Town: Government Printer. Available: <https://www.gov.za/documents/local-government-municipal-systems-act> (Accessed 20 August 2021).

South Africa. Development Planning Transportation and Environment. 2001. *Cellular Mast Policy for the City of Johannesburg*. Available: http://www.forward.joburg/DevPlan_Docs/City%20of%20Johannesburg%20Cellular%20mast%20policy.pdf (Accessed 27 June 2021).

South Africa. 2002a. *Electronic Communications and Transactions Act No. 25 of 2002*. 23708. Available: <https://www.gov.za/documents/electronic-communications-and-transactions-act#:~:text=to%20provide%20for%20human%20resource,provide%20for%20matters%20connected%20therewith.> (Accessed 28 December 2022).

South Africa. City of Cape Town. 2002b. *Telecommunication Infrastructure Policy*. City of Cape Town Municipality. Available: https://www.ellipsis.co.za/wp-content/uploads/2014/07/HYS_Draft_Telecommunication_Policy.pdf (Accessed 3 May 2021).

South Africa. National Planning Commission. 2010. *National Development Plan 2030: Our Future Make It Work*. South Africa: Sherino. Available: <https://www.poa.gov.za/news/Documents/NPC%20National%20Development%20Plan%20Vision%202030%20lo-res.pdf> (Accessed 8 January 2021).

South Africa. Department of Cooperative Governance and Traditional Affairs. 2013. *Spatial Planning and Land Use Management Act, Act No. 16 of 2013*. 36730. Cape Town: Government Printer. Available: <https://www.gov.za/documents/spatial-planning-and-land-use-management-act> (Accessed 20 August 2021).

South Africa. 2014a. *Electronic Communications Amendment Act No. 1 of 2014*. 37536. Available: <https://www.gov.za/documents/electronic-communications-act> (Accessed 8 January 2021).

South Africa. Department of Communications. 2014b. *National Integrated ICT Policy Green Paper No. 44 of 2014*. 37261. Pretoria: Minister of Communications. Available: https://www.gov.za/sites/default/files/gcis_document/201409/37261gon44.pdf (Accessed 21 September 2021).

South Africa. Department of Cooperative Governance and Traditional Affairs. 2016a. *Integrated Urban Development Framework*. Available:

<https://www.sacities.net/publication/the-integrated-urban-development-framework-iudf/> (Accessed 20 October 2023).

South Africa. Telecommunications and Postal Services. 2016b. *National Integrated ICT Policy White Paper No. 1212 of 2016*. 40325. South Africa. Available: <https://www.gov.za/documents/electronic-communications-act-national-integrated-ict-policy-white-paper-3-oct-2016-0000> (Accessed 20 September 2021).

South Africa. Department of Environmental Affairs. 2017. *Amendment of the Environmental Impact Assessment Regulations Listing Notice 3 of 2014*. 40772. Available: https://www.dffe.gov.za/sites/default/files/gazetted_notices/nema_listingnotice_33306rg9314gon546_0.pdf (Accessed 05 December 2022).

South Africa. City of Cape Town. 2017 - 2022. *City of Cape Town Five-Year Integrated Development Plan 2017-2022*. Cape Town. Available: [https://www.capetown.gov.za/Family%20and%20home/City-publications/the-citys-five-year-plan-\(idp\)](https://www.capetown.gov.za/Family%20and%20home/City-publications/the-citys-five-year-plan-(idp)) (Accessed 27 June 2021).

South Africa. National Planning Commission. 2020a. *Digital futures: South Africa's digital readiness for the 'Fourth Industrial Revolution'*. South Africa: Research ICT Africa. Available: <https://researchictafrica.net/publication/digital-futures-south-africas-readiness-for-the-4ir/> (Accessed 01 June 2021).

South Africa. Office of the Premier. 2020b. *ICT Integration Plan for Digital Transformation Strategy*. Pietermaritzburg. Available: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.kznonline.gov.za/images/Downloads/Downloads/Cloud%20Policies/KZN%20Provincial%20Integration%20Plan.pdf> (Accessed 20 May 2022).

South Africa. Office of the Premier. 2020c. *KwaZulu-Natal Digital Transformation Strategy 2020-2025*. Pietermaritzburg. Available: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www.kznonline.gov.za/images/Downloads/Downloads/Cloud%20Policies/Digital%20Transformation%20Strategy%202020%20-%202025%2004052020.pdf> (Accessed 20 May 2022).

South Africa. Department of Cooperative Governance and Traditional Affairs. 2020d. *KwaZulu-Natal Provincial Planning and Development Norms and Standards for Electronic Communication Facilities*. Pietermaritzburg: Department of Cooperative Governance and Traditional Affairs. Available: www.kzncogta.gov.za; (Accessed 20 January 2022).

South Africa. Department of Communications and Digital Technologies. 2020e. *National Digital and Future Skills Strategy South Africa*. Available: <chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/>

extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.gov.za/sites/default/files/gcis_document/202203/46033gon1874.pdf (Accessed 13 April 2023).

South Africa. The Presidency. 2020f. *National Policy Development Framework 2020*. Available: <https://www.gov.za/documents/other/national-policy-development-framework-2020-02-dec-2020> (Accessed 16 November 2023).

South Africa. City of Johannesburg. 2020 - 2021. *City of Johannesburg IDP 2020/21 Review*. Johannesburg. Available: https://www.joburg.org.za/documents_/Pages/Key%20Documents/Intergrated%20Development%20Plan/Integrated-Development-Plan.aspx (Accessed 27 June 2021).

South Africa. Cooperative Governance and Traditional Affairs. 2021a. *Guideline: Submission of planning norms and standards for electronic communication facilities in KwaZulu-Natal*. Pietermaritzburg: Government Printer. Available: https://www.kzncogta.gov.za/wp-content/uploads/2020/08/1.ELECTRONIC%20COMMUNICATION%20NORMSANDSTANDARDS_docx_1.docx_1.pdf (Accessed 20 August 2021).

South Africa. Department of Public Works and Infrastructure. 2021b. *National Infrastructure Plan 2050*. 44951. Government Printer. Available: <https://www.gov.za/speeches/minister-patricia-de-lille-gazetting-draft-national-infrastructure-plan-2050-nip-2050> (Accessed 20 August 2021).

South Africa. 2021c. *A South African Smart Cities Framework*. Available: www.cogta.gov.za/cgta_2016/wp-content/uploads/2023/01/Annexure-A-DCoG_Smart-Cities-Framework.pdf (Accessed 19 July 2022).

South Africa. Department of Public Works and Infrastructure. 2022a. *National Infrastructure Plan 2050 (NIP 2050) Phase 1*. Available: chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.gov.za/sites/default/files/gcis_document/202203/46033gon1874.pdf (Accessed 01 June 2023).

South Africa. Department of Agriculture Land Reform and Rural Development. 2022b. *National Spatial Development Framework*. Pretoria. Available: https://www.gov.za/sites/default/files/gcis_document/202302/47999gen1594.pdf (Accessed 15 June 2023).

South African Cities Network. 2015. *SPLUMA as a tool for spatial transformation*. Braamfontein. Available: http://sacitiesnetwork.co.za/wp-content/uploads/2015/05/SPLUMA-as-a-tool-for-spatial-transformation_final_April2015.pdf (Accessed 11 June 2021).

South African Cities Network. 2016. *Assessing Local Government Capacity for Spatial Transformation in South African cities 2016*. Available: <https://www.sacities.net/spatial-planning-land-use-reports/> (Accessed 17 July 2022).

South African Cities Network. 2021. *State of South African Cities*. Johannesburg. Available: https://www.sacities.net/wp-content/uploads/2022/04/SoCR-V-2021_WEB-144dpi.pdf (Accessed 11 February 2023).

South African Government. 2023. *South Africa's people*. Available: <https://www.gov.za/about-sa/south-africas-people> (Accessed 21 July 2023).

Stăncioiu, A. 2017. The Fourth Industrial Revolution Industry 4.0. *Fiabilitate Și Durabilitate*, 1 (19): 74-78. Available: https://www.utgjiu.ro/rev_mec/mecanica/pdf/2017-01/11_Alin%20ST%C4%82NCIOIU%20-%20THE%20FOURTH%20INDUSTRIAL%20REVOLUTION%20%E2%80%9EINDUSTRY%204.0%E2%80%9D.pdf (Accessed 27 April 2021).

Sutcliffe, M. and Bannister, S. 2020. *Research on the 4th industrial revolution: Implications for local government in the context of skills development*. South Africa. Available: https://cdn.lgseta.co.za/resources/research_and_reports/2019%20%E2%80%93%202020%20RESEARCH%20PROJECTS/RESEARCH%20PROJECT%20-%204TH%20INDUSTRIAL%20REVOLUTION%20IN%20THE%20LOCAL%20GOVT%20SECTOR.pdf (Accessed 21 January 2021).

Sutherland, E. 2020. The Fourth Industrial Revolution – The Case of South Africa. *Politikon*, 47 (2): 233-252. Available: <https://www.tandfonline.com/action/showCitFormats?doi=10.1080/02589346.2019.1696003> (Accessed 15 April 2021).

Talvitie, J. 2003. *The impact of mobile communication on land use planning*. Available: https://www.fig.net/resources/proceedings/fig_proceedings/fig_2003/TS_10/TS10_4_Talvitie.pdf (Accessed 01 May 2021).

Talvitie, J. 2004. Incorporating the impact of ICT into urban and regional planning. *European Journal of Spatial Development*, 2 (2): 1-32. Available: <https://journals.polito.it/index.php/EJSD/article/view/164> (Accessed 24 November 2022).

Taylor, N. 2010. What is this thing called spatial planning? An analysis of the British government's view. *The Town Planning Review*, 81 (2): 193-208. Available: <http://www.jstor.org/stable/40660677> (Accessed 05 June 2021).

The Kenya Institute for Public Policy Research and Analysis. 2023. *Kenya Economic Report 2023*. Available: <https://kippra.or.ke/download/kenya-economic-report-2023-main-report/?wpdmdl=14955&ind=1695886127206> (Accessed 28 November 2023).

The Markewicz Redman Partnership. 2018. *Cato Ridge Local Area Plan Review, Functional Area Plans and Draft Scheme*. Durban: eThekweni Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning> (Accessed 02 September 2023).

The Nations Online Project. 2023. *Map of South Africa*. Available: https://www.nationsonline.org/oneworld/map/south_africa_map.htm#google_vignette (Accessed 28 December 2024).

The Nigerian Economic Summit Group. 2023. *State of the Nigerian Economy*. Available: <https://www.nigerianstat.gov.ng/pdfuploads/NIGERIAN%20ECONOMY.pdf> (Accessed 21 November 2023).

The Planning Initiative. 2016. *eThekweni Inner City Local Area Plan*. Durban: eThekweni Municipality. Available: <https://www.durban.gov.za/pages/government/documents?d=DPEM/Documents%20%20Notices/Strategic%20Spatial%20Planning> (Accessed 02 September 2023).

The World Bank. 2023a. *Data bank - population*. Available: <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=SG> (Accessed 08 August 2023).

The World Bank. 2023b. *Nigeria overview*. Available: <https://www.worldbank.org/en/country/nigeria/overview> (Accessed 09 November 2023).

The World Bank. 2024a. *Population, total - Kenya*. Available: <https://data.worldbank.org/indicator/SP.POP.TOTL?locations=KE> (Accessed 09 November 2023).

The World Bank. 2024b. *The World Bank in Nigeria*. Available: <https://www.worldbank.org/en/country/nigeria#:~:text=Nigeria%20At%2DA%2DGlance,of%20youth%20in%20the%20world>. (Accessed 10 March 2024).

Thornton, L., Carrim, Y., Mtshaunlana, P. and Reyburn, P. 2006. *Telecommunications law in South Africa*. South Africa: STE Publishers. Available: <https://www.wits.ac.za/linkcentre/ict-ecosystem-programme/ict-ecosystem-publications/telecommunications-law-in-south-africa/> (Accessed 06 January 2021).

Todes, A., Karam, A., Klug, N. and Malaza, N. 2010. Beyond master planning? New approaches to spatial planning in Ekurhuleni, South Africa. *Habitat International*, 34 (4): 414-420. Available: <https://www.sciencedirect.com/science/article/abs/pii/S0197397509001003> (Accessed 21 December 2021).

United Nations. 2021. *Technology and Innovation Report 2021: Catching technological waves*. New York. Available: <https://unctad.org/page/technology-and-innovation-report-2021> (Accessed 22 June 2021).

Victor, S., Precious, Z. and Facundo, C. P. 2022. *Inequality in Southern Africa: An Assessment of the Southern African Customs Union*. World Bank Group. Available: <http://documents.worldbank.org/curated/en/099125303072236903/P1649270c02a1f06b0a3ae02e57eadd7a82> (Accessed 21 July 2023).

Watson, V. 2002. The Usefulness of Normative Planning Theories in the Context of Sub-Saharan Africa. *Planning Theory*, 1 (1): 27-52. Available: 10.1177/147309520200100103 (Accessed 08 August 2022).

Woerjantari, S., Erika Yuni, A., Angela Upitya, P., Nova, A., Delima, P. and Arsyil, Z. 2021. Placemaking in the Digital Era. *Proceedings of the ARTEPOLIS 8 - the 8th Biannual International Conference (ARTEPOLIS 2020)*, Article ID: 160-171. Available: <https://doi.org/10.2991/assehr.k.211126.018> (Accessed 04 September 2022).

Wolff, J. 2021. How Is Technology Changing the World, and How Should the World Change Technology? *Global Perspectives*, 2 (1). Available: 10.1525/gp.2021.27353 (Accessed 14 October 2023).

Wyckoff, M. A. 2014. Definition of placemaking: Four different types. *Planning & Zoning News*, 32 (3): 1. Available: <http://www.pznews.net/media/13f25a9fff4cf18fff8419ffaf2815.pdf> (Accessed 04 September 2022).

Xi, G., Zhen, F. and Chang, E. 2016. Measuring Urban Space of Flows in Information Era: Empirical Evidence from Nanjing, China. *International Review for Spatial Planning and Sustainable Development*, 4: 42-57. Available: 10.14246/irspsd.4.4_42 (Accessed 18 September 2022).

Xu, M., David, J. and Kim, S. 2018. The Fourth Industrial Revolution: Opportunities and Challenges. *International Journal of Financial Research*, 9: 90. Available: 10.5430/ijfr.v9n2p90 (Accessed 01 June 2021).

Yiftachel, O. 1989. Towards a new typology of urban planning theories. *Environment and Planning B: Planning and Design*, 16 (1): 23-39. Available: <https://journals.sagepub.com/doi/abs/10.1068/b160023> (Accessed 17 August 2021).

Yiftachel, O. and Huxley, M. 2000. Debating Dominance and Relevance: Notes on the 'Communicative Turn' in Planning Theory. *International Journal of Urban and Regional Research*, 24 (4): 907-913. Available: https://www.researchgate.net/publication/264584411_Debating_dominance_and_relevance_Notes_on_the_'communicative_turn'_in_planning_theory (Accessed 17 August 2021).

Zainal, Z. 2007. Case study as a research method. *Jurnal Kemanusiaan*, 5 (1): 1-4. Available: <https://jurnalkemanusiaan.utm.my/index.php/kemanusiaan/article/view/165> (Accessed 27 April 2021).

Appendices

Appendix A – Municipal Planners



DURBAN UNIVERSITY OF TECHNOLOGY
INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE

SEMI-STRUCTURED INTERVIEW – PUBLIC STAKEHOLDERS: DEVELOPMENT PLANNING OFFICIALS ETHEKWINI MUNICIPALITY

Name of Interviewer:

Name of Interviewee:

Method of interview:

Date:

AIM:

- To evaluate the role and effectiveness of spatial planning.
 - To examine the statutory processes in eThekweni Municipality for the facilitation and implementing electronic communication infrastructure.
 - To identify if there are planning policy, legislation, or procedural shortfalls.
 - To gain insight on municipal planning challenges
-

1. What is your understanding of electronic communication infrastructure?

Answer:

2. How many years of experience do you have in your field?

- less than 3 years
- 4 – 5 years
- 6 – 10 years
- greater than 10 years

3. On average how many electronic communication applications do you process per month?

- less than 5
- greater than 5
- NA

4. Approximately how long does it take for you to make a statutory planning decision for electronic communication infrastructure applications?

- less than 1 month
- 2 – 3 months
- greater than 4 months

5. Are you reliant on Information and Communication Technologies in your personal and work environment?

- Yes
- No

6. What type of technologies do you utilise daily? (e.g. the internet, mobile communication, digitised systems, etc.)

Answer:

7. Literature reveals that through harnessing ICT development, cities can address challenges such as spatial inequality, the digital divide and socio-economic development. In your opinion, would the increased development of electronic communication infrastructure aid in bridging these gaps?

- Yes
- No

How?

8. The planning process or statutory planning relates to compliance with rules, regulations and policies which regulate land use. Land use planning is central to statutory decision making. Do you believe that statutory planning applications are necessary when developing electronic communication infrastructure?

- Yes
- No

Why?

13. What are your thoughts on the implementation of spatial planning policies and plans in South Africa?

Answer?

14. Technology has created boundaryless cities, which means the conventional management of urban spaces cannot be used. Electronic communication makes the development of spaces more complex with the introduction of 'real-time' activities. As a planner, how do you feel about the changing landscape of planning given the virtual spaces created by technology? e.g. homes have now become offices and classrooms.

Answer:

15. What ideas, thoughts or suggestions do you have related to the study?

Answer:

9. How do you suggest the development of government-private stakeholder investment for the deployment of electronic communication infrastructure?

Answer:

10. Do you believe eThekweni Municipality is geared towards ICT development and the rapid deployment of electronic communication infrastructure which aligns to National Development Plan (NDP) Vision 2030's goal to expand ICT access?

Answer:

11. The municipal SDF is reviewed annually. How often are other spatial plans of the Municipality reviewed to align with the spatial visions and key spatial proposals of the SDF?

- annually
- every 3 – 5 years
- every 10 years
- almost never

12. There is an increased need for planning to acknowledge the influence of space and time, which requires the planning process to engage with the growing need for electronic communication infrastructure. In your opinion, are spatial plans and policies in South Africa aligned to technological change brought on by the Fourth Industrial Revolution?

- Yes
- No

If no, why so?

Appendix B – Private Planners



SEMI-STRUCTURED INTERVIEW – PRIVATE STAKEHOLDERS: PRIVATE TOWN PLANNERS

Name of Interviewer:

Name of Interviewee:

Method of interview:

Date:

AIM:

- *To evaluate the role and effectiveness of spatial planning.*
 - *To examine the statutory processes in eThekweni Municipality for the facilitation and implementing electronic communication infrastructure.*
 - *To identify if there are planning policy, legislation, or procedural shortfalls.*
 - *To gain insight on planning challenges in the private sector.*
-

1. What is your understanding of electronic communication infrastructure?

Answer:

2. How many years of experience do you have in your field?

- less than 3 years
- 4 – 5 years
- 6 – 10 years
- greater than 10 years

3. On average how many electronic communication applications do you process per month?

- less than 10
- greater than 10

4. Approximately how long does it take for you to receive a decision for electronic communication infrastructure development on municipal owned land?

- less than 1 month
- 2 – 3 months
- greater than 4 months

5. Approximately how long does it take for you to receive a statutory planning decision for electronic communication infrastructure applications?

- less than 1 month
- 2 – 3 months
- greater than 4 months

6. What are the challenges you experience as planner when trying to submit electronic communication infrastructure applications to the Municipality?

Answer:

7. Are you reliant on Information and Communication Technologies in your personal and work environment?

- Yes
 No

8. What type of technologies do you utilise daily? (e.g. the internet, mobile communication, digitised systems, etc.)

Answer:

9. Literature reveals that through harnessing ICT development, cities can address challenges such as spatial inequality, the digital divide and socio-economic development. In your opinion, would the increased development of electronic communication infrastructure aid in bridging these gaps?

- Yes
 No

How?

10. The planning process or statutory planning relates to compliance with rules, regulations and policies which regulate land use. Land use planning is central to statutory decision making. Do you believe that statutory planning applications are necessary when developing electronic communication infrastructure?

- Yes
- No

Why?

11. How do you suggest the development of government-private stakeholder investment for the deployment of electronic communication infrastructure?

Answer:

12. Do you believe eThekweni Municipality is geared towards ICT development and the rapid deployment of electronic communication infrastructure which aligns to National Development Plan (NDP) Vision 2030's goal to expand ICT access?

Answer:

13. There is an increased need for planning to acknowledge the influence of space and time, which requires the planning process to engage with the growing need for electronic communication infrastructure. In your opinion, are spatial plans and policies in South Africa aligned to technological change brought on by the Fourth Industrial Revolution?

- Yes
- No

If no, why so?

14. What are your thoughts on the implementation of spatial planning policies and plans in South Africa?

Answer?

15. Technology has created boundaryless cities, which means the conventional management of urban spaces cannot be used. Electronic communication makes the development of spaces more complex with the introduction of 'real-time' activities. As a planner, how do you feel about the changing landscape of planning given the virtual spaces created by technology? e.g. homes have now become offices and classrooms.

Answer:

16. What ideas, thoughts or suggestions do you have related to the study?

Answer:



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**SEMI-STRUCTURED INTERVIEW – PUBLIC STAKEHOLDERS: REAL ESTATE,
ETHEKWINI MUNICIPALITY**

Name of Interviewer:

Name of Interviewee:

Method of interview:

Date:

AIM:

- *To understand how applications for electronic communication infrastructure are facilitated by Real Estate.*
 - *Gain insight on the policies and procedures that influence this departments rollout of infrastructure on municipal owned land.*
 - *To assess the ability for Real Estate to facilitate development on municipal owned land.*
-

1. What is your understanding of electronic communication infrastructure?

Answer:

2. How many years of experience do you have in your field?

- less than 3 years
- 4 – 5 years
- 6 – 10 years
- greater than 10 years

3. On average how many electronic communication applications do you process per month?

- less than 5
- greater than 5
- NA

4. Approximately how long does it take for you to provide consent for electronic communication infrastructure applications?

- less than 1 month
- 2 – 3 months
- greater than 4 months

5. Does the municipality refuse the development of electronic communication infrastructure on municipal owned land?

- Yes
- No

If yes, why?

6. Are you reliant on Information and Communication Technologies in your personal and work environment?

- Yes
- No

7. What type of technologies do you utilise daily? (e.g. the internet, mobile communication, digitised systems, etc.)

Answer:

8. What criteria is followed when assessing a wayleave application for the development of electronic communication infrastructure?

Answer?

9. What policy directives does Real Estate follow for the development and rollout of electronic communication infrastructure?

Answer?

10. How do you suggest the development of government-private stakeholder investment for the deployment of electronic communication infrastructure?

Answer:

11. Do you believe eThekweni Municipality is geared towards ICT development and the rapid deployment of electronic communication infrastructure which aligns to National Development Plan (NDP) Vision 2030's goal to expand ICT access?

Answer:

12. Does Real Estate have an influence the deployment of electronic communication infrastructure on private owned land?

Answer?

13. What ideas, thoughts or suggestions do you have related to the study?

Answer:

Appendix D – Licensees



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INYUVESI YASETHEKWINI YEZOBUCHWEPHESHE

SEMI-STRUCTURED INTERVIEW – PRIVATE STAKEHOLDERS: ELECTRONIC COMMUNICATION LICENSEES

Name of Interviewer:

Name of Interviewee:

Method of interview:

Date:

AIM:

- *To understand how spatial planning policies on the deployment of electronic communication infrastructure for the private sector.*
 - *To gain an understanding on the impacts of statutory planning procedures on the private sector.*
 - *Insight on state of ICT development in South Africa*
-

1. What is your understanding of electronic communication infrastructure?

Answer:

2. How many years of experience do you have in your field?

- less than 3 years
- 4 – 5 years
- 6 – 10 years
- greater than 10 years

3. On average how many electronic communication applications do you process per month?

- less than 10
- greater than 10

4. Approximately how long does it take for you to receive a statutory planning decision for electronic communication infrastructure applications?

- less than 1 month
- 2 – 3 months
- greater than 4 months

5. Approximately how long does it take for you to receive a decision for electronic communication infrastructure development on municipal owned land?

- less than 1 month
- 2 – 3 months

greater than 4 months

6. What are the municipal challenges experienced when developing electronic communication infrastructure?

Answer:

7. The planning process or statutory planning relates to compliance with rules, regulations and policies which regulate land use. Land use planning is central to statutory decision making. Do you believe that statutory planning applications are necessary when developing electronic communication infrastructure?

Yes

No

Why?

8. How do you suggest the development of government-private stakeholder investment for the deployment of electronic communication infrastructure?

Answer:

9. Do you believe eThekweni Municipality is geared towards ICT development and the rapid deployment of electronic communication infrastructure which aligns to National Development Plan (NDP) Vision 2030's goal to expand ICT access?

Answer:

10. In your opinion, how can South Africa make significant progress towards the delivery of ICT and electronic communication access?

Answer:

11. What ideas, thoughts or suggestions do you have related to the study?

Answer:

Appendix E – DUT Ethical Approval



Institutional Research Ethics Committee
Research and Postgraduate Support Directorate
2nd Floor, Berwyn Court
Gate 1, Steve Biko Campus
Durban University of Technology

P O Box 1334, Durban, South Africa, 4001

Tel: 031 373 2375

Email: lvishad@dut.ac.za

http://www.dut.ac.za/research/institutional_research_ethics

www.dut.ac.za

16 March 2022

Mrs J Ramjith
69 Daffodil Crescent
Ladysmith
3370

Dear Mrs Ramjith

Spatial Planning in South African Municipalities for electronic communication infrastructure: A case of the eThekweni Municipality, Kwa-Zulu Natal, South Africa

I am pleased to inform you that Full Approval has been granted to your proposal.

The Proposal has been allocated the following Ethical Clearance number **IREC 007/22**. Please use this number in all communication with this office.

Approval has been granted for a period of **ONE YEAR**, before the expiry of which you are required to apply for safety monitoring and annual recertification. Please use the Safety Monitoring and Annual Recertification Report form which can be found in the Standard Operating Procedures [SOP's] of the IREC. This form must be submitted to the IREC at least 3 months before the ethics approval for the study expires.

Any adverse events [serious or minor] which occur in connection with this study and/or which may alter its ethical consideration must be reported to the IREC according to the IREC SOP's.

Please note that any deviations from the approved proposal require the approval of the IREC as outlined in the IREC SOP's.

Yours Sincerely

Prof J K Adam
Chairperson: IREC

Appendix F – Participant Consent Form



APPENDIX 2C: CONSENT LETTER

CONSENT

Title of the Research Study: Spatial Planning in South African Municipalities for electronic communication infrastructure: A case of the eThekweni Municipality, Kwa-Zulu Natal, South Africa

Principal Researcher: Jenisha Ramjith (BTech: Town and Regional Planning)

Statement of Agreement to Participate in the Research Study:

- I, hereby confirm that I have been informed by the researcher, **Jenisha Ramjith**, about the nature, conduct, benefits and risks of this study - Research Ethics Clearance Number: 007/22.
- I have also received, read, and understood the above written information (Participant Letter of Information) regarding the study.
- I am aware that the results of the study, including personal details regarding my sex, age, date of birth, initials and diagnosis will be anonymously processed into a study report.
- In view of the requirements of research, I agree that the data collected during this study can be processed in a computerised system by the researcher.
- I may, at any stage, without prejudice, withdraw my consent and participation in the study.
- I have had sufficient opportunity to ask questions and (of my own free will) declare myself prepared to participate in the study.
- I understand that significant new findings developed during the course of this research which may relate to my participation will be made available to me.

_____	_____	_____	_____
Full Name of Participant Thumbprint	Date	Time	Signature / Right

I, Jenisha Ramjith herewith confirm that the above participant has been fully informed about the nature, conduct and risks of the above study.

_____	_____	_____
Full Name of Researcher	Date	Signature

_____	_____	_____
Full Name of Witness (If applicable)	Date	Signature

_____	_____	_____
Full Name of Legal Guardian (If applicable)	Date	Signature